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# Allergology & Immunology

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## POLLEN ALLERGY

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***3rd September,*** POSTER SESSIONS
P_GM GENERAL MONITORING
P_RM REGIONAL MONITORING
P_PH PHENOLOGY
P_AA AEROAGRICULTURE

•

***4th September,*** ORAL SESSIONS
AA AERO-AGRICULTURE
FSP FUNGAL SPORES - PATHOGENS
FS FUNGAL SPORES - MONITORING
ME MELISSOPALYNOLOGY
PH PHENOLOGY

•

***5th September,*** ORAL SESSIONS
PLENARY SESSION
PATHOMECHANISM and CLINICAL PICTURES of POLLEN ALLERGY
POLLEN ALLERGY TREATMENT WITH REGARD TO POLLEN MONITORING
SPECIFIC IMMUNOTHERAPY - NEWS
ALLERGEN EXPOSURE and DIAGNOSTICS

•

***5th September,*** POSTER SESSIONS
P_H HEALTH IMPACT
P_ES ENVIRONMENTAL STUDIES
P_AM ALLERGEN MONITORING/CLIMATE CHANGE
P_FS FUNGAL SPORES
P_FM FOSSIL AND MODERN POLLEN RAIN

•

***6th September,*** ORAL SESSIONS
IN INDOORS
AM ALLERGEN MONITORING
RMP RAGWEED and MUGWORT problem
CC CLIMATE CHANGE

•

***6th September,*** POSTER SESSIONS
P_IN INDOORS
P_RMP RAGWEED and MUGWORT problem

•

***7th September,*** POSTER SESSIONS
ES_I ENVIRONMENTAL STUDIES
RM REGIONAL MONITORING
FM FOSSIL AND MODERN POLLEN RAIN

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3th September 2012 ORAL SESSIONS
OPENING SESSION

**Hialine project: allergen release from pollen across Europe**

Buters J.[1], Galán C.[2], Thibaudon M.[3], Smith M.[4], Brandao R.[5], Antunes C.[5], Torres C.[2], Albertini R.[6], Grewling L.[7], Rantio-Lehtimäki A.[8], Celenk S.[9], Sofiev M.[10], Sauliene I.[11], Cecchi L.[12]
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[5]University of Evora, Portugal
[6]University of Parma, Italy
[7]Adam Mickiewicz University, Poland
[8]University of Turku, Finland
[9]University of Uludag, Turkey
[10]Finnish Meteorological Institute, Finland
[11]Siauliai University, Lithuania
[12]University of Firenze, Italy

**Objectives:** Exposure to allergens is one of several factors determining sensitization and allergic symptoms in individuals. Exposure to aeroallergens from pollen is assessed by counting allergenic pollen in ambient air. However, proof is lacking that pollen count is representative for allergen exposure. Exposure to allergen is poorly monitored by only monitoring pollen count. Monitoring the allergen itself in ambient air might be an improvement in allergen exposure assessment as has been demonstrated in a prior study in the frame of the MONALISA project. The main objective of the HIALINE-project has been to implement an outdoor allergen early warning network, in addition to the pollen forecasts. Monitoring the allergens themselves together with pollen in ambient air might be an improvement in allergen exposure assessment. It has been also investigated whether meteorological factors in an effort to predict the effect of climate change on the allergenicity of pollen.
**Methods:** Airborne pollen and the major allergens from the top 3 airborne allergens in Europe (Phl p 5, Bet v 1 and Ole e 1) have been sampled across 9 European countries during 2009-11. Airborne pollen has been measured by using a Hirst type volumetric spore trap. Aeroallergens have been collected with a ChemVol®2400 high-volume cascade impactor, being extracted and analyzed by allergen specific ELISA´s. Particulate matter (PM) in ambient air was fractioned into >PM10 (XL) and 10 µm > PM > 2.5 µm (M). Allergen forecast has been calculated by incorporating the SILAM chemical transport model and compared with the observations of HIALINE.
**Results:** In general it has been observed similar profiles for airborne pollen and aeroallergens content in the air, being aeroallergens more associated to XL fraction stage. On the other hand, it has been detected allergenic activity out from pollen season, especially in the case of M stage. Smaller particles are more exposed to medium-long distant transport. Moreover, results have provides strong evidence that similar value of airborne pollen evokes different ambient air allergen loads in different geographical areas. Even more, when the same area is considered the allergen load of the pollen can vary within the season. Pollen differs in allergen release between European countries. Our study supports the importance of the aeroallergen quantification together with airborne pollen counts, in order to define the outdoor air allergenic load.
**Conclusions:** Under these results, the expected outcomes are the implementation of a network of European outdoor allergen measurements to better predict allergic symptoms. Also the climatic factors that govern allergen exposure in outdoor air will be established. These can be used to calculate the effect of climate change on the health effects of airborne allergens. Polleninfo.org offers a new tool on Patient's Hayfever Diary (PHD).

3th September 2012
GM.1

**Short-term effects of exposure to birch, grass and ragweed pollen on clinical symptoms of pollinosis in a panel study of 200 patients in France**

Thibaudon M.[1], Clot B.[2], Martin S.[3], Segala C.[3], Besancenot J.[1], Caillaud D.[4]
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[2]MeteoSwiss, Payerne, Switzerland
[3]SEPIA-SANTE, Baud, France
[4]CHU Clermont-Ferrand, France

**Objectives:** Few panel studies on the relationship between the concentration of airborne allergenic pollen and intensity of symptoms have been so far carried out with a significant number of hay-fever patients and adequate statistical methods. The present study aimed at comparing daily recorded symptoms of allergic patients with airborne pollen concentrations of birch, grasses and ragweed.
**Methods:** Three different panels were used: for birch 61 patients (March-April 2010), for grasses 106 patients (April-August 2010), and for ragweed 37 patients (July-September 2009 and 2010). RNSA and MeteoSwiss provided the pollen data. Statistical analysis for correlated data was used (Generalized estimating equations and Generalized additive mixed models) for the symptoms (rated from 0 to 3).
**Results:** The proportion of patients having symptoms to birch pollen with serious nasal, ocular and bronchial symptoms was linear up to pollen concentrations of 110, 70 and 70 grains/m3 respectively and reached a plateau above these thresholds. For an increase of 10 grains/m3, odds ratios (OR) were 2.01, 4.80 and 2.97, respectively. For grass pollen the increase in nasal and ocular symptoms was linear up to 80 and 90 grains/m3 respectively. An increase of 10 grains/m3 resulted in an increase of ocular and nasal symptoms (OD 1.06 and 1.08). The relation between bronchial symptoms and pollen was linear (OR: 1.026). The rate of patients with various types of symptoms increased in a linear and significant way with exposure to ragweed pollen, more in 2009 than in 2010. For an increase of 10 grains/m3, OR of ocular symptoms was 1.324 in 2009 and 1.049 in 2010. No trigger threshold was observed for any of these three pollen types.
**Conclusions:** The clinical response in sensitized patients exposed to pollen varied during the pollen season. With increasing birch pollen concentrations, nasal, ocular and bronchial symptoms increased up to a saturation point when symptoms were maximal for all patients. For grasses pollen, nasal and ocular symptoms similarly increased up to a saturation point. The relationships between bronchial symptoms and grasses one the one hand and all symptoms and ragweed pollens on the other are linear. This seems to be related to the slow but continuous increase in the number of patients having these symptoms throughout the season.

3th September 2012
GM.2

**Relationship between weather conditions and release of airborne allergen pollen and spores in Haifa (Israel)**

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[2]Department of Plant Sciences, Tel Aviv University, Israel

**Objectives:** Daily airborne pollen and fungal spores counts were collected over one year (1.2.06 – 31.1.07), using a Burkard continuous volumetric pollen trap, located in the center of neve-shaanan neighborhood in Haifa. Twenty one allergenic pollen types and twenty four spores' types were identified. Daily record of seven main meteorological factors (rainfall and sunshine, wind direction, Wind speed, air temperature, relative humidity and air pressure) were gathered too. The aim of the present study is to determine the main pollination / sporulation seasons (MPS) / (MSS), the peak periods (PP), and specific days (SD) for each type of pollen and spores were identified, and correlations with meteorological factors were done by using linear regression method. A total of 23,340 pollen grains were identified. Cupressus contributed 39.6% of the overall pollen grains, Pinaceae – 21.1%, Fagaceae – 11.4%, and the remaining 27.9% by 18 other species. Similarly, 86,970 spores were identified. Cladosporium contributed 42.3% of the overall spores, Ascospora 39.1% and the remaining 18.6% by 22 other species.
**Results:** The following tables represent the outcome of the linear regression calculated between the pollen and the spores airborne concentrations to the climatology parameters (mean daily temperature, relative humidity and air pressure) in three different time periods (main pollination seasons, the peak periods and specific days).
**Conclusion:** Meteorological factors like temperature, relative humidity and barometric pressure were found to have a correlation between them and various types of pollen and spores. The correlation is more significant at the main pollination / sporulation seasons. At the peak periods (PP), and specific days (SD), there were significantly less observations than at the MPS / MSS, which may be the cause for less statistical significance. This study has a major importance of improving the quality of life to those who suffer from allergies induced by airborne particles. By using common weather forecasts we can give an early warning when certain allergenic conditions will develop.

| POLLEN | MAIN POLLINATION SEASONS | | | PEAK PERIODS | | | SPECIFIC DAYS | | |
|---|---|---|---|---|---|---|---|---|---|
| | Temp | Rel. humidity | Air pressure | Temp | Rel. humidity | Air pressure | Temp | Rel. humidity | Air pressure |
| Cupressaceae | 0.35 | -0.38 | | 0.62 | | | | | |
| Olea | 0.51 | 0.33- | 0.27- | 0.77 | -0.67 | | | | |
| Poacea | 0.29 | -0.16 | | | | | 0.37 | | |
| Fagaceae | 0.33 | -0.19 | | | -0.37 | | | | |
| Pinaceae | 0.31 | 0.28- | 0.36- | 0.80 | | | | | |
| Artemisia | 0.21 | -0.20 | | | -0.46 | | | | |
| Parietaria | 0.19 | -0.12 | | 0.31 | | | | | |
| Uritaceae | 0.24 | | | | -0.34 | | | -0.58 | |
| Eucalyptus | 0.18 | -0.13 | | 0.36 | -0.41 | | | | -0.26 |
| Chenopodiaceae | 0.30 | 0.15- | 0.18 | 0.37 | | -0.22 | 0.34 | | |
| Mercurialis | 0.34 | -0.41 | | | -0.40 | | | | |
| Pistacia | | -0.28 | | 0.52 | | | | | |
| Brassicaceae | | | | | 0.29- | -0.34 | | | |
| Umbelliferae | | | | | -0.29 | | | | |
| Arecaceae | 0.17 | | | | | | | | |

| SPORES | MAIN POLLINATION SEASONS | | | PEAK PERIODS | | | SPECIFIC DAYS | | |
|---|---|---|---|---|---|---|---|---|---|
| | Temp | Rel. humidity | Air pressure | Temp | Rel. Humidity | Air pressure | Temp | Rel. humidity | Air pressure |
| Alternaria | 0.39 | 0.23- | 0.21- | 0.29 | -0.53 | | | | |
| Cladosporium | 0.33 | 0.17- | -0.17 | | -0.39 | -0.27 | -0.56 | | |
| Stemphylium | 0.27 | | | 0.42 | -0.41 | -0.35 | | | |
| Bipolaris | 0.30 | -0.15 | | | -0.38 | | | -0.43 | |
| Ascospora | 0.25 | | 0.25- | 0.26 | | -0.33 | | | |
| Epicoccum | 0.30 | | -0.26 | | | -0.23 | | | |
| Chaetomium | 0.25 | -0.17 | | | | | | | |
| Nigrospora | 0.19 | | -0.12 | | | | | | |
| Rust | 0.19 | | -0.13 | | -0.33 | | | | |
| Beltrania | 0.19 | | | | | | | | |
| Johnson Grass Smut | | | -0.25 | 0.28 | | -0.38 | | | |
| Periconia | | | -0.18 | 0.38 | | -0.24 | | | |
| Circinotrichum | | | | 0.20 | | -0.27 | | | -0.30 |
| Agaricus | | | | | -0.19 | | | | |
| Arthrinium | | | | | | | 0.65 | | |
| Oidium | | -0.11 | | | | | | | |

3th September 2012
GM.3
**POLLnet, the aerobiological network of the Italian Environment Protection Agencies**

Bucher E.[1]
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**Objectives:** In the past aerobiological monitoring in Italy was carried out mainly by research institutes and national health agencies. Since the foundation of the Environment Protection Agencies in the nineties, monitoring of biological particles in air is considered more and more as an aspect of air quality control. First efforts for national collaboration on aerobiological monitoring have been national meetings organized by the Institute of Environmental Protection and Research (ISPRA) more than ten years ago.
**Results:** With the project POLLnet (2002-2005) began the concrete collaboration of Regional/ Provincial Environment Protection Agencies (ARPA/APPA) to promote aerobiological monitoring: ARPA Emilia Romagna started to work on a regional forecast model based on meteorological and aerobiological data, and APPA Bolzano developed a web application (with ORACLE database) for data processing and prepared first drafts for the national web pages. Finally, in 2010 the topic "pollen network" was introduced in the triennial program of the institutional system, an essential step to support the collaboration. During the period 2010-2011 progresses were obtained with the appointment of regional representatives and the creation of different working groups on quality, software and website, communication and forecast models. In 2011 the quality working group of POLLnet, supervised by ARPA Emilia Romagna, conducted a regional intercalibration exercise regarding pollen grains recognition and counting with the participation of 19 laboratories from four ARPA. The regional forecast model of Emilia Romagna, based on the concept of neural networks, was further calibrated, and first results are promising. The web application has been further improved facilitating the publication of the pollen bulletin and data elaboration with standardized reports. The POLLnet website has been developed and moved on the domain www.pollnet.it. The homepage informs about upcoming events as well as the activity of the working groups. Furthermore it offers links to the regional and international pollen information services, scientific associations and aerobiological brochures online. The botanical schedules with pollen and plant descriptions are still in elaboration. A special reserved area is dedicated to the storage of technical documents like meeting protocols or software news. At the present (2012) over fifty aerobiological monitoring stations, associated to fifteen ARPA, are present on the POLLnet web pages with detailed description and information about the monitoring sites. All participating stations are committed to publish their pollen bulletin online weekly, possibly within Wednesday. Probably due also to announcement of the national pollen information service in local and national media, the POLLnet website registered almost 7000 visitors in the period from June to December 2011.
**Conclusions:** The POLLnet network could offer an efficient national pollen information service as many ARPA dispose already of appropriately trained staff. Because of the national austerity measurements it is absolutely necessary that the collaboration for the national network is assigned a legal background and aerobiological monitoring is considered no more a voluntary but an officially ARPA activity. Furthermore, for a better organization and standardization of the aerobiological monitoring a management and quality manual must be prepared as soon as possible.

3th September 2012
GM.4
**How can the weather conditions influence the grass pollen concentrations? A 20 year period of observations in Krakow, Poland**

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**Objectives:** It is assumed, that the meteorological conditions influence the pollen concentrations of anemophilous plants. The evaluation of the relationship between grass pollen concentration and meteorological conditions is truly important from the medical and forecast arrangement point of view. To go into the problem of grass pollen behaviour in relation to the weather conditions, the synoptic situations, as independent variables, should be also taken into consideration. The aim of the study was to find the relationship between maximum grass pollen concentration, the days with the increase and decrease in pollen concentration and the concentration over the threshold value and the weather conditions in Krakow, in 1991-2010.
**Methods:** The volumetric method of sampling (Burkard/Lanzoni trap) was used to obtain the grass pollen concentrations in Krakow in 1991-2010. Pollen grains were counted using a 4 horizontal line method. The pollen concentrations were analysed in relation to synoptic situations according to classification by T. Niedźwiedź (circulation types, air masses and atmospheric fronts) and to selected meteorological elements. The correlation was searched for which would reflect the expected dependence of pollen influx on the weather. To filter out other, obvious dependencies, like that connected with plant growing seasons, relative increases of pollen were correlated with the relative changes in weather. Namely, the pollen amount was categorized in a way that daily decrease/increase by the factor of 1.5 was coded by -1/+1, while the remaining days (relatively stable) were coded by 0. Both day types compared had to have at least 5 pollen grains. Somehow in a similar way the meteorological elements were coded. The binarized quantities were correlated, the deeply significant correlations were found between grass concentrations and maximum temperature ($p<0.00001$).
**Results:** The weather in the days preceding maximum concentrations in Krakow in the studied period was influenced mainly by the high pressure system (60%), especially by anticyclonic wedge (Ka; 45%), while in the days with maximum concentration the frequency of anticyclonic situations was lower (Ka – 25%; other anticyclonic – 15%). The weather conditions influencing the highest pollen concentrations (>65 pgm-3) were: high temperature (Tmax>25°C), low relative humidity (mean daily value <65%), moderate cloudiness, high relative sunshine (>75%) and no precipitation. The strong significant correlation between the daily increase/ decrease in pollen concentration and air temperature (Tmax, Tmin, T at 18 UTC) was found. The concentration increase was related to the anticyclonic wedge (Ka) and was influenced by both polar maritime old and polar continental masses occurrence (PPms, PPk), whereas days with the concentration decrease were related to the cyclonic situations with an advection of air masses from northwest or southwest (NWc, SWc).
**Conclusions:** The grass pollen concentrations were mainly influenced by air temperature, in a less degree by precipitation, cloudiness and sunshine. The maximum pollen concentrations and the days with the pollen increase/decrease were related to the anticyclonic situations, especially anticyclonic wedge (Ka).

3th September 2012
MM.1
**Evaluation of recovery programs in endangered Artemisia species using pollen records as an indicator**

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[2] Environment and Water Agency, Consejería de Medio Ambiente, Rural y Marino, Junta de Andalucia, Spain
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[4] Department of Geodiversity and Biodiversity, Delegacion Provincial de Granada, Consejería de Medio Ambiente, Rural y Marino, Junta de Andalucia, Spain

**Objectives:** Genus Artemisia is present in Granada province (Spain) by 9 species: A. absinthium, A. alba subsp. nevadensis, A. chamaemelifolia, A. umbelliformis, A. granatensis, A. campestris subsp. glutinosa, A. caerulescens subsp. gallica, A. barrelieri and A. herba-alba. Due to a high specificity of habitat, degree of endemicity, as well as an intense collection of species with medicinal interest, some of the species are in high risk of extinction, being catalogued in Atlas and Red Books of Threatened Flora with the maximum IUCN Categories: CR (A. granatensis), EN (A. umbelliformis) and VU (A. alba, A. caerulescens). This work analyses the Artemisia pollen data series from the Aerobiological Sampling Unit at the University of Granada with the aim of establishing the aerobiological dynamic of the pollen in the air and its relation with meteorological parameters, as well as to identify the success and efficiency of the Recovery Programs for Threatened Flora carried out by Regional Administration, using the pollen records as biological indicators.
**Methods:** Daily Artemisia pollen records from 1992 to 2010, recorded in the Granada Sampling Unit have been analyzed. For the same period, meteorological parameters for the nearest station supplied by AEMET have been considered. The information regarding the Recovery Programs comes from the Office of Program of Recovery of Threatened Flora in High Peaks of Andalusia, Environment and Water Agency, started in 2001, which have reinforced populations of the 3 most threatened species by direct planting and sowing.
**Results:** Artemisia pollen is present in the atmosphere of Granada in two periods along the year: winter and summer. The summer period corresponds to the flowering of the species forming part of the orofilous and criofilous (high peaks above 2.500 m) vegetation; Principal Pollination Period lasts from mid-July to the end of September, with a very variable length: from only a few days to more than 60 days; seasonal peaks may also oscillate from only 2 pollen grains to 45 in some years. Pollen Index during the series has been also very variable showing a clear relationship with the presence of precipitations in the immediate periods prior to flowering. Regarding the Programs of Recovery, it has been observed a higher effectiveness, measured in terms of pollen emissions, when germinated seedlings instead of seeds were introduced into the land. As the introduced plants need some time of adaptation and surviving, the pollen records emitted for the new individuals are observed two years after introduction.
**Conclusions:** The pollen records may be used as parameter to assess the effectiveness and success of Programs and Recovery Plans carried out with some species in high risk of extinction due to they are indicative of an adequate reproductive development, one of the factors to be considered at time to estimate possibilities of surviving.

3th September 2012
MM.2
**Comparison of three different analysing methods of Hirst slides**

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**Objectives:** Daily pollen counts, produced for daily forecasting, require a quick and economic subsampling method in slide counting. Moreover, results should be comparable and independent on the method. In this study we have compared time efficiency and equivalence of three different methods to count particles on Hirst slides: (1) longitudinal transects (LONG), (2) bi-hourly transversal transects (TRANS), and (3) bi-hourly stratified random sampling (SRS).
**Methods:** Four taxa, different in size, shape, frequency, and degree of aggregation were counted: Betula and Pinus in 12 slides, Cladosporium spores and Artemisia in 9 slides. The slides were chosen randomly from peak season of each taxon. Several (4) analyst counted the slides (400x, wide-field), and time consumed was registered. In methods LONG and TRANS counting was done from a continuous sweep, in SRS from 96 random fields, 8 from each 2-hour period. The sampling areas were 65, 103, and 21 mm2, respectively. To test equivalence, 95% CI of differences between methods were defined using Poisson regression (proc genmod, SAS, version 9.3). The sampling area per slide was used as an offset and slides were considered as repeated effect, nested with bihourly counts in methods TRANS and SRS. 10% and 20% of estimated mean were used as equivalence margins.
**Results:** The acceptance of equivalence between the methods varied in different taxa. With equivalence margin of 10%, TRANS and SRS proved to be equivalent in all taxa with high counts, i.e. Betula, Pinus and Cladosporium. With this precondition, method LONG was not equivalent to other methods. While counting Artemisia, a taxon with remarkably lower concentrations, all methods were non-equivalent. With equivalence margin of 20%, all methods were equivalent to each other in Betula, Pinus and Cladosporium. In Artemisia counting, methods LONG and SRS differed from each other but the TRANS was equivalent to both of them. The time consumed was dependent on taxa: for quickly recognisable Pinus pollen, the method LONG was fastest, the analysis of smaller Betula pollen needed equal time in the SRS and LONG. The SRS was most economical for high Cladosporium counts.
**Conclusions:** Methods TRANS and SRS proved to be consistent even though sampling area in SRS was only 32% of the area analysed in TRANS. This is mainly due to similar bi-hourly sampling tactic, which considers diurnal variation. In this study, though it is possible, diurnal variation was not recorded in the method LONG resulting in decreased equivalence to other methods.

3th September 2012
MM.3
**Bi-colour staining in aerobiology: identification of pollen and evaluation of physiological state**

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**Objectives:** In aerobiology the staining of samples targets on easy discrimination between biological material and inorganic particles. Colouring supports the identification and thus counting of the organisms according kind and species. But it became evident, that the pure number of pollen does not reflect their challenge to allergic patients. Additional information on the biological status of the pollen, assessable from content of non structural proteins, is desirable. The bi-colour staining solution aroprot® reveals differential staining of pollen according to certain morphological features and also to their physiological state. This marks the species of a single grain as well as e.g. its vitality, maturation and may be allergenic load of the grain.
**Methods:** The two dyes in aroprot® bind to proteins: the green one binds to the neutral proteins of the surface and the second violet has affinity to the free amino groups in the cytoplasmic compartment of the pollen.
The biological material selected for an analysis were 1) air sample collected with a Hirst-type trap in Warendorf, Germany 2) olive pollen collected in olive plants at Spoleto, Italy and 3) maize pollen collected from plants grown in a greenhouse in Sassenberg, Germany. Samples were prepared according to aerobiological standards. PEA mixed with aroprot® was from by a.e.r.o.medi B.V., Netherlands. For the maize pollen, the physiological state was evaluated in tubular growth assay on agar dishes according to Warden (In: The Maize Handbook, 1974). Measurement of colour intensity and distribution pattern for single pollen grains was made with a microscopic image analysis system (PCS) developed for a.e.r.o.medi B.V., Netherlands.
**Results:** The analysis of microscope images from aerobiological standard samples proved: 1) Easy recognition of particles of biological origin: Dander colours blue, pollen exine stains green and the appropriate cytoplasm pink to violet. 2) About 95% agreement of measured and eye counted total pollen numbers. 3) A distinct and reproducible pattern of differential staining by 'aroprot®' in pollen: In samples of olive pollen released in middle of June, the new microscopic system discriminated 72% full stained, 16% semi-stained and 12% unstained grains. This corresponds to ocular observation: 65% full – 14% semi-stained versus 21% unstained grains. 4) Shifts in the staining of maize pollen populations can be related to altered ability of tubular growth.
**Conclusions:** The bi-colour staining of aerobiological material with aroprot® discloses more information on single organisms. Morphological features become more obvious and additionally the physiological state of organisms is indicated. To gather this additional information an automated colour analysis of microscope images is required. But this way analysis of pollen become objective and rapid, additionally the differences in staining can be precisely discriminated. Analysis of staining' with aroprot® enables detailed studies on the influence of origin, environment, climatic conditions, transport etc. on pollen physiology.

3th September 2012
MM.4
**Computer aided analysis and assessment of pollen**

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**Objectives:** Analysis, interpretation, and assessment of pollen are time consuming and labor intensive processes that demand skill and deep knowledge of the involved employees. Due to the increasing computational power of today's computers, the availability of affordable digital cameras, and new methods from computer science, it is possible to transfer these processes to a computer system. We will present the combination of a new, inexpensive multi-feed microscope and a computer system to automate the analysis, interpretation, and assessment of pollen. We will give examples that show the excellent performance of the system.
**Methods:** Microscopic images of a sample on a microscope slide are taken by the newly developed multi-feed microscope. Up to ten slides can be put on the sample tray for automated analysis. Using a digital camera, high resolution images of the sample are taken. Coverage of the whole slide is up to user's demands. The samples are stained, subject to the used staining solution. Depending on the staining solution an optimal transformation of colour images to contrast value images is performed. Each image is segmented using sophisticated, adaptive snake algorithms from digital image processing. As a result of the segmentation process, each single pollen can be clearly separated from each other and other particles, even in the case of pollen clusters. The shape of the cell and the texture of the cytoplasm carry important information about type and vitality of the pollen. We use methods from texture based image processing and geometrical measures to determine features of the pollen that correspond to biological properties. These features are used in a fuzzy logic rule based system to implement the mapping of mathematical features onto biological features. Fuzzy logic is used, because it is a kind of mathematical logic, which allows the use of uncertain and imprecise data that is typical for the analysis of biological samples. In addition, fuzzy logic rule bases are self-explanatory due to their relation to natural language. The fuzzy logic based system allows the explanation of found results, to support further development of the knowledge base.
**Results:** The combination of the multi-feed microscope and the computer system was used to analyze samples of e. g. Urtica dioica. Up to 400 pollen, located in a single image, could be clearly separated from each other, processed by the system, and classified into three different classes, depending on the texture of the cytoplasm. The accuracy of the separation process is almost 100%, i. e. almost each single pollen could be separated from the others. Time needed for the whole process of pre=processing, segmentation, measuring, and classification were less than two minutes. These results are reproducible for other pollen, too.
**Conclusions:** The combination of an affordable, but accurate multi-feed microscope and a sophisticated computer system allows the fast and reliable assessment of pollen. Due to the multi-feed microscope, up to ten slides can be analyzed, without human interaction.

3th September 2012
MM.5
**Comparison of two portable samplers for airborne viable fungi**

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**Objectives:** A great variety of samplers and methods have been used to monitor airborne fungi and other bioaerosols. Sampling with viable methods usually do not enable a continuous sampling and the days and hours of sampling should be appropriately selected. Nevertheless, it is possible a more accurate identification of some fungi that grow in the media selected. The aim of the present study was to compare the results of one year of simultaneous sampling with two personal samplers with different intake flow rate and number of holes in the sieve.
**Methods:** Two personal traps were used, Sampl'air from AES Chemunex company and personal sampler of Petrid dish from Burkard, both with a sieve of respectively 258 and 100 holes of 1 mm diameter close to the Petri dishes, and an intake air flow respectively of 100 and 20 litres per minute. Sampling was taken weekly on a terrace of a 16 m height building, in Science Faculty, Badajoz (SW Spain) from March 2010 to July 2011. Sampling time was 1 minute for AES and 10 minutes for Burkard, both simultaneously at solar midday. Malt extract agar (MEA) with chloramphenicol was used as growing media. After 5-7 days at 27°C, colonies were counted and identified. Data were given as Colonies Form Units (CFU) per cubic meter. As data did not follow normal distribution, they were statistically analysed using Spearman correlation and Kruskal-Wallis tests. Meteorological data were used to analyse any possible relationship with rain, temperature, solar radiation, wind speed and relative humidity.
**Results:** Total daily average concentrations were between 342 CFU/m3 for AES and 347 CFU/m3 for Burkard. More than 80 taxa have been identified. The four genera more important in decrease order of concentration were Cladosporium, Alternaria, Penicillium and Aspergillus, the last two with similar concentrations. The highest concentration of spores was detected in the atmosphere in spring and autumn and the lowest in winter and summer (with similar data in both seasons). Seasonal comparisons using the non parametetric Kruskal-Wallis test for the total data showed differences for AES and did not show differences for Burkard and for the four fungus types separately. For the daily data, there were significant positive correlations between the two samplers for the total concentrations and for fungus types separately. The analysis of correlations with the meteorological data did not show any significant correlation with the total concentration for both samplers, while Aspergillus, for both samplers, was negatively correlated with solar radiation.
**Conclusions:** It seems that both samplers recorded the same number of colonies, so that both would be equally efficient. The highest total concentrations of airborne spores were found in spring and autumn and also for the four main types of fungi studied. Meteorological data did not seem to affect the total concentrations. Only with Aspergillus were found negative correlations with solar radiation in both samplers.

3th September 2012
MF.1
**Empirical investigation of pollen dispersal characteristics using an isolated source**

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**Objectives:** The increasing prevalence of allergen-related diseases in Europe calls for pre-emptive measures for the benefit of affected people. Therefore, great interest is focussed on high-detailed allergenic pollen forecasts. Current full physical transport and dispersion modelling can provide pollen forecasts with full spatial coverage. The most important shortcoming in these models however, is the description of emissions. The quantification of pollen emissions, description of dispersion characteristics and determination of the governing meso-scale and micrometeorological factors are subject of the present project MicroPoem, which includes experimental field work as well as numerical modelling.
**Methods:** In order to have a well-defined source location, an isolated birch stand with a persistent wind direction during day and night time was chosen for the set-up of a 'natural tracer experiment', which was conducted during the birch pollen season 2009. Several micrometeorological towers were operated up- and downwind of this source and an array of 26 pollen traps was laid out. Additionally, the lower boundary layer was probed by means of a sodar and a tethered balloon system. The background and downwind distribution of the isolated source is addressed in detailed using a 2-d and 3-d Eularian/Lagrangian CFD model. The CFD model and an additional Lagrangian model valid for non-neutral conditions are then to determine dispersion characteristics. In order to infer the emission of the source from measured concentrations, the background fraction of the observed pollen numbers needs to be known. The background concentration of pollen is notably influenced by roughness elements due to their impact on the wind field and ability to trap pollen. Hence, the downwind distribution of the background pollen concentration on the leeside of the wind break (i.e., the isolated source) is addressed using a CFD model.
**Results:** The maximum background fraction measured downwind of the isolated source is only around 10% and decreases with distance from the tree stand due to settling. Hence, the largest background concentrations are found close to the stand. The range of influence of the background concentration on downwind measurements is strongly dependent on wind velocity and the roughness length (z0) in the downwind area. For wind velocities <6ms-1, background pollen travel only up to 25 times the canopy height until they settle. Higher roughness supports suspension, resulting in longer travelling distances of the background concentration, whereas a low z0 supports settling. Pollen that are moving above the canopy are less decelerated by the wind break and thus are mostly transported over longer distances. In general, the results indicate a very strong impact of the wind break as well as the trapping effect on the downwind dispersion of background concentration.
Conclusions: The present study provides useful insight into the characteristics of pollen dispersion. The results help to estimate the emission of birch pollen and their spatial distribution. The knowledge can be used to identify the fraction of locally emitted pollen in observational data and thereby quantify long-range transport. The quantification of the emission as function of meteorological factors improves the accuracy of existing forecast models.

3th September 2012
MF.2
**The Danish operational pollen forecasting system**

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**Objectives:** In 1977 continuous monitoring of airborne pollen was started in Denmark, and since 1981 public pollen forecasts of birch, grass and mugwort have been performed for Copenhagen, Zealand, and from 1983 also for Viborg in Jutland. The public pollen forecast is site specific and gives the average concentration for the following day expressed in three levels: low, moderate and high. The traditional official public pollen forecasts in Denmark are produced by the DMI meteorologist on duty in collaboration with the aerobiologist from AAD. The forecast is based on the weather forecast, the actual pollen counts and statistical material on the correlation between meteorological parameters and pollen concentrations. The main objectives were in the first phase to develop a new automatic pollen forecasting system, called HIRPOL, based on data from DMI-HIRLAM, and in the second phase to develop and implement the fully dynamical on-line integrated modelling system called EnviroPol based on the Enviro-HIRLAM developed at DMI.
**Methods:** The HIRPOL system is based on statistical relations between meteorological variables, pollen emissions and pollen concentrations. The meteorological data are taken from the meteorological numerical weather prediction model DMI-HIRLAM with a horizontal resolution of 5 km – later improved to 3 km. Vegetation maps and land use data are generated for the DMI-HIRLAM model system utilising data from the CORINE database with 1 km resolution – later improved to 100 meter resolution. The EnviroPol system is based on the Enviro-HIRLAM developed at DMI in cooperation with the Finnish Meteorological Institute and other European partners. It is an advanced dynamical on-line integrated model system for meteorology and pollen covering the pollen emissions, atmospheric transport, dispersion and deposition of pollen particles.
**Results:** In the summer 2005 the automatic forecasting system, HIRPOL, was launched on the public internet (http://www.pollenprognoser.dk) giving much more detailed information on the expected pollen concentration of grass and mugwort in Denmark every 6 hour up to two days forecast ahead. Since 2006 the automatic system also included the forecast of birch pollen. Since 2009 the modelling system was improved by the implementation of the EnviroPol system for birch. In 2011 the dynamical model system was further developed also to include pollen from grasses and mugwort. Detailed data for more than 500 sites are presented on http://www.dmi.dk during the season. Verification of data for Copenhagen and Viborg shows fairly good results especially for Copenhagen with correlation coefficients up to around 0.80.
**Conclusions:** The forecasting system is robust and gives fairly good and reasonable results. Especially during the pre-season the dynamical system, EnviroPol, is superior compared with the old statistical system, HIRPOL. During the main season the differences are not so distinctive. The system and results will be presented and discussed.

3th September 2012
MF.3
**Platanus pollen season in Andalusia (southern Spain): trends and modeling**

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**Objectives:** Clinical studies have identified Platanus as a major cause of pollen allergy in many Spanish cities. The present study reports an analysis of Platanus pollen season throughout Andalusia region (southern Spain), which has among the highest pollen counts and the highest incidence of Platanus-related allergies in Europe. High airborne pollen counts in Andalusia reflect not only the abundance of Platanus but also the considerable pollen production of these species. The main aim was to analyze pollen season trends from 1992 to 2011 in Andalusia; Different regional and local models were also constructed to forecast the start of the season. The effect of climate on plant phenology has been studied analyzing possible trends and modeling the response of plants to climate.
**Methods:** Daily pollen counts were recorded using Hirst-type volumetric spore-traps. Daily pollen counts were obtained for a period from 11 to 20 years depending on the site (1992-2011), following the methodology proposed by the Spanish Aerobiology Network.
**Results:** Pollen season start-dates were very similar at all sites, usually occurring in March. The pollen season was delayed over the study period. Pollen-season duration tended to be longer. Pollen index has generally increased in the study period. The starting date for temperature accumulation was around 10 February although threshold temperatures varied by site. The global regional model for Andalusia failed to provide sufficiently accurate results compared with sub-regional or local models. For modeling purposes in Andalusia region, three sub-regions are recommended: Inland, East Coast and West Coast.
**Conclusions:** Interest in Platanus is increasing because its widespread use has led to high pollen counts, with the consequent implications for pollen allergy suffers. Temperature is the parameter most influencing airborne pollen counts. The pollen season start-date showed a progressively delayed onset influenced by a trend towards lower temperatures. The percentages of variance explained by local models were greater than those explained by regional and national models although acceptable results were obtained using the proposed regional model.

3th September 2012
MF.4
**Predicting pollen movement and viability using atmospheric models**

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**Objectives:** Adoption of genetically modified (GM) crops has raised concerns that GM traits can accidentally cross into conventional crops or wild relatives through transport of wind-borne pollen. In some cases, such as production of plant-made pharmaceuticals (PMPs), there is concern over even small probabilities of outcrossing. To assess this risk it is necessary not only to compute the transport and dispersion of pollen but also to recognize that pollen is a living organism that becomes non-viable as it loses moisture. Therefore our objective is to construct a method that predicts both pollen transport and pollen viability.
**Methods:** The Lagrangian approach is well suited to this challenge because it allows diagnosis of environmental conditions that pollen grains experience as they travel. We take advantage of this capability by combining a high-resolution version of the Weather Research and Forecasting (WRF) meteorological model with a Lagrangian particle dispersion model to predict maize pollen dispersion and viability. WRF is used to obtain fields of wind, turbulence kinetic energy, temperature, and humidity. These fields are then used as input to the Lagrangian dispersion model which predicts transport of tracer particles that represent a statistical sample of a pollen cloud. We diagnose vapor pressure deficit at each point along the path of each tracer particle (i.e., virtual pollen grain), from which changes in moisture content of the pollen grains and consequent loss of viability are calculated.
**Results:** Small amounts of pollen were predicted to be transported 5 km or more from the source. Previous estimates of maize pollen transport using only surface conditions have predicted transport only to a few tens of meters, owing to the large terminal fall speed of maize pollen grains. Conversely, we found that strong updrafts in the convective boundary layer (commonly known as „thermals") can lift maize pollen grains to heights of several hundred meters. This allows the grains to be transported long distances before settling to the ground. Pollen lifted into the upper part of the boundary layer also was predicted viable longer than has been inferred from surface observations of temperature and humidity. This occurs because temperature decreases with height in the daytime atmospheric boundary layer approximately as the dry adiabatic lapse rate, while absolute humidity remains approximately constant with height. Therefore, the upper part of the daytime boundary layer has a low vapor pressure deficit which prevents pollen from drying out and helps preserve its viability. These results are consistent with measurements using both piloted and remote-controlled aircraft that have shown the presence of viable maize pollen through the entire depth of the convective boundary layer.
**Conclusions:** We conclude that pollen dispersion is affected not just by the surface winds and turbulence but that the full three-dimensional dynamics of the turbulent atmospheric boundary layer should be accounted for in predicting pollen transport. Our results also illustrate the complex interplay between the physical processes and biology, in that the thermodynamic structure of the atmospheric boundary layer allowed maize pollen to retain its viability.

3th September 2012
MF.5
**Optimizing temperature sum models for operationally forecasting the start of flowering**

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**Objectives:** The start of the pollen season is known to vary from year to year. In central Europe species such as hazel and alder can start flowering as early as January or as late as March depending on the course of the winter. Forecasts of the start of the pollen season can assist allergy sufferers for the timing of medicine intake and for planning the leisure time. A widely used method to forecast the start of flowering is temperature sum modelling. Daily temperatures are added up until a certain threshold is reached, indicating the start of the flowering season. We present analyses to optimize temperature sum models designed to predict the start of flowering.
**Methods:** Designing temperature sum models involves selecting the starting date for the temperature sum, the base temperature and possible weights. In case of chilling, similar decisions have to be taken for the chilling variables. Additionally, a definition for the start of flowering has to be used. Using pollen and temperature data from 12 Swiss pollen stations we tested all possible combinations of the above mentioned variables to find optimal temperature sum models for hazel, alder, ash, birch and grasses. The analysis was based on the years 1982-2011. For some stations, however, data was not available back to 1982. The variables were discretized so that approximately 150'000 models were tested, depending on the species. With chilling around 250'000 combinations were computed. The performance of the temperature sum models was assessed using the cross-validated mean absolute error scores (MAE). The whole analysis was calculated using the statistical computing language R.
**Results:** The best models were achieved for birch (Betula) with a MAE of approx. 2 days. For ash (Fraxinus) and grasses (Poaceae) the MAE of the optimized models attained values of 2-4 days, for hazel (Corylus) and alder (Alnus) 2-5 days. The inclusion of chilling could not improve the results. The optimized models were used for operationally forecast the start of flowering for hazel, alder, ash, birch and grasses.
**Conclusions:** The forecasts were updated daily from the start of January 2012 and were published on the webpage of MeteoSwiss. For the daily forecasts the observations were extended in time using Kalman-filtered temperature forecasts from the IFS weather model and the climatology thereafter. This way it was possible to update every day the forecasts of the start of flowering for the five species. The closer the flowering date was approached, the higher accuracy was achieved.

3th September 2012
MF.6

**Predicting the start of the birch and oak pollen seasons in Poznan, Poland using thermal time models**

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**Objectives:** Birch (Betula sp.) and oak (Quercus sp.) are related genera belonging to the Fagales order. Their pollen grains are an important cause of allergy. In Poznań, birch and oak pollen seasons start dates can vary markedly from year-to-year. It is therefore important to define the main parameters responsible for pollen season variation and describe the relations between these factors and the growth rate of male inflorescences. Once these parameters have been established it is possible to construct forecast models that can be used during allergy treatment and prophylaxis.
**Methods:** Daily average Betula and Quercus pollen counts (1996-2010) were collected in Poznań by volumetric spore trap of the Hirst design. The data set was divided into two subsets: (1) 1996-2007 for model construction; (2) 2008-2010 for model validation. Models used in this study were based on the hypothesis that bud ontogenesis begins when dormancy is completed and requires a light signal. Day of the year (DOY) as an operational variable for the light signal (critical day length) was applied. Daily mean, maximum and minimum temperatures were used as independent variables. Three different functions describing the relation between temperature and the rate of ontogenesis were applied: linear, power and sigmoidal. The model parameters were fitted by minimizing the RMSE in the parameters space using an evolutionary algorithm in Solver add-in for Microsoft Excel.
**Results:** The best models for predicting the start of Betula pollen season obtained high R2 values (0.871-0.923) and low RMSE (from 2.33 to 2.8). The estimated critical day length varied between 9h 35min to 9h 55 min (41-46 DOY). The validation of models showed that the differences between observed and predicted start dates of birch pollen seasons were: 1 day in 2008, 0 day in 2009 and 4 days in 2010.The thermal time model prepared for forecasting the start of oak pollen seasons also obtained high R2 values and low RMSE (R2>0.9 and RMSE<1.5). In the best model the calculated critical day length was 12h 30min (84 DOY). This model used mean daily temperature and power function as independent variables. The validation of the model gave very good results. In 2008 and 2009 the differences between estimated and observed start dates was 1-2 days. The highest differences were in 2010 (from 5 to 7 days).
Conclusions: The goodness of fit of thermal time models was very high (RMSE<2.5 and R2>0.9). The differences between estimated and observed start dates varied from 0-6 days. The models revealed that the most important factors governing the start dates of oak and birch pollen seasons were: (1) critical day length; (2) the values of daily temperature. The application of different types of function between growth rate and temperature did not have a marked influence on the goodness of model data fit.

3th September 2012
MF.7

**The numerical pollen dispersion model COSMO-ART: model design and operational use at MeteoSwiss**

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**Objectives:** In Europe, about 15% of the population suffer from pollinosis. Pollen forecasts are a helpful tool for medical doctors to advise their patients. In addition, pollen forecasts can assist allergy sufferers to plan their leisure time and the medicine intake which reduces the symptoms. This highlights the need for regionally and temporally detailed pollen forecasts.
**Methods:** Numerical pollen dispersion models such as COSMO-ART (COnsortium for SMall-scale Modeling – Aerosols and Reactive Trace gases; [1]) can provide spatially and temporally highly resolved pollen forecasts. COSMO is a non-hydrostatic mesoscale model that is used in operational weather forecasts in a number of European weather services including those of Switzerland and Germany. The ART module describes the chemical reactions and the aerosol dynamics as well as the pollen emission and dispersion processes. We present the main features of the pollen module of COSMO-ART. A phenological heat sum model is used to predict the start and the end of the pollen season. This model performed very well in the verification process with an average accuracy of 2-3 days. The pollen season is described by various sigmoidal functions. The parameterization of the pollen emission is superposed on these seasonal factors and depends strongly on the meteorological conditions. The calculation of the settling velocity takes into account that the pollen grains can hydrate or dehydrate. An important input to COSMO-ART is the source distribution. However, this input is not available for the allergy-relevant species such as hazel, alder, birch, grass or ragweed. Hence, plant distribution datasets need to be derived from suitable sources. For birch and grass we used the dataset by Pauling [2]. The source distribution for grass pollen was produced using a similar method.
**Results:** During the birch pollen season 2011, COSMO-ART was operational at MeteoSwiss for the first time using horizontal resolution of 7km. Good agreement with the observations was achieved at many, though not all, observation sites. In addition, grass pollen were in a test phase in the same year. We will present the results of the birch and grass pollen season 2012. Verification is done through rigorous comparison with observations and the calculation of skill scores. Moreover, the results of COSMO-ART are compared with statistically based pollen models and traditional man-made forecasts.
**Conclusions:** Future developments of COSMO-ART include the increase of the spatial resolution to 2km. This will significantly improve the results especially in complex terrains such as the Alps. Additionally, further allergy-relevant species such as ragweed will be modelled on an operational basis.
**References**
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3th September 2012
MF.8

**Pollen emission in the numerical weather pollen prediction system COSMO-ART**

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**Objectives:** Forecasting pollen concentrations a few days in advance helps allergy patients to adapt their outdoor activities and allergy treatments. Nowadays, pollen forecasts are mainly based on pollen monitoring, weather forecasts and climatological information about the state of the pollen season. A very recent approach is the incorporation of pollen grains into numerical weather prediction systems that are able to calculate the emission, transport and deposition of pollen grains explicitly. The advantages of these systems lie in their spatial and temporal resolution and the capacity to forecast pollen concentrations a few days in advance.
**Methods:** The model system COSMO-ART is an extension of the numerical weather prediction system COSMO which is used for operational weather forecasts by several national weather services. The ART extension was developed by the Karlsruhe Institute of Technology to investigate aerosols and reactive trace gases and their interaction with meteorological variables. It also includes, among others, a module that allows the computation of pollen concentrations. This module includes an emission parameterization that shows some drawbacks when applied to small plants, such as ragweed or grasses. We therefore developed a new parameterization of the emission process which aims to overcome these drawbacks and can be used for any kind of pollen types. It takes into account the biological and meteorological processes of flowering and pollen entrainment. We used the model system to simulate an entire pollen season and compared the results to measured pollen concentrations.
**Results:** A first test with the birch pollen season of 2010 shows that the new parameterization scores equally well as the old parameterization, while the apparent drawbacks have been overcome. In both setups, statistical analyses have been used to measure the skill of the forecast, taking into account the measured values. We used the pollen season 2010 to calibrate our emission parameterization. This tuned formulation will then be used to simulate the pollen seasons 2011 and 2012. The skills of the different model setups will be compared statistically.
**Conclusions:** The newly developed emission parameterization has a great potential to enhance numerical pollen forecasts. Such forecasts have a high spatial and temporal resolution. They can be used both for operational uses, such as forecasts for allergic people, and for research regarding the dispersal of pollen in the air.

3th September 2012
MF.9

**A method to assess the representativeness of pollen measuring stations**

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**Objectives:** The Swiss Pollen Network consists of 14 Hirst type pollen traps of which 8 are located on the Swiss Plateau. The location of the pollen traps has historical reasons, since the traps were mainly placed on hospitals, where the allergologists worked. The network has never been tested for the spatial representativeness of the traps. The goal of this study is to group pollen traps with similar courses of the pollen season, characterize the spatial variability of pollen loads and define homogeneous pollen regions with representative traps.
**Methods:** The similarity of the pollen traps was calculated by correlation analysis using 10 allergenic species during the years 2005-2009. Cluster analysis was employed to group similar pollen traps for each pollen type separately and for the mean of the seven most important pollen species. Verification of the grouping was done by regression analysis. It was tested how well the pollen concentration of one station could be modeled using the other stations in the group. In addition, local weather parameters were included.
**Results:** Only on the Swiss Plateau and in Ticino the newly defined pollen regions are represented by more than one pollen trap. Five traps of the network could not be grouped together with other traps, thus defining separate regions. Large areas without pollen traps occur in altitudes above 700-800 m. The Swiss Plateau, a region of about 300x50 km with roughly the same altitude, is separated into two homogeneous pollen regions. Correlation coefficients between pollen traps for the mean of 7 pollen species within these regions are 0.84 respectively 0.85. The geographical distance between traps within the two homogeneous Swiss Plateau regions range from 40 to 100 km. The regression analysis for the verification of the clustering was calculated only for birch pollen. Correlation coefficients of modelled and measured data for the test years 2000-2004 within a region of the Swiss Plateau are above 0.9, which shows that the cluster analysis reveal significant results. Reasons for the similarity of the pollen flight on the Swiss Plateau is the influence of regional weather which leads to synchronous variation in pollen loads, a probably well mixing of pollen over the Swiss Plateau and similar plant distributions.
Conclusions: Based on the clustering of the pollen traps it is possible to define homogenous pollen regions. This is especially the case for the Swiss Plateau which is well covered by the existing pollen network. For altitudes above 700-800 m the Swiss Pollen Network can give only punctual information and it is not possible to present pollen information for the whole prealpine and alpine region. The results of the clustering analysis confirm that pollen forecasts produced for single stations are valid for quite large areas on the Swiss Plateau. However, for regions with only one single pollen trap, the question remains how well this region is represented by this trap. Cluster analysis is a suitable tool for identifying homogeneous pollen regions, gaps in the network and for providing guidance to improve the spatial representativeness of the network.

P_GM.1
**The Italian Monitoring Network in Aerobiology (R.I.M.A.®) is the network of Italian Aerobiology Association (A.I.A.)**

Rete Italiana di Monitoraggio in Aerobiologia
Associazione Italiana di Aerobiologia

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**Objectives:** R.I.M.A.® is the network of Italian Aerobiology Association, a scientific society of biologists and allergologists. The first monitoring Centres in Italy started their activity about 30 years ago when biologists and allergologists began this innovative research. Step b3333y step the growing interest of scientists in this field gave rise to numerous monitoring units in Italy. Since 1986 a personal computer programme has been in place with the aim of storing, processing and transmitting pollen data. Daily pollen counts from the various centres are collected for processing at the Data Collecting Centre where they are conveniently stored and converted into concentration values. At the beginning the monitoring period activities were carried out only for a few months a year and the number of pollen families recorded was low. Pursuant to the network's rules, in 1987 other pollens were identified by all stations The daily data form for pollen and spores also increased and soon the monitoring period was extended to the whole year. In 1995 the Italian association of Aerobiology accepted the "recommendations for methodology for routinely performed monitoring of airborne pollen". The "Method for sampling and counting of airborne pollen grains and fungal spores" published in Italy in 2004, represents an important point of reference for italian aerobiologists. In 2007 the daily data form for pollens and spores was extended, and the identification and count of the other genera became obligatory. One Alternaria spore became mandatory too. The Board of the Italian Association of Aerobiology (A.I.A.) approved the first rules of R.I.M.A.® in 2009.
**Discussion:** At present R.I.M.A.® includes about 50 monitoring units. They send weekly daily pollen counts 52 weeks a year. The aerobiological stations of the network are funded and hosted by universities, hospitals, health local agencies, environmental regional agencies and sometimes private institutions. Each unit has a general leader and a person in charge of readings, both should hold a degree in Life Sciences, Natural Sciences, Ecology, Agriculture or Medicine; with the rest of staff, they manage one or more stations. They must to be members of A.I.A, attend training courses recognized by A.I.A, and finally regularly take part in refresher courses and programmes for quality control organized by R.I.M.A.® in agreement with A.I.A.
R.I.M.A.® Centres are as the follow: type A - centres send at least the mandatory content of the taxa 52/52 weeks a year, by 10 a.m. each Wednesday, except in cases of force majeure which must be readily communicated; type B - centres ensures the correctness of sending but after the timing or about limited taxa. New software has been implemented to manage data from the centres and is free of charge for R.I.M.A.® centres. It allows to enter pollens counts directly into the data-base and also process them with graphs. A new website was created, (www.ilpolline.it) in order to reach a growing number of people interested in issues concerning pollen allergies. The new web allows to display information, newsletters, announcement, comments posted by readers and the weekly pollen bulletin.

3th September 2012
P_GM.2
**Temporal and spatial distribution of Poaceae pollen in areas of southern United Kingdom, Spain and Portugal**

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**Objectives:** The main aim of this study was to analyse the temporal and spatial variations of Poaceae pollen in different biogeographical areas.
**Methods:** Pollen data (2005-2011) recorded using Hirst type volumetric spore traps were obtained at Worcester (SW UK), Badajoz (SW Spain) and Évora (SE Portugal). The pollen season was delimited using the Threshold 30 method. Weekly average data were examined using Spearman correlations and ANOVA to compare differences between places. Total annual pollen was compared with monthly rain between January and May using Spearman correlations.
**Results:** On average, Poaceae pollen seasons lasted 59 days in Worcester, 78 days in Badajoz and 77 days in Évora. The average sums of daily pollen concentrations recorded in the pollen season were 6045 for Worcester, 6620 for Badajoz and 12722 for Évora. The number of days >50 grains/m$^3$ was on average 32 for Worcester, 35 for Badajoz and 48 for Évora. On average, Poaceae pollen seasons started on DOY 150 in Worcester, DOY 104 in Badajoz and DOY 110 in Évora. For data from all sites combined, there were statistically significant correlations ($p<0.01$) between Poaceae pollen season intensity and duration ($r=0.567$), the number of days >50 grains/m$^3$ and duration ($r=0.553$), and start dates and duration ($r=-0.679$). Weekly pollen data recorded at Badajoz and Évora was highly correlated. Weekly pollen data from Worcester were compared with Évora and Badajoz by moving data backwards week by week. The best fit and most statistically significant correlations were obtained by moving Worcester data backward by five weeks (Badajoz, $r=0.809$, $p<0.001$) and four weeks (Évora, $r=0.848$, $p<0.001$). The strongest relationship between season intensity and rainfall was between the annual sum of Poaceae pollen recorded in Badajoz and Évora and total rain during January and February. There was a statistically significant ($p<0.001$) correlation between weekly Poaceae pollen counts and weekly temperature and with rainfall at Worcester, but not in Badajoz or Évora. ANOVA showed that differences between places were lower than differences between years.
**Conclusions:** Overall, longer Poaceae pollen seasons coincided with earlier pollen season start dates. Winter rainfall noticeably affects the intensity of Poaceae pollen seasons in Mediterranean areas, but this was not as important in Worcester. Weekly data from Worcester followed a similar pattern to that of Badajoz and Évora but at a distance of more than 1500 km and 4-5 weeks later.

3th September 2012
P_GM.3
**Analysis of airborne pollen grains appearing at low concentrations in Badajoz (SW Spain)**

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**Objectives:** Aerobiological studies mainly focus on the most abundant pollen types, mainly because they cause allergy. However, some types of pollen that represent a small proportion of the total pollen, can be present in some days in air at a significant concentration. The aim of our study was to evaluate the presence of these "minor pollens" in Badajoz (SW Spain).
**Methods:** Sampling was conducted in Badajoz (SW Spain) for 19 years (1993-2011) with a Burkard sampler. The climate in our area is Mediterranean and the landscape is dominated by pastures with oak and irrigated crops. The pollen types selected for study were those that represented less than 1% of the total and that had appeared in at least five years. This criterion included 25 types of pollen.
**Results:** During the 19 years of study, nearly a million grains of pollen were counted and 104 pollen types were identified. The concentrations followed a logarithmic distribution. More than 94% of the total pollen captured belonged to 15 pollen types, the rest representing less than 1%. Most of the "minor pollens" appeared in spring (Ericaceae, Pistacia, Ligustrum, Corylus, Echium, Juglans), but also in other seasons: winter-spring (Brassicaceae), winter (Alnus, Salix, Ulmus, Acacia, Populus), spring-summer (Cannabis, Anthemideae, Apiaceae, Lactuceae), summer (Typha, Senecio, Helianthus, Juncus, Castanea), summer-autumn (Xanthium, Artemisia, Cyperaceae, Arecaceae), and autumn (Casuarina). The annual average concentrations of these pollen types were often below 1 grains/m$^3$. Nevertheless, significant maximum daily concentration peaks were reached sometimes for some of them: in 1998, Anthemideae (204 grains/m$^3$); in 2005, Populus (196 grains/m$^3$), Typha (140 grains/m$^3$) and Ulmus (47 grains/m$^3$); in 2006, Echium (53 grains/m$^3$) and Brassicaceae (46 grains/m$^3$), and in 2008, Casuarina (46 grains/m$^3$). Along 19 years of study, we found that concentrations of some pollen types tend to decrease (Typha, Senecio, Helianthus, Anthemideae, Artemisia, Apiaceae, Castanea and Cyperaceae), other types tend to increase (Casuarina, Ligustrum and Echium) and the rest does not show a clear trend.
**Conclusions:** "Minor pollens" may have a short but intense pollen season, so they could be considered as allergens despite its low annual concentration since some days in the year its concentration can reach significant levels. The annual trends observed in our case could be explained by the reduction of natural areas, increasing of ornamental sites or the transformation of land use.

3th September 2012
P_GM.4
**The distribution of Iva Xanthiifolia Nutt. and its pollen concentration in the air of the Lublin city area (Poland)**

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**Objectives:** Iva xanthiifolia Nutt. is native to North America and is considered to be an invasive alien plant in many regions of the world, including Poland. Its spread poses a serious threat both to the local species diversity and human health due to its allergenic properties. Iva xanthiifolia appears at ruderal communities, crops and colonizes new habitats in urban environment. In Poland the historical and current routes of its expansion run along railway tracks and grain elevators situated in urban and industrial areas. The first appearance of Iva xanthiifolia in the Lublin area was noted in 1955, then in 1978, 1991, 2003, 2010 and 2011 (data of different authors). The authors also reported the increase in the number of stations. Iva xanthifolia, similar to Ambrosia sp., is one of the most important causes of pollen allergy. Iva xanthifolia is an annual plant, 0.5-2.0 m in height. Heads are small and have 8-20 male flowers and 1-5 female flowers. Iva xanthifolia pollen grain has furrows which are 2-4 times longer than furrows of Ambrosia artemisiifolia. The aim of the present study was to determine the relationship among the number of Iva xanthifolia stations in Lublin and the concentration of its pollen in the air.
**Methods:** The observations were conducted in the years 2001-2011. The distribution of Iva xanthiifolia was based on floristic inventory made at 1 km x 1 km squares. These squares represent a decimal extension of the grid of squares used in the Distribution Atlas of Vascular Plants in Poland – ATPOL. The degree of hemeroby scale was calculated and the abundance of individuals was estimated. The rate of appearance was defined comparing present and historical data. The investigations of pollen concentration in the air were carried out by the volumetric method using a VPPS 2000 Lanzoni pollen trap. The sampler was placed in Lublin's city centre at a height 18 m (51°14'37''N and 22°32'25''E, 197 m a.s.l.).
**Results:** In the years of study Iva xanthiifolia was found at 40 ATPOL grid squares. The number of stations ranged from 1 to 11 per 1 km x 1 km square. The most stable stations were located at FE2788, FE2798, FE3800 and were situated next to railways and post industrial areas. The habitats were anthropogenicaly transformed (poly- and euhemeroby – 70%, mezo- and oligohemeroby – 27%). The species was present in phytocoenoses from Artemisietea vulgaris, Stellarietea mediae and Molinio-Arrhenatheretea classes. The density of populations differed among stations and years. The degree of cover ranged widely (5-80%). The largest number of Iva xanthiifolia individuals was noted in 2001, while the highest concentration of its pollen was found in 2005. The correlation between the number of pollen grains occurred in the air and the number of individuals found was weak ($r=0.164$).
**Conclusions:** The obtained results may indicate that the most important agents influencing the Iva pollen count in the air of Lublin were meteorological factors. A high concentration of Iva pollen in 2005 was probably originated from long-distance transport.

3th September 2012
P_GM.5
**The relationship between the cloudiness at different altitudes and basic pollen season parameters for Poaceae, Betula sp. and Artemisia sp. in Poznań**

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**Objectives:** The cloud cover controls the sunshine duration and the Earth energy balance. Depending on the height of clouds occurrence and their structure, cloudiness may cause different processes: low clouds are more effective in absorbing the shortwave solar radiation, whereas the high clouds absorb more longwave radiation. Clouds characterize also the current state of the atmosphere and, finally, cloudiness affects the flowering phenology, production and releasing of pollen. The main goal of this study was to determine the influence of cloudiness at different altitudes – by all clouds or only low clouds – on selected pollen season parameters (PSP).
**Methods:** Daily average Betula, Artemisia and Poaceae pollen counts (2000–2011) were collected in Poznań by a volumetric spore trap of the Hirst design. The sampler was situated at the height of 33 m, approximately 1 km southwest from the city centre. The limits of pollen season were defined by the 95% and 90% methods. The daily cloudiness values (expressed as an obscured fraction of the sky) were calculated from the SYNOP codes published by OGIMET for the Poznań-Ławica meteorological station. The data for cloudiness by low clouds and by all clouds at 6, 9, 12, 15 and 18 UTC was considered. The daily cloudiness values were used to compute the 10-day average cloudiness by low clouds and by all clouds. The Pearson parametric correlation test was used to detect the possible influences of these meteorological parameters on the main characteristics of pollen season (start, end, peak day and peak value).
**Results:** A number of statistically significant relationships occurred between the PSP and cloudiness. The strongest ones have been described. Poaceae pollen season start (90%) was highly connected (r=0,888, p<0,001) with the 10-day average of cloudiness by low clouds (days 119-128 from 1st January), whereas the peak day was significantly correlated with all clouds cover (r=0,777, p<0,01). Strong influence of this parameter on Artemisia sp. peak value was observed (r=0,789, p<0,01; r=0,768, p<0,01, for cloudiness by all clouds and only low clouds, respectively). Betula pollen season end (90%) was significantly correlated with all clouds cover (r=0,726,p<0,01). For Artemisia sp., there occurred also the negative correlations of the peak day and season end (90%) with both types of cloudiness.
**Conclusions:** The correlations between PSP and both cloudiness by low clouds and by all clouds were mostly positive. They indicate that, along with the cloudiness increase in the period before the pollen parameter day, this day is delayed. Surprisingly, the negative correlations with cloudiness for Artemisia sp. suggest the delay of the peak day and season end (90%) along with the decrease of cloudiness. The PSP of Betula sp. and Artemisia sp. were better correlated with the cloudiness by all clouds than by the low clouds whereas Poaceae parameters were generally in the stronger relationship with the low clouds amount. Finally, we can conclude that both types of cloudiness have an influence on the characteristics of pollen season, but the strength of this relationships depends on the taxa.

3th September 2012
P_GM.6
**Analysis of hourly peaks in pollen concentration with height and space**

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**Objectives:** In general, the concentrations of airborne pollen reach peaks at some hour of the day, but time when these peaks are reached depends on environmental factors that may affect differently according to place where pollen is recorded. This work aims to analyse how differently hourly peaks occurs depending on weather as well as distance and height of sampling.
**Methods:** The study was carried out in Badajoz (SW Spain) for three years. The four most abundant pollen types were analysed: Quercus, Poaceae, Olea and Plantago. Three sampling sites recorded pollen from 2009 to 2011 at the University of Extremadura, two of them at the same place at the Faculty of Sciences but at different height (one at ground level and the other at 16 meters height), and the third sampler 2.9 km apart and at 6 meters height at the Agrarian Engineering School. Weather parameters including temperature, relative humidity, speed and direction of wind were compared with pollen data. Hourly data from five consecutive days for each year including the maximum annual pollen concentration were analysed using Spearman correlation coefficient. UTC was used to express time.
**Results:** Comparison between places for all pollen types showed a high positive and statistically significant correlation in nearly all the years. Maximum peaks were not reached the same day in all cases. Hourly peaks were reached in most cases on average between 11 to 15 hours, although peaks appeared nearly in any hour of the day, including night hours. Peaks were reached on average firstly at ground level, 0.2 h later at 6 m, and finally 1.1 h later at 16 m with respect to the sampler at ground level. Two similar hourly peaks on the same day appeared in some cases. Hourly temperature and wind speed showed a statistically significant positive correlation with hourly peaks and negative with relative humidity. Matches of hourly peaks at the same hour for the three samplers appeared only in 2 occasions. Matches of hourly peaks between pair of samplers were 23.3% frequent for samples in the same place but at different height, other comparisons were less frequent. Hourly peaks between pair of samplers showed an average difference of 2.6-3 hours but this reached even 14 hours.
**Conclusions:** Hourly pollen peaks were not reached following constant hourly patterns, however, on average data showed correlation between spore traps at different heights and distance. Although it appears that from the lowest points to highest might be a delay in the hourly peaks, this difference is similar to that found between points separated 3 km. Daily pattern of temperatures affects hourly peaks, but wind speed modifies this regular pattern, and even may be responsible for the appearance of two peaks in some cases.

3th September 2012
P_GM.7
**Airborne pollen along an elevation gradient**

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**Objectives:** We studied airborne pollen along the highest elevation gradient in Greece (2917 m), on Mt Olympos National Park. Our aim was to identify locally prevailing circulation patterns in terms of pollen quantity, quality and temporal availability, and examine the match between airborne pollen fingerprints and taxa distribution along this gradient.
**Methods:** Air samples were collected every 10 days within the period March to October using a portable Hirst-type volumetric trap. During each sampling day, 12 samples from different altitudes were taken, each lasting 20 min. For four of the stations, sampling was done twice during the day, one in the morning, while ascending, and one in the afternoon, while descending.
**Results:** Thirty-five taxa were found contributing pollen in the study area. For half of them, participation to the total pollen load was low (<0.5%); the remaining 18 taxa, considered as main pollen taxa, accounted for 99.1% of all pollen recorded in the study area over the entire period and elevation range. Most abundantly represented were Pinaceae (32%), Quercus (24%), Urticaceae (18%), Cupressaceae (6%) and Poaceae (5%); the first two make up 55% of the total yearly concentration. Maximum daily pollen concentrations for the majority of these taxa (14) were recorded at low elevation stations (<1000 m). The main pollen season starts in March and ends in October. It peaks from early April to late July, when at least pollen from 15 of the 18 main taxa is in the air. The longest pollen seasons correspond to Asteroideae, Poaceae, Plantago and Pinaceae, whereas the shortest to Ambrosia and Cannabaceae. There is a pronounced decrease of the duration of the pollen season with elevation. The number of main pollen taxa also decreased with elevation and so did the concentration of airborne pollen produced by lowland taxa (in six out of seven); in contrast for only two of the other taxa (11), the latter relationship was significant.
**Conclusions:** Our results suggest a limited movement of pollen grains beyond the elevation range, within which they are produced, what implies limited mixing of air-masses along the elevation gradient of Mt Olympos. We estimated the number of main taxa represented in the airborne pollen to decrease by approximately 4 for every 1000 m of elevation increase, whereas the average duration of the species pollen seasons to decrease by 3 days for every 100 m of elevation increase; taking into consideration the lapse rate, this corresponds to a 5-day decrease of the average pollen season for every degree (Celsius) of temperature decrease.

3th September 2012
P_GM.8
**Meteorological factors in relation to fluctuations in the concentration of Alnus pollen in the air of Lublin**

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**Objectives:** Alnus pollen grains reach very high concentrations in the atmosphere of Lublin and they are responsible for allergic reactions during the early spring period. Monitoring of alder pollen content in the air is of essential importance in diagnosis and treatment of pollen allergy. The aim of the present study was to analyse the alder pollen seasons in Lublin and to determine the effects of meteorological conditions on the occurrence of pollen grains of this taxon in the air.
**Methods:** Pollen monitoring was carried out by the volumetric method using a Lanzoni VPPS 2000 trap during the period 2001-2010. The pollen trap was placed on the roof of a building of the Lublin University of Life Sciences at a height of 18 m above ground level. Mean daily Alnus pollen concentrations were expressed as the number of pollen grains per cubic meter of air (P/m$^3$). The 95% method was used to determine the start and end dates of the pollen season. Statistical dependence between season parameters as well as between season parameters and meteorological data were calculated by Speraman's rank correlation coefficient. Regression analysis was applied to produce forecast models. Before the type of regression was chosen, the scatter plots and the Pearson correlation coefficients were analysed in addition to the Spearman correlation coefficients. In the event that no linear relationships were observed, the non-linear regression was examined; on the other hand, where the scatter plots and r Pearson showed a linear relationship between the dependent variable and the independent variables, a multiple stepwise forward regression was performed.
**Results:** The alder pollen seasons were characterized by very high variations. The earliest onset of the pollen season was recorded in 2002 (4 February), whereas the latest one in 2006 (28 March). Over the 10-year study period, the highest seasonal peak was observed in 2003 and it was 14 times higher than the maximum concentration in 2009. The pollen season was found to last longer when it had started earlier ($r_s$=-0.748). During shorter seasons, higher values of the maximum concentration ($r_s$=-0.717) and of the Seasonal Pollen Index ($r_s$=-0.705) were recorded. There was a statistically significant positive correlation between maximum concentration and SPI ($r_s$=0.806). All pollen seasons were right-skewed. The season start date depended primarily on air temperature in the third decade of January. The alder pollen season ended earlier when high temperatures were recorded in March. High temperatures in the third decade of January and in February promoted an extension of the pollen season. Maximum pollen concentration was negatively correlated with minimum temperature in February. The seasonal peak was recorded earlier when February and March were warm as well as when there was low air humidity in February and low cloud cover in the second decade of February and March. Low minimum temperature in January and in February was conducive to high SPI values.
**Conclusions:** Similarities in the rate of increase in pollen concentration depended on the date start of the pollen season. Onset, end, duration, peak value, peak date, and SPI were primarily dependent on thermal conditions in January, in February or in March.
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3th September 2012
P_GM.9
**Aerial pollen spectra in different city building patterns: seasonal dynamics and implications for allergology**

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**Objectives:** In the growing season of 2011, pollen occurrence was studied in the air of the town of Humpolec, Czech Republic, with the aim to (1) characterize seasonal dynamics in the town and its individual parts, (2) compare the results based on two aerobiological pollen collection methods, volumetric and gravimetric, with respect to their potential applications in allergology.
**Methods:** The volumetric trap, Burkard, was installed together with a control gravimetric trap (my own construction, inspired by Durham trap) in the town centre, on a roof top at a height of 12 m. Other six gravimetric traps were placed at lower heights in different urban and suburband environments: historical centre, blocks of flats, detached houses, agricultural grounds, industrial zone and the adjacent village of Plačkov. Burkard and glass slides of gravimetric traps were changed once a week. Standard counting method was used for Burkard trap – daily slides, 4 longitudinal lines, analysed area 48 mm$^2$, magnification 400 ×. The same area (circular area in the centre of slide) was analysed on the microscope slide from gravimetric traps. The weekly Burkard values were compared with weekly values of control gravimetric trap. Weekly values of the other six gravimetric traps were mutually compared. The comparison was based on pollen calendars of individual taxa and pollen calendars of individual urban and suburban environments.
**Results:** 101 683 pollen grains belonging to 62 taxa were indentified. The volumetric trap recorded 54 taxa and the individual gravimetric traps recorded within 39-48 taxa. The most frequently occurring taxa were Urticaceae (intermediate significance for allergology), Picea and Pinus (low significance), Betula (high significance) and Quercus (intermediate significance). The volumetric method provided quantitative and taxonomic, temporally explicit information about the pollen situation in Humpolec. A pollen calendar was compiled, which indicated three distinct periods within the pollen season spring dominated by woody plant pollen; summer with grass pollen and late summer to autumn dominated by herb pollen. The two aerobiological methods provided slightly different results. However, the allergologically important temporal and taxonomic information about the pollen distribution in the air was very similar. Of the urban and suburban environments, the largest allergological risk occurs in the industrial zone with numerous allergenic species such as Artemisia vulgaris, Urtica dioica and Betula pendula. A comparison with meteorological data revealed, that occurences of some taxa were dependent on the wind direction. The pollen of Artemisia and Urticaceae predominantly came from the industrial zone, Picea from the neighbouring forests and Ambrosia from long distance transport with the eastern wind.
**Conclusion:** These results can be applied by allergologists and architects, either to eliminate the existing allergologically inappropriate situations, or for land-use planning.

3th September 2012
P_GM.10
**Biometeorological and autoregressive indices for predicting olive pollen intensity**

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**Objectives:** Knowledge of the main factors influencing the marked year-on-year changes observed in olive flowering intensity is of considerable scientific, agricultural, environmental and public-health interest. Te main objective of this work were: 1, to propose an accurate model to predict olive PI in Córdoba province. With this purpose, we tested the accuracy of a Meteorological-based Model constructed using simple meteorological-related variables versus an Index-based Model based on Bio-Meteorological Indices and an autoregressive index; 2, to taking into account the influence of Mediterranean extreme climate events on olive pollen production were included in the proposed Index-based Model by applying different adjustment criteria; 3, finally it has been consider the cyclical component of PI series by the development of a Cyclicity Index.
**Methods:** We have work with a 29 years database (1982-2010) of meteorological and aerobiological data of Córdoba city, Spain. It has a Mediterranean climate with some continental features. To improve the effectiveness of forecasting models, a new indices-based system was developed. A new method based on extreme weather events has been also developed. This new method aims to optimize the Root Mean Square Error between typified biometeorological indices and typified Pollen Index by applying adjustment criteria that give "bonuses" or "penalties" to the biometeorological indices. Another new developed index has been an autoregressive index by using previous database, enables us an indirect estimation taking into account the cyclical climate behaviour influence, to be incorporated in the model. To test the Index-based model (a regression model using the five developed indices), a Meteorological-based Model (a multivariate regression analysis of simple meteorological-related variables) was constructed and his accuracy was compared with the Index-based Model accuracy.
**Results:** The four biometeorological indices developed were: Thermal Index, Pre-Flowering Hydric Index, Dormancy Hydric Index and Summer Index. The autoregressive index, another developed index, were termed Ciclicity Index. The performance of the Index-based model was compared with the traditional Meteorological-based Model performance. Index based-Model showed a lower confidence intervals for coefficients, a higher significance levels and a lower standard errors that the Meteorological-based Model.
**Conclusions:** The Index-based Model built on biometeorological and Cyclicity Index was found to perform better for olive pollen forecasting purposes than the Meteorological-based Model. The proposed developed method taking into account the effects of extreme events could be a sound basis for the improvement of phenological forecasting models in Mediterranean area. The Cyclicity Index with its novel use of autoregressive techniques for predicting the PI, considerably improved forecasts. The autoregressive technique has not been previously employed in aerobiological research, and was in fact purpose-built for this study.

3th September 2012 POSTERS
P_RM.1
**Aerobiology in North-Africa: first results from the city of Ceuta (Spain)**

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**Objectives:** The city of Ceuta is located in a particular geographical enclave in the southern border of the Strait of Gibraltar (35°55'19''N, 5°22'54''W), in the junction of two seas: the Atlantic Ocean and the Mediterranean Sea. Its biogeographical position, included in the Mediterranean region, Mediterranean-Magrebi sub-region, Tangerino-Atlantic province, and the typical mediterranean climate, with mild temperatures (16.6°C) and irregular precipitations abundant in spring and autumn (600mm/year), favor the presence of more than 500 species in hardly 20 km$^2$ of surface, being prevalent the mediterranean and macaronesian elements. Its particular ecological conditions have generated as well a certain degree of endemicity. Exotic flora has been also introduced as ornamentals. The objective of this work has been to characterize the airborne pollen spectrum in the city in order to determine: a) the alochthonous or autochthonous origin of the material, b) the possible implication of some spore and pollen types in respiratory pathologies, and c) the relationships between the pollen content and meteorological parameters, in particular with the characteristics eastern-western wind pattern prevalent in the area.
**Methods:** Aerobiological sampling has been carried out by mean of a volumetric Hirst-type sampler (Lanzoni s.r.l., Bologna, Italy), placed at the terrace of the Institute of Ceuta Studies Building, according to the guidelines for sampler positioning and management established by the Spanish Aerobiology Network. The sampling started on June the first 2011 and it will be ended by the end of May 2012. The meteorological data have been supplied by AEMET (Spanish Agency of Meteorology). Data about the incidence of the diseases related to the presence of pollen and spores in the atmosphere (extrinsic asthma) have been consulted in the Unit of Archive and Clinic Documentation, University Hospital of Ceuta.
**Results:** The partial results of the aerobiological sampling show a total of 2104 pollen grains, corresponding to 44 different taxa. Among them are types belonging to autochthonous flora (Quercus, Pinus, Ericaceae, Chamaerops, Thymeleaceae), other from ornamental exotic flora (Cupressaceae, Casuarina, Ligustrum, Fraxinus, Platanus), and other from alochthonous origin (Olea, Cedrus, Cannabis). Urticaceae, Palmae, Olea, Cannabaceae and Cupressaceae are the most abundant pollen types, beinig june and july the months with the highests records. Ruderal flora is also present with taxa such as Poaceae, Apiaceae, Amaranthaceae, Plantago, Artemisia, Mercurialis, Brassicaceae and Urticaceae. Regarding the fungal spores, values corresponding to Cladosporium and Alternaria have been recorded, being significantly higher the former. The highest spore presence was detected during the months of September, October and November.
**Conclusions:** The aerobiological characterization of the atmosphere of Ceuta reveals that the concentrations of pollen grains and fungal spores in the air could be enough to be involved in the development of some respiratory diseases, although the particular climatic conditions prevalent in the area, with frequent wind gusts, favour a dissemination of the concentrations of particulate matter.

3th September 2012
P_RM.2
**Inter-seasonal fluctuations of pollen productivity in Ryazan' city (Central Russia)**

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**Objectives:** Pollen grains of early flowering tree genera are the main cause of allergic diseases in Central Russia. The synchronous inter-annual fluctuations in flowering among them might have cumulative effects on allergy sufferers during the seasons of high pollen emission.
**Methods:** We studied the synchronization of years of high and low pollen emission for 8 genera: Alnus, Corylus, Betula, Populus, Salix, Ulmus, Acer, Fraxinus. Investigations were based on gravimetric aerobiological data from Ryazan' (54°37'N, 39°43'E) for years 2007-2010. The annual fluctuations of airborne pollen sums were compared with aerobiological data from Moscow (55°75'N, 37°37'E).
**Results:** Wide fluctuations of annual pollen emission were revealed for all taxa. Seasons with high and low pollen emission were not totally synchronized, but high seasons coincided more often. The best synchronization was observed for Alnus, Corylus, Betula, Populus and Acer. Due to synchronization of high years and the mostly non-overlapping flowering seasons, the time of exposure to pollen may be very long during the high years. Fluctuations of pollen emission in Ryazan' and Moscow were very well synchronized. It supports the hypothesis of fundamental influence of the proximal causes to inter-annual variations of airborne pollen loads. We did not revealed any temporal shift in start of pollen season during last 4 years. There was no also any difference in time of season start between Moscow and Ryazan'. Moscow is located 180 km north-west from Ryazan'. The absence of time difference can be explained by the influence of megalopolis climate. Thus, years of high and low pollen emission tends to occur at the same time.
**Conclusions:** A possible reason of this phenomenon is the same proximal factor that regulates the reproductive output of different species. The same weather conditions can also increase the similarity in inter-annual variations of pollen emission.

3th September 2012
P_RM.3
**Analysis of airborne ragweed and birch pollen grains in Zagreb, Croatia 2009-2010**

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**Objectives:** Some pollen grains are known to cause allergic diseases in human beings such as allergic asthma and hay fever. These diseases appear especially in flowering periods of plants. Determination of the type and concentration of pollen grains is beneficial to patients suffering from allergic diseases. Ragweed pollen is the most frequently associated with agriculture and is found in cultivated fields. It also occurs on disturbed soils, wasteland and roadsides along the railways, irrigation canals, on riverbanks and in building yards. Atmospheric birch pollen is of special aerobiological interest in Northern and Central Europe as one of the most common causes of spring-time pollen allergy. The aim of the study is to present the results of airborne ragweed and birch pollen grains carried out from January 2009 to October 2010 using continuous volumetric sampling of airborne pollen in Zagreb atmosphere.
**Methods:** The standardized aerobiological volumetric method of airborne pollen sampling by the use of Hirst sampler was used.
**Results:** During monitoring period, 7582 pollen grains of ragweed, equal to 9% of overall pollen spectrum and 16819 grains of birch equal to 19% were measured. Concentrations of ragweed pollen during monitoring period were very similar, while concentrations of birch pollen rise four times since 2009. Total annual concentration of ragweed pollen measured in 2009 was 3844 and in 2010 annual concentration was 3738. Overall concentration of birch pollen measured in 2009 was 3819, while in 2010 measured concentration was 13000 grains. In 2009 concentration of ragweed pollen exceeded the value of over 100 grains during 15 days of monitoring. In 2010 those same values were measured in period of 14 days. More detailed measurements in monitoring period were made for birch pollen. In 2009 concentration values over 100 grains were present during 9 days, while in 2010 those values were present during 18 days. Interesting fact is that concentration of birch pollen in 2010 was above 1000 pollen grains during 5 days, while above mentioned value was measured in only one day during 2009.
**Conclusions:** According to these results we can conclude that the levels of highly allergic pollen of ragweed and birch can be considered as a problem for public health in Zagreb and therefore require further and constant monitoring.

3th September 2012
P_RM.4
**Airborne pollen load in Lithuania: pollen spectrum and allergenicity**

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**Objectives:** Billions of pollen grains annually produced by anemophilous plants widely spread in the atmosphere and can lead to health problems for up to 40% of the population. The negative effect grows into an allergic reaction, sometimes causing symptoms of asthma. It is well known that pollen allergens are specific and may have a synergistic effect. Different pollen types occurring even in low concentrations and belonging to the same family can increase the risk of sensitization. The aim of this investigation was focused on the study of the general pollen load and the allergenic potential during the growth period in Lithuania.
**Methods:** The data corresponding to 8 years (2004-2011) of pollen monitoring was documented graphically and evaluated statistically. Airborne pollen was collected using Hirst-type volumetric spore traps sited at Klaipeda, Siauliai and Vilnius. To define pollen seasons, a criterion of 2.5% was applied. The term of pollen index is used to describe the sum of daily pollen counts/m3 of air in a given period. To establish the daily allergenic potential pollen types were ascribed to one of four levels: high, moderate, low allergenic and non-allergenic. Woody and herbaceous plants were categorised according to abundance.
**Results:** In Lithuania 37 pollen types were recorded. During the pollen season, the highest daily pollen concentrations were recorded for the plants of the genus Betula >4000 grains/m$^3$) and the Pinaceae family (>3000 grains/m$^3$). The dominant pollen in April originates from the genera Alnus and Betula (it accounts for 2/3 of the total monthly pollen count), in May Pinaceae and Betula dominate (>6/7), in June Pinaceae, Poaceae and Urticaceae, in July Urticaceae and Poacea, in August Urticaceae and Artemisia, respectively. 17 of the monitored pollen types are ascribed to moderate and high allergenic. During the period when the main pollen index was formed, i.e. May-August, pollen with high allergenicity (29% of moderate and high allerginic pollen types) were monitored daily with some interruption periods.
**Conclusions:** The most favourable periods for tourism and recreation in the different regions of Lithuania were chosen according to the concentrations of allergenic pollen. The assessment of the allergenic pollen distribution revealed that in spring the coastal region is more suitable for recreation in comparison with other research areas. In early summer a smaller load of high allergenic pollen is formed, comparing with the aerobiological situation in late summer.

3th September 2012
P_RM.5
**Poaceae as a keynote member of the airborne pollen spectrum of Ukraine**

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**Objectives:** Poaceae are remaining the most important allergen in Ukraine. In accordance with the data of clinical trial performed in the Vinnitsa Municipal Clinical Hospital Number One, 5% of Vinnitsa population is suffering from the grass pollen allergy. The symptoms starting mostly from the mid-May and lasting till the end of July. While the patients' hay fever diary shows good correlation between symptoms and Poaceae pollen count in Vinnitsa we can suppose the same conjunction of the grass hay fever symptoms and pollen count in other regions of Ukraine. So, the aim of our study was to determine the concentration and the duration of the grass pollen season in different Ukrainian cities.
**Methods:** Study was performed with the volumetric sampling using the Burkard trap (Hirst type) in the 6 Ukrainian cities during the 2010 season. These cities include Vinnitsa (Western Central Ukraine), Donetsk, Dnepropetrovsk (Eastern Ukraine), Simpheropol (Crimea, Southern Ukraine), Odessa (South, Black Sea cost), Poltava (Northern part of the Eastern region). Samples were taken from the 1st of March till the 15th of October.
**Results:** Study showed the longest grass pollen season for Vinnitsa and Odessa (151 day). The most abundant pollination (27% of the total count) and the highest peak (85 pg/m$^3$) were seen in Vinnitsa. The second position for massiveness of the Poaceae season was held by Poltava (20% of the total count). Southern cities Odessa and Simpheropol showed similar massiveness of the grass pollination for 16% and 15% of the total pollen count respectively. Eastern cities Dnepropetrovsk and Donetsk were represented by 12% and 10% of the total Poaceae count for Ukraine accordingly. Having the second massiveness of the pollen count Poltava showed the shorted pollination period – for 127 days only. Except Vinnitsa, the longest period for the 151 day was recorded for Odessa. Donetsk had pollination period for 150 days. Simpheropol and Dnepropetrovsk were characterized by the 144 and 137 days of grasses pollination. The earliest start of grass pollen season (April, 28), as it was expected, was recorded for Simpheropol. The second position was held by Donetsk (May, 13). These pollen sites showed the earliest pollen peaks as well. The highest grass concentration was recorded on May, 5 in Simpheropol and on June, 10 in Donetsk. Other cities showed start of grass pollination from May, 14 till May, 20 with the Odessa the latest one. Peaks of pollination were seen on June, 13, 17 and 21 for Poltava, Odessa and Dnepropetrovsk respectively. Vinnitsa had a latest peak for the July, 6.
**Conclusions:** The most abundant grass pollen season is seen in the Central (Vinnitsa) and Northern Eastern (Poltava) parts of Ukraine. Southern regions (Simpheropol and Odessa) show moderate grass pollination while the lowest one is seen in the Eastern regions of Ukraine. Most intensive grass pollination is associated with Poltava. The second abundant pollen quantity was spread in here during the shortest pollination period.

3th September 2012
P_RM.6
**Comparision of the two yearly pollen data for Bursa, Turkey**

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**Objectives:** Changes in the severity and frequency of rhinitis, conjunctivitis and asthma depending on the biogeographical factors have been highlighted by many researchers. Interactions of variables such as diversity and the number of plant species, atmospheric pollutants and climatic factors are important parameters in the evaluation of vegetation-originated allergens and the allergic diseases caused by these allergens.
**Methods:** In this study, pollen grains were sampled by using a Lanzoni trap (Lanzoni VPPS 2000) in the atmosphere of Bursa. The pollen data from 2000 and 2011 were compared and changing on the pollen level was discussed.
**Results:** The pollen concentration increased 6-fold and the highest level identified on April in 2010, nevertheless the highest pollen level was identified in May. A total of 6 223 pollen grains were identified in 2000 and 30 488 in 2011. The dominated plant taxa in the year 2000 were Pinus, Olea, Gramineae, Platanus, Cupressaceae/Taxaceae, Quercus, Acer, Chenopodiaceae/Amaranthaceae, Castanea, Xanthium, Artemisia. On the other hand, Pinus, Olea, Cupressaceae/Taxaceae, Platanus, Graminea, Quercus, Urticaceae, Fraxinus, Morus, Ambrosia, Chenopodiaceae, Castaneae were identified as a dominant pollen grains in the aeroflora of the Bursa during the year 2011. Ambrosia pollen grains were detected in the year 2011.
**Conclusions:** Climate change one of the main culprits for the increasing pollen number in per cubic meter. As a second point changing of planted area and amount of plants effects the ratio of pollen.

3th September 2012
P_RM.7
**Aeroallergen flora of Tavsanli (Kutahya), Turkey**

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**Objectives:** A qualitative and quantitative evaluation of pollen fall in the atmosphere of Tavsanli (Kutahya, Turkey) is presented in this study.
**Methods:** A continuous aeropalynological survey of the atmosphere of Tavsanli was carried out from January 2003 to December 2004 by means of the gravimetric method using Durham apparatus. Weekly pollen grains in per $cm^2$ were calculated.
**Results:** During two years, a total of 17 079 pollen grains/$cm^2$ which belong to 52 taxa, 25 of total belong to arboreal plants (AP) and 27 of total non-arboreal (NAP) plants, and unidentified pollen grains were recorded. In 2003, 11 630 pollen grains and in 2004, 5 449 pollen grains were recorded. Total pollen grains consist of 88.46% AP, 9.67% NAP plants and 1.87% unidentified pollen grains. Pinus spp., Cupressaceae/Taxaceae, Quercus spp., Gramineae, Platanus spp., Salix spp. Moraceae and Oleaceae were responsible for the greatest amounts of pollens in the investigated region. 67.48% of total pollen grains were appeared during May.
**Conclusion:** Pollen grains of 52 taxa were determined during the pollen season in the atmosphere of Tavsanli, 8 of them formed about 89.71% of spectrum. In the region investigated, pollen grains were recorded 10 months of the year and reached their maximum levels in May. The presented pollen calendar for the region in this paper may be useful for allergologist and patients who suffer from pollinosis and allergy.

3th September 2012
P_RM.8
**Identification of potential sources of airborne Olea pollen in the southwest Iberian Peninsula**

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**Objectives:** This study aims to determine the potential origin of Olea pollen recorded in Badajoz in the Southwest of the Iberian Peninsula during 2009-2011.
**Methods:** We used a combination of daily average and diurnal (hourly) airborne Olea pollen counts recorded at Badajoz (southwestern Spain) and Évora (southeastern Portugal), an inventory of olive groves in the studied area and air mass trajectory calculations computed using the HYSPLIT model.
**Results:** Three different scenarios where olive pollen can be transported to Badajoz from either distant or nearby sources were identified by examining olive pollen episodes that had distinctly different diurnal cycles in olive pollen in relation to the mean. Back trajectory analysis showed that olive pollen can be transported to Badajoz from the West on prevailing winds, either directly or on slow moving air masses, and from high densities of olive groves situated to the Southeast (e.g. Andalucía).
**Conclusions:** Regional scale transport of olive pollen can result in increased nighttime concentrations of this important aeroallergen. This could be particularly important in Mediterranean countries where people can be outdoors during this time due to climate and lifestyle. Such studies are valuable for allergy sufferers and health care professionals because the information can be incorporated into forecasts, the outputs of which are used for avoiding exposure to aeroallergens and planning medication. The results of studies of this nature can also be used for examining gene flow in this important agricultural crop.

3th September 2012
P_RM.9
**Two decades of airborne pollen monitoring in Gdańsk, N. Poland**

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**Objectives:** Long-term monitoring of airborne pollen dynamics is of special interest not only with respect to allergy problems but also due to great value of this kind of observation to assess the impact of climate change on plant flowering. It affords data which are used to delimit the meteorological parameters influencing seasonal variation in the atmospheric pollen counts and next for modeling pollen forecasts. These may be also used for past climate reconstructions based on fossil pollen data. The aim of the presentation is to discuss selected results of an aerobiological monitoring in Gdańsk, N. Poland. We will focus on the pollen calendar and some attempts to forecasting models.
**Methods:** The city of Gdańsk is part of a large urban agglomeration extending as a narrow strip along Gdańsk Bay (southern Baltic Sea) for a distance of about 50 km. Regular aerobiological sampling by means of a Burkard trap and with use of the standard methods started in 1994 and it is continued up to the present year. Linear regression system was used for the forecasting models.
**Results:** The general pollen calendar based on multi-year average counts shows large dependence of the pollen seasons of the taxa flowering in early spring on meteorological parameters. Very high correlation coefficients have been obtained for the beginning of the Alnus pollen season (negative correlation with the number of days with temperatures below 0°C from the beginning of a year) and for its duration (number of rainy days during the season). Also the beginning and duration of the Betula pollen season are very dependent on meteorological factors. The crucial period is the end of March and beginning of April when an increase in mean temperatures accelerates flowering while strong wind during flowering makes the season longer. Rather good correlations has been obtained also for Quercus – temperatures from the second part of March are of great importance for the starting dates of the pollen season and a higher number of windy days during the season is responsible for its prolongation. Those taxa flowering in a generally warmer periods of a year are less dependent on temperatures. The well-fitting models have been obtained for length of the Urtica season which is dependent on the number of days with wind during the season and for the beginning of Artemisia season (higher sum of mean maximum temperatures of June and July accelerates the season) and for its duration (here also a number of windy days during the season is the most important factor).
**Conclusions:** The long-term aerobiological monitoring in Gdańsk enables to specify the most important climatic factors responsible for the start and then dynamics of the pollen seasons of particular taxa. It also shows several specific features which result from the typical climatic parameters of the area lying at the sea cost.

3th September 2012
P_RM.10
**The pollen season parameters in Parma, Italy, 1994-2011**

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**Objectives:** Pollen grains, their allergens and environment play an important role in the pathogenesis of respiratory allergies. In the last thirty years, many epidemiological studies have highlighted a worldwide increase in allergic respiratory diseases. This outcome has been attributed to several anthropogenic and non-anthropogenic factors. However, climate changes may also have interacted with the biology of plants, leading to modified pollen seasons and quali-quantity pollen release with modifications on the clinical symptoms in patients affected by pollinosis. The present study was carried out to ascertain the variations of the pollen season parameters in Parma (Northern Italy) between 1994 and 2011.
**Methods:** 11 taxa were taken into account (Alnus, Betula, Chenopodiaceae, Corylus, Cupressaceae, Poaceae, Artemisia, Plantago, Platanus, Ambrosia, Urticaceae), considering: season start, end, duration, peak day, peak value and seasonal pollen index (SPI). The average data on annual temperature (°C) and total rainfall (mm) were taken into consideration. The pollen was monitored according to standard methods of the Italian Monitoring Network in Aerobiology (R.I.M.A.®) of the Italian Aerobiology Association (AIA). Airborne pollen grains were collected using 7-day recording volumetric Spore-Trap type Hirst, which is the standard equipment used for aerobiological sampling worldwide. The sampler was placed at 18.2 m above ground level on the meteorological tower of Parma University in the town center. The city of Parma lies in the Po Valley, to the South of the Po river, 100 km from the Tyrrhenian coast and 200 km from the Adriatic coast, 52 m above sea level, latitude 44°48'15''N, longitude 10°19'E. Statistical analyses were performed using SPSS 19.0 software.
**Results:** The analyses of the pollen season dynamics showed the highest concentrations during April-May for Poaceae and Urticaceae. The shortest pollen season was for Platanus (25.8 days), while the longest was for Urticaceae (130.9 days). The highest SPI was obtained for Urticaceae (19,068). The highest variability was for: 1) start day: Betula, Urticaceae; 2) end day: Alnus, Plantago; 3) duration: Alnus, Platanus; 4) peak day: Plantago, Urticaceae; 5) SPI: Chenopodiaceae, Urticaceae; 6) peak value: Urticaceae. We observed significant correlations between: i) end and duration (Alnus, Poaceae); ii) start and duration (Betula, Plantago, Chenopodiaceae); iii) SPI and peak value (Corylus, Cupressaceae, Artemisia, Plantago, Betula, Platanus, Ambrosia). We also observed a significant negative trend in relation to: a) duration (Platanus, Urticaceae), and b) SPI (Corylus, Betula, Poaceae). A positive trend was observed in relation to start (Artemisia), peak day (Platanus), SPI and peak value (Ambrosia). Temperature and rain did not show significant variations with a mean for the period of 15.0°C and 789.9 mm, respectively.
**Conclusions:** The aim of our aerobiological observation was to define our regional pollen spectrum composed of pollen from both local sources and long distance transport. Our data series allows to estimate the pollen seasons' variability and to determine trends for the season parameters. Our results can be useful in managing the symptoms of patients suffering from respiratory allergies and in supplying information about the release of airborne pollen grain related to climate changes.

3th September 2012
P_RM.11
**Poaceae pollen in Rome**

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**Objectives:** In recent decades allergic diseases have become always more prevalent in European countries and various factors determine this increase. Widespread airborne pollen represents an important cause of this increase. Poaceae pollen represents an important amount of total pollen collected during a year in Rome. In Italy, Poaceae family is represented with 117 genera and 395 species, according to the official Flora of Italy. Poaceae development is influenced by water availability in soil and by temperature changes. Moreover landscape changes and different land use, especially in suburban areas, can play an important role. In Rome there are three monitoring centres belonging to the Italian Aerobiological Monitoring Network, named RM5, RM6, RM8. We collected pollen data from POLLGAIA database powered by the Italian Association for Aerobiology. Three monitoring centres use the same volumetric sampler (VPPS 2000 by Lanzoni) and operate according to the new Management and Quality Manual of R.I.M.A.®. RM5 and RM6 samplers were located to standard height, RM5 on the top of University buildings and RM6 on the top of the Hospital San Pietro, when RM8 was at 45 meters above the road. Pollen counts were performed according to the guidelines published by the Italian Association for Aerobiology. Pollen counts are expressed in pollen for cubic meter.
**Methods:** On the basis of available meteorological data we defined the climatic characteristics and we calculated continental index according to Rivas Martinez. On the basis of available meteorological data we elaborated a modified Walter and Lieth Diagram. According to abundant literature we considered different indexes, such as Atmospheric Pollen Season APS according to Jäger 1996, Seasonal Pollen Index, number of days with more than 25 pollen grain for cubic meter (threshold proposed by REA indicates a value of triggering clinical symptoms). The peak value and the day when it occurs and finally meteorological data. Data were elaborated with Excel, to see possible trends, SPSS, and to evidence possible correlations between pollen counts and meteorological data were used Spearman's and Kendall's correlation test.
**Results:** The continental index according to Rivas Martinez for Rome is 28, pronounced sub-continental. APS begins on the 25th of April and ends on the 27th of July. SPI lower value is 2451, the average is 3866 and the higher value is 4661 grains/m$^3$. Number of days with more than 25 grains/m$^3$ is minimum 24, average 47, maximum 64. Minimum peak value is 90 grains/m$^3$, maximum one is 383 grains/m$^3$; day of peak varies from the 25th of April to the 5th of June. We tested the possible correlations using pollen data and temperatures and rainfall in different period. For rainfall we considered autumnal rainfall, rainfall from January to March, from January to June and so on. The more significant correlation we find is between APS and Rainfall. Spring rainfall influence positively the APS length, with more millimeters the length of APS increase. Nevertheless when rainfall are abundant SPI and peak value are lower.
**Conclusions:** The greatest risk to people allergic to Poaceae during the flowering period lasts in Rome from May to June and during this period, the average daily number of pollen grains can exceed 25/m$^3$ reaching maximum pollen concentration in May. Temperature trend seems to influence start and end of APS. Maximum Temperature values determine advance of start and end dates, while a decreasing of minimum temperature determine delay of starting APS.

3th September 2012
P_RM.12
**The dynamics of the Quercus L. pollen season and risk of pollen allergy in central-eastern Poland**

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**Objectives:** Several species of the genus Quercus grow in Poland. The following species are found in natural stands: Q. petraea, Q. robur, and Q. pubescens. Oak pollen found in the aeroplankton at high concentrations can be a cause of pollen allergy. The aim of the present study was to evaluate Quercus pollen seasons in central-eastern Poland and the effects of some meteorological factors on their patterns. Attention was drawn to the number of days with a high and very high concentration of oak pollen grains which indicate the risk of occurrence of pollen allergy in sensitive persons.
**Methods:** Pollen monitoring was carried out by the volumetric method in Lublin in the period 2001-2010. A Lanzoni VPPS 2000 pollen trap was placed in the city centre at the roof of a building at a height of 18 m above ground level. The 95% method was used to determine the start and end dates of the pollen season. Spearman's correlation analysis was employed to examine relationships between the pollen season parameters and meteorological factors.
**Results:** On the basis of the results of the 10-year study, the onset of the Quercus pollen season was determined to be between 25 April and 4 May. The duration of the pollen season varied significantly between years and it was 20-34 days. The end of the pollen season was recorded between 16 May and 3 June. The pollen season started earliest in the years 2002 and 2007. Maximum Quercus pollen concentrations occurred between 30 April and 10 May, while the highest concentration (924 pollen grains/m³) was recorded in 2003 (6 May). Annual Quercus pollen totals were slightly higher in the first half of the 10-year study period and the trend line also showed a gradual decrease in the value of this parameter. In the case of most of the seasons, the charts showed 2 or 3 peaks, which indicates that several species shed pollen at different times. Most of the Quercus pollen seasons under study were asymmetrical seasons in which the post – peak periods were longer than those before the maximum. The highest annual pollen count (2966 grains/m³) was three times higher than the lowest pollen total (962 grains/m³). A positive correlation (rs=0.856) was found between pollen season duration and average daily relative humidity. The analysis of correlations also showed that average and maximum temperature, rainfall and relative humidity had no effect on the pollen season start date. On the other hand, the annual total was negatively correlated with 40-day cumulative temperature before the pollen season (rs=-0.648). The number of days with a high pollen concentration (50-200 grains/m³) was 3-16 in particular years, while 1-4 days were recorded with a very high concentration (>200 grains/m³). The number of days with a concentration exceeding the threshold value at which allergy symptoms occur (for Quercus it is 80 grains/m³) ranged from 1 to 11, averaging 8 days.
**Conclusions:** Maximum Quercus pollen concentrations were recorded in central-eastern Poland between 30 April and 10 May. The annual Quercus pollen total was higher when 40-day cumulative temperature before the pollen season was lower. The number of days with a concentration higher than the threshold value for Quercus pollen averaged 8 days.

3th September 2012
P_RM.13
**Aeropalinological investigations in Sofia (1967-2011)**

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**Objectives:** Nowadays there is a great interest in nature and its influence on human health. The project involves aeropalinological investigation in Sofia from 1967 till 2011. The results from an every year inform the patients and medical doctors for the pollen seasons. The results of a long-term observation could be useful for explanation of ecological problems, climatic changes and pollen allergy.
**Methods:** At the beginning, of the study, the Durham method was applied surveys were held based on method of Durham. Since 1991, the Lanzoni device had been used. The sedimentation method shows the influence the local vegetation, but the volumetric method – region vegetation.
**Results:** A positive correlation between pollen season and meteorological parameters was found for the beginning of the Burch pollen season and daily temperatures of previous months, sunshine in Poaceae and rainfalls in the pollen seasons of Artemisia. On the basis of the quantity of the pollen grains can be determined the characteristics of each object pollen taxa, which can be a risk factor for pollen allergy. The relatively short-term observations can be used in forecasting the beginning and duration of the pollen seasons. The geographic situation and the meteorological parameters characteristic for Sofia determine the different correlation linkages between the data of flowering season of the studied taxa and temperature in Alnus, Betula and humidity in Artemisia. The positive distribution tendency is in the pollen grains from Platanus, Quercus, Ambrosia, Artemisia.
**Conclusion:** The investigation of pollen spectra in Sofia is important to determination which can be a risk factor for pollen allergy, facilitates the allergologists in making exact diagnosis and defining the effective prophylaxis and treatment of patients. In the future the aeropalinological investigation will be in use for determined ecological change.

3th September 2012 POSTERS
P_PH.1
**Relation between phenological date and atmospheric pollen concentration of Ericaceae**

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**Objectives:** Ericaceae family mainly consists of entomophilous plants, although Erica arborea L. shows a certain anemophilous. This fact together with the wide distribution of the genus Erica plants, occurring mainly in the north of Spain, is the reason why the pollen type Ericaceae is known as "airborne pollen" and included in the annual pollen calendar of many cities in Spain. The aim of this study was to use phenological studies in combination with aerobiological analysis in order to observe the relationship between the release of pollen and its presence in the atmosphere.
**Methods:** Data from Ericaceae pollen type had been collected using a Burkard volumetric pollen trap working continuously from 2008 to 2010 in León (Northwest of Spain), following the proposals of the Spanish Network of Aerobiology [1]. Phenological observations were carried out on 25 plants from two Erica arborea populations and two E. australis L. populations placed near the city, from the years 2008 to 2010.
**Results:** The Ericaceae tetrads were mainly recorded in León from May to June. The minimum annual pollen index was recorded in 2009 (321) and the maximum in 2010 (449). In average, this pollen type represented 2.4% of total annual pollen. E. arborea pollen provides the highest contribution to the amount of Ericaceae pollen in the atmosphere of the city and in addition, it could be considered as presenting secondary anemophily, because it shows a higher pollen production than other taxa of the family. The onset of flowering has been delayed along the three years studied due to the decrease of the mean temperature in the winter months and early spring. The flowering period lasted from 41-53 days in E. arborea and from 51 and 61 days in E. australis. Despite the fact these plants are located between 7 and 27 km from the city, the study shows coincidences between the highest percentage of Ericaceae plants in the major pollen release phases and high levels of their pollen recorded in León.
**Conclusions:** Major differences observed in Ericaceae pollen curves were attributed to the influence both of weather conditions (temperature and photoperiod mainly) and pollen transport by the variable gusts of winds from areas where the flowering occurs at a different time. This information might prove useful to improve pollen forecasts.
**References:**
1. Galán Soldevilla C, Cariñanos González P, Alcázar Teno P, Domínguez Vilches YE. Manual de Calidad y Gestión de la Red Española de Aerobiología. Servicio de Publicaciones de la Universidad de Córdoba, Córdoba 2007: 61.

3th September 2012
P_PH.2

**Phenology of flowering and threat of allergenic airborne pollen of herbaceous plants in Szczecin and Gudowo (Western Pomerania, Poland)**

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**Objectives:** The aim of the present study was primarily to make phenological observations of Chenopodium album, Artemisia vulgaris, and Secale spp., to perform measurements of the rate of growth of their inflorescences, and to analyse herbaceous pollen content in the atmosphere of Gudowo in the period 2009-2010 and in the atmosphere of Szczecin in 2009. The study also investigated the effect of meteorological factors on airborne pollen and the risk of pollen allergens to pollinosis sufferers.
**Methods:** Phenological observations were carried out in the period 2009-2010 at five locations in the village of Gudowo. Every day, the length of 20 selected inflorescences was measured, its mean value was then calculated, and phenological stages were determined. Pollen deposition was studied at two sampling sites – in Gudowo and in centre of Szczecin by the gravimetric method (Durham sampler). The effect of meteorological parameters on the occurrence of airborne pollen grains was evaluated (using Spearman's rank correlation coefficient).
**Results:** In 2010 the flowering period of the studied taxa was shorter than in 2009 and its onset was observed later. Flowering of rye and pigweed was shorter by 4 days, while in the case of mugwort by 10 days. Differences were noted in the dates of occurrence of the successive phenological stages and in their duration, in particular the stage $F_3$, which marked the beginning of full flowering and lasted until the appearance of the first overblown flowers, was shorter. The concentration of airborne rye pollen grains increased with the development of inflorescences, whereas in the case of Atremisia this increase occurred after its mass flowering ended and the inflorescences reached the largest size. In 2009 the highest values of goosefoot pollen deposition were recorded during the full bloom period, while in 2010 already after flower senescence. Single pollen grains of the investigated taxa floated in the air for several weeks after inflorescence senescence. Pollen grains of most of the studied taxa appeared in the atmosphere of the city two weeks earlier; only pollen grains of Urtica and Chenopodiaceae were observed earlier in the air of Gudowo. Grasses were characterized by the longest pollen shed period and they also showed the highest percentage in pollen counts (60%). Pollen grains of mugwort and goosefoots appeared in the air latest and they showed the lowest percentage. In 2010 pollen grains of studied taxa appeared in the air later and remained much shorter as well as the maximum values of daily pollen deposition were lower. A statistically significant positive correlation with pollen deposition was found in relation to air temperature, maximum wind speed, while a negative correlation was found with respect to precipitation and – only in the case of Rumex – air humidity and pressure.
**Conclusions:** The pollen shed periods of particular taxa varied at both sampling sites and between years; this depends on whether these sites are located in the urban or rural environmental as well as on meteorological conditions. Flowering of most taxa occurs earlier in cities, while average airborne pollen concentrations are higher for rural areas.

3th September 2012
P_PH.3

**Alnus x spaethii a hybrid species which can cause allergies already at Christmas**

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**Objectives:** Alnus x spaethii is a hybrid alder species (A. japonica x A. subcordata) which was described for the first time in 1908. The tree figures on recommended tree guidance lists in towns, since it tolerates urban climate and pollution. Observations show that Alnus x spaethii is flowering much earlier than the indigenous alder species of Central Europe.
**Methods:** At the pollen station of Buchs unusual early peaks of alder pollen have been observed in the last years. This peak occurred several days to weeks earlier than at any other Swiss pollen station. An alley of Alnus x spaethii trees, planted in 1995-2000, 800 m south of the pollen trap is a likely pollen source. Phenological observations were made in the pollen seasons 2011 and 2012 and pollen were measured with a Hirst type pollen trap in December 2011. In Grabs, a neighboring village of Buchs, a 24 year survey of the sensitization of school children has been carried out. Using data from this study, sera from 54 pupils in 1986 and 46 pupils in 2006 were reanalysed by a microarray-based determination of IgE to 103 molecular Allergens including nAln g 1. Also, 12 pupils with positives specific IgE in the 1986 year group were recalled and reinvestigated in 2010.
**Results:** Alnus x spaethii was fully flowering on 28 December 2010 and at the same date in2011. In December 2011 first pollen grains of Alnus were recorded on the 20 December and the threshold for high concentrations (70 Pollen/$m^3$) was exceeded on the 2 January 2012. The separation of the presence of Alnus x spaethii pollen from the pollen of Alnusglutinosais estimated by comparing the alder pollen counts of Buchs with the neighbouring pollen stations. The flowering period of Alnus x spaethii lasts in Buchs for approximately two to three weeks and can bring another 14 days with moderate and 1-6 days with high pollen concentrations. Overall the alder pollen season of 2011 in Buchs had a duration of 74 days and was at least twice as long as in all other Swiss pollen stations. Sensitisation against alder (nAl g 1) was not found in 1986, but was detected in 2006 in 5 out of the 46 not selected "healthy" schoolchildren (10.9%). This increased sensitization was not seen with other tree pollen allergens such as birch (Bet v1). From a cohort of 10 pupils, 3 show a new sensitisation to nAln g1 in 2010.
**Conclusion:** Due to the presence of Alnus x spaethiian early and long alder pollen season was observed in Buchs. Additionally, increasing sensitisations to alder in the region of Buchs was observed. Thus newly introduced plant species seem to be able to become a relevant allergen within a short. It is a challenge for the aerobiological community to prevent the planting of such hybrid tree species which will clearly worsen the pollen situation for allergic people. It is an important challenge to identify the regions in Switzerland and Europe with a similar situation as in Buchs.

3th September 2012
P_PH.4

**Models for forecasting olive tree flowering time in central Spain**

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**Objectives:** The biological cycle of the olive tree is closely linked to weather-related variables and their study is of great interest in Castilla-La Mancha (Spain), the second Spanish region in olive oil production, where 34.4% of the groves are located in the province of Toledo. The aim of this study is to show that meteorological variables have large influence on the floral phenology of the olive tree in the province of Toledo, and build models to predict the start date of the pre-flowering and flowering periods.
**Methods:** Phenological observations were carried out during 2009-2011 in 4 sites in the province of Toledo. We have measured the pre-flowering phases (51, 54, 55, 59 BBCH scale) and the flowering phases (60, 65, 68 BBCH scale). The start date of each phenological phase has been correlated with the mean monthly and seasonal values of temperature, rainfall, sunshine hours and relative humidity. In addition, we have obtained regression models to predict the start date of the pre-flowering and flowering periods.
**Results:** The start of the pre-flowering period is negatively correlated with maximum temperature of the previous months of the pre-flowering period and with the maximum temperature of the pre-flowering period. However, there is a positive relationship with maximum temperature in November. These relationships may be due to the achievement of the heating and chilling requirements for the budburst. Rainfall during the latent period and the relative humidity in February also is positively correlated to the start of the pre-flowering phases. The start date of the flowering period is negatively correlated with maximum temperature between January and the beginning of flowering period, especially during the month of February. There is also a positive but weak correlation, between the flowering phases and the hours of sunshine from January until the beginning of the pre-flowering period.
The best models to predict the start of the pre-flowering and flowering periods are obtained with the variable maximum temperature in February. The model to predict the start of the pre-flowering ($R^2$=0.596, n=8, P<0.05) has a root-mean-square error (RMSE) of 5.1 days. The prediction model of the start of flowering ($R^2$=0.907, n=8, P<0.001) has a RMSE of 2.3 days.
**Conclusions:** Temperature is the variable that has a greater influence on the biological cycle of the olive tree, followed by other parameters such as precipitation, relative humidity or sunshine. This information can be useful for the practice of agriculture, however to construct more accurate prediction models, more years of phenological samplings should be considered.

3th September 2012
P_PH.5

**Relationship between floral phenology and Plantago lanceolata pollen concentration in the atmosphere**

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**Objectives:** The genus Plantago of Plantaginaceae family is a weedy, cosmopolitan, and herbaceous perennial that grows in disturbed sites, abandoned crop fields and lawns. This taxon includes different species such as P. lanceolata L., P. coronopus L., P. media L. or P. major L. Plantago pollen is one of the most important pollen types in the atmosphere of Europe and is always described as allergenic (D´Amato & Spieksma, 1992). The studies concerning the composition of the atmospheric pollen spectra of Spanish cities, show that Plantago pollen is present in all of them, although in varying amounts and generally never more than 10%. The aim of this study was to analyze the relationship between atmospheric pollen concentration and phenological phases during two years of study in a city of the northwest of Spain.
**Methods:** The study was carried out in León (North-western Spain) during the years 2007 and 2008. Phenological monitoring was performed in eight sites located about three kilometres from the pollen sampling station. We selected 30 plants of Plantago lanceolata which were monitored once a week from late March to mid-August. The flowering period was divided into 5 phases: - Phase 0 begins when the first inflorescence and ends when the first flower appears; - Phase 1 starts at the opening of first flower until 25% of the flowering; - Phase 2 ending when 75% of flowers are open corresponding to maximum pollen release; - Phase 3 goes from the moment in which more than 75% of the flowers are open until the end of the pollen release; Phase 4 starts when all flowers have lost their anthers. Aerobiological sampling was carried out with a Hirst volumetric pollen trap. The method used for sampling and samples analysis has been proposed by the Spanish Aerobiology Network (Galán et al., 2007, Spanish Aerobiology Network: Management and Quality Manual, Universidad de Córdoba).
**Results:** We have observed that the development of inflorescences and pollen dispersal was began before in 2008 compared to 2007, namely the flowering was started one week before and ended two weeks earlier. Plantago pollen grains were detected in the atmosphere just before the beginning of flowering in the plot studied. The peaks of atmospheric concentration of Plantago pollen (34 grains/$m^3$ in 2007 and 51 grains/$m^3$ in 2008) occur in the weeks during phase 2 when there is the highest percentage of P. lanceolata flowers.
**Conclusions:** The differences between the plots at the onset, duration and end of phenological phases of Plantago lanceolata are mainly due to the characteristics of the land in which they develop and water availability. However, the differences between the two years analyzed are caused mainly by meteorological conditions. There is a clear relationship between phenological behaviour of P. lanceolata and Plantago sp. pollen trend concentration during the two years studied. This suggests that Plantago lanceolata provides most of the pollen from the pollen spectrum of the Plantago genus.

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3th September 2012
P_PH.6
**Use of phenological maps to forecast airborne pollen concentration**

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**Objectives:** "IPHEN Project, Italian Phenological network" began in 2006. Its aim was the production of phenological maps for Italian area. The project was based on a simulation model developed in order to produce weekly maps of phenological phases for 6 species (Vitis Vinifera cv Chardonnay and Cabernet Sauvignon, Sambucus nigra, Cupressus sempervirens, Cupressus arizonica, Robinia pseudo-acacia, Olea europea). A standard routine to correct model results on the base of phenological data collected by a group of observers working on different parts of Italy was implemented. Final results were broadcasted on the Internet site www.ucea.it." [1]. The aim of this job was to evaluate the use of phenological maps produced by IPHEN, for Cupressus and Olea, two allergenic species, as map of prediction of allergenic pollen.
**Methods:** In this paper we wanted to compare the results obtained by phenological monitoring with aerobiological data detected in some sites of R.I.M.A. (Italian aeroallergen monitoring network). Values of daily pollen concentration of Cupressus and Olea pollen grains were considered, for 2010 and 2011. The first step was the analysis of phenological data to reconstruct the development cycle of cypress and olive trees at the ground; at the same time, we performed an analysis of the pollen season, identifying the start date, peak, end of pollination, the length and the SPI. Subsequently, the phenological cycle and the cycle of pollen, for the same species and at the same site, were compared to verify their timing. Another objective of the work was to verify the relationship between the air concentration of cypress and olive trees pollen grains detected by aerobiological monitoring and phenological stage of plants and the comparison of phenological maps with the pollen concentration detected by the site.
**Results:** The aim of this job was the comparison between the results of the aerobiological monitoring and the phenological ones. Aerobiological monitoring showed the presence of Cupressus pollen grains and Olea pollen grains while the phenological observation had detected phases before flowering. In the case of cypress one can say it belongs to other genus or species (Cupressus arizonica) of Cupressaceae. We can also suppose that it comes from plants located in favorable areas, sheltered from cold winds and favorable exposure to make them quite early. Olea pollen grains have also been detected before flowering of local trees. In that case, we can explain their presence in the air as the effect of a long distance transport; for example, Olea pollen grains detected in Rome can be explained with olive tree flowering in the south of Latium or in Campania region and sometimes, from some trees that live in the city and are affected by the heat.
**Conclusions:** Phenological maps are really useful in predicting the start of the pollen season. To know the phenological development of a species on the National territory is an important information for predicting the concentration of pollen in the following period. Forecast is an important tool for people allergic and must be the most-accurate as possible.
**References:**
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3th September 2012
P_PH.7
**The patterns of Alnus and Corylus pollen seasons and pollination periods in two Polish cities located in different climatic regions**

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**Objectives:** The pollen presence in the air in a given place is an effect of interactions between the factors associated with the formation of inflorescences, pollination and transport conditions in the atmosphere. The flowering pattern has a considerable effect on the pollen season, its onset, duration, and airborne pollen concentrations, therefore it is important to know the ecology and phenology of pollination. Many papers emphasise that these phenomena do not necessarily overlap in time. Alder and hazel pollination and airborne pollen are characterized by high variability and a dynamic pattern, while the weather factors have a strong impact on these phenomena. The present study was carried out at two sites not only located at a substantial distance from each other, but also in different climatic regions. A thesis was put forward that in these regions both the hazel and alder pollen seasons and the pattern of pollination would differ in terms of their timing and dynamics. An important issue was to verify whether the pollen season coincided with the pollination period, and if so to what extent, as well as whether the relationships between these phenomena were similar in both cities.
**Methods:** Aerobiological monitoring was carried out in two cities, Szczecin (53°26'26"N, 14°32'50'E) and Rzeszów (50°01'N; 22°02'E) situated in different climatic regions using the volumetric method. During phenological observations 7 phenophases were distinguished according to the Łukasiewicz method. The species under question occur in both cities and their surroundings. By comparing the timing of flowering periods at the chosen sites, the synchronization index was calculated.
**Results:** The timing of the pollen seasons differed markedly. Generally, in Rzeszów the first alder and hazel pollen grains appeared with a great delay comparing to Szczecin. The study found statistically significant correlations between pollen concentration and temperature in three seasons for alder, whereas for hazel only in 2009 and 2011, and statistically significant correlation with relative humidity for both taxa in 2009. Meteorological elements in the preceding days may affect, to a certain degree, the current concentrations. Alder and hazel trees flowered distinctly earlier in sites located in well-insolated and wind-sheltered places, while a delay in the timing of pollination was observed in shadow and very windy sites. In Szczecin the highest amount of hazel pollen was generally recorded during the full pollination period, whereas in the case of alder at the beginning of pollen shed or during the full pollination period. In Rzeszów the season of maximum hazel and alder pollen concentrations did not coincide with the full pollination period.
**Conclusions:** Pollen concentrations are mainly related to temperature. In both cities the full pollination periods of hazel and alder rarely coincided with the period of the highest concentrations and in each year pollen dominated in a different phenophases. The pollen season is generally longer than the flowering period, since we take into account all airborne grains, also those originating from secondary deposition and long-distance transport.

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3th September 2012 POSTERS
P_AA.1
**Are agricultural areas the main source of Alternaria fungal spores in the atmosphere?**

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**Objectives:** The fungal genus Alternaria includes numerous plant pathogens, some of which are not only an agricultural problem, but can also threaten human health. How Alternaria is distributed in time or space has rarely been investigated, and the main source to airborne Alternaria spores remains to be identified. In this study we hypothesize that agricultural areas with certain types of crops and production systems such as rotation with mechanical harvest are the main source of Alternaria spores in the air.
**Methods:** Measurements from the long term Danish Pollen and Spore program have been analysed at Copenhagen during 2001-2010 with respect to Alternaria spores. Back trajectories and land cover with respect to agricultural areas from the CLC2000 data set are combined and analysed using similar protocols as previous trajectory studies on data from the Danish or English monitoring programmes. Local emission studies from Danish agricultural fields are used to identify if they could be a potential source of Alternaria spores. Counting of spores from the potential source was done using a similar methodology as in the Danish pollen monitoring programme.
**Results:** The analysis of bi-hourly Alternaria spore concentrations shows a typical daily pattern with peak concentrations in the late afternoon. The emission studies verify that local fields can be a source to Alternaria spores. The source strength between individual fields and between individual sampling days can vary with a factor of 2. A typical episode with possible Long Distance Transport (LDT) was identified. Back trajectories during the selected period show that during the period with elevated concentrations, air masses arrived from Central Poland. According to CLC2000 large parts of Denmark, central and northern Germany and central Poland are dominated by agricultural production under rotation.
**Conclusions:** The measured airborne concentrations of Alternaria spores in Copenhagen suggest that the daily load of Alternaria spores is dominated by local or near local sources. The emissions studies verify, that this hypothesis is true, but also that the source strength in between fields is large. The measurements from the monitoring programme also indicate episodes of LDT of Alternaria spores that originate from central Poland with areas that are dominated by agricultural areas under rotation systems such as barley, wheat and potatoes. Previous studies in Poland have highlighted central Poland around Poznan and Warszawa as areas with a very high load of Alternaria spores compared to e.g. southern Poland such as Krakow. It is well known that the species Alternaria alternata (Fr.) Keissl. (common name: early blight) is a problematic fungal pathogen in certain agricultural crops, especially potatoes. This study supports the hypothesis that agricultural areas can be the major source of elevated Alternaria spores in the air and that measured concentrations are mainly due to local sources with intermittent LDT from major agricultural areas in rotation.

3th September 2012
P_AA.2
**The phytocoenoses on antropogenically transformed areas as a potential sours of pollen allergens**

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**Objectives:** In urban areas the green spaces are developed as a part of planning initiatives to improve city conditions. However, beyond the planned arrangements the spontaneous vegetation grows on different antropogenically transformed habitats. The vascular plants flora of ruderal phytocoenoses includes a lot of anemophilous species with allergic properties (e. g. Atriplex, Chenopodium, Rumex, Artemisia, Iva, Bromus, Phleum, Setaria, Digitaria, Calamagrostis, Eragrostis, Hordeum, Urtica, Lolium or Puccinellia (data of different authors). The aim of the study was to identify and determine the dynamics of ruderal phytocoenoses that consist of anemophilous species with allergenic characteristic.
**Methods:** The study was condacted in the Lublin city area, Poland (FE27, 28, 37, 38). The inventory of phytocoenoses was made in 2005-2010 and the obtained data were compared to historical data. A total of 158 relevés were made. The phytocoenoses were distinguished on the basis of characteristic species, according to the Braun-Blanqueta method (1964). The syntaxonomic classification of the identified phytocoenoses was determined mainly according to Matuszkiewicz [1]. The distribution of ruderal phytocoenoses was based on floristic inventory made at 1 km x 1 km squares. These squares represent a decimal extension of the grid of squares used in the Distribution Atlas of Vascular Plants in Poland - ATPOL [2].
**Results:** In the Lublin area two groups of phytocoenoses dominated by species producing potentially allergenic pollen were present. The first group, unstable phytocoenoses, usually consisted of annual and biennial species. They were widespread along roadsides, on ruderal waste grounds, construction sites, trash and rubble dumps or allotment gardens. Among rapidly changing were Panico sanguinalis-Eragrostietum, Corispermo-Brometum tectorum, Atriplicetum nitentis, Atriplicetum tataricae, Chenopodietum ruderale, Chenopodio rubri-Atriplicetum patulae, Chenopodietum stricti, Ivetum xanthiifoliae, Galinsogo-Setarietum, Echinochloo-Setarietum, Puccinellietosum distantis, Digitarietum ischaemi, Hordeo-Brometum. The following – Corispermo-Brometum tectorum, Calamagrostietum epigeji, Lolio-Plantaginetum, Arrhenatheretum elatioris, Convolvulo arvensis – Agropyretum repentis, Artemisio-Tanacetum, com. with Bromus inermis belonged to the secound group of stable phytocoenoses. Usually the stable phytocoenoses formed wide patches (20-50m$^2$).
The Panico-Galinsogetum and Artemisietum annui phytocoenoses were not found, compared with historical data. Otherwise previously absent Atriplicetum tataricae, com. with Eragrostis albensis,Digitarietum ischaemi, Calamagrostietum epigeji were distinguished. That phytocoenoses were usually present along railways and traffic routes.
**Conclusions:** The changing nature of ruderal phytocoenoses may cause difficulty in predicting the appearance and concentration of allergenic pollen in the air of Lublin.
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3th September 2012
P_AA.3
**Evaluation of intensity and distance of oilseed rape pollen transfer in Great Poland in 2011**

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**Objectives:** Oilseed rape (Brassica napus L. ssp. oleifera Metzg.) is both self-and cross-pollinated. The frequency of outcrossing is dependent on the genotype of the cultivar and environmental conditions. Cross pollination is estimated to be between 0 and 90% depending on cultivar. Outcrossing mainly occurs between fields in the neighborhood but also pollen dispersal is observed in long distance. The extent of gene flow of genetically different types is largely dependent on the scale of pollen production and dispersal and on distance between fields in a particular season and place. The matter of gene flow is particularly relevant to oilseed rape because this species is partially allogamous, and produces a huge quantity of pollen, 5×1012 pollen grains per ha. Pollen is dispersed by wind, hive bees, bumble bees and other insects. The extent of pollen-mediated gene flow in oilseed rape is strongly dependent on climatic conditions (e.g. wind speed and direction) as well as its pollen characteristics. Rapeseed pollen grains are relatively large (32-33 µm), heavy and sticky, with viability estimates ranging from 1 to 5 days under natural conditions. The objective of this research project was to investigate the frequency and distance of pollen dispersal in Polish environmental conditions to determine the size of the buffer zone between the crops of different types of oilseed rape.
**Methods:** The experimental field (acreage about 0.6 ha) was isolated by at least 5 km from other oilseed rape plantations. The monitoring of intensity and distance of pollen oilseed rape transfer was done in the period from 6 to 25 May 2011 using passive and active pollen traps. Passive traps were placed at five compass directions around the field at the distance of 90 m in increments of 5 m. Hirst-type volumetric pollen traps (Burkard Manufacturing, UK) were positioned on a linear transect in the direction of the prevailing wind (S-E) at the distance of 90 and 180 m from the edge of the field. Calculation of pollen concentrations was based on pollen number visualized on Vaseline-covered and stained Melinex tapes that were mounted on microscope slides and quantified with light microscopic techniques.
**Results:** The obtained results indicate that pollen transfer through winds in oilseed rape was significant for short distance. The highest intensity of pollen was generally found in the first 40 m from the edge of field, at each compass direction, a decrease in intensity with increasing distance was observed. However, in the peak of flowering pollen grains flow up to 180 m of the investigated distance.
**Conclusions:** Cross pollination is not the main problem for coexistence of different types of oilseed rape cultivars. The transfer of different genotypes by pollen dispersal can be managed through spatial separation and the use of buffer or discard zones where crops are in close proximity.

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3th September 2012
P_AA.4
**Development of multiplex assays to quantify spore release of major agricultural pathogens**

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**Objectives:** Potatoes and barley are two of the major economic crops grown in Scotland. Losses due to fungal pathogens are estimated in the tens of millions on an annual basis. The two most important pathogens of barley are Rhynchosporium commune and Ramularia collo-cygni. In potatoes the major diseases are Phythophthora infestans and Alternaria solani. The aim of this study is to develop multiplex assays to simultaneously quantify spore levels of major pathogens of barley and potatoes and provide a tool for epidemiology and plant pathology studies.
**Methods:** Real time PCR assays to detect 2 major pathogens of barley have been developed. The R. commune assay is based on specific primers for the cytochrome b complex and the R. collo-cygniassay is based on the ITS region. Both of these assays have detection thresholds lower than 0.13pg. Initial multiplex assay design has focused on annealing temperatures. A real time PCR assay has also been designed for P. infestans. An assay for A . solani will be designed from the ITS region for this pathogen. A series of Burkard seven day spore samplers were situated next to crops in order to monitor spore movement.
**Results:** Preliminary results for the barley pathogen multiplex assay indicate an optimal annealing temperature of 56°C. Plant samples and DNA extracted from the Melinex tape in Burkard seven day samplers was tested. No significant losses of sensitivity were observed.
**Conclusions:** The movement of spores from the major barley pathogens has been studied in Scotland over recent years. Results from spore samplers have helped increase our understanding of the epidemiology of both diseases. In addition, the development of qPCR assays has allowed the study of asymptomatic movement of the diseases. The development of the multiplex assay will increase the throughput of samples and help generate further data for epidemiologists and plant pathologists. The multiplex assay for the potato pathogens will be used, in combination with meteorological data, to increase knowledge of spore movement and lead to the development of risk assessment models for this crop.

3th September 2012
P_AA.5
**Some monofloral honeys from the Sandomierz Upland**

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**Objectives:** The subject of the present study were 24 monofloral honeys harvested during the period 2004-2006 in the Sandomierz Upland (south-eastern Poland). The aim of this study was to identify their pollen spectrum and forage plants that provide nectar to honey bees within the study area.
**Methods:** Microscopic pollen analysis of these honeys was performed following the methodology given by Louveaux [1] and Moar [2], whereas pollen classification followed the description given by Zander [3]. The recommendations of the Polish Standard PN-88/A-77626 “Bee honey” [4] were used in honey evaluation. Honey colours were determined following A Dictionary of Color by Maerz and Paul [5].
**Results:** Among the investigated material there were distinguished 9 monofloral clover honeys, 8 honeys obtained from hemp-nettle and 7 honeys from fruit trees. The clover honeys originated from the nectar of Trifolium pratense and Trifolium repens. Five samples comprised red clover honeys with the percentage of T. pratense pollen ranging between 49.1% and 88.7%. The white clover honey contained 46.1% of T. repens pollen. The other 3 samples were blended honeys in which the total pollen percentage of both clover species was 50.2%, 53.0%, and 67.3%, respectively. The clover honeys were characterized by a pleasant, delicate aroma of clover flowers. Their colour varied from crème to grey-olive. In the 8 hemp-nettle honeys, the percentage of Galeopsis pollen was in the range from 46.3% to 80.2%. Their colour was from dark crème to amber brown and they had a delicate, weakly detectable aroma. Among the 7 fruit tree honeys, 5 originated from the Prunus pollen source, and the percentage of pollen of this taxon was from 46.6% to 75.8%. The other 2 honeys were blended honeys containing Prunus and Malus pollen in which the total pollen percentage of these two taxa was 46.2% and 68.1%, respectively. The honeys from fruit trees, with a delicate aroma of their flowers, were characterized by bright yellow to amber colour.
**Conclusions:** The Sandomierz Upland can be considered to be an area where unique monofloral honeys are harvested from hemp-nettle, clover and fruit trees. The honey bee flora in the study area comprises herbaceous plants as well as trees and shrubs.
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3th September 2012
P_AA.6
**A reliable method for monitoring of pollen flow in triticale (x Triticosecale Wittmack)**

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**Objectives:** Pollen grains are the largest part of the bioaerosol. Their primary function is to provide microgametophytes to compatible pistils, where they germinate and fertilization takes place. Yet the side effect of pollen presence in the air is induction of allergic reactions in humans. Hexaploid triticale (x Triticosecale Wittmack), is a man-made, intergeneric hybrid which combines genomes A and B of durum wheat (Triticum durum L.) with the R genome of rye (Secale cereale L.). Triticale is considered a self-pollinating species, but sufficient evidence exists of outcrossing among plants in the immediate vicinity. The level of outcrossing in triticale is affected by such factors as humidity, air temperature, as well as date of anthesis, varietal differences, the strength and direction of the wind and the distance that the pollen grain has to flow. Here we present a reliable method developed to study pollen flow in hexaploid triticale.
**Methods:** a genetically modified triticale line [1] carrying the uidA marker gene under the control of the rice actin promoter was used. Transgenic pollen can be identified histochemically – the uidA gene product (glucuronidase) in the presence of x-gluc (substrate for glucuronidase) transform the latter into a blue-colored product. Tests were performed in 2010 and 2011 on two fields (2 ha each). Transgenic triticale sown on the area of 400 $m^2$ was surrounded by non-transgenic plants of isogenic cv. Bogo. Passive traps were located at different distances from transgenic triticale. Pollen collection was done for nine days during triticale flowering. The traps were collected every 24 hours and staining reaction was carried out to detect transgenic pollen grains. These were counted using a scanner and dedicated software was performed.
**Results:** The concentration of the pollen in the air depended on wind direction and the distance from the pollen donor. In the direct vicinity of transgenic plants, the maximum concentration of 750 grains per 1$cm^2$ of passive trap was recorded. At a distance of 85-100 m from transgenic plants only individual pollen grains were identified. The highest pollen density was observed to the north (in the first year) and to the south (in the second year), consistent with predominant wind directions recorded in those years.
**Conclusions:** Triticale pollen can reach a distance of over one hundred meters from the pollen source, but a strong distance gradient in dispersion is present. Pollen concentrations vary considerably depending on the distance, wind direction and years of monitoring. The proposed method has been developed for transgenic triticale, yet it may serve as reliable tool to study pollen flow in other species.
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Zimny J, Becker D, Brettschneider R, Lörz H. Fertile transgenic Triticale (x Triticosecale Wittmack). Mol. Breeding. 1995; 1 (2): 155-164.

4th September 2012
AA.1
**Aerobiology and phenology as a tool to predict Treixadura grapevine harvest**

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**Objectives:** Advance knowledge of potential grape production is of great value for harvest and post-harvest planning; it enables the winery to estimate requirements in terms of crop insurance, and grape-picking workforce, and to optimize post-harvest processes. At the same time, it facilitates the detection of possible fraud due to the introduction of foreign grapes into Designation of Origin areas such as north-western Spain. Average annual grape production in Galicia is over 40 million kilograms; 85% of grapes are of white varieties. This paper has sought to combine the study of aerobiological, meteorological, phenological and pollen production variables in order to develop an accurate model for predicting the "Treixadura" variety grape yield.
**Methods:** An aerobiological and phenological study has been carried out in a vineyard of the Designation of Origin Ribeiro, located at the Cenlle district (Ourense-Spain) during the grapevine vegetative cycle, from 2004 to 2011. Airborne fungal propagule concentrations were determined using a volumetric Hirtst type model Lanzoni VPPS 2000 spore trap located inside the vineyard, following the method proposed by the Spanish Aerobiological Network (R.E.A.). The phenological observations have been carried out on 20 plants of the Treixadura variety, applying the phenological scale standardized by the BBCH. To determine the pollen, flower and bunch quantity produced per plant, ten vines were selected from the 20 for conducting the phenological study. Meteorological data were obtained from a Hobo Micro Station data logger located in the vineyard. Lineal regression and a multiple regression analysis were used in order to elaborate a model to predict the final grape production. As model estimators the meteorological, phenological, and phytopathological variables with highest significance and positive Spearman correlation coefficient were selected.
**Results:** The 2010 harvest presented the highest grape Treixadura production with a total 2109 kg in the vineyard studied and the 2005 and 2007 vintages with the lowest quantity (around 750 kg of grape). For the model elaboration, data from years 2004 to 2010, and meteorological and phenological variables were considered. The grape production prediction model for the variety Treixadura considers as independent variables the August average temperature and the concentration of P. viticola spores in the first fortnight of April. The resulting equation explains more than the 90% of the variability of the predicted harvest. The model has been tested with the data of the 2011 harvest by means cross validation, verifying the existence of a 2.3% of difference between the real and the estimated production.
**Conclusions:** The integration of meteorological, phenological, pollen production, and phytopathological variables, provide a valuable tool for predicting potential grape harvest and thus wine production.

4th September 2012
AA.2
**Identification and quantification of Fusarium species in air samples**

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**Objectives:** Fusarium head blight is a disease of increasing concern to wheat (Triticum aestivum L.) production. Economic losses result from decreased grain yield and quality due to contamination by mycotoxin. Fusarium head blight is caused by the fungi in the Fusarium genus with the following species being the most commonly involved: F. culmorum, F. avenaceumand F. graminearum. These fungi survive between crop seasons as saprophytes in debris of infected cereals and they produce spores in the following growing season. Under favorable weather conditions spores, transmitted by air, may infect different parts of wheat plants, mainly stem bases and heads. The objective of this work was to determine daily patterns of airborne spores of Fusarium spp in different regions of intensive wheat production in Poland.
**Methods:** From 1 May to 15 July 2011 the analysis of the concentration of Fusarium spp. spores in air samples was done at 4 sites located close to winter wheat fields. The studies were done using two **Methods:** 1) the volumetric method, with the use of Hirst type spore samplers (Burkard Manufacturing Inc., UK) and 2) the biological method using MicroBio MB1 samplers (Cantium Scientific, UK). Both devices were placed in: Radostowo (Pomerania, north of Poland), Choryń (Great Poland, west of Poland), Charbielin (Opole region, south-west of Poland) and Krasne (Carpathian Foothills, south-east of Poland). The Burkard spore sampler was places at the ground level and the orifice was at 1 m about the ground level. MicroBio sampler was also kept 1 m above the ground level. Visual observations of spores on tapes from Burkard spore sampler were done using the light microscope. Fungal colonies growing on three types of microbiological media (Potato Dextrose Agar, Pentachloronitrobenzene Agar and Small Nutrient Agar) were grown, subcultured till pure and identified at the species level using PCR-based molecular methods. Molecular detection was based on Internal Transcribed Spacer and Sequence Characterized Amplified Regions, using multiplex PCR and PCR (Polymerase Chain Reaction).
**Results:** In all locations the spores of Fusarium spp. were found in air samples and their concentration differed in space and time. Numerous spores of Fusarium spp, were observed, mainly of F. culmorum spore type. The spores of Fusarium belonged to several species, with F. graminearum, F. culmorum and F. avenaceum being highly represented. In all studied regions the maximum concentration of spores was observed at the end May and the first ten days of June. This coincided with the flowering period of wheat. This is the time of the highest colonization of wheat by these pathogens.
**Conclusions:** Wheat producers can find optimal time of treatment based on the presence and concentration of Fusarium spores in air samples, what allows better prediction of risk of Fusarium head blight and allow more judicious use of fungicides.

4th September 2012
AA.3
**Advancing our understanding of the epidemiology of the barley pathogens Rhynchosporium commune and Ramularia collo-cygni**

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**Objectives:** The aim of this work was to study the epidemiology of the major barley pathogens, Rynchosporium communeand Ramularia collo-cygni. These diseases cause significan economic losses on an annual basis and any advances in our understanding of their epidemiology could lead to improved control methods.
**Methods:** The epidemiology of these diseases was studied in detail over a number of years using large scale field experiments which combined a number of factors known to influence disease epidemics, such as seed source, spore movement and fungicide treatment. The movement of fungal spores was monitored by means of a Burkard 7 day spore sampler, which allows a daily quantification of fungal DNA levels in the environment. The environmental conditions which favour the spread of spores were measured using an automated weather station situated close to the field experiment
**Results:** Detailed disease assessments indicated that R. commune infection early in the growing season is influenced primarily by seed source and that this should be incorporated into future risk models along with varietal resistance and weather conditions. Analysis of the R. commune DNA recovered from the spore sampler indicated an optimal temperature for spore dispersal of eight degrees Celsius. R collo-cygni spore release events were found to be related to periods of sustained surface wetness in the crop. Seed borne infection was also discovered to be the primary source of R. collo-cygni infection in barley crops.
**Conclusions:** Information derived from field experiments has been incorporated into risk assessment models aimed at optimizing control of the pathogens. Control methods have been refined to improve seed treatments. In addition data from the spore sampler is currently being incorporated into disease forecasting models for the two diseases

4th September 2012
FSP.1
**Culturable airborne fungi in fruit and vegetable markets of Delhi and National Capital Region, India**

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**Objectives:** Propagules of the pathogenic fungi causing postharvest fruit/vegetable rot are found abundantly in the atmosphere. They are a major cause of deterioration of stored fruits and vegetables in markets throughout the world leading to both qualitative and quantitative losses. This has become a major concern of international organizations. The present study was envisaged to identify and quantify prevalent airborne fungal spores in fruit/vegetable markets causing post harvest fruit and vegetable spoilage.
**Methods:** An aerobiological survey of three fruit and vegetable markets of Delhi and National Capital Region (NCR), India was undertaken from March-June 2011 to determine various fungal pathogens present in the atmosphere using the petri plate exposure method. The fungi were enumerated (colony forming units) and identified on the basis of colony morphology and microscopic characteristics. The data was reported as percent abundance of fungal genera/ species. The Pearson correlation coefficients were calculated to study the relationship between the colony counts and simultaneously measured meteorological factors. Fungi were also isolated from rotten fruits/vegetables collected from these markets.
**Results:** Culturable fungal concentrations ranged from 69 CFU (Colony forming units) to 372 CFU/day in the fruit/vegetable markets. Day-to-day variations were observed in airborne fungal counts in the samples collected from all the three markets. However, no significant differences were observed among the three sampling sites. Eleven genera of culturable fungi were identified in the present study. Aspergillus species were the most dominant components of aeromycota constituting 46% of the total fungal colonies. Other frequently isolated fungi were Alternaria, Cladosporium, Penicillium, Fusarium, Heliminthosporium etc. Sterile mycelia also formed a major component of isolated fungi in the three markets (11.9%). The dominant species of Aspergillus were A. niger, A. flavus and A. fumigatus. The lowest fungal counts were observed in the samples collected on days with highest temperature (39.8-42.8°C) and lowest humidity (56-65%). The fungi encountered in the air samples were also isolated from rotten fruits and vegetables. Fruit/vegetable spoilage fungi were identified as: a) Fusarium, Penicillium and Alternaria from potato and tomato; b) Penicillium and Aspergillus in banana and papaya; c) Aspergillus and Fusarium in mango; and d) A. niger and A. flavus in guava.
**Conclusions:** Aspergillus, Penicillum and Alternaria species were the most common components of aeromycota of fruit and vegetable markets of Delhi and NCR, India. The concentration of airborne fungi varied with temperature and humidity. Besides, these fungi were also associated with postharvest fruit and vegetable rots causing economic losses. Thus, detection of airborne fungal spores may help in prediction and prevention of post harvest fungal diseases to enhance the shelf life of fruits and vegetables.

4th September 2012
FSP.2

**Studies on prevalant fungal aerospora; a possible risk factor of respiratory allergy related to hospitalization**

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**Objectives:** In India more than 70% of the total allergic patients are suffering from respiratory allergy, of which 35% are due to fungal aeroallergen. The aims of this study were 1. to detect prevalent aero-allergenic fungal species over a suburb near Kolkata analyzing their periodic patterns and determinant climatic factors; 2. to establish a 'fungal spore calendar' and a statistical model to predict the aerospora load weekly by multiple regression analysis, considering the meteorological parameters as variables; 3. to assess the allergenicity of the prevalent spores and 4. to study the effect of seasonal variation (both qualitative and quantitative) of airborne fungal spores on the manifestation of respiratory allergic symptoms in local population, as well as related hospitalization.
**Methods:** Burkard 7-days volumetric sampler and Andersen sampler were used for monitoring of fungal aerospora in 2006 to 2011. Their allergenic activities were studied by in vivo and in vitro analyses. Detailed medical history of allergic patients and hospitalization data were collected from different allergy clinics and hospitals located near the studied area.
**Results:** Airborne fungal spores of more than 54 airborne fungi types were recorded; among them 21 were found to be prevalent in the studied suburb. Their daily mean concentrations were ranged from 69.2-1714.8 spores/$m^3$ of air. The peak of total spore concentration was found during monsoon time (Jun.-Aug.), whereas the concentration became lower during winter (Jan.-Feb.). In case of total viable spore, the concentration reached its peak in June and was found to be lowest in Feb. The highest diurnal spore concentrations were noted at late-morning, which fell to the lowest at evening. Local meteorological factors, especially temperature and relative humidity showed significant effects on aerospora load. A predictive model to forecast the concentration of 6 prevalent allergenic fungal genera in the air was developed by multiple regression analysis with 58-82% accuracy level, considering the five common meteorological parameters as predictors. 68.7% of the studied patients (2154 in number), who was suffered from different respiratory allergic symptoms were noticed sensitive to 14 different fungal species according to the Skin Prick Test result; 37% of them showed 2+/3+ level of reaction. ELISA revealed that all the sensitive patients exhibited high concentration of total IgE, as well as allergen (to which patients are sensitive) specific IgE in their sera. When Pulmonary Function Test was performed, 84% of patients were noticed to have mild type of lung function impairment. Emergency hospitalization due to respiratory allergy like, asthma and rhinitis was highest in July and lowest in April, which showed a positive correlation (r=0.745; p=0.011) with the airborne spore concentration.
**Conclusions:** The studied area is highly contaminated with fungal aeroallergens which are significant causative agents for severe respiratory allergy. The spore calendar and prediction model can be useful from allergological point of view, especially for the right diagnostics and treatment of inhalant allergy.

4th September 2012
FSP.3

**Aeromycological and immunoproteomic analysis of major aeroallergens from Rhizopus Stolonifer (Ehrenb.) Vuill**

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**Objectives:** Airborne fungi, a significant constituent of atmospheric bioaerosol, are well-known source of allergens and can cause allergic rhinitis and bronchial asthma in sensitive subjects. Rhizopus stolonifer, the filamentous fungus grows on bread and is a widely distributed Mucoralean mold. Although a significant exposure risk is assumable in indoor environment, the role of this fungus in provoking allergic symptoms in pre-sensitized individuals, however, was poorly investigated. We conducted this study to monitor airborne R. stolonifer and to evaluate its potential as indoor as well as outdoor aeroallergen.
**Methods:** Seasonal periodicity of R. stolonifer was studied for two years (March,2009-December,11) by Burkard and Andersen sampler. The relationships between meteorological parameters and airborne R. stolonifer concentration were explored by linear regression models. The allergic potential of R. stolonifer extract was studied on 389 Asthma patients including residents of the locality where aeromycological study was conducted, by performing skin prick tests (SPT) and measuring the allergen-specific IgE levels in SPT positive patient□s sera by Enzyme-linked Immunosorbent Assay.To evaluate the specificity of the extract ELISA inhibition assay was performed with 5 sera samples & pooled as well. Total protein was profiled in 12% SDS-PAGE, two-dimensional gel & immunoblotted with individual as well as pooled patient sera to identify its IgE-reactive components. Periodic acid Schiff (PAS) staining of total protein as well as periodate modification of blot followed by immmunoblotting were done. IgE positive spots were analysed by MALDI-TOF.
**Results:** Airborne R. stolonifer concentration range was 4-47 CFU/$m^3$ round the year and reached the peak concentration in February & March. Relative humidity was found to be a significant predictor for occurrence of R. stolonifer in air. Positive skin reaction was observed in 105 patients (27%) including 10 (9.5%) showing markedly high (2+ to 3+) skin sensitization. ELISA inhibition have shown qualitative as well as quantitative heterogeneity of specific IgE profile against R. stolonifer protein. Three proteins (15, 35.4 and 45 kDa) were detected as IgE reactive bands & spots on SDS-PAGE and 2D gel respectively. These were detected as glycoproteins upon PAS staining and retain the allergenicity even after oxidation of their glyco-moiety. Mass Spectrometric analysis has identified the Tryptic digests of IgE positive 2D spots as putative surface glycoprotein, Lactate dehydrogenase and Argininosuccinate lyase.
**Conclusions:** Three glycoproteins were identified as potential aeroallergens of R. stolonifer and exposures to this fungus, where it naturally occurs may confer risk of IgE-mediated sensitization in sensitive individuals.

4th September 2012
FS.1

**The comparison of Ganoderma spore occurrence in two different periods (1997-1999, 2008-2010) in Cracow, Poland**

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**Objectives:** Ganoderma is a member of the Ganodermataceae family growing on dead or living hardwood and conifers. Ganoderma spores are considered to be a potential source of allergens provoking asthma and rhinitis. Spores of Ganoderma are distinctive and morphologically easy to recognize. The study was aimed at the comparison of Ganoderma spore cumulative annual and monthly totals, and season start, end, duration and peak concentration in two periods 1997-1999 and 2008-2010 to find whether there are any differences. The effect of meteorological parameters on spore concentrations also was considered.
**Materials:** The study on the Ganoderma spore occurrence was performed on the basis of data collected in Cracow using the volumetric method. Spores were sampled from June through October each studied year employing the Hirst type trap (Burkard Manufacturing Inc. UK). Spore concentrations were investigated in two periods separated with an eight year gap. To determine the start, the end and the duration of the season the 90% method was applied.
**Results:** The comparison of annual total spore concentrations in two periods has shown much higher, two-, threefold, values in 2008-2010. Analysis of monthly concentrations revealed the highest concentrations in August, except at 1998 when the peak period was in July. Considering the spore season dynamics (start, end, duration) similar values were found. In 1997-1999 all the seasons started in the last two weeks of June and they were over in the first week of October. Duration of the seasons were 101, 109 and 105 days respectively. In 2008-2010 these values were more differentiated. The seasons started in the first two weeks of June, in 2009 it was in the third week of June and they were over in the first two weeks of October, in 2010 it was in the last week of September. Duration of the seasons were 121, 97 and 108 days respectively. High Ganoderma spore concentrations in 2008-2010 resulted from the increased number of days when concentration overrun 300 spores (21, 19 and 20 days respectively). Only one day in 1997 and two days in 1998 were of so high concentrations. In 1997-1999 there were not many day series with no precipitation especially in July and August, whereas in 2008-2010 such day series happened more often. If there are several days with little or no precipitation, after a rainy period, it is usually associated with warm, sunny weather and low relative humidity and then high Ganoderma spore concentrations are observed.
**Conclusions:** The study on Ganoderma spore occurrence in two periods (1997-1999, 2008-2010) revealed differences in annual and monthly totals, in number of days when concentrations exceeded 300 spores and in weather situation between the periods.

4th September 2012
FS.2

**Atmospheric concentrations of Alternaria, Cladosporium, Ganoderma and Didymella spores at Cork (Ireland) and Worcester (United Kingdom) in 2010**

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**Objectives:** Alternaria and Cladosporium spores are considered as the most allergenic taxa and jointly may constitute up to 93% of total fungal spores in the air. However, Ganoderma and Didymella spores are also monitored in certain places due to their high abundance in the air and harmful properties. The selected taxa require contrary weather conditions for spore release and can be grouped as 'dry' (Alternaria and Cladosporium) and 'wet' (Ganoderma and Didymella). The aim of this study was to compare spore and meteorological data obtained from two monitoring sites located on the periphery of Europe. This study shows for the first time fungal spore information obtained from Ireland (Raffeen Hill, Co. Cork), which was collected on an automatic volumetric spore trap. The measurements were compared to those made at an established UK sampling site (Worcester).
**Methods:** The study of airborne Alternaria, Cladosporium, Ganoderma and Didymella spores was carried out between May to July 2010 at Raffeen Hill, a rural location situated outside Cork City (51°50□25□N, 8°22□31□W) and also at the National Pollen and Aerobiology Research Unit in Worcester (52°11□48□N, 2°14□31□W). In both cases automatic volumetric spore traps were used for collection prior to analysis by optical microscopy. Microscope slides were stained with basic fuchsine (Cork) and lacto phenol cotton blue (Worcester) and the samples were examined under x400 magnification; fungal spores were counted along one central longitudinal transect. The meteorological data were provided by weather stations co-located with the spore traps. Statistical analyses were performed using SPSS (19.0) and Microsoft Excel (2010).
**Results:** The overall spore concentrations were determined to be higher at the Worcester site in comparison with Cork for the whole period under investigation. As expected, of the four spores types evaluated Cladosporium were the most prevalent at both sites. Total average Cladosporium levels at Worcester (5837 spores/$m^3$) were seen to be approximately a magnitude of about 3.5 times the ambient concentrations at Cork (1527 spores/$m^3$), an observation also noted with regard to both Didymella and Alternaria. Progressively increasing monthly concentrations of Didymella were seen from May to July with peak concentrations detected in July at both sites. This trend was also seen for the Alternaria, Ganoderma and Cladosporium collections in Worcester where again highest average concentrations were monitored in July 2010. However this trend was not followed at the Cork site where the highest monthly spore concentrations for Alternaria, Ganoderma and Cladosporium were identified in June. All four spore genera exhibited definite diurnal trends. Peak concentrations of Alternaria and Cladosporium were measured during daytime hours and correlated with decreasing humidity and increasing temperature. The converse behaviour was apparent regarding Ganoderma and Didymella. Both of these genera were predominantly sampled during night time hours where humidity increases and temperature drops.
**Conclusions:** Spore concentrations at the Worcester site were greater than in Cork. Of the four genera evaluated, Cladosporium was seen in greatest concentrations. A Alternaria, Cladosporium and Ganoderma reached their maxima a month earlier in Cork than in Worcester. Diurnal trends were apparent for all of the spore types.

4th September 2012
FS.3

**Advanced statistical approach to modelling airborne fungal spore concentrations**

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**Objectives:** Modelling and forecasting daily and hourly fungal spore concentrations pose many problems. Spore seasons are relatively short and rapid changes in spore concentrations are commonly observed. That suggests, that there are some threshold conditions above which an increase in fungal spore content can be observed. Another issue is the non-normality of both spore and explanatory data, nonlinear dependencies as well as the use of categorical variables (i.e. atmospheric phenomenon). Therefore, the goal of this study was to verify the usefulness of advanced statistical models in the field biometeorology. We examined the possibilities of application of Artificial Neural Networks (ANN) and Multivariate Regression Trees (MRT) in predicting as well as modelling of daily and hourly spore concentrations.
**Methods:** This investigation was based on daily and hourly, airborne fungal spore concentrations recorded in Szczecin, Poland, with a volumetric Lanzoni trap. Simultaneously environmental parameters were measured. The following data sets were analysed: Ganoderma daily spore concentrations with meteorological parameters recorded on the same day; Alternaria daily spore concentrations with meteorological parameters recorded on the same day and up to 3 days prior; Alternaria and Cladosporium daily spore concentrations with meteorological parameters and air pollutant concentrations recorded 3 days prior; Ganoderma hourly concentrations with meteorological parameters recorded on the same hour.
In order to indicate the threshold (cut-off) values of explanatory parameters, the MRT (Multivariate Regression Tree) method was used as well as ANN (Artificial Neural Network) classification models. ANN method was also used for regression analysis of relationships between spore concentrations and explanatory variables as well as for creating forecasting models of spore contents.
**Results:** The study showed the usefulness of the proposed statistical data analysis methods. For Ganoderma daily concentration time series the obtained MRT and ANN classification models gave the threshold conditions above which Ganoderma sp. appeared in the air. Further ANN analyses of spore seasons revealed that the airborne fungal spore concentration depended only slightly on meteorological factors. Another approach was used in case of Alternaria daily concentrations. They were modelled and predicted with good accuracy using ANN split models – classification (spore presence or absence) throughout a whole time series followed by regression for spore seasons and spore concentrations. Incorporating the pollutant data allowed to predict Alternaria and Cladosporium daily concentrations with good accuracy from meteorological conditions and air pollution recorded three days earlier using an ANN predictive model for time series. As for Alternaria and Cladosporium hourly spore contents, MRT revealed threshold meteorological conditions at which the fungal spore concentrations considerably increased or decreased. In turn, the ANN regression models showed the relationships between hourly changes of meteorological parameters and spore contents.
**Conclusions:** MRT and ANN, advanced statistical techniques, are useful in creating both regression models of relationships between explanatory environmental factors accompanying a given spore concentration as well as forecasting models – used for prediction of spore content. The approach should be adjusted in dependence on the taxa analysed as well as type of data – daily or hourly.

4th September 2012
FS.4

**Seasonal and diurnal variations of Didymella spores in the air of Worcester (United Kingdom) (2005-2007)**

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**Objectives:** Didymella is a widespread pathogenic fungus which can be found on the leaves of cereals, vegetables (i.e. cucumber, chickpea), fruits (i.e. watermelon, raspberry) and ornamental flowers (i.e. chrysanthemum, zinnia). Didymella ascospores are commonly considered as one of the major allergenic taxa in the United Kingdom which triggers respiratory tract diseases although to date no threshold value for symptom expression in humans has been established for this genus. The main aim of this work was to study recorded in Worcester Didymella spore counts and to compare them with meteorological parameters to reveal the factors that influence the highest fungal spore release. This investigation showed regular seasonal and diurnal variations in fungal spore occurrence in the air.
**Methods:** A study of airborne Didymella spores was carried out during three years (2005-2007), using an automatic volumetric spore trap located on the roof of the University of Worcester (52°11′48″N, 2°14′31″W), approximately 25m above sea level. Microscope slides were stained with Lacto Phenol Cotton Blue and were examined under x400 magnification; Didymella spores were counted along one central longitudinal transect for all studied years and with distinction between hours for 2006-2007. The meteorological data were provided from the meteorological station sited at the same place as the spore trap. Statistical analysis was carried out using SPSS (v 19.0) software package to investigate the relationship between number of spores and meteorological parameters.
**Results:** The main fungal spore season in examined years started by the end of June and lasted until the end of September. The maximum spore concentrations were recorded in July (2005 and 2007) and in August (2006). Overall the highest spore count was recorded on 21st of July 2007 approaching 10 000 spores per cubic metre of air. The regular diurnal pattern has also been observed for studied genus; a low spore concentration was observed between 9am and 9pm. Then the number of Didymella spores was gradually increasing during night hours to peak at 4am. Statistically significant positive correlations were found between number of Didymella spores in the air and rainfall, humidity, leaf wetness, dew point temperature; negative correlations were observed for mean temperature, leaf temperature and air pressure.
**Conclusions:** Didymella spore concentration in the atmosphere of Worcester varied from year to year revealing gradual increase of total number of recorded spores. The regular seasonal occurrence of Didymella spores in the air of Worcester has been noticed for each of studied years (June-September). The regular diurnal pattern has also been observed for Didymella spores where the maximum concentration appeared early in the mornings.

4th September 2012
ME.2

**The use of pollen analysis for assuring the quality of lime tree honey produced on the Fruska Gora Mountain**

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**Objectives:** Analysis of pollen in honey indicates the nectar sources visited by bees during nectar forage. Lime tree (Tilia) honey has a very strong and characteristic flavour. It is often interpreted as unifloral even though it contains notable amounts of pollen from a number of different nectar sources. The aim of this study was to examine the possibility of using pollen data in quality control and production of unifloral lime tree honey.
**Methods:** Quantitative and qualitative pollen analysis was performed on 72 samples declared as lime tree honey from the Fruska Gora Mountain. Slides were prepared and analysed following harmonized methods of melissopalynology. The melissopalynological characteristics were examined in respect to the timing and location of when the honey was collected from the beehive. The relationship between airborne Tilia pollen concentrations, lime tree flowering phenology and the amount and source of pollen suspended in the honey was also analyzed. Particular attention was given to using aerobiological data for tracking changes in Tilia flowering.
**Results:** The most intensive intake of lime tree honey lasted about 10 days. It started at the beginning of full flowering when an average of 50% of T. tomentosa flowers are opened on the Fruska Gora Mountain and ended when the majority (about 90%) of petals had fallen. Among pollen types from nectar-producing plants, lime tree honey from the Fruska Gora Mountain in Serbia contained, on average, 67% Tilia pollen. This is significantly more (p=0.00) compared to honey foraged in other geographical areas of Serbia and other European countries (Austria, Belorussia, Bulgaria, Italy, Poland, Romania, Slovenia, Switzerland) as well. When lime tree honey is extracted at the collection locality, before beehives are moved to sunflower fields, the proportion of lime tree pollen in the honey can reach as much as 95%.
**Conclusions:** High amounts of lime tree pollen in honey could be used as a parameter for identifying honey produced in areas with large amounts of Tilia. This study identified procedure that involved melissopalynological analysis in quality assurance of lime tree honey with protected geographical origin that is produced on the Fruska Gora Mountain.

4th September 2012
ME.3

**Characterization and assessment of some Indian honey quality in relation to floristic composition and physicochemical parameters**

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**Objectives:** The methods adopted for assessing quality criteria in Indian honey by using different internationally recommended physicochemical parameters are not adequate for Indian apiary market. In the present study an attempt has been made to evaluate the quality of different Indian honey samples by those recommended parameters as well as their floristic composition with vegetational impact to compensate such problem.
Method: In the present study pollen analyses of forty honey samples collected during 2008-2012, were done [1] to portrait their floristic diversity in accordance with their different geographical origin. Among these, twenty samples were further analyzed to assess their quality for different physicochemical parameters like, moisture content, free acidity, pH, electrical conductivity, reducing sugar (glucose, fructose, sucrose, maltose and turanose) contents by HPLC, protein contents by Bradford method, HMF by White's spectrophotometric method, Invertase activity, phenol contents and heavy metal (Cu, Cd, Pb, Cr and Fe) contents by atomic absorption spectrophotometry. The methods as followed in the present study are in accordance with the methods recommended by the International Honey Commission (IHC), 2009.
**Results:** A large number of pollen types were identified from the honey samples which can be referred to as important bee forage in the respective areas, namely, Syzygium sp., Eucalyptus sp., Brassica sp., Borassus sp., Coriandrum sativum, Terminalia sp., Cassia sp., Phoenix sp. etc. Among the different parameters, the moisture contents of the studied honey samples showed a quite high amount with ranges between 16.6-25%. The higher values of moisture content signify probability of fermentation or spoilage of honey samples. Electrical conductivity ranges between 0.17-1.03mS, free acidity content of the samples are almost within range (50meq/kg.) except for one sample showing the value of 55meq/kg., pH varies within 3.27-3.97. The invertase activity range is 89.32-0.635 U/kg., whereas HMF content is in between 47-473.65 mg/kg. Most of the honey samples showed higher values of HMF than recommended limit (80mg/kg.) which may signify the tropical climatic condition or, poor storage condition or, wrong procedure of processing. Phenol content is in between 6.3-22.5 GAE/100g. Protein contents are quite low, that is 5.2- 9.3 mg/100g. Glucose content is in between 28.9-32.1% whereas fructose showing 41.2-45.9% ranges and sucrose 1.3-4.6%. Maltose and turanose are present in trace amount. Among the heavy metals analyzed, Cd was found in three samples (0.09-0.1 mg/L), Pb in three samples ((0.03-0.3mg/L), Cr was absent in all the samples, Cu (0.13-0.83mg/L) and Fe (0.21-1.21mg/L) were found in each of the samples. The probable reason for the presence of heavy metals in honey is the common use of pesticide, fungicides in the crop fields or may be the indication of air pollution.
**Conclusion:** Some important pollen types were derived as the good bee foraging source, whereas the studied physicochemical parameters depict an overall knowledge in honey quality and may have some strong impact over quality control of apiary industries in India.
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4th September 2012
PH_I.1

**Flowering of common hazel in the Czech Republic in dependence on mete-orological conditions**

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**Objectives:** Periodicity in the life of plants and animals is considered to be an indirect indicator for the periodicity in the climate. At CHMI phenological network (wild plants) is also observed common hazel as one of the most important pollen allergen in the Czech Republic. Phenological phases connected with flowering are important for prediction of pollen season.
**Methods:** In paper were evaluated phenological phases inflorescence emergence (BBCH 55), beginning of flowering (BBCH 61) and end of flowering (BBCH 69) within the period 1991-2010 from CHMI phenological stations. Subsequently were processed statistical and climatological characteristics during the phenophase interval beginning of flowering and end of flowering: sum of air temperatures (°C), duration of sunshine (hours) and number of days with precipitation total of at least 1 mm, including pentad air temperature to phenophase entrance. Temporal variability was executed in MS Excel, spatial variability in GIS (Clidata–GIS application, ArcView 3.2). For detailed analysis were used climadiagrams [1] and phenotermo-pluviodiagrams [2], they show relation between flowering and air temperature and precipitation total at stations in Lednice (165 m a.s.l.) and Přibyslav (533 m a.s.l.).
**Results:** The flowering of common hazel lasts on average 22-23 days, the sums of air temperatures range between 69 and 80°C, sunshine duration lasts from 80 to 85 hours and it can occur about 7 days with precipitation total of at least 1 mm. The maximum concentration of pollen grains was registered at Prague station on 17th March 2005 (93 pollen grains/m$^3$). The longest duration of flowering at Lednice station lasted 50 days (1997) with the sum of air temperatures (∑t) 255.7°C and precipitation total (∑r) 43.4 mm, at Přibyslav station it was 37 days (2008) with the sum of air temperatures 75.5°C and precipitation total 49.6 mm. The shortest interval of flowering was at Lednice station 6 days (2010); (∑t) 56.7°C, (∑r) 0 mm and at Přibyslav station it was 7 days (1994); (∑t) 26.5°C, (∑r) 0 mm.
**Conclusions:** The common hazel begins to flower between 24th February and 24th March, the end of flowering comes between 18th March and 15th April on average. The inflorescence emergence occurs between 13th February and 15th March. The vertical phenological gradients for the beginning and end of flowering are 3 days/100 m. The selected climatological parameters within the chosen phenophase intervals are very variable according to the course of weather of the given year as well as the duration of pollen season.
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4th September 2012
PH_I.2

**Corylus avellana flowering in the period 2006-2011 according to thermal conditions analogies**

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**Objectives:** Corylus avellana flowering season, it is one of the most unstable periods of a year in a climatological aspect. Specific rapid changes of weather conditions and frequent fluctuations of temperature are typical in the turn of winter and early spring season in a temperate climate of Poland. Moreover, numerous analysis proved that climate changes are reflected in the dates of thermal thresholds defining thermal seasons of a year. The most clear changes are observed in a winter season which occurs earlier, lasts shorter, opposite to early spring season which tend to extend. Therefore in this study, author tried to present the similarity of the thermal genesis for Corylus avellana phenological phases development in Poland in a thermally different years, with cool and warm winter season in the period 2006-2011.
**Methods:** Mean monthly temperature from December to February were used to estimate: a) monthly deviations of temperature of following years with reference to 1971-2000 normal (for selected meteorological stations), b) thermal classification of winter season, preceding flowering season each year. Maps of spatial differentiation of hazel flowering in Poland in a study years: 2006-2011 were made as an illustration of thermally different years, with cool and warm winter season.
Meteorological and phenological data from selected stations came from Institute of Meteorology and Water Management-PIB.
**Results:** Analysis of hazel flowering in Poland in a study years, showed that phenological phases respond for specific weather, especially thermal condition, preceding winter season. There were examples of early flowering after warm winter and late flowering after cool winter. Any opposite relations weren't observed in a study years.
**Conclusions:** This kind of comparison of meteorological and phenological data explain the general patterns of temperature influence on flowering season. One of the most important determinants for the start of plant vegetation is temperature. Its characteristics just before the flowering phases are important as much as temperature of preceding winter season.

4th September 2012
PH_I.3

**Variations in the spatial relations of the bloom time of hazel (Corylus avellana L.) in Poland and Germany**

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**Objectives:** Hazel pollen is one of the most important allergens in Central Europe. The time of its appearance in the atmosphere and its levels depend, on the one hand, on the bloom time of the plants, and on the other, on weather conditions. The weather controls both, the start of flowering and the transport of pollen in the atmosphere. So far, spatial studies of the bloom times of hazel have largely involved the preparation and interpretation of cartographic images [1,2]. With time, the methodology of such studies have changed; in the recent years, the tool increasing employed for this purpose has been GIS, including geostatistics [3-6]. However, little use has been made of the many possibilities offered by a numerical analysis of spatial data. One of them is a mathematical definition of spatial relations in the form of an autocorrelation model. The aim of this study was (1) to identify and interpret in genetic terms the nature and year-to-year variability of the spatial autocorrelation of the bloom times of hazel in Central Europe, and (2) to test ways of employing mathematical models of spatial autocorrelation designed for various areas of similar climatic and habitat conditions to estimate and simulate bloom times.
**Methods:** Use was made of data for Germany from the multi-year period 1951-2010 available in the base PEP725 [7] and for Poland, from the phenological observation network of the Institute of Meteorology and Water Management existing in the years 1946-1992 and today (since 2007) [8,9,1]. The density of the observation network in Germany was very high throughout the entire 60-year study period, while in Poland it varied greatly and was usually limited to several dozen of points.
**Results:** The results obtained to date show a great role of random variation involving differences in habitats, genetic factors, as well as observers' errors. Random variation accounts for an average of 32% of the total variance of bloom times of hazel and equals about 9 days. The autocorrelation range of bloom times exceeds 240 km, and its structure is complex. The most significant autocorrelation (35% of the variance, more than 9 days) is that at a distance of about 15 km (SD=7.3 km). It appears every year in each of the analysed data sets from Germany and Poland. In a bit more than half of the cases the structure has a range of about 70 km (SD=19.2 km) and accounts for just under 8% (3.5 days). The remaining 23% of the variance of bloom times of hazel goes to an autocorrelation at a longer distance, exceeding the one for which calculations were performed, i.e. 240 km.
**Conclusions:** The reasons of the above autocorrelation structure of bloom times of hazel and its year-to-year variations are a combined effect of regional variations in the climate and circulation patterns specific to each year.
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4th September 2012
PH_I.4

**Spatial variations in Betula pendula and Quercus robur flowering phases in relation to airborne pollen concentrations in Poznań (Poland)**

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**Objectives:** English oak (Quercus robur) andsilver birch (Betula pendula) are popular elements of parks and gardens in Poznań. The time of flowering of these trees is strongly regulated by air temperature. In Poznań the phenomenon of urban heat island was previously described. It was therefore hypothesized that due to the higher air temperature in the city center the birch and oak flowering periods will start earlier and have a shorter duration compared to the surrounding areas.
**Methods:** Daily average pollen counts (2009-2010) were collected in Poznań by volumetric spore trap of the Hirst design. Aerobiological monitoring was conducted simultaneously with phenological observations of B. pendula and Q. robur flowering. Four phenophases were observed: F1- beginning of flowering (first flower release pollen), F2- full flowering (>25% of flower release pollen), F3- decline of flowering (<25% of flower release pollen), F4- end of flowering (none flower release pollen). Ten phenological sites, located in different part of Poznań, were observed. Approximately 20 individual trees were examined on each site. To estimate the differences between the mean start dates of phenophases at each site, the one-way ANOVA and Turkey's post-hoc test were used. The relationships between the distance from the city center on the mean start dates and duration of flowering phases was checked by Pearson correlation test and regression analysis. The percentage of pollen grains recorded during the F2 phase at each phenological location was calculated.
**Results:** ANOVA and post-hoc tests revealed that birch trees located in the city center started flowering significantly earlier (about 4-5 days) than those located in the outskirts of Poznań. Regression analysis showed that the delayed flowering was about 0.5 days/km from the city centre. The oak trees started flowering earlier in the city center than in the surrounding areas (3-4 days earlier in 2009 and one week earlier in 2010), but in most cases these difference were not statistically significant. Distance from the city center did not influence the duration of phenophases of B. pendula and Q. robur. The peak day of birch and oak pollen concentrations usually occurred during the full flowering phase (F2). During that phenophase between 9.1-36.1% of the seasonal sum of birch pollen was recorded in the air. In the case of Q. robur that value varies between 6.3-56.8%.The highest number of airborne pollen grains was generally recorded when populations located around city center were flowering.
**Conclusions:** Populationsof B. pendula and Q. roburlocated near the city center started flowering earlier than those situated in the outskirt of Poznań, particularly birches. These populations had the most influence on the recorded seasonal sum of pollen. In addition to temperature, other factors that should be considered when examining the differences in flowering dates within city area include soil and microclimate conditionsaround each area, density of trees in a stand and the different varieties of examined species with different genetic-driven phenology.

4th September 2012
PH_II.5

**Pollination of perennial grasses: Hyparrhenia hirta, Dactylis glomerata and Sorghum halepense**

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**Objectives:** Grass pollen is one of the most abundant in the air of Mediterranean climates and the first problem that causes respiratory allergy. As there are many species included in this pollen type, seasonal aerobiological studies should take into account that it is possible to find different patterns of pollination. This work aims to provide information about how pollination occurs for three perennial grasses widely distributed and with very different models of flowering.
**Methods:** 10 plants of Hyparrhenia hirta, 26 of Dactylis glomerata and 9 of Sorghum halepense were transplanted to pots from the surroundings of Badajoz (SW Spain) to the experimental garden of the Faculty of Science. For each plant, inflorescences and flowers shedding pollen were recorded during the year 2011. An automatic meteorological station close to plants recorded weather parameters of rain, temperature, wind speed and direction, relative humidity and radiation. Inflorescence and flower production along the time were compared with meteorological data.
**Results:** Hyparrenia hirta presents pairs of spikelets that appear when the stems are growing. The spikelets flowered from the end of April to the end of year, with a period without flowers from the start of July to the start of September. In spring, spikelet production was ten times higher than in autumn. The number of spikelets shedding pollen depended closely on temperature. The number of pairs of spikelets per stem ranged from 1 to 14, with 4-5 on average, depending on the length of the stem and the date they started to flower, so the earlier flowers appear larger number of these are produced and the stems were longer. Dactylis glomerata presents spikelets in condensed raceme-like panicles at the end of the stems. The spikelets flowered from the end of April to the end of May. They lasted 3-17 days, although this duration depended directly on how early spikelets bloomed. Flowering did not depend directly on any weather parameters, nevertheless it seems that the minimum temperature and wind speed affected flowering. Sorghum halepense presents spikelets in panicles at the end of the stems. The spikelets flowered from the end of May to mid July, with maximum production in the second week of June. Total number of spikelets shedding pollen did not depend directly on any weather parameter measured. The number of stems per plant ranged 7-47, their size and the size of the panicle decreased progressively with time, so the amount of flowers shedding pollen was greater at the beginning of the season and lower at the end of the season.
**Conclusions:** Species studied showed different models of pollination. Hyparrhenia hirta pollination was bimodal, with maximum pollen production in spring and a second peak of flower production in autumn. It is a well-adapted behavior to a Mediterranean climate with a latent period in summer. Dactylis glomerata flowered in a brief period in mid spring. Once flowering began, weather parameters only seemed to diminish flower production. Shorghum halepense is a typical C4 grass that flowers in early summer with a strong start to bloom.

4th September 2012
PH_II.6

**Altitudinal gradient and trends in floral phenology of olive tree (Olea europaea L.)**

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**Objectives:** The phenology of the olive tree responds to microclimatic aspects such us topography, altitude or relief. The influence of these aspects can be reflected in the start and in the duration of the phenofases. The aim of this work is to show up the altitudinal effect on the floral phenology of the olive tree considering the start date and the length of the flowering period and to relate these results with pollen curve and aerobiological data. The study was carried out in Toledo (Castilla-La Mancha, central Spain).
**Methods:** Phenological observations were carried out during 2009-2011 in 8 sites in the province of Toledo. Sampling sites were selected between 440 and 875 m a.s.l. This altitudinal gradient includes areas where the most olive groves are located in Toledo. Start and end of the flowering period were taken into account in phenological observations. Pollen counts were captured in Toledo, using a Hirst-type volumetric spore-trap and following the methodology established by the Spanish Aerobiology Network. Correlations and linear regressions were carried out to obtain the relation within the start date and the length of flowering and the altitude. Subsequently, sites were classified based on the criteria of flowering, using a hierarchical cluster analysis.
**Results:** Results show a strong positive correlation ($r=0.939$; $p<0.01$) between the start of the flowering period and the altitude. There is a delay of the start date of flowering as the olive groves are located on higher altitudes. This ratio varies depending on the year, although the trend is similar in all years of study. In contrast, the length of the flowering period is not significantly correlated with altitude. Over the study period, an annual average of 7,772 olive tree pollen grains was collected. The Main Pollen Season starts in May and lasts 31 days. Phenological results are related to pollen counts: the first peak of the pollen curve comes from crops at lower altitudes (below 455 m a.s.l.), while the last peaks correspond to pollen from crops located at higher altitudes (above 700 m a.s.l.). The cluster analysis classifies the olive groves in 4 main groups that differ in the mean number of days of the start of flowering before or after the total average: -8.4 days (group 1), -5 days (group 2), 0 (group 3) and + 4 days (group 4).
**Conclusions:** The relation between the start of flowering and the altitude and the classification of crops based on this relation, has allowed us to follow the sequence of flowering and to know which areas are those which bloom before and after; as well as, to interpret the sources of the different peaks in the olive tree pollen curve.

4th September 2012
PH_II.7

**Airborne Pinus pollen in Spain: pollination patterns and trends of the annual indexes and the peak dates**

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**Objectives:** Pinus dominates, together with Quercus, the Spanish forested landscape. There are eight pine species that occur naturally or under cultivation in Spain and are differently distributed across the territory: P. canariensis, P. halepensis, P. nigra, P. pinaster, P. pinea, P. radiata, P. sylvestris and P. uncinata. In this study we compare the airborne Pinus pollen data at 13 Spanish sites: 8 in Catalonia (Barcelona, Bellaterra, Girona, Lleida, Manresa, Roquetes-Tortosa, Tarragona, Vielha), 1 in Extremadura (Badajoz), 2 in Andalusia (Almería, Granada) and 2 in the Canary Islands (Izaña, Santa Cruz de Tenerife).
**Methods:** Pollen sampling and analyses followed the methodology proposed by the Spanish Aerobiological Network (Red Española de Aerobiología, REA). In most cases a 16-year period (1996-2011) was taken into consideration with the exception of Almería, Izaña, Roquetes-Tortosa, Santa Cruz de Tenerife and Vielha, where the study period comprised 7 years (2005-2011).
**Results:** Pinus pollen represents between 1% of the atmospheric pollen spectrum in Badajoz (corresponding to a mean Annual Index [AI] of 578 pollen grains [P]) and 20% in Bellaterra (mean AI 8515 P). The absolute highest AI has been measured in Bellaterra (14829 P, year 2011) and the absolute daily maximum concentration has been measured in Roquetes-Tortosa (2230 P/m³, 11/03/2009). The absolute lowest values (30 P in 2008 and 6 P/m³, 14/04/2011) were found in Santa Cruz de Tenerife, in the Canary Islands. The peak dates occur later in mountain areas (Vielha, Izaña) and inland (Lleida, Manresa, Granada) than in lowlands (Girona, Badajoz, Bellaterra) and littoral areas (Barcelona, Tarragona, Almería). There is a clear decrease in the airborne Pinus pollen counts together with the number of Pinus species in the area, the latitude, in cities versus open areas, and inland versus littoral. Mean daily pollen concentrations are higher in northern localities and decrease to the south. Littoral and lowland peninsular stations register pollination since early spring (due to P. halepensis, P. pinea, P. pinaster, P. radiata) and they show a second pollination phase from May on (due to P. nigra, P. sylvestris, P. uncinata). Mountain stations (Vielha, Izaña) have a single pollination period. In the lowland subtropical station of Tenerife pollen dispersion occurs mainly in spring and is due to P. canariensis. In the Catalan stations, airborne Pinus pollen AI show clear increasing tendencies along the 16-year period and especially in the last 7-year period; in Granada AI are stable; and in Badajoz, Almería, and Tenerife they show a clear decreasing trend. Regarding the peak dates they show in general a slight tendency to begin later with the exceptions of Almería and Tenerife, that show a tendency to advance the pollination peaks; Vielha, Tortosa and Granada, where the summer peak tends to occur earlier and Girona, where the spring peak tends to occur earlier.
**Conclusions:** The pattern of the pine pollination is clearly influenced by the vicinity of the plants to the sampling traps. Aerobiological data seem to indicate that Pinus species are spreading as forested landscape. Longer observation periods are needed to obtain clear climate change signals.

4th September 2012
PH_II.8

**Time-series analysis of pollen seasons in Rzeszów (SE Poland) in 1997-2005 with reference to phenology**

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**Objectives:** Pollen seasons for particular taxa are characterised by great variability. Disturbances of the behaviour of pollen seasons are usually caused by unstable weather conditions before or during pollen production and the pollen season and may also be dependent on the movements of air masses on a very large scale. Dynamic systems, which pollen seasons undoubtedly are, may be sensitive to even slight initial disturbances and may behave in a random way. While on the level of pollen seasons particular taxa show great variability, within the context of the whole seasonal occurrence of airborne pollen, the system turns out to be, within the boundaries of certain disturbances, a stable one. The aim of the study was to distinguish possibly stable time intervals and determine if their number and pollen spectra are the same in nine years. An important aim of the study was to assess the level of similarity of multidimensional pollen spectra from the nine-year monitoring period. An important aim of this work was to determine to what pollen taxa can be indicators characterizing phenological periods.
**Methods:** The aeroplynological monitoring was carried out from 1997 to 2005. A volumetric method was applied, which used Hirst's trap. The multidimensional correlation method (MultCorr), hierarchical cluster analysis, correspondence analysis (CA), PCA and Conslink methods were used to analyze data. Characteristics phenological seasons were defined with selected ecological parameters, calculated on the basis of the dates of seasons and pollen counts. Shannon biodiversity index (H') and the evenness (J') and species abundance (S') indices were considered.
**Results:** Although the dynamics of the airborne pollen is unstable, some features of pollen seasons of particular taxa are characterized by relatively low variability. Gaussian function well described the main atmospheric pollen seasons for several pollen taxa. It was found that pollen of particular taxa occurred in the air, in a similar sequence. In Rzeszów the total pollen season begins January 11th, and ends October 21st. The comparison of the pollen spectra over the nine-year survey period proved that periods from April 25th until May 14th and the second and third decades of June, were the most similar. The total pollen season can be divided into the stable time structures characterized by a characteristic pollen spectrum. After division, three first rank time structures were distinguished. These time structures were divided into shorter time intervals (division by second rank). They have repeatable, specific pollen spectra. On the basis of correspondence analysis, particular pollen taxa were fitted to every phenological season. In Poland, the beginning of hazel pollination is the phenological indicator for pre-spring, but hazel pollen was often recorded - even at high concentrations - before that season. Pinus well characterized the full spring, Poaceae and Rumex could be fitted to early summer. From the perspective of pollen, summer and early autumn should be treated as a single period. Pollen of Urtica, Artemisia and Ambrosia dominated in these phenological seasons. The highest biodiversity index (H') characterized full spring and early summer.
**Conclusions:** It was found that from the chaotic phenomenon, which is the occurrence of pollen in the air, a stable system with a repeatable annual pattern can be created. The total pollen season can be divided into recognizable time structures, which can be recognized and found repeatedly year after year. Five time intervals were distinguished. They have specific pollen spectra with dominating taxa. It was shown that pollen can be a good indicator of phenological phases. For Rzeszów, Pinus pollen is the best indicator of phenological seasons, as it fully corresponds to full spring.

4th September 2012
PH_II.9

**Forecasting olive flowering intensity based on year clustering**

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**Objectives:** It is now widely accepted that weather conditions occurring several months prior to the onset of flowering have a major influence on various aspects of olive reproductive phenology, including flowering intensity. Given the variable characteristics of the Mediterranean climate, we analyse variations in olive flowering intensity in southern Spain, and relate them to previous climatic parameters using a year-clustering approach with the main objective of forecasting olive pollen season intensity. A second objective is to compare the accuracy between different classification methods trying to improve the methodology.
**Methods:** The present study was carried out in the city of Cordoba (Spain), situated in south-west Iberian Peninsula (37°50'N, 4°45'W), 123 m a.s.l. The area has a Mediterranean climate with some continental features. We have work with a 30 years database (1982-2011). A first step was to group all the years into several clusters based on phenological and meteorological characteristics. The grouping was based on clustering analysis. For the clustering analysis we first determine the optimum number of natural groups of years (K) by a hierarchical clustering analysis. Afterwards we generate the "clusters" by applying a "K-means" conglomeration. Every year cluster was used to characterize every year category. After characterizing each year category, classification models were constructed based on phenological and meteorological data. Three different models were tested for classification purposes, using: a) discriminant analysis; b) decision-tree analysis; and c) neural network analysis. Finally, flowering-intensity forecasting models were constructed for each year category by Partial Least Square Regression method.
**Results:** The results indicate that the clustering grouped the years into four categories with different meteorological characteristics. Category 1 with 13 years, category 2 with 6 years, category 3 with 6 years and category 4 with 5 years. Comparative of classification models results showed that the neural-networks model was the most effective, yielding four year categories with clearly-distinct weather features. It was proved that specifics models for each category increase the accuracy compared with a general model including all the study years.
**Conclusions:** Predictive models obtained using clustering analysis are more effective than general models because weather conditions act differently on each year category, and because the years comprising each category share similar aerobiological characteristics. The Neural network-based model is proved as the most effective classification method. The regression method by Partial Least Squares proved valuable for generating aerobiological forecasting models. Finally was corroborated that summer weather conditions were found to play a major role in olive flowering intensity.

5th September 2012
PLENARY Session

**Pollen allergens – latest news**

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Keywords: pollen monitoring, health impact

**Objectives:** Pollen grains of anemophilous plants are the most important allergen carriers in ambient air, and pollinosis is a highly prevalent multi-organ disease (eyes, nose, bronchi, oral cavity) in civilized countries. New data on pollen allergens arrived in the last years in different areas.
**Results:** Changes of the quantity of major allergens in pollen: the amount of Bet v 1 in birch pollen from different regions may differ and may be altered even in pollen from the same tree from year to year. Influence of city-factors: Air temperature and atmospheric $CO_2$ are significantly higher in urban relative to rural areas similar to those associated with projected global climatic change. Therefore, the number of pollen, their allergen load and their combination with fine dust particles was determined in big cities and the data show differences in comparison to rural areas. Generally, the allergenicity of pollen in cities is increased. Pollen allergens can altered by air pollution, e.g. by nitration of pollen allergens. Nitration alters antigen processing and presentation via HLA-DR, by enhancing both the quality and the quantity of the Bet v 1-specific peptide repertoire. Nitration of pollen derived allergens can occur by NO(2) and ozone in polluted air and it has been shown that nitrated major birch (Betula verrucosa) pollen allergen Bet v 1.0101 (Bet v 1) exhibits an increased potency to trigger an immune response. However, the mechanisms by which nitration might contribute to the induction of allergy are still unknown.
Non-allergic proteins: Pollen can be altered in the atmosphere and release their allergens leading to allergen-containing aerosols in the ambient air. Pollen has been shown not only to be an allergen carrier, but also to co-release non-allergenic proteins and non-protein compounds like highly active lipid mediators (pollen-associated lipid mediators), which have pro inflammatory and immunomodulating effects enhancing the initiation of allergy.
Pollen cytoplasmatic granules: Under atmospheric conditions, pollen grains can release pollen cytoplasmic granules (PCGs). The allergens associated with these intrinsic subfractions induce, in laboratory animals as well as in asthmatic patients, allergic and inflammatory responses. By using allergomic strategy (1- and 2-dimensional gel electrophoresis, immunoblotting, using grass-pollen-sensitized patient sera and mass spectrometry (MS) analysis it was shown that several of the allergens listed in the IUIS nomenclature, Phl p 1, 4, 5, 6, and 12, were detected in pollen and PCG extracts, whereas Phl p 11 was found only in PCGs, and Phl p 2 as well as Phl p 13 were found only in pollen extract. Since the major grass pollen allergens were found in PCGs and because of their small size, these submicronic particles should be considered as very potent sensitizing and challenging respirable vectors of allergens.
Detection of plant viruses: In two species (birch and grass pollen) plant viruses have been detected (e.g. cherry leaf roll virus) in pollen and their possible influence of the allergen quality and quantity in pollen of virus-infected trees have been determined.

5th September 2012
1_Pathomechanism

**Allergic air-borne contact dermatitis tone and a half-terpenlactons of pollen grains**

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**Objectives:** Air-born dermatitis is an allergic or irritant skin reaction to different substances suspended in air aerosol. It can be either episodic, seasonal or chronic which depends on the presence of the causative agent, and usually manifests itself in the skin exposed to it. Environmental history, clinical morphology, patch test with the suspected agent allow to recognize and differentiate the two forms of eczema.
In patients with pollen allergy, which is usually IgE mediated, seasonal symptoms of rhinitis, conjunctivitis, asthma and in rare cases of contact urticaria, air-born dermatitis practically non-exist (in our material of more than 200 patients with pollen allergy we didn't find the presence of any case).
In two cases of patients without the classic features of pollen allergy (two men aged 53 and 70 years) confirmed recurrent seasonal air- born dermatitis combined with photodermatosis in the summer. In both cases, the contact hypersensitivity to lactones was confirmed as well as positive provocation test with chrysanthemum leaves, of which one patient had professional contact and on this basis professional air-born dermatitis was recognized.
Patients did not have the classic symptoms of IgE dependent pollen allergy. Personal and familial history was also negative. Foto-tests after 48 and 96 hrs were positive. The additional diagnostic tests with standard contact allergens showed, in one of them sensitivity to fragrance mix and peru of balm, in the other case strongly positive test to nickel, which could explain the recurrences of hand dermatitis also in out of season.
**Conclusions:** Contact allergy to pollen allergens may occur without evidence of IgE dependent pollen allergy, in the form of seasonal allergic air-born contact dermatitis. The sensitizing agents are one & half-terpenlactones of pollen grains. Air-born dermatitis is sometimes associated with photodermatosis.

5th September 2012
2_POLLEN ALLERGY - 1 abstract
**Statistical study of the health impact related to allergenic pollens**

5th September 2012
IMMUNOTHERAPY_1 abstract
**New approach to the optimization of the specific immunotherapy with regard to pollen monitoring. Preliminary results**

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**Objectives:** Subcutaneous immunotherapy (SIT) is a causal treatment of allergic diseases. Year-round schedule of SIT is one of the most popular procedures. During the pollen season, especially when the symptoms of allergic rhinitis are manifested by patients, the dose of allergen should be reduced, or the scheduled visit should be postponed. In these cases the current and predicted pollen concentrations seem to be really useful for allergologists conducting SIT. The aim of the study was to answer the following question: does individualization of immunotherapy schedules referring to pollen count have any influence on the doses reduction, missed or extra visits, because of symptoms exacerbations?
**Methods:** A group of 128 patients being examined was treated applying traditional subcutaneous immunotherapy with grass, tree or weed pollen allergens in the Dpt of Allergology, University Hospital in Krakow since 2009. In 2011, 32 patients sensitive to grass pollen were requested to fill in the diary cards with symptom score. The pollen count was obtained using the volumetric method and mathematic models were used to predict the increase or decrease in grass pollen concentration. From this group 15 patients were selected for inclusion the optimization criteria in 2012.
**Results:** Among 128 patients treated with immunotherapy, 16% were treated with trees, 48% grasses, 3% weeds and 33% mixed grasses and trees immunotherapy. After the 2011 season 15 diary cards and medical histories of 15 patients from the group of 32 filling in the cards were analysed. Our findings show that all patients had symptoms of allergic rhinitis during the pollen season, 8 persons had also conjunctivitis, 2 persons allergic dermatitis and 3 asthma exacerbations. Because of those symptoms in 10 patients the injection dose was reduced during the season, but no visits were delayed. In some cases patients got the injection in time of the high pollen occurrence (3 cases). The patients used antihistaminic drugs on request. In more than 50% of individuals the symptoms increased during the pollen season.
**Conclusions:** It is agreed not to use the next injections in patients sensitive to pollen allergens, during the symptoms manifestation and the high pollen exposure. Data from regional pollen monitoring and possibility of extending the breaks between visits should be the basic tools for allergologists to make the appointments with their patients. The preliminary results of our research showed the great need of using pollen data in day by day medical practice. The observations in 2012 are expected to throw new light on the immunotherapy optimization.

5th September 2012
2_POLLEN ALLERGY TREATMENT_2 abstract
**WWW.ALLERGIERADAR.NL: a public website for the collection of year-round hay fever symptoms**

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**Objectives:** On average 10-20% of the population in the industrialized world suffers from pollen allergy, also known as hay fever. The geographical distribution and severity of hay fever symptoms in the Netherlands year-round is largely unknown. Our objective was to study whether symptoms collected by an interactive internet platform from participants characterized by an internet questionnaire can provide relevant information on hay fever.
**Methods:** On May 13, 2009, the website www.allergieradar.nl was launched. Participants could register by completing an extensive questionnaire on their hay fever (symptoms, doctor diagnosis, etc). Once registered, participants regularly entered their geographical position and their symptoms of nose, eyes and lungs on a scale from 1-10. These were presented on the website providing an "allergy map" of the Netherlands. All data from 2009 (May 13-Dec 31), 2010 and 2011 (both Jan 1-Dec 31) were stored in a database and analysed using the software package STATA/IC 11.0 (StataCorp, USA).
**Results:** In those 2.5 years approx. 20500 entries with symptoms scores were submitted by 1675 participants. Analysis of the data of the registration questionnaire showed that the 83% of the participants had a doctor diagnosed hay fever and 69 % had been tested for allergies. The tested participants were most frequently positive for tree or grass pollen (71 and 74% respectively). The majority of these participants suffered from nose and eye symptoms (>93%) and 54% (also) from lung symptoms. The daily mean maximum symptom score of these participants correlated with the logarithm of the daily pollen counts (correlation coefficient=0.61). The medication use of the participants increased with the severity of the symptoms (correlation coefficient=0.71), suggesting that the participants take their medication on demand. During to the registration questionnaire several participants indicated to be monograss- or monotree-pollen allergic according to an allergy test. As expected these participants sent in their symptom scores mainly in the grass pollen or tree pollen season, respectively. Analysis of the individual symptoms showed that lung symptoms were more severe during the tree pollen season compared to the grass pollen season.
**Conclusions:** We conclude that these internet symptom scores are a valuable tool in studies on hay fever symptoms in the general population and for the development of hay fever forecasts.

5th September 2012
IMMUNOTHERAPY_2 abstract
**Cross-sectional, retrospective study on health impact by specific immunotherapy to aeroallergens in children**

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**Objectives:** Specific immunotherapy (SIT) remains the only causative treatment in IgE mediated diseases. It induces immunotolerance mechanisms and in this way protects gaining new allergies as well inhibits an allergic march in patients with upper respiratory tract allergy toward their lower respiratory tract manifestation and bronchial hyperreactivity (BHR). It also influences innate immunity via increasing mucosal IgA concentration and diminishes number of infections. The aim of this cross-sectional retrospective study to evaluate the individual feeling of baseline disease improvement and the change of infections events due to SIT introduction.
**Methods:** Patients from hospital outpatients department were recruited. The questionnaire concerned 6 main topics. Among them three evaluated the course of allergic rhinitis, allergic conjunctivitis and bronchial asthma. The next 3 modules survey atopic dermatitis control, incidence of infection events, pharmacotherapy both, regular and on demand. Patients responded to the questionnaire during the regular immunotherapy visits in clinic. In the case of children below 10 years of age, answers were given by their parents.
**Results:** Study concerned 78 patients (55 male, 70%), aged 4.5-18 years. In all patients the main diagnosis was allergic rhinitis, since in 48 (61%) – bronchial asthma. In 10 patients (13%) atopic dermatitis was a co-morbid disease. The frequency of target allergen were as follows: Der. far. and Der. pt. – 55 children (70%), and equally 14 (18%), allergic to grass/rye and tree allergic pollens (4%). Novo-Helisen depot predominated within extract manufacturers (54 children, 70%), followed by Phostal (14 children, 18%), Allergovit (7 children, 9%), and finally Purethal (3 children, 4%). Fifteen children were treated shorter than one year, while in 25 children lasted longer than 3 years. Analysis of the questionnaire revealed improvement both in allergic disease symptoms as well as the decreasing prevalence of infections. The factors contributing to the better outcome of treatment has been established.
**Conclusions:** The monitoring of SIT-treated patients is useful to give feedback of disease's control and probably it may help to establish more individual options of management.

5th September 2012
1_Allergen Exposure

**Rapid detection of allergen challenge in practical allergology**

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**Objectives:** Allergic reactions are almost exclusively triggered by protein molecules. Thus the proof of proteins either free or cell-bound in air, dust or food samples from the environment of patients is an indication for a suspected case of an allergic disease. A rapid in vitro assay, named Direct Vision System was developed for visualisation and assessment of free proteins, biological organisms and structures, like pollen, mould spores, mites, yeast cells, and bacteria.
**Methods:** Direct Vision System uses the staining properties of the ready to use solution redprot®. The dye ofredprot® interacts with certain residues of amino acids, thus selectively staining proteins, and protein containing structures - preferentially in the cytoplasmatic compartment. Direct Vision System is easy to handle: Dry samples are transferred to a slide, covered with redprot® - and after five minutes content is identified and counted by microscopic inspection. High sensitivity is reached, when a liquid sample is mixed with an appropriate amount of redprot®-solution (5 to 20% of total volume) and the colour change is read 5 to 15 minutes later in a spectrophotometer giving the exact amount of soluble protein.
**Results:** The high specific affinity of the dye to the biological structures results in background-free staining byredprot®, yielding colour ranges from pink to blue and violet within few minutes. In air samples free proteins and dander reveal immediately blue colour, while biological particles like pollen and mould spores appear violet in the cytoplasma. In samples from liquids or dust yeast cells and bacteria are intensively stained. In dust or food samples, even vivid mites, small worms and insects are coloured by the staining solution redprot®. Staining pattern of organisms relates to structure of the particles. Intensity of colour indicates via protein content to its biological activity, e.g. growth, viability, maturation and - probably - pathogenic capacity.
**Conclusions:** Direct Vision System enables the detection of a broad spectrum of biological particles: Samples from air, liquids or surfaces can be scanned easily for contamination of biological origin according to their protein moiety. Additionally to a 'rough' quantitative estimation of biological contamination, a detailed identification and discrimination of samples regarding kind and physiological state of the particles, e.g. pollen, spores, yeast cells, bacteria or others using a microscope is possible.

5th September 2012
2_Allergen Exposure

**Assessing human exposure to grass pollen in Denmark**

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**Objectives:** Exposure to pollen is typically assessed using data collected at fixed roof-top monitoring stations, which give a general picture of airborne pollen concentrations over a wide region. Actual exposure levels can be obtained through personal exposure monitoring. This is typically done using a suction sampler worn on the chest or lapel that measures breathing zone concentration; a more useful exposure parameter for pollen allergy sufferers is the amount of pollen inhaled, i.e. the dose. The objective of this study was to investigate how well monitoring station data reflect actual exposure, something that is currently not well understood.
**Methods:** Exposure samples were collected during the 2011 grass pollen season in an area of abundant unmaintained grass coverage close to the centre of Aarhus, Denmark. Sampling was performed at two-hourly intervals between 12:00 and 20:00 on 14 separate days whilst walking a set route. Journey times were in the region of 28 minutes. Nasal Air Samplers (small impaction devices worn inside the nostrils that capture inhaled particles) were used. The number of inhaled grass pollen grains was counted under a light microscope and compared with concurrent concentrations recorded at a nearby roof level pollen monitoring station. The relationship between these two data sets was also compared with local meteorological variables (wind direction, wind speed, temperature, relative humidity and solar radiation).
**Results:** The number of grass pollen grains inhaled during individual exposure episode ranged from 6 -127 (median 34), and inhalation rates were between 0.23-4.83 (median 1.20) grains $min^{-1}$. Corresponding concentrations recorded at the monitoring station lay within the range 0-311 (median 56) grains $m^{-3}$. The Spearman's correlation coefficient between the exposure and monitoring station data was 0.65 ($p<0.001$). Exposure was disproportionately high relative to monitoring station data in 15% of the dataset, with these occurring close to midday (12:00-14:00). On no occasion was exposure disproportionately low. Correlation coefficients for the 'early' (12:00-14:00) and 'late' (18:00-20:00) periods differ considerably ($r_s$=0.51 and $r_s$=0.82 respectively). The mean profile of monitoring station concentrations shows a persistent increase from 12:00-20:00 whilst for the exposure data the opposite is true. No relationship was observed between the standardised ratio of exposure to monitored data and any of the available weather data.
**Conclusions:** Whilst the monitoring station data is a reasonable proxy for exposure, the quality of the relationship depends upon the time of day. Within the study area the risk of exposure decreases between noon and mid-evening, likely reflecting diurnal variation in the emission of grass pollen. This trend is contrary to what the monitoring station predicts, and this has implications where allergen avoidance is being advocated as a method for controlling symptoms. An exposure model for grass pollen is currently being developed for Aarhus. Model performance will be tested against the empirical exposure data described here, the ultimate aim being to build upon this study by using the model to assess the importance of source proximity to exposure.

5th September 2012
3_Allergen Exposure

**Pollen allergy – the diagnostics value of skin prick tests and asIgE level**

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**Objectives:** The pollen allergy symptoms, like seasonal rhinitis, conjunctivitis, asthma and dermatitis appear during the pollen exposure in patients in European countries. Positive skin prick tests and increased asIgE serum level are the objective tests for diagnostics and qualification to the specific immunotherapy. The aim of the study was to evaluate the value of history, skin prick tests and sIgE level in diagnostics of pollen allergy.
**Methods:** The retrospective analysis was done in a group of 100 patients (44 women, 56 men in the age of 14-69yrs) suffering from pollen allergy and treated in the Outpatients Dpt of the Clinical and Environmental Allergology in Krakow in 2008-2012. The patients were diagnosed on the basis of: i. history (seasonal rhinitis, conjunctivitis, pollen asthma); ii. skin prick tests (SPT) with standard allergen solutions of tree-, grasses-, and weed mix (Nexter-Allergopharma); iii. asIgE level for Betula (T3), Phleum (G6), Artemisia (W6) allergens (CAP/FEIA). $Chi^2$ coefficient test and correspondence analysis were used for the statistical analysis.
**Results:** All patients suffered from allergic rhinitis and conjunctivitis. In 15% of patients the atopic asthma was also diagnosed and 30% of patients manifested the oral allergy symptoms (OAS) provoked by fresh apples, peaches, celery, carrots or nuts. The OAS symptoms occurred usually after a few years of non treated seasonal allergy symptoms. In 25% of patients the positive familiar history of allergy was confirmed, moreover 35% of patients suffered from allergic diathesis in early childhood. The seasonal allergy symptoms caused by tree pollen were recognized in 24 patients, by grass pollen in 3 patients, by weed pollen in 1 patient only. The allergy symptoms dominated in the time of higher tree pollen concentrations (in 19 patients), grass and weed pollen concentrations (in 17 patients). The history, positive skin prick tests and asIgE level > 1 KU/L confirmed the diagnosis of pollen allergy in 62% of patients. Not full compatibility was found between the history and skin prick tests in 8% of patients, between anamnesis and asIgE level in 6% of patients and between anamnesis and both analyzed parameters in 22% of patients. In 4% of patients the incompatibility between symptomatic diagnosis and the tests results was found. In these cases the non IgE-related allergy should have been considered. The statistical analysis confirmed the significance of skin prick tests, IgE level and symptoms in the pollen allergy diagnostics ($p<0.05$).
**Conclusions:** 1. Positive SPT with pollen allergens and elevated serum level of asIgE in patients suffering from pollen allergy show high significant compatibility with history. 2. In above 30% of patients some incompatibilities were observed between history and SPT or asIgE, suggesting some changes observed during natural development of the disease. 3. In single cases (about 2%) the full incompatibility among history, SPT and asIgE was observed. Non IgE-related allergy or irritant reactions should be taken into consideration in these cases.

5th September 2012
4_Allergen Exposure

**Nasal nitric oxide measurements in patients with seasonal allergic rhinitis**

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**Objectives:** Seasonal allergic rhinitis (SAR) is a common, still increasing phenomenon regarding the patients of all age groups. Nasal nitiric oxide measurement seems to be an useful method in diagnose and monitoring of SAR. The aim of the study was an attempt to evaluate the value of fraction of nasal exhaled nitric oxide (FeNO) measurements in SAR patients of different age groups during and after pollen season.
**Methods:** The study group consisted of 486 SAR patients with mean age 40.14±12.55 (range 18-81) years. The diagnosis of SAR was based on clinical history, positive skin prick tests and serum specific IgE concentration. FeNO measurements were obtained with chemiluminescence analyser during and after pollen season. Results achieved for the study group were compared to control group consisting of 314 healthy volunteers with mean age 38.3±7.55 (range 18-77) years.
**Results:** In young patients a prevalence of allergy to grass and birch was noticed, whereas in patients above 50 y.o. mostly allergy to grass and mugwort was observed. In the study group in all age categories mean FeNO level during pollen season was higher than in control and comparable past the season. Maximum values of FeNO were obtained just after peak period of SAR symptoms. In pollen season, mean FeNO levels were comparable in patients with SAR as following: in patients aged 18-35: 62±8.22 ppb, in group 35-50 y.o.: 58.3±11.09 ppb and in group 50-75 y.o. 57.4±12.93 ppb.
**Conclusions:** FeNO measurement is an useful method of SAR assessment in patients of all age groups. Increasing incidence of SAR in elderly group is noticed.

5th September 2012
5_Allergen Exposure
**Urban PM2.5 impact on human bronchial epithelium**

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**Objectives:** Epidemiological data indicates that urban particulate matter below 10 and 2.5 μm (i.e. PM10 and PM2.5) promotes both pulmonary and cardiovascular disorders. Although the exact mechanisms of PM2.5 remain unclear, it is known that the most vulnerable to detrimental effects of PM2.5 include children, the elderly and those suffering from cardiopulmonary diseases. Akin to aeroallergens, PM2.5 particles may be deposited in human respiratory system and induce inflammation. Despite significant reductions in emission of air pollution in the past two decades, in 2010, Krakow accrued its highest average annual concentrations of PM10 and PM2.5. The levels of PM10 exceeded alarm limit values (200 mg/m$^3$) during the winter months. A causative factor in this situation was natural factors such as the geographical localization of Krakow in the valley of the Vistula River, which promoted fog formation, and a lack of prevailing winds. Moreover, urbanization (e.g. terraced buildings) in the city center, along with excess transport and household emissions, coupled together with frequently occurring thermal inversions, favoured accumulation of particulate matter over the city. Increased levels of PM2.5 in Krakow, a city inhabited by nearly one million people, may pose to be a cardiopulmonary risk factor for the winter months.
**Methods:** In order to examine the toxicity of PM2.5 on human respiratory health, particulate matter was collected in the winter of 2010/2011, at two localizations (A and B) in Krakow, that were separated from each other by 1 km. PM2.5 was collected onto polycarbonate filters using a Negretti collecting system. Elemental composition was assessed by inductively coupled plasma mass spectrometry (ICP-MS). Cytotoxicity was examined using three-dimensional cultures of normal human bronchial epithelium (EpiAirway). A genomic response analysis were conducted after 4 hrs exposure to PM2.5.
**Results:** ICP-MS results confirmed the presence of 14 elements in PM2.5 samples from the two collecting sites. Gene expression analysis demonstrated a profound difference in toxicity, whereby PM2.5 from the site A up-regulated only 1 pro-inflammatory gene cyp1a1, whereas PM form the collection site B up-regulated 11 genes. The results indicated that PM2.5 from locations separated by minimal distance (i.e.1 km) exhibited different degrees of bioreactivity, as a consequence of different chemical compositions.
**Conclusions:** Reduction in particulate matter pollution is necessary to improve the health status of city dwellers. PM10 and PM2.5 monitoring is essential, especially for warning the public about the health risks. However, it must be stressed that PM2.5 toxicity depends not only on its concentration in the atmosphere, but also its chemical composition, whereby metallic components have a greater impact on any ensuing bioreactivity.

5th September 2012 POSTERS
P_H.1
**Symptoms of the Swiss birch and grass pollen season 2011**

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**Objectives:** The European Pollen Diary (www.pollendiary.com) was established for giving allergic people the possibility to record regularly their symptoms online on a private account. The Pollen Diary helps the patients to follow their symptoms and to compare them with the pollen counts. Moreover, from the scientific point of view the Pollen Diary provides valuable information on the reactions of patients compared to the measured pollen concentration.
**Methods:** The Pollen Diary allows to record the severity of symptoms of the nose, the eyes and lungs and an estimation of the overall symptoms. For the pollen season 2011 the allergic symptoms of Swiss users were set in relation to the concentration of airborne pollen.80 users of the region of Zurich who made at least 30 entries into the European Pollen Diary have been included in the analysis. The pollen concentration was measured by the Swiss National Pollen Monitoring Network usingHirst type samplers.
**Results:** The birch pollen season 2011 in Zurich had an intense start. Between the 2nd and the 9th of March daily concentrations above 1000 pollen/m$^3$ were registered. The Seasonal Pollen Index reached 12500 which is slightly above the average. 16 days with high pollen load (≥70) was recorded which is well below the average of 23 days. The grass pollen season in Zurich was average, but the number of days with high pollen load (≥50) reached 31 days which is above the average of 25 days. Using Spearman correlation between the calculated value of "overall symptoms total" and the daily pollen concentration of birch and grass pollen, 31 users where identified as allergic to birch pollen whereas 40 users proved to be allergic to grass pollen.11 users were allergic to grass and birch pollen. For 20 users no significant correlation was found neither to birch nor grass pollen. Nose symptoms are the most frequently observed symptoms, followed by eye and lung symptoms. On days with high birch pollen load (≥70 pollen/m$^3$) the percentages of users allergic only to birch pollen with symptoms were: nose 92% (Std.dev. 8.5), eyes 69% (Std.dev. 16.9) lungs 38% (Std.dev14.4). On days with high grass pollen load (≥50 pollen/m$^3$) the percentages of users allergic only to grass pollen with symptoms were: nose 78% (Std.dev. 13.8), eyes 55% (Std.dev. 16.9) lungs 24% (Std.dev10.2).The intense birch pollen season in 2011 is reflected in a higher percentage of sufferers with severe symptoms compared to the average grass pollen season. The use of anti-allergic pharmaceuticals corresponded to the high pollen loads.
**Conclusions:** The Pollen Diary represents a new tool for better understanding the direct consequences of different pollen loads on allergy sufferers. Moreover, the tool helps to verify the threshold values used for pollen forecasts.

5th September 2012
6_Allergen Exposure
**Five day ahead hay fever forecast for grass pollen allergic patients in the Netherlands**

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**Objectives:** Grass pollen is one of major causes of hay fever in the Netherlands. Since 1980 the expected weather situation for grass pollen allergic patients is disseminated by radio and Teletext. This hay fever forecast is prepared manually and was developed using symptoms from patients visiting the outpatient clinic. We aimed to update this method by developing a computer-driven model based on current patients recruited from the general population.
**Methods:** Procedures for patient recruitment, collection of symptoms scores (2007 and 2008) and pollen counts (1977-2008) have been previously described. Historical weather parameters (1977-2008) and forecasted weather parameters (2005 – 2008) were obtained from the Royal Netherlands Meteorological Institute. Statistical analyses were performed with the software package STATA/IC 11.0 (StataCorp, USA).
**Results:** Because the final model that will be used in daily practice has to rely on forecasted weather parameters, we selected forecasted weather parameters (i.e. temperature [minimum, average and maximum] and wind) which accurately predicted the true weather ($R^2$≥0.5). We used this weather prediction to develop a pollen forecast using multiple linear regression analysis which included the following predictors: i. pollen counts of the previous 2 week-period of the current year; ii. daily means of the pollen counts of the previous 10-years and derivatives of this curve; and iii. predicted maximum, minimum and mean temperature and derivatives of these parameters. This model resulted in an explained variance of $R^2$=0.71 (95%CI 0.68-0.74), when using forecasted weather parameters in the model. Next a prediction for hay fever symptoms was developed using a linear regression model based on: i. these forecasted pollen counts, ii. day number of the year iii. pollen counts of the previous 2 week-period and iv. predicted maximum and mean temperatures. The resulting hay fever forecast model resulted in an explained variance of $R^2$=0.80 and $R^2$=0.82 for 2007 and 2008 respectively. In order to test the performance of this multi-day hay fever forecast model, we divided the observed and predicted symptom score values into three categories:. The multi-day forecast for up to 5 days ahead showed an agreement between the observed and predicted categories ranging from 61% to 79 % for 2007 (kappa ranging from 0.41-0.67) and 70% to 78% for 2008 (kappa ranging from 0.53-0.66).
**Conclusions:** These results indicate a good performance of the newly developed multi-day hay fever forecast model up to 5 days ahead. Future dissemination of this 5 day ahead forecasts by different media (internet, newspapers, radio Teletext, SMS, and Twitter) will inform the hay fever patients in an effective way, resulting in better planning of activities and medication intake by the patients.

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5th September 2012
P_H.2
**The European project HIALINE (Health Impacts of Airborne Allergen Information Network):**
**three years of monitoring Betula pollen and allergens in Parma (Italy)**

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**Objectives:** Exposure to allergens is pivotal in determining sensitization and allergic symptoms in individuals. Pollen grain counts in ambient air have traditionally been assessed to estimate airborne allergen exposure. However, the exact allergen content of ambient air is unknown. HIALINE therefore monitored atmospheric concentrations of Betula pollen grain and the matched major birch pollen allergen Bet v 1 across Europe. Monitoring the allergens themselves together with pollen in ambient air might be an improvement in allergen exposure assessment. New knowledge through the use of new experimental approaches in the field of aerobiological monitoring will enable better management in the prevention and clinical management of pollinosis. In order to promote the outcomes of the project we present the results of three years of birch pollen grain and the matched major Betula pollen allergen Bet v 1 monitoring in Parma, Italy.
**Methods:** We have monitored Betula pollen count and Bet v 1 allergen concentrations. Quality control was carried out for the pollen monitoring activities and determination of allergen concentrations. The pollens were sampled through a Hirst pollen trap. Allergens were collected with a Chemvol high-volume cascade impactor, extracted from pollen and quantified by ELISA. Antibodies for analysis were provided by the industrial partner in this project.
**Results:** 2009: (During 2009 HIALINE season in Parma is started after start of Betula biological season): peak day 21 pollens/m$^3$; peak day 4/15; cumulative Betula pollen count 100; Bet v1(pg/m$^3$/24h): peak day 81.99, peak day 5/7 with 1 pollen/m$^3$; cumulative 681, per pollen/season 6.81, per pollen/peak 81.99. During the period examined 93.88% of Bet v1 is recorded in the PM>10μm fraction. 2010: peak day 43.9 pollens/m$^3$; peak day 4/21; cumulative Betula pollen count 497; Bet v1(pg/m$^3$/24h): peak day 250.2, peak day 4/20 with 35.7 pollens/m$^3$, cumulative Betula pollen count 1237, per pollen/season 2.49, per pollen/peak 7.0. During the period examined 91.3% of Bet v1 is recorded in the PM>10μm fraction. 2011: peak day 39.79 pollens/m$^3$; peak day 4/4; cumulative Betula pollen count 423.26; Bet v1(pg/m$^3$/24h): peak day 284.03, peak day 4/4; cumulative 1750.24, per pollen/season 4.14, per pollen/peak 7.14. During the period examined 89.7% of Bet v1 is recorded in the PM>10μm fraction.
**Conclusions:** The results in Italy should be compared with those from partners in other countries. It will be important to confirm some observations during the first and second year of the project activity which showed the presence of a different allergenic power in different geographical areas as observed for other types of pollen (Poaceae and Olea). The aim of the project was to measure the pollen's capacity to release allergens and this will result into an allergen exposure forecast, taking into consideration pollen counts and allergen release from different locations. The results of the project will help medical doctors, authorities and patients to better manage the different aspects related to pollinosis.

5th September 2012
P_H.3

**The evaluation of quality of life in children with asthma after rehabilitation treatment in sanatorium**

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**Objectives:** The rehabilitation treatment in children with asthma is known as an additional treatment during asthma treatment. It reaches best results when provided in the mountain area. The poor physical condition is often accompanied by psychological problems in children with asthma. Our goal was to evaluate the quality of life and the rehabilitation therapeutic effect in asthma children.
**Methods:** The study comprised of 58 children aged 5-18 recruited in 2 outpatient clinics. 57% of children were treated both in the outpatient clinic (regular asthma treatment) and in sanatorium (both sea or mountain resorts). Most of the children during the rehabilitation process were granted with 3 different rehabilitation procedures (78 %), 12% of children had more than 3 procedures and 10% had 1 rehabilitation procedure. The control group consisted of 25 children. All parents were asked to fill up QOL questionnaire. ACT (Asthma Control Test) was performed.
**Results:** ACT showed that 42% of children in the studied group presented with poorly controlled asthma symptoms comparing to 24% of poorly controlled asthma children in the control group. The children having symptoms since early infancy were found only in the studied group (20%). During asthma exacerbation, the inhaled steroids and bronchodilatetors were given in 1/3 of children in the studied group comparing to 1/5 in the control group. The rehabilitation procedures included: respiratory effort exercises (20%); nebulization (16%); physical strengthening exercises (15%); sollux lamp (14%); medical baths (9%). According to the parental questionnaire: 63% of children were first- time- treated in sanatorium; 24% was treated in sanatorium at least once a year previously; 88% of parents showed interest in the repeated sanatorium treatment. After rehabilitation treatment, we observed in 43% of children the decreased symptoms (cough, wheezing, shortness of breath), however 8% of children showed worsening of their symptoms. 66% of children had no improvement in physical activity and no improvement in psychological symptoms like anger, fear, sadness, discouragement, affliction accompanying a poor physical condition. 74% of children in the studied group showed increased fear of the next asthma exacerbation. The life quality in children was evaluated in 0-10 point scale. The mean in the studied group was 6 in compare to 2 in the control group. The parental questionnaire showed that 50% of parents did not understand the need of continuation in the rehabilitation process, especially during a non- symptomatic period. Similarly, 50% of parents were giving medicines only during symptoms worsening.
**Conclusion:** The proper parental education is crucial during the rehabilitation process and it should be continued at home.

5th September 2012
P_H.4

**Nasal cytology as a useful tool for allergic and non-allergic rhinitis treatment**

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**Objectives:** Scraping cytology of the nasal mucosa is one of the diagnostic methods used in the evaluation of upper airways diseases. The main indications for this examination are: differentiation of rhinitis into allergic and non-allergic, the treatment selection and monitoring, the estimation the side effects of the drugs on nasal mucosa. Nasal cytology is simple to perform in all patients, independent on symptoms and patient age, non-invasive for patients. The aim of the study was to evaluate the results of cytological examination in a group of allergic patients regarding to the SPT results, sIgE level and diagnosis.
**Methods:** The nasal cytology was ordered in a group of 1573 patients diagnosed and treated in the Dpt of Allergology, University Hospital, Krakow in 2008-2011, to confirm the preliminary diagnosis put on the basis of the positive SPT and increased sIgE level or in case of the negative results of these analyses. From this group the main research group (330 patients) was distinguished on the basis of the percentage of eosinophils (>2%). For research purposes the main group was divided into 2 semi-groups: the patients with eosinophilia in cythogram > 2% (186 patients) and with eosinophilia > 20% (144 patients). The samples were collected by scraping technique from both interior nasal turbinates. The slides were stained by eosin-hematoksylin method, and examinated under the light microscope (1000×). The epithelial and invasive/inflammatory cells were counted up to 100.
**Results:** In 71.30% of patients with lower percentage of nasal eosinophilia (3-20%) the SPT results were positive, the SPT with pollen allergens and house dust mites prevailed. In some of these patients the SPT results were confirmed by the increased sIgE level. In 28.70% of patients with lower nasal eosinophilia (3-20%) the SPT results were negative. The following diagnosis dominated in this group: allergic rhinitis, atopic asthma, atopic dermatitis and contact dermatitis. On the other hand in 45.80% of patients with nasal eosinophilia > 20% the positive SPT were observed. In this group 9 patients have demonstrated the level of eosinophilia > 70%. Similarly to the group with lower eosinophilia, the SPT with pollen allergens (20% of patients) and house dust mites (25% of patients) dominated. In patients with negative SPT the level of eosinophilia ranged from 21-78%. In 1/3 of these patients the allergic rhinitis was diagnosed. About 80% of patients with higher eosinophilia was ordered to take nasal glucocorticosteroids, but 20% of this group was treated by antihistaminic only.
**Conclusions:** The nasal cytology is a real useful tool for allergic and non-allergic rhinitis differentiations, moreover it is an advice for treatment selection.

5th September 2012
P_H.5

**The changes in the level of exhaled nitric oxide (FENO) in patients with atopic asthma**

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**Objectives:** Nitric oxide plays an important role in the pathogenesis of asthma. Therefore it's level in exhaled air (FENO) is considered to be an important marker of airway inflammatory process. FENO changes during the year, depending on subject exposure to different types of allergen in patients with bronchial asthma. In the present study we aimed to evaluate a relationship between the concentrations of nitric oxide in exhaled air and symptoms of asthma.
**Methods:** 53 patients (30M and 33F) with atopic asthma were studied. Mean age of that group of patients was 26 (9-63) years. Most of studied patients had positive skin prick tests to more than one type of allergen. The most common allergens were house dust mites, then grass pollens and tree pollens. 34 patients were undergoing subcutaneous immunotherapy (SCIT). The remaining 19 have already finished SCIT. FENO was measured using ProVita analyzer during three consecutive visit in out-patient clinic. Patients did not show bronchial obturation in the spirometry.
**Results:** The level of FENO was analyzed during three consecutive visits. There was statistically important difference between the level of NO in first visit (67.9+/- 51.6 vs. 43.9+/- 34.9 ppb; p<0.001) and between first and third visit (35.8+/- 21.6 ppb) p<0.0001. The difference between the second and third visit was borderline significant (p=0.051). The level of exhaled nitric oxide in two groups was also compared: patients without full control of asthma (with symptoms like cough or dyspnea; n=19) and patient without symptoms (n=29). The level of FENO was much higher in the group with symptoms than in the group with fully controlled asthma (83.9+/- 45.1vs. 59.7+/- 55.5 ppb), but this difference was not statistically significant. The level of exhaled nitric oxide was also compared between patients currently undergoing maintenance immunotherapy (2-4 years since starting of SCIT) and subjects in whom treatment was concluded after 2-8 years. The level of exhaled NO was higher during the course of immunotherapy than in the group in which the immunotherapy was finished (73.1+/-56.8 vs 54.3+/-41.9 ppb), but this difference did not reach statistical significance.
**Conclusions:** Measurement of FENO can help to better optimization of treatment patient with bronchial asthma.

5th September 2012
P_H.6

**Correlation between the airborne pollen count and symptoms of the patients in Vinnitsa, Ukraine**

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**Objectives:** The correspondence between the patients' hay fever symptoms and the pollen load in the air may be useful for proper seasonal allergy prevention and control. The aim of our study was to determine the correspondence between the timing of patients' seasonal allergy symptoms, their severity and pollen count in Vinnitsa, Ukraine. Treatment of choice was taken into consideration as well.
**Methods:** Pollen collection in 2009, 2010 and 2011 used volumetric methods employing a Hirst Burkard trap placed at a height of 25 meters above the ground on the roof of a Vinnitsa National Medical University building. There were 36 weekly samples taken from March, 1 till October, 31. Seasonal allergic patient symptoms at university clinics were correlated with time and severity of ocular, nasal and lung symptoms. 37 patients with determined tree pollen allergy and 12 patients with a grass hay fever were observed. Patients with an arboreal pollen allergy were diagnosed for the alder, birch, hornbeam and oak sensitivity mostly.
**Results:** Data analysis showed significant correspondence between the timing of the patients' symptoms and a pollen count. After data processing by the "Statistic 5.5" software package we determined moderate levels of the Kendal Tau correlation coefficient between decreased wellness of patients and increased concentration of alder pollen in the atmosphere (τ=0.3, p<0.01). Alder pollen caused minor eye symptoms (τ=0.2, p<0.05) and moderate nose (τ=0.6, p<0.01) and lung (τ=0.6, p<0.01) symptoms. The therapy of choice was nasal drops (τ=0.5, p<0.01) and antiallergenic tablets (τ=0.5, p<0.01). Birch pollen significantly reduced the life quality of patients as well (τ=0.4, p<0.01). Betula allergens caused minor eye symptoms (τ=0.7, p<0.01), minor (τ=0.4, p<0.01), moderate (τ=0.5, p<0.01) and severe (τ=0.5, p<0.05) nasal symptoms, minor (τ=0.6, p<0.01) and moderate (τ=0.7, p<0.01) lung symptoms. The symptomatic treatment was provided with the nasal drops (τ=0.8, p<0.01), antiallergenic tablets (τ=0.8, p<0.01) and inhaler (τ=0.6, p<0. 01). Hornbeam (Carpinus) pollen in the air also reduced the patients wellness (τ=0.5, p<0.01). It caused minor eye symptoms (τ=0.4, p<0.01), minor (τ=0.4, p<0.01), moderate (τ=0.5, p<0.01) and severe (τ=0.5, p<0.05) nasal symptoms; minor (τ=0.5, p<0.01) and moderate (τ=0.7, p<0.01) lung symptoms. The most effective treatment of the case was nasal drops (τ=0.8, p<0.01), antiallergenic tablets (τ=0.7, p<0.01), inhaler (τ=0.6, p<0.01).
Minor nasal (τ=0.2, p<0.05) and lung (τ=0.4, p<0.01) symptoms were caused by oak pollen. The best therapy of the case was inhaler (τ=0.6, p<0.01). Deterioration of patients' health (τ=0.3, p<0.01) correlated with increased grass pollination level too. Grass pollen provoked moderate eye (τ=0.4, p<0.05) and minor lung symptoms (τ=0.2, p<0.05). Case therapy involved the nasal drops (τ=0.7, p~0.00), eye drops (τ=0.4, p<0.01) and the antiallergenic tablets mostly (τ=0.3, p<0.01).
**Conclusion:** Study showed reliable correlation between the patients' symptoms and airborne pollen count in Vinnitsa. Further study of the sensitivity is required for proper pollen forecasting.

5th September 2012 POSTERS
P_ES.1

**Diurnal variation in pollutants and pollen levels based on three urban pollen stations in Arhus Denmark during the period 2009-2011**

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**Objectives:** Grass pollen is the most important allergenic pollen type in Europe due to its ubiquity, length of season and number of allergic subjects. Chemical air pollutants have the potential to affect allergic subjects directly by stressing the respiratory system but also indirectly by affecting the allergenicity of pollen. Despite the important interactions between air pollutants and aeroallergens in the urban landscape, very few studies focusing on this subject have been published. The purpose of this study is thus to investigate how grass pollen and air pollution concentrations vary in the urban landscape.
**Methods:** Three Hirst-type spore traps were placed at roof top locations in Aarhus, a maximum distance of 8.5 km´s from each other. Observations have been carried out for the pollen season in 2009, 2010 and 2011, where grass pollen was counted for 2 hour intervals. Half-hourly levels of $NO_2$, $NO_x$ and $O_3$ were obtained from a roadside and an urban background monitoring station (part of the Danish Air Quality Monitoring Programme), located next to the City Centre pollen trap. Average diurnal variation for pollen and pollutants were calculated for peak pollen days (daily average concentrations over 50 grains $m^{-3}$); days when it rained were omitted due to the distorting effect of precipitation.
**Results:** Measurements from in total 44 days were included in the analysis, contributing a total of 80 peak pollen days from the three traps. On peak pollen days, average (SD) diurnal $O_3$ levels in urban back ground were lowest from 3am-6am; 20 (11) ppb, before rising to a maximum of 42 (9.7) ppbat 4pm. For the entire grass pollen season (not just peak days) average $O_3$ levels peak at 36.15 (11.32) ppb. Average mean diurnal $NO_2$ concentrations at street level on peak pollen days were lowest between midnight and 3.30am (mean 12.7 (8.4) ppb), rising to a maximum of 26.4 (12.5) ppbat 6.30am. The $NO_2$ level between 7.30am and 10pm were 20-25 ppb, with a decrease at 7pm to 17.8 (10.1) ppb. The average $NO_2$ diurnal profile for the entire grass pollen season is almost identical to that for peak days only. The mean diurnal pollen concentration on peak days varied between 23 (45) pollen $m^{-3}$ at 3am and 205 pollen $m^{-3}$ (197) at 7pm.
**Conclusions:** Urban background ozone concentration on peak pollen days stay at their highest level during the entire day, and therefore coincide with the high pollen counts at 7pm. Literature indicates that ozone levels similar to those measured here can exacerbate asthma. Roadside $O_3$ concentrations can however be assumed to be very low in areas with high traffic intensity due to the reaction between ozone and NO in traffic exhaust gasses, and subsequent formation of $NO_2$. $NO_2$ peaks in the early morning and late evening, but decreases around 7pm where high pollen levels occur. Further studies will include analysis of variation between pollen counts from the three traps, variation in the diurnal pattern of grass pollen and analysis of $NO_2$, $NO_X$ and $O_3$ at both rooftop and street level.

5th September 2012
P_ES.2

**Respiratory allergic symptoms in adolescents increase with exposition to environmental vehicle pollutants**

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**Objectives:** Respiratory allergic diseases like rhinitis and bronchial asthma appear to be increasing worldwide. They influence mostly people living in urban areas. Air pollutants may increase the frequency and intensity of symptoms in already allergic patients and also promote airway sensitization to airborne allergens in predisposed subjects. The problem of asthma and other allergic diseases among young people living in industrialized areas is widely discussed. Although there is a few articles concerning the problem of allergies in children living in the country or in the city, none of them shows the difference between living in the city near big routes and far away from them. The prevalence of asthma and other allergic diseases were investigated in 16-years-old children living in Krakow in correlation to the distance from the big routes.
**Materials:** We enrolled 4388 16-years-old adolescents from several high schools in Krakow. We used a modified version of the International Study of Asthma and Allergies in Childhood (ISAAC) questionnaire. The group of patients was divided into two subgroups- children living near busy roads, up to 200 meters and children living farther- over 200 meters- from big route. The results were estimated by the use of Chi-square test with $p<0,05$ considered as statistically significant.
**Results:** In the first group, children living near the big routes, the number of reported allergic symptoms was higher than in the second group, children living far away from the busy roads: perennial or intermittent rhinitis was reported in 26% in the first group and 23,3% in the second group ($p=0,0033$), attacks of dyspnea, cough and wheezes 15,1% vs 10,1% ($p<0,0001$), sensitization to common inhalant allergens 24% vs 21,7% ($p=0,0068$), recurrent bronchitis with cough or wheezes and dyspnea in childhood 13,4% vs 10,2% ($p=0,0001$), treatment in allergological clinic 15,5% vs 13% ($p=0,0019$), wheezing in the past 12 months 6% vs 4,1% ($p=0,0008$),the presence of dry cough at night (not correlated with common cold) in the past 12 months 9,6% vs 7% ($p=0,0002$), hay fever 16,3% vs 14,9% ($p=0,0273$).
**Conclusions:** The number of allergic symptoms differs in children living closer and farther from big routes which could be related to amount of inhaled vehicle pollutants, especially Diesel exhaust particles.

5th September 2012
P_ES.3

**Identification of high-risk situations when pollen and air pollution contribute to antihistamine drug prescription**

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**Objectives:** About one person out of five suffers from pollen allergy, which induces rhinitis, conjunctivitis and/or asthma. Since ozone and particles cause oxidative stress, and can damage the airway mucosa, symptoms could be aggravated when high concentrations of these pollutants coincide with, or precede, high levels of pollen. An integrated approach to air quality, including coupled modelling of physical, chemical and biological factors with a health impact, requires that we know more about the short-term effects of such incidents. We relate the occurrence of pollutants and pollen, respectively, to Lamb's weather types. The Lamb system splits the prevailing synoptic conditions in a certain geographical area into a number of categories. The actual weather is also a result of local conditions, such as wind speed and precipitation, which also should be considered. Thus we look for high-risk situations, and we investigate the joint actions of pollen and pollutants on the level of antihistamine drug prescription.
**Methods:** We used data from years 2009-2011 in Gothenburg and 2009-2010 in Malmoe, including Alnus (alder), Betula (birch), Fagus (beech), Quercus (oak), Poaceae (grass), and Artemisia (mugwort) in the study. Pollen data were collected using standard volumetric spore traps, situated at ca 30 metres height at the roof-tops of Sahlgrenska University Hospital (Ostra) and Skane University Hospital, Malmoe. Air pollution data were provided by the Environmental Departments of Gothenburg and Malmoe, respectively, and were collected at the rooftop of the commercial centre "Femman" in the centre of Gothenburg, and of the City Hall, in the centre of Malmoe. Lamb's weather types was calculated from the variation in surface pressure values, The effect from pollen and pollutants on drug prescription was calculated with simple and multiple linear regressions: we also plan to use General Additive Model time series analysis. The correlation between pollen and pollutants was investigated graphically in scatter plots, where each point was distinguished by a symbol showing the weather type prevailing during the day represented by the spot.
**Results:** The pollen seasons differed from one another in the degree of overlap between pollen types, in the effects of pollutants and in the additive effects of pollutants and pollen in combination. Ozone and $PM_{10}$ did not always have an effect, but during the study period more often in Gothenburg than in Malmoe, which also is true for the combinations. The effects were sometimes stronger when a lag period of 1-3 days for pollutant exposure was considered. Certain weather types are more associated with high pollen and pollutant levels than others are. Often, pollen and pollutants co-vary, either indicating that they are favoured by the same circumstances, or in the case of particles, that some of the particles are of pollen or anther origin.
**Conclusions:** During certain circumstances, pollutants appear to reinforce the health impact of allergenic pollen. It is possible to identify situations when the risk for aggravated symptoms is high.

5th September 2012
P_ES.4

**Pollen diagnostics of toxicomutagenic background of urban industrial territories in the Precarpathian Region (Ukraine)**

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**Objective:** A characteristic feature of urban industrial ecosystems is growth of environmental genetic tension. It has been caused by pollutants with marked mutagenic activity which penetrates ecotopes. The aim is to improve the system of genetic monitoring by introducing pollen diagnostic. This approach is based on the ability of most pollutants to induce recessive mutations, which can only be apparent in haploid pollen cells. These changes can be viewed as bioindicative markers of environmental mutagenic tension.
**Methods:** The research was done in the Precarpathian background areas as well as on the territories that underwent man-made changes: in urban ecosystem of Ivano-Frankivsk and in the area polluted by the Burshtyn thermoelectric power station and the Ivano-Frankivsk cement and slate plant. Subject of inquiry is the level of environmental toxic and mutagenic tension; the material used in the research is pollen Salix caprea L., Populus pyramidalis Roz., Betula pendula Roth, Tilia cordata Mill. Sterility, vitality and morphologic features of pollen were summarized. Sterility was evaluated by the presence of starch in pollen seeds. Vitality was identified by sprouting in the agar medium; morphological features were analyzed by the diameter of pollen seeds.
**Results:** The influence of urban technogenic factors leads to valid ($P<0.05$) increase of the share of non-starchy pollen in woody plants and its vitality loss. The greatest changes were detected under conditions of ecotope pollution by emissions of cement production (large- dispersed parts highly concentrated with Mn, Pb, Cu, Cr, Cd). Sterility fluctuates from 81.5.
**Conclusions:** The influence of urban technogenic factors has distinct gametocidal action. Sensitivity of male gametophyte is reduced in the following chain: P. pyramidalis > T. cordata > B. pendula > S. caprea. The revealed changes show the level of mutagenic tension of environment. Estimate credibility increases by considering more criteria of damage of male gametophyte.

5th September 2012
P_ES.5
**Pollen concentration and weather parameters, air pollution in Szczecin, Poland (2004-2011)**

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**Objectives:** Weather parameters are known to affect the dispersion of particles of biological origin. The release and dispersion of pollen also depends on the microclimate, which explains the differences in the timing of flowering and occurrence of pollen in the air within the same species. Numerous experimental and epidemiological studies have shown that air pollutants may evoke airway sensitization by modulating the allergenicity of airborne allergens. Furthermore, an individual's response to pollution exposure depends on the source and contamination's components as well as meteorological factors. The aim of the study was to examine the relationship between pollen content, and the prevailing meteorological parameters and air pollution in the area of Szczecin.
**Methods:** Analysis of the pollen count (Corylus, Alnus, Fraxinus, Betula, Poaceae, Rumex, Artemisia) was performed on the basis of the data collected in Szczecin in the seasons of 2004-2011. The volumetric measurement point was located on the roof of the University building in the centre of the city of Szczecin (53°26′26″N, 14°32′50″E). Measurements were performed in Szczecin by Lanzoni VPPS. The air pollution and meteorological data were provided by the Automatic Weather Station (Vaisala, Finland), located at the monitoring site. The correlation between meteorological and air pollution parameters and the concentration of grass pollen was described by the multiple regression model and Spearman rank correlations.
**Results:** Spearman's correlation analysis with weather parameters demonstrated that the maximum wind speed, mean and maximum air temperature, rain, relative humidity and dew point are the factors influencing the average daily pollen concentrations in the atmosphere; furthermore, air pollution such as ozone, $SO_2$, $NO_x$, CO and $PM_{10}$ are statistically significantly related to the presence of pollen grains. Most of examined taxa (except Artemisia pollen) were statistically significantly correlated with these meteorological factors and air pollution observed at the same day as well as 1 and 2 days before. Maximum, mean and minimum air temperature, dew point temperature and relative humidity most commonly affect the pollen count of the analyzed taxa at the same day. Artemisia pollen count was only statistically correlated with maximum, minimum air temperature and dew point temperature observed at the same day as well as 1 and 2 days before. In the multiple regression model significant correlations occurred between air temperature and Alnus, Corylus and Fraxinus pollen count at the same day as well as 1 day before.
**Conclusions:** The most important variables in the model for Corylus, Alnus, Fraxinus, Betula, Poaceae, Rumex were air temperature, dew point temperature, humidity, $O_3$ and $PM_{10}$ content at the same day, 1 and 2 days before.

5th September 2012
P_ES.6
**Air quality index for $PM_{2.5}$, and its seasonal and daily variability in Wroclaw**

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**Objectives:** $PM_{2.5}$ is defined as a particulate matter with an aerodynamic diameter up to 2.5µm. $PM_{2.5}$ is one of the major air pollution and several studies have evidenced the link between exposure to fine particulate matter and adverse health effects (e.g. premature mortality, chronic respiratory diseases, decreased lung function). Both short- and long-term exposures have significant impact, moreover there is no safe level for $PM_{2.5}$ exposure. In urban areas, fine particulate matter associated with diesel exhaust (DEPs), are probably a major component of $PM_{2.5}$ especially in. Europe. DEPs can transport pollen allergens and contribute to frequency of polinozis. The primary objective of this paper is to assess variability of the concentration of $PM_{2.5}$ in the context of human health.
**Methods:** The data concerning $PM_{2.5}$ concentration were gathered between 2010 and 2011, but main analysis covered the period from 01.05.2010 to 30.04.2011. The measurements of particulate matter have been conducted using TEOM 1400a analyzer (Rupprecht & Pataschnick) at the Meteorological Observatory of Wroclaw University. The place of measurement was situated at the east part of city, about 5km from the center. Local heating and road emission are the main sources of air pollution close to monitoring site. Air Quality Index (AQI) was calculated based on measured value of $PM_{2.5}$ according to guidelines given by EPA The relationship between concentration of $PM_{2.5}$ and meteorological conditions was statistically analyzed using daily and hourly data.
**Results:** Due to different pattern of $PM_{2.5}$ concentration, the analyzed period was divided into two seasons: summer and winter. The daily concentration of fine particles ranged from 3.6 to 49.3 µg $m^{-3}$ during summer and from 2.1 to 139.5 µg $m^{-3}$ in winter season. AQI was determined for the 24-averages concentration of $PM_{2.5}$, moreover for our purposes the same category was used for hourly $PM_{2.5}$ concentration. The Air Quality Index was classified as: unhealthy in 5.0% of cases, unhealthy for sensitive groups in 12.2%, moderate in 41.0% and good in 41.8%. The worst condition occurred in December, 2010 and February, 2011. Taking into account hourly value of $PM_{2.5}$ mass concentration and the same category of AQI, the category very unhealthy appeared in about 6% of hours. Analyzing the daily variability of AQI the worsening of air quality occurred between 18 and 6 UTC. The cases of high concentration of $PM_{2.5}$ (episodes) lasting 3 or 4 days, were registered in winter. The large anticyclone system connected with low temperature, temperature inversion and low wind speed favored poor air quality. Those situations could led to increased health problems like respiratory diseases.
**Conclusions:** Annual average $PM_{2.5}$ concentration measured in Meteorological Observatory doesn't exceeded limit value (but it should be mentioned, that TEOM underestimates the true value). The $PM_{2.5}$ mass concentration exceeded daily threshold value recommended by WHO many times during the year, these situations were typical for winter season, but also occurred in warm period. High level $PM_{2.5}$ episodes (AQI category: unhealthy) connected with low temperature can cause serious health problem.

5th September 2012 POSTERS
P_AM.1
**Relation between airborne Platanus pollen counts and Pla a 1 allergen levels in Central Spain**

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**Objectives:** Platanus hispanica Miller ex Munich (plane tree, London plane tree) is used as an ornamental tree in parks and gardens in numerous cities in Spain. It is considered an important source of airborne pollen allergens. In the last years the ornamental use of the plane trees has increased in the cities and sensitization to Platanus allergens has augmented likewise. Pla a 1 is the major allergen recognized by most subjects sensitized to Platanus pollen allergens. The aim of this work is to analyze the relation between the concentrations of Pla a 1 allergen and the airborne Platanus pollen counts in the city of Toledo (central Spain), during the plane tree pollen season 2011.
**Methods:** Pollen counts were performed using a Hirst-type volumetric spore-trap and following the methodology established by the Spanish Aerobiology Network. Airborne allergens were captured using a Burkard Cyclone sampler and the quantification of Pla a 1 allergens was carried out with immunochemical techniques, Enzyme-Linked Immunosorbent Assay (ELISA). The Main Pollen Season (MPS) was defined to start when the daily mean pollen concentration was 1 p.g/$m^3$ or more, during 5 consecutive days. The end of the MPS was determined, respectively, when there were 5 days with less than 1 p.g/$m^3$ of air on an average.
**Results:** Over the pollen season, the pollen sum, i.e. the yearly sum of daily averages/$m^3$ of air, was 2,507. The MPS comprises 52 days, from March 20th to May 10th. Platanus pollen counts reached the highest peaks the last week of March and the first two weeks of April. The maximum daily pollen values were reached on the 1st of April (645 grains/$m^3$) which also was the peak day of the Pla a 1 allergen concentration (0.23 ng/$m^3$ of Pla a 1). Data analyses show a correlation value of r=0.6 between airborne pollen counts and allergen Pla a 1 concentration (r= 0.6), p<0.001 (Spearman test).
**Conclusions:** Pla a 1 allergen is detected during the same period when airborne Platanus pollen grains are present. The highest pollen concentrations were reached the same day as the highest Pla a 1 allergen concentrations.

5th September 2012
P_AM.2
**Contribution to the quantification of Pla a1 and Platanus pollen in the atmosphere**

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**Objectives:** The allergic response in susceptible patients does not always coincide with the presence and magnitude of airborne pollen counts. Nowadays the prevalence of allergy to Platanus is moderate, although the percentage of monosensitized patients is low. In Spain, with regard to the hay fever, the 7.7 % of patients shows rhinitis and conjunctivitis and the 6.9% shows asthma and in Castilla y León the 2.3% and the 2.4% respectively. Platanus acerifolia (Aiton) Willd. is an abundant ornamental plant in the World because it has good resistance in some negative environmental conditions. In the town of Valladolid there are about 30,000 trees, and the different methods of prunning affect the flowering of them. This study aims to investigate the relationship between the atmospheric concentration pattern of Pla a 1 aeroallergen, the Platanus pollen and the different meteorological parameters
**Methods:** The period of this study includes the Platanus main pollen season, from March to June in the years 2009 and 2010. The pollen sampling was carried out using a Hirst-type volumetric trap (Lanzoni©) for pollen grains and a Burkard Cyclone sampler (Burkard©) for Pla a 1 allergen. Pollen samples were prepared and analysed following the procedure recommended by the Spanish Aerobiology Network. Allergen samples collected in Eppendorf tubes were analysed following the two-site enzyme-linked inmunosorbent assay procedures (ELISA), with certain modifications. Meteorological data were supplied by an AEMET weather station in Valladolid. SPSS 14.0 for Windows Evaluation version was used for all statistical analyses.
**Results:** The aerobiological dynamics of Platanus pollen grains and Pla a 1 are quite alike, particularly during the Platanus pollination period. Curves for pollen and allergen concentration displayed similar behaviour. In the period of study, the total amount of allergen detected is similar: 507,62 pg/$m^3$ in 2009 and 570,52 pg/$m^3$ in 2010; however the total Platanus pollen concentrations detected is almost double in 2009 (7.565 pollen grains/$m^3$) that in 2010 (4.312 pollen grains/$m^3$). We detect moderate and negative significant correlations between concentration of Platanus pollen and meteorological parameters connected with the temperature in 2009. We also detect positive correlations (0.568) between concentration of Platanus pollen and levels of aeroallergens in 2010.
**Conclusions:** The levels higher of Pla a1 are produced with a high concentration of Platanus pollen.

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5th September 2012
P_AM.3
**Fraxinus airborne allergen quantification**

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**Objectives:** Intact pollen grains are unlikely to intrude into the deeper airways due to their bigger size, and this is the reason the aeroallergens quantification, should be included in allergic asthma epidemiologic studies. Fraxinus trees are not considered an important source of airborne pollen allergens in North-West Spain, but its major allergen Fra e1 could present cross reactions with the olive major allergen Ole e1. In order to obtain a more real knowledge of its allergenic activity in the atmosphere the objective of this study was to ascertain whether pollen Fraxinus concentrations and Fra e1 allergen were correlated.
**Methods:** The content of airborne Fraxinus pollen in Ourense (NW Spain) was quantified by using a volumetric sampler Lanzoni VPPS 2000 and conventional count with microscopy identification techniques. The content of the atmospheric allergen was quantified by using a Burkard Cyclone sampler and enzyme-linked immunosorbent assay (ELISA) double sandwich modified technique. Meteorological data were obtained from the Spanish National Institute of Meteorology.
**Results:** Fraxinus pollen is present in the atmosphere in January and February. The pollination period is short with a duration of 57 days. The mean maximum daily concentrations are 69 pollen grains/$m^3$ and the maximum aeroallergen concentrations were 0.758 ng/$m^3$. We observed that the aeroallergen daily distribution curve follow very closely the variations of the Fraxinus daily mean pollen concentrations. Regression analysis test showed a high correlation between allergenic activity and pollen counts with an high Adjusted $R^2$ value. Fra e1 allergen it is detected by means the use of Ole e1 antibodies. Therefore, the allergenic people sensitized to the Olea pollen could present allergenic reactions in previous moments (January or February) to the Olea pollen presence in the atmosphere.
**Conclusions:** The combination of pollen count and the allergen quantification must be assessed in the epidemiologic study of allergic respiratory diseases.

5th September 2012
P_CC.2
**Pollen monitoring as indicator of climate change in Northern Sardinia, Italy**

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**Objectives:** Airborne pollen is responsible for several allergic diseases. Prediction of the start of the pollen season is particularly important for optimizing the effectiveness of medical treatment in allergic people and in airborne pollen allergies prevention. Airborne pollen concentration pattern is related to the release of pollen from anthers, and it reflects flowering phases. Timing of phenological events, especially flowering phase, is mainly affected by meteorological factors. Although other factors, e.g. day-length and soil type, also determine the start timing of phenological events, however, temperature is one of the most important explaining variables. Given this strong relation, climatic warming should thus also be evident in long-term phenological observation series. Moreover, links between climate and the start of processes like flowering need to be better investigated. The main objective of this work is to verify whether airborne pollen data of some Mediterranean families could be used as indicator of climate change in Mediterranean areas. To this aim a long term dataset of pollen concentration relative to Oleaceae, Graminaceae and Pinaceae families, which represent the most widespread allergenic species in Mediterranean environment, was used for assessing the relationship between airborne pollen pattern and climate variability in a study area located in Northern Sardinia, Italy.
**Methods:** Daily pollen concentration data for three families (Oleaceae, Graminaceae, and Pinaceae) were measured from 1984 to 2010 in a urban area of northern Sardinia (Italy) using a Burkard seven-day recording volumetric spore trap. The date of the full flowering phase for each families was defined as the day when the cumulated daily pollen values reached the 50% of the total annual pollen concentration. Daily maximum and minimum temperature values were recorded during the same period by an automatic weather station. Cumulative Degree days were calculated, for each year, from different starting dates using the daily averaging method. Trends of full flowering dates for each family and of °D accumulation over the two decades were analyzed. Two-years running means were calculated. A linear regression model was used for the trend analysis.
**Results:** The full flowering dates, based on percentages of total pollen emission, showed a significant decreasing trend for all three families examined. These results are in accordance with those found by other authors who observed a trend towards earlier beginning of pollination for many species in Europe. The results suggest the hypothesis that during the studied years phenological trends observed for the three families examined were probably linked to temperature values recorded during the periods preceding the flowering dates. The negative trend of the starting dates values could be a response to rising spring temperature.
**Conclusions:** Airborne pollen of the examined families is sensitive to spring thermal variation and could be taken into consideration as bioindicator of changes in air temperature. In addition measurements of airborne pollen may be a complement of existing direct phenological observations and provide valuable information about the impacts of climate change on flowering phases of this group of species.

5th September 2012 POSTERS
P_CC.1
**The effects of climate change on the pollen season in Denmark**

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**Objectives:** During the last three decades the climate in Denmark has become warmer and in climate scenarios [1] it is foreseen that the temperature will increase in the coming decades. This predicted future increase in temperature will probably affect both the flowering of plants and the dispersion of pollen in the air. The main objectives are to update previous trend analysis of the pollen season in Denmark [2] and to estimate future changes based on the IPCC estimated temperature changes and models based on Growing Degree Hours (GDH's). Especial focus is on the start of season and the size of season (annual-total ~ accumulated daily pollen number), as an accurate prediction of these are most important for the medication of allergic patients. But also length of season and peak values will be included in the study.
**Methods:** Pollen data are from the two operational pollen stations in Denmark: Copenhagen from 1977 and Viborg from 1980 to 2011. The pollen sampling is performed by standard methods with Burkard Traps. The distance between the two stations is about 220 km. Meteorological data for Copenhagen are taken from the synoptic stations at Vaerloese, Kastrup Airport and Tune. For Viborg the meteorological data are from the synoptic station at Karup. Data have been quality controlled. Simple models based on Growing Degree Hours (GDH's) for estimation of the pollen season are developed and analysed.
**Results:** The previous trend analyses showed that the variations in the birch pollen season were quite similar for the two stations in Denmark more than 200 km apart. In Copenhagen there was a marked shift to an earlier season – it started about 14 days earlier in year 2000 than in 1977, the peak-date was 17 days earlier and the season-end is 9 days earlier. For Viborg the trend to an earlier season is in general the same, but slightly smaller. During the same period there was also a distinct rise in the annual-total amount of birch pollen, peak-values and days with concentrations above zero. Updated trend analysis shows that the changes in start and length of the season for the two last decades has been minor, while the general increase of pollen amounts has continued. The trend analysis also in general shows similar result for other species as alder, hazel, elm, grasses and mugwort. But the amplitude is not the same for different species.
**Conclusions:** Rising mean temperatures during winter and spring can explain the calculated trends toward earlier pollen season. Models for estimation of the starting date based on Growing Degree Hours (GDH's) gave very fine results with a correlation coefficient around 0.90 and rms error around 4.2 days. The concept of GDH modelling can also be used for predicting e.g. peak-date and end of season.
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5th September 2012
P_CC.3
**SILAM and HYSPLIT models to understand olive pollen dynamic in southern Spain**

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**Objectives:** Nowadays, different modelling tools are used to analyse the spatial and temporal variability of atmospheric pollen, allowing to increase the knowledge between source and receptor sites. In this work, the Eulerian variant dispersion model, SILAM, and the trajectory model HYSPLIT have been evaluated to detect the source origins and transport routes of olive pollen detected at Cordoba city. This city is located to the southern Iberian Peninsula, in the world's leading olive-oil-producing region, in which the characterization of the olive pollen transport through the atmosphere has an important relevancy.
The results of this work has allowed 1) the comparison of different modelling tools to identify the olive source areas that have impact to people allergic in Cordoba city, 2) the definition of the temporal influence of each source area over olive counts in Cordoba city and 3) the analysis of the olive pollen transport in Cordoba province.
**Methods:** The study was carried out at two sites of Cordoba province (Cordoba city and Baena) taking pollen and field phenology data from the year 2006. We analysed the most illustrative days in which high pollen counts were recorded, inside and outside of the full flowering period of Cordoba city. Each episode was analysed by computing source apportionment by SILAM and backward trajectories by HYSPLIT (hourly backward trajectories), and analysing the bi-hourly pollen measurement at Cordoba and Baena.
**Results:** The results have indicated three main source areas of olive pollen with influence over olive counts at Cordoba city, showing a temporal variability in its influence. The first one, with influence at the beginning of May, covered from the surroundings of Cordoba to the southwest area, along the Guadalquivir valley. The second one comprised the south of the province, having influence in mid-May and indicating a regional transport from south sources, while the third one is situated in the east area of the city, registering its influence at the end of May-beginning of June. The results indicated a better approximation of SILAM model to the sources identification. In addition, this work revealed the necessity to take into account the characteristics of the meteorological files to compare modelling results, especially in case of a weak pressure gradient. In these cases, the results revealed the capability of high-resolution meteorological data to recognise the rapid changes of the wind directions in contrast with the stable in time transport direction observed in the air masses.
**Conclusions:** This work provided the first approximation to the real origin for the Olive pollen counts in Cordoba city, identifying three main Olive sources with a temporal variability. The use of SILAM and the HYSPLIT computation have allowed to determine that the most versatile model for evaluating the sources of pollen was SILAM. The needed of a having an accurate information about the sources location and its flowering phenology for the HYSPLIT analysis made it less accurate to define olive pollen dynamic in southern Spain, although it presented acceptable approximation to SILAM predictions.

5th September 2012 POSTERS
P_FS.1
**Long-term trends in airborne fungal-spore concentrations in Thessaloniki, Greece**

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**Objectives:** It is well known that climate change has been affecting the ecology of living organisms and it is expected to have an impact also on fungal biodiversity patterns, which will be important from both a scientific and a conservation perspective. However, only little similar information has been reported for fungal spores, not only for Greece but also worldwide and, thus, there are not conclusive results. The above commensurate changes can also have implications in public health: fungal spores are implicated in respiratory allergy symptoms with prevalence among children and with symptoms manifested even as acute respiratory failure. Although the above health effects are widely known, the seasonal and long-term trends have not been elaborated so far, particularly in Greece, and therefore the impact of fungal spores' potentially changing concentrations cannot be possibly predicted.
**Methods:** A monitoring programme for airborne fungal spores has been operational in Thessaloniki since 1987. We analysed a dataset for the last decades to assess the quantitative and qualitative features of fungal-spore circulation, concentrating on long-term patterns. We tested for trends towards higher yearly concentrations and earlier, longer or more highly peaked seasons. This included a wide spectrum of taxa, all those that contributed at least 0.1% or more to the total atmospheric spore concentration.
**Results:** The salient feature of the time-series analysis is that the levels of spores have been decreasing, both for yearly concentrations and for maximum daily values. This is true for the majority of the individual taxa examined, but with significant alterations in a much lower number of taxa, e.g. Agrocybe, Botrytis, Cladosporium, Nigrospora. For the spore-season-related attributes (onset, peak, end and duration), there was no systematic tendency and very few changes took place; however, an overall decreased duration of the main spore season is evident, which is characterized by the simultaneous later occurrence and earlier end for the majority of studied taxa. The observed decrease in spore concentrations coincides with a rise in air temperature, the only meteorological factor to change significantly over this period in Thessaloniki.
**Conclusions:** Our results suggest that changes in spore distributions are expressed as marginally decreasing concentrations and shrunk spore seasons. Very particular genera showing trends might serve as bio-indicators of expected climate change. If airborne concentrations of fungal spores reflect the actual responsive ability of fungi under increased environmental variability, it could be assumed that current and forecasted climate change might have a dramatic impact on fungal communities and biodiversity.

5th September 2012
P_FS.2
**The occurrence of fungi aerosol in Kraków - Poland**

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**Objectives:** Bioaerosols are formed from biological materials like: fungi spores, parts of fungi hyphae, viruses, bacteria or plant pollen. High concentration of fungi aerosol in atmospheric air may pose a potential hazard for human health. The aim of the study was to characterize quantitatively and quantitatively fungal aerosol in the air in Kraków. An attempt was made to analyse the occurrence of fungi potentially pathogenic for humans.
**Methods:** Bioaerosol measurements were carried out over a period of one year - in every month. The air samples were collected in four measuring points: 1 – Krasińskiego Ave. (center of the city), 2 – Kościuszko Mound (suburbs), 3 – J. Pawła II Ave. (near tobacco plant), 4 – Ujastek Str. (near steelworks). Air samples were collected using a six-stage Andersen impactor (model 10-710, Graseby-Andersen, Inc., Atlanta, GA, USA). Bacterial bioaerosol was collected on blood trypticase soy agar (TSA) and fungal bioaerosol on malt extract agar (MEA). Dishes with blood TSA were incubated for 1 day at 37°C, than for 3 days at 22°C and than 3 days at 4°C. Dishes with MEA were incubated for 4 days at 30°C and than 4 days at 22°C. After incubation of the samples the qualitative and quantitative analyses of viable microorganisms were carried out. Bioaerosol concentration was calculated as colony forming unit per cubic meter of air (cfu/m$^3$).
**Results:** Bioaerosol concentrations in atmospheric air in measuring points ranged from 17 to 356 cfu/m$^3$. The highest fungal aerosol levels were observed in measuring point 2 (near tobacco plant) (356 cfu/m$^3$) and the lowest levels were noted on Kościuszko Mound (suburb) (17 cfu/m$^3$). Comparing measured fungal aerosol concentrations with quantitative Polish standards of atmospheric air quality (PN-89/2-04111/03) it was stated that thresholds limits were not exceeded. Seasonal changes of fungal aerosol suggest that the concentration of aerosol increases in the period of spring and summer and decreases during autumn and winter. It is probably due to a low temperature in autumn and winter, which inhibits sporulation and enzymatic activity of fungi. 24 species of fungi were isolated from air samples: Alternaria, Aspergillus, Cladosporium, Fusarium, Glocladium, Mucom, Oospora, Penicillium, Rhizopus, Trichothecium, Verticillium. Dominant species were: Alternaria alternata, A. geophila, Aspergillus flavus, A. fumigatus, Cladosporium herbarum, C. cladosporioides, Penicillium notatum and P. jenseni – a typical species composition of outdoor mycoflora.
**Conclusions:** Quantitative analyses of fungal aerosol revealed that its concentrations were similar in all measuring points and never exceeded 356 cfu/m$^3$. However it should be mentioned that among isolated fungi there were species potentially dangerous for human. Based on BSL classification (biosafety levels) to these species were included Alternaria alternata, Cladosporium herbarum, Mucor hiemalis, Rhizopus nigricans (BSL-1), Aspergillus flavus and A. fumigatus (BSL-2).

5th September 2012
P_FS.3
**A comparison of Alternaria spore concentrations in aeroplankton of Lublin, Poznań and Rzeszów in the period 2009-2011**

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**Objectives:** Fungi of the genus Alternaria are commonly found in soil, plants, in the external environment of residential buildings and in the air. They are pathogens of many cultivated and wild plants and are considered to be major fungal allergens. It has been shown that at a concentration of 80 Alternaria spores in 1 m$^3$ of air the first allergic symptoms occur in sensitive people, whereas at a concentration of 100 spores in 1 m$^3$ of air allergy symptoms are observed in all allergic people. Spore concentrations in aeroplankton are subject to daily and seasonal changes and the pattern of their occurrence depends on many environmental factors, primarily weather conditions.
**Methods:** The present study was conducted in Lublin (east Poland), Poznań (west Poland) and Rzeszów (southeast Poland) in 2009-2011 during the period between 15 April and 15 October. The volumetric method was used (Lanzoni 2000). The traps were placed at a height of 30 m (Poznań and Rzeszów) and 18 m (Lublin) above ground level. Spores were counted along one longitudinal transect on the microscopic slide. The results were expressed as average daily fungal spore concentrations per cubic metre of air. The relationship between spore concentration and some meteorological factors was explored by the Spearman rank cerelation coefficients method. A probability of less than 0.05 was considered significant. The number of days in which the concentration of Alternaria spores could have contributed to the occurrence of allergy symptoms in sensitive people (the concentration exceeded the threshold value) was determined.
**Results:** In 2011 occurred the lowest annual spore count in the air of the cities under study, compared to the previous years. Rzeszów was found to be characterized by definitely lower spore concentrations than Lublin and Poznań. In all study years, maximum concentrations of Alternaria conidia were recorded in July and August. In Poznań the highest daily spore concentration was recorded on 8 August 2009 (2085 spores/1 m$^3$ of air), in Lublin on 3 August 2010 (1615 spores/1 m$^3$ of air), while in Rzeszów on 15 July 2010 (694 spores/1 m$^3$ of air). During the study years, high Alternaria spore concentrations, exceeding the threshold values, persisted for 36-76 days and they could have been a cause of more intense allergy symptoms. Correlation coefficients were calculated between air temperature, rainfall, wind speed as well as relative air humidity and Alternaria spore concentration in aeroplankton. A high statistically significant correlation related to the effect of mean, minimum and maximum air temperature on the number of released spores of this taxon. A negative, but statistically significant correlation indicates a decreasing number of Alternaria spores under lower rainfall and lower humidity conditions as well as with weaker wind.
**Conclusions:** Maximum concentrations of Alternaria spores occurred in July and August, which was promoted by high air temperature. The lowest annual Alternaria spore counts were recorded in Rzeszów (southeast Poland). Throughout the study period, sensitive patients were exposed to Alternaria spore concentrations exceeding the threshold values for 36-76 days.

5th September 2012
P_FS.4
**Diversity of fungal spores in Seville, Spain**

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**Objectives:** The fungal spores are always present in the air in a great quantity and variety, their concentration is influenced by many biological and environmental factors that interact with each other, thus each locality has its own aeromicoflora. The inhalation of these spores can provoke respiratory illness during an outdoor exposure or intense occupational exposures. Furthermore, agricultural crops are also affected by diseases caused by airborne fungi, leading to extensive economic losses.
**Methods:** This study was carried out using a Burkard spore trap placed on the roof (15 m height) of the Faculty of Pharmacy in the city of Seville during two consecutive years. The samples were analysed on parallel horizontal sweeps applying the technique of the tangent fields. The study area presents a Mediterranean climate with a light Continental climate influence, characterized by mild winters without snow and freezes, and very hot summers. The coldest month temperature is 5°C and the warmest is 35°C; the average rainfall is 534 mm.
**Results:** Throughout the two years of study a total of 2,568,746 fungal spores were obtained, which were further classified into 117 different types or taxa: 30 belonged to the Ascomycetes class, 18 to the Basidiomycetes class, 64 to the Deuteromycetes class, and finally, 2 types of Oomycetes and 1 Zygomycetes. Moreover, an 85% of the total sampled spores corresponded to the conidia of Deuteromycetes, mainly Cladosporium genus, the percentage of basidiospores reached less than 9%, followed by ascospores with 4% and the Oomycetes and Zygomycetes spores the remaining 2%. The total fungal spores showed a seasonal prevalence pattern with two peaks of maximum concentration, the first and minor during the spring and the second in autumn, primarily caused by a higher proportion of conidia during the months of September and October. The separate analyses of different seasons showed that the conidia concentration of the total collected spores had a slight fluctuation during spring, summer and autumn, decreasing by 20% during winter. The basidiospores were more frequent in autumn and winter and the ascospores reached their highest level only in winter. The presence of different fungal spore types throughout these years showed little variability, only 13 of them appeared in a testimonial way in any of the two years of study. About 80% of the analyzed types appeared continuously during twelve months, while the remaining 20% occurred for less than 6 months. A decrease of the spore concentration was not associated with a decrease in the number of spore types present in the air. In months with higher spore concentration the variety of taxa has not increased.
**Conclusions:** During the sampling period 117 different taxa were identified in the atmosphere of Seville, where 64 of them were Deuteromycetes that reached the 85% of total spores collected. There was no direct proportionality between the diversity of fungal spore types and the concentration of spores in the atmosphere, although a seasonal prevalence pattern with 2 peaks (spring and autumn) was observed.

5th September 2012
P_FS.5
**Statistics of fungal-spore concentrations: a comparison with pollen for Thessaloniki, Greece**

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**Objectives:** High levels of fungal spores in the atmosphere have important implications for public health, with fungal spores implicated in a variety of respiratory problems especially in children. The concentration of fungal spores remains poorly-studied not only for Greece but also worldwide. This is especially true of the statistical patterns in the time series of fungal-spore concentrations. It has been suggested that aerobiological patterns are dominated by atmospheric conditions so that the statistics of these quantities is really an exercise in climatology convolved with flowering season. If true, the statistical patterns in the residuals, after subtraction of the basic harmonics, should be the same for fungal spores as for pollen.
**Methods:** A monitoring programme for airborne fungal spores has been in operation in Thessaloniki since 1987. We analysed this dataset for a wide spectrum of taxa of the last decades to investigate the statistical aspects of fungal-spore concentrations. We tested the regularity of the seasonal pattern and the statistical properties of the residuals and compared them with some representative pollen time series. We also set up predictions using a Box-Jenkins approach. We analysed the spectra of power residuals once the basic harmonics had been removed.
**Results:** We find seasonal patterns very different than for pollen, with seasons of fungal spores concentrations being longer and less well-defined than for pollen. Many of the same patterns prevail, however. There is a strong skew in the statistical distribution, with the coefficient of variation of daily concentration (1987-2004) for different taxonomic groups ranging between 1.52 and 5.42 but with the total having a CV of 1.71. The large number of zero-observations makes logarithmic transformation problematic and Box-Jenkins-type forecasts show great variation in ranking of predictions for different groups depending on the measure of goodness of fit. Finally, there is often a greater proportion of red noise observed in the background residuals.
**Conclusions:** Although there are major differences between the two types of series both aerobiological classes share important statistical traits, especially on shorter timescales.

5th September 2012
P_FS.6
**Concentrations of Cladosporium and Alternaria spores in the air of Białystok, Poland**

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**Objectives:** Many research revealed the dominant role of Cladosporium in outdoor mycoflora. However, in some regions Alternaria spore counts are present in the highest numbers. Due to worldwide spread and their small size moulds constitute an important source of airborne allergenic proteins responsible for rhinitis and asthma. The aim of this study was to compare the course of sporulation seasons for Cladosporium and Alternaria – two main fungi responsible for an inhaled allergy. The volumetric measurements of Cladosporium and Alternaria spores were carried out in Białystok (Northern-East of Poland) in 2010-2011.
**Methods:** The concentration of spores was determined with the use of Lanzoni 7 Day Recording Trap (Hirst type) installed on the roof top, at the height of 18 m above the ground level. Sampler drum covered with the Melinex tape was changed weekly. The slides were prepared with the use of standard methods (British Aerobiology Federation 1995). The airborne fungal spores were counted in one horizontal line and the concentrations were expressed as spores per cubic meter. Sporulation season was determined by the 90% of the annual sum. The beginning, duration and the end of season were defined as well as the number of days with the concentration above the threshold of spores count at which the symptoms of allergy develop.
**Results:** The Cladosporium season in 2010 started on 8th of May – over four weeks earlier compared to 2011 (10th of June). It was longer in 2010 and lasted 131 days, whereas in 2011 - 118 days. The significant difference in the number of days with the threshold concentration was observed. In the year 2010 - 91 days with the concentration above 2800 s/m$^3$ were recorded, while in 2011 only 72 days. The maximum concentration of Cladosporium spores (13732 s/m$^3$) also occurred earlier in 2010 (22nd of August) and was higher compared to the 2011 season (26th of August – 11436 s/m$^3$). The 2010 season for Cladosporium spores ended on the 15th of September and three weeks later in the year 2011 (5th of October). The sporulation season of Alternaria in 2010 began on 22nd of June - one week earlier than in 2011. The duration of both examined seasons was similar – 84 days in 2010 and 82 days in 2011. There was no significant difference between the number of days with the concentration above the threshold 80 s/m$^3$. The maximum concentration of Alternaria spores was significantly higher in 2010 (933 s/m$^3$) in comparison to the year 2011 (742 s/m$^3$).
**Conclusions:** The spores of Alternaria and Cladosporium were present in very high concentrations from June to August and could constitute the high risk of allergy for sensitive individuals in two examined years. However, the noticeable differences in the course of seasons of both genera were probably caused by variations in meteorological conditions. Future monitoring of fungal spores seems to be essential.

5th September 2012 POSTERS
P_FM.1
**The structure of pollen grains in Sida hermaphrodita (L.) Rusby (Malvaceae)**

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**Objectives:** The analysis of pollen grains in pollen depositions focuses on the total amount of the pollen grains and determination of participation of particular types of pollen grains. In the present work, we concentrated on the structure and quality of pollen grains of Sida hermaphrodita (L.) Rusby (Malvaceae). The plant species investigated originates from southern parts of Northern America, where it naturally growths in moist riverine habitats. It was introduced to Poland in the 50s of the last century.
**Methods:** Pollen grains were collected from S. hermaphrodita plants cultivated in the experimental field of University of Life Sciences in Lublin. We employed LM, SEM, and CLSM using standard techniques of investigations to study the structure and disturbances in pollen grains. Monoclonal antibodies JIM 8, JIM 13, JIM 14, JIM 15, JIM 16, and MAC 207 were used for immunodetection of arabinogalactan proteins (AGPs) (the mAbs were obtained from the Complex Carbohydrate Research Center at The University of Georgia, USA. The development and distribution of the antibodies were supported in part by NSF grants RCN0090281 and DBI 0421683).
**Results:** Pollen grains develop in numerous kidney-shaped anthers of bisexual S. hermaphrodita flowers. A single, mature, bi-celled pollen grain is spheroidal, apolar, pantoporate with circular pores and has characteristic spinal sculpture of the surface. The pollen grains taken from opening anthers showed essential differentiation in the size and structural disturbances. Up to 54% of pollen grains had a diameter of 40-50 µm, and 40% of pollen grain were significantly smaller with a diameter of 20-36 µm. During microgametogenesis, the localization of JIM 8 and JIM 13 epitopes dynamically changed but they were constantly detected. In the mature pollen grains, the AGP epitopes investigated were localized in the pollen wall intine and as a thin layer in the surface of the generative cell. Localization of JIM14 AGP epitopes differed from the others because the fluorescence was weaker and was additionally visible in the anther walls. Localization of the epitopes recognized by MAC 207 does not produce any specific pattern. These molecules were uniformly spread among both somatic and generative tissues of the anthers. At the end of development, all smaller pollen grains were devoid of the generative cell. The disturbances observed were the result of abnormalities which appeared during microsporogenesis and pollen grain development. The disturbed microspores were evidently smaller and had structural aberrations. Disturbances occurring during early stages of microgametogenesis were observed in about 30.5 % of the microspores. Overexpression of AGPs was observed in the generative cells of the disturbed pollen grains.
**Conclusions:** 1) Up to 40 % of pollen grains of Sida hermaphrodita showed structural disturbances. 2) Atypical distribution of arabinogalactan proteins (AGPs) was observed in the disturbed pollen grains.

5th September 2012
P_FM.2
**The characteristics of pollen grains in Poa annua L. (Poaceae)**

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**Objectives:** Poa annua L. (annual meadow grass or annual bluegrass) is a widespread low-growing grass in temperate climates. Unlike the native Deschampsia antarctica, Poa annua is in Antarctic invasive species. In the present work, we concentrated on the structure and quality of pollen grains of Poa annua L. (Poaceae).
**Methods:** Poa annua pollen was collected from plants originating from three sites located at completely different latitudes: 1) plants growing in Antarctica, near the H. Arctowski Polish Antarctic Station, King George Island (South Shetland Islands), 2) plants growing in Ushuaia (South America, Argentina, the Beagle Channel) located approximately 900 km north of the South Shetland Islands, 3) plants growing in the vicinity of Olsztyn, 4) greenhouse Poa annua plants imported in 2010 from the Antarctic and collected in the area of Olsztyn. For TEM and SEM, the developing spikelets of Poa annua plants consisting of flowers with pollen grains were processed according to the standard methods of fixation, dehydratation, and embedding in epoxy resin, Epon 812. The semithin and ultrathin sections were prepared using a Leica Ultracut microtome using glass and diamond knives. Observations were carried out in TEM JEOL1400 and the JEOL JSM-5310LV scanning electron microscope. For the cytological investigations in LM, the material was fixed in AA (3 parts 96% ethyl alcohol: 1 part of concentrated acetic acid).
**Results:** At the stage of maturation, the morphology of Poa annua pollen from plants growing in all the investigated places is very similar. A majority of pollen grains are regular, spherical, and monoporate with a diameter of about 18-25 µm. The pollen grains from the Antarctic have a slightly larger diameter of about 21-27 µm. Unusual shapes were observed among the pollen grains collected in the Antractic (both Poa growing in the Antarctic, and plants brought from the Antarctic and grown in a greenhouse). They were elongated, tapered or with a constriction, grains of a length of about 38.8 µm. The diameter of the pollen grain aperture in the case of the Antarctic grasses was 2.77-3.30 µm, while in the case of the grasses originating from the other places it was 1.93-2.53 µm. The results concerning the atypical structure of pollen grains were confirmed under electron microscopes.
**Conclusion:** Pollen grains of Poa annua growing in the Antarctic differed in some features in comparison to the pollen grains of grasses growing in the other sites.

5th September 2012
P_FM.3

**Pollen spectra from peat, pollen traps and vegetation composition from the Seda Mire, North Vidzeme Biosphere Reserve, Latvia**

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**Objectives:** Pollen monitoring in Seda Mire is carried out in two sites. One Tauber trap is settled in semi – natural forested mire, where human impact is insignificant, but the second trap is located in extracted peatland, where human impact is very strong. Pollen monitoring in Seda Mire was started in 1998, but in 2003 location of traps were changed because of damages and overflowing. Since 2003 new sites traps are settled. Seda Mire is the fourth largest mire (7582 ha) in Latvia located in North Vidzeme Biosphere Reserve and nowadays is partly extracted peatland. The aim of study was to compare and find out how pollen spectra are different in natural and abandoned mire and how they reflect present vegetation.
**Methods:** According to Pollen Monitoring Program guidlines [1] in Seda Mire were placed two modified Tauber traps and surround the traps was made vegetation mapping. Peat (0-50 cm) and moss polster samples for pollen analysis have been taken next to the each trap. The aim of investigation is to analyse the modern pollen „rain" monitoring data, to compare them with surrounding vegetation and to assess the changes of the Seda Mire vegetation.
**Results:** Pollen composition from the trap and peat layer have been compared with the vegetation composition close to the site and also around the mire in the range of 20 km. Area around the pollen trap No.3 is surrounded by pine-birch forest. Pollen trap No.4 is located at the former peat extraction field approximately 45 m from the birch forest. The data of annual pollen deposition across vegetation units from closed forest to open area in Seda Mire demonstrate small difference in the relationship value between pollen spectra and vegetation composition. Comparison of pollen data with that of the tree species composition in the surrounding forests reflect influence of the south, south-western winds. Influence of the dominating the south winds in the spring (April, May) during blossoming of the Pinus, Betula, Picea, Alnus has been noted both in data from traps as well that from peat very upper layer of peat and moss. Largest agreement have been found between composition of the forest tree species and pollen spectra from the peat at the depth of 5-7 cm. Pollen composition from peat layer 0-5 cm show more differences, which can be explained by wash-out pollen and spores from very upper layer.
**Conclusions:** This research has shown the local pollen – vegetation relationships and development of vegetation from closed forest to open area. Comparison of pollen data obtained annually since 2003 show gradual changes in pollen spectra composition: increase in tree pollen and decrease in herb pollen and spores in both trapping sites.
**References:**
1. Hicks S, Tinsley H, Pardoe H, Cundill P. European Pollen Monitoring Programme. Supplement to the Guidlines. Oulu University Press, Oulu, 1999: 24.

5th September 2012
P_FM.4

**Clinicoimmunologic studies of Cassia occidentalis pollen: an aeroallergen from West Bengal, India**

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**Objectives:** Cassia occidentalis belongs to the family Caesalpineaceae. It a common wildly growing weed of West Bengal. This plant is well adapted to the humid tropical climate of this region and also grows commonly in different parts of India. Its pollen grains are airborne and cause IgE-mediated type I hypersensitivity in atopic patients. The aim of the present study is to determine the concentration and seasonal periodicity of airborne Cassia occidentalis pollen grains, and also to estimate its allergenic potency with an object to characterize the important IgE-reactive protein component(s) present in these pollen.
**Methods:** An aerobiological survey was performed using a personal Burkard volumetric sampler over a year (May 2011 to April 2012) in the rural part of West Bengal. The allergenic potency of these pollen was studied by skin prick tests (in vivo), IgE-enzyme-linked immunosorbent assay and dot blotting (in vitro) method. Soluble pollen proteins were extracted in PBS (pH 7.3). The whole extract was fractionated in the ranges of 0-30%, 30-60% and 60-90% saturation of $(NH_4)_2SO_4$. Total protein and the fractions resolved in 12% SDS-PAGE and IgE immunoblotting were done in sera from 4 patients. The soluble pollen proteins were separated by ion exchange and gel filtration chromatography for further immunological characterization.
**Results:** Cassia occidentalis pollen grains were found to be prevalent in the air of the rural zone of West Bengal from May to August. C. occidentalis pollen antigen caused marked skin sensitivity in 7.5% of atopic population. Protein of 21 kDa was found to have provoked positive IgE reactivity through IgE immunoblotting.
**Conclusions:** Cassia occidentalis pollen were found to be prevalent in the air of West Bengal and the 21kDa protein has shown sensitization to atopic patients.

5th September 2012
P_FM.5

**The hitherto disregarded role of fern spores in aerobiological analysis in Poland**

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**Objectives:** Fern spores belong to particles of the biological aerosol, which occurs in the atmosphere. Some of them, due to the toxic substances they contain, may be harmful for human health. The aim of this work was to present the morphological features of fern spores occurring in Poland on natural sites. These features will be useful in the analysis of aerobiological conditions and comparative assessment of their content in the atmosphere of selected regions of Poland.
**Methods:** Fern spores were collected from living plants from natural sites in Poland. Only spores of Ophioglossaceae, which occur only rarely were obtained from the herbarium. A determination of the size and the characteristics of the perine exine surface, connected with spore morphology, was performed using light as well as a scanning electron microscope.
**Results:** Spore samples represented 44 species in 18 genera and in 13 families of ferns. It was found that spore size ranges between 20 to 75 µm and among these Osmunda regalis and Polypodium interjectum were seen to have remarkably large dimensions. The spores are ellipsoidal, tetrahedral and spherical/globoid in shape. Their apertures are monolete or trilete types. The exine surface patterns are baculate, cristate, granulate, reticulate, tuberculate and verrucate. The peculiar character of fern spores is described after a review of basic articles concerning the allergogenic features of some species with special attention to Pteridium aquilinum whose spores and vegetative tissues revealed mutagenic and carcinogenic activity.
**Conclusions:** A presentation of the morphological features of spores of 44 fern species, occurring in Poland, will form the basis for a qualitative and quantitative analysis of these structures in aeroplankton. These studies will be implemented in several of our research centres.

5th September 2012
P_FM.6

**Pollen monitoring at Nizhneyazvenskoe Marsh Nature Reserve within European Pollen Monitoring Programme (EPMP) using Tauber pollen traps**

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**Objectives:** Perm Krai, situated on the eastern part of the Russian plain and in the western foothills of the North and Middle Urals, has very diverse vegetation. Steppe areas, broadleaved and coniferous forest, subzones of the southern and middle taiga, foothill and mountain taiga forest and mountain tundra vegetation are represented here. The aim of this study is to correlate vegetation with pollen grains influx and to make quantitative and qualitative evaluation of influx during a certain period.
**Methods:** Studies within EPMP have been conducted since 2010. These studies and aeropalynological research with a Burkard trap will provide a more complete picture of the Perm Krai pollen influx. Working within EPMP we applied the spore-pollen monitoring method using Tauber pollen traps. The traps were installed in autumn 2010 at Nizhneyazvenskoe marsh nature reserve in 3 places: in the marsh, at the forest edge and in the forest. The traps were removed in autumn, 2011. Data processing was conducted at PNRSU and Moscow State University biological departments according to the standard approach. A qualitative and a quantitative data analysis were done with the help of an OLYMPUS light microscope with picture visualization system and a cell[B] programme. Obtained data was processed in Tilia 1.7.16.
**Results:** Forest vegetation surrounding the traps in terms of species composition is poor. The first layer consists of Pinus and Betula. The underwood is absent. Lichens dominate in the lichen-moss layer (90% projective coverage). Pinus and Betula pollen grains quantitatively prevail in all three traps. The percentage of Pinus was 31.6% – 61.8% – 28.0% (forest edge – forest – marsh) and Betula – 49.4% – 24.4% – 27.0%, respectively. The largest number of pollen types (23 types) was found in a trap installed in a marsh. Fabacea pollen grains are in the 3rd place after the mentioned types (7.7% of the total grains quantity). The largest number of arboreal pollen grains, which is 441, was found in a forest that seems to be caused by less air circulation there than in the marsh. The amount of produced pollen can vary from year to year and may depend on many ecological and biological factors. To track changes in these factors, long-term studies should be conducted.
**Conclusions:** In all three samples (traps) arborous pollen grains quantitatively dominate. 70.4% of the total number of pollen grains and spores is at the forest edge, 88.2% is in the forest, 71.7% is in the marsh. The grains quantity of non-arboreal types is several times less, which is 22.0%, 10.4% and 23.6%, respectively. Whereas the number of non-arboreal pollen types is 11, the number of arboreal types is 6. Types of pollen grains that are not situated near the trap were found in the spectrum of the pollen influx. It shows a good pollen grains distribution by the wind.

5th September 2012
P_FM.7
**Pollen-climate relationships in broadleaved-coniferous forest zone (Central Russia)**

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**Objectives:** The main aim of the study was to provide a new information about modern pollen influx and its connection with meteorological data.
**Methods:** Pollen data were obtained from 6 Tauber traps located in two regions in mixed broadleaved-conifer zone in European part of Russia. The first location (Tver region) represents spruce forest with some secondary elements in low disturbed area, the second one (Moscow region) – secondary spruce, pine-spruce and spruce-birch forests more than 100 years old in densely populated area. All traps were installed and treated according PMP guidelines. The period of observation was four years (2008-2011). Pollen accumulation rate (PAR) was analyzed for Picea, Pinus, Betula, Alnus, Poaceae, Chenopodiaceae, Artemisia, Urtica and Ambrosia. PARs were compared with average monthly air temperature of current and previous vegetation season. Short observation period does not allow us to conduct any statistical analysis.
**Results:** From meteorological point of view the years 2011 and especially 2010 were different from 2007-2009 that were very close to climatic norm. The summer of 2010 was extremely hot (average July and August temperature was 6-8° above norm) and dry, with lots of fires in Central Russia. The season 2011 was characterized by very long and cold winter, late spring and dry hot summer. Fluctuations of PAR of arboreal taxa are very well synchronized between two locations. The highest influx of Picea, Pinus and Alnus was detected in 2011. It supports the hypothesis that high pollen production of pine and spruce is triggered by July temperature of the year before flowering. Pollen influx of birch in 2011 was considerably low comparing with previous season. Two or three-years rhythm of pollen productivity was described for birch on the base of aerobiological data. The short observation period does not allow us to conclude whether the low birch influx in 2011 is a result of weather condition during previous summer or reflect normal annual fluctuation. Chenopodiaceae, Ambrosia and Artemisia had the highest influx in 2010. They represent "south" elements in our flora and hot summer of 2010 was very favorable for flowering and seed production. It led to high PAR in both 2010 and 2011 seasons. Ambrosia is considered as long-transported (location 1) or partly long-transported (location 2) taxon in our region, its high influx in 2010 may reflect not only local vegetation. Grasses and nettle were detected as dominant non-arboreal taxa in spectrum of 2011. High summer temperature decreased the influx of these taxa in 2010 and caused very sharp increase in pollen production next season.
**Conclusions:** Preliminary results based on four years observations showed that there are some connections between PAR and meteorological parameters. Further studies and longer dataset are required to support this hypothesis.

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6th September 2012
IN.1
**Dichloran glyserol agar (DG18) in indoor air mould sampling**

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**Objectives:** Indoor air problems caused by moisture and mould damages are common in Europe. Mould growth in indoor environment may cause health problems to people living or staying in damaged buildings. There are many types of mycological analyses to estimate the degree of mould contamination in buildings – i.e. in building materials and in indoor air. Often the evaluation of fungal damage in buildings is carried out by culturing the samples on different artificial media, by analysis of the composition of microbes in different kinds of samples, and calculation of the microbial concentrations. In most cases the ideal culture medium is a medium suitable for most saprophytic fungi. The most frequently used culture medium for detecting fungi growing in indoor samples is MA (malt agar) or MEA (malt extract agar). DG18 (dichloran glycerol-18 agar) is sometimes used for detecting fungi preferring lower water activity. The objective of this study was to compare the features of MEA and DG18 in indoor air samples taken with the Andersen six-stage cascade impactor. It was expected that the two media would either result in different species composition, or in differences of the total CFU-counts (CFU=colony forming unit), or both.
**Methods:** Totally 200 indoor air samples taken with the Andersen sampler were compared. All samples were cultured both on DG18 and MEA. The samples were incubated for ten to fourteen days at 25°C. After 7 days incubation the mould colonies were counted and after 10 to fourteen days colonies were identified based on morphological features at genus or species level (some Aspergillus – species and Paecilomyces variotii) and concentrations of fungi were expressed as CFU/m$^3$ (colony forming units/m$^3$). The results of the two growth media were compared by the total CFU counts, by the mean number of taxa growing on each culture media and by the differences on species composition.
**Results:** There were no significant differences in total CFU/m$^3$ counts between MEA and DG18. The mean number of taxa encountered in samples was approximately the same on both culture media. The most prominent differences were obtained in the taxa growing on the two different media. The xerophilic Aspergillus restrictus – group was growing in 50% of the air samples on DG18, but was almost absent on MEA (only in 2% of the air samples). Also xerophilic taxa Wallemia and Eurotium typically grew more often on DG18.
**Conclusions:** There were no significant differences between the total CFUs or number of taxa growing on each media.However, the media resulted in diverging species composition, judged to be much more important than total CFUs alone, when the importance of the mould damage in buildings is assessed. This is why use of different media is encouraged.

6th September 2012
IN.2
**Measurement of exposure to indoor molds – comprehensive approach combining quantitative and qualitative tools from long-term air sampling**

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**Objectives:** The link between mould/moisture and health effects has been demonstrated repeatedly but, until now, studies involving determinations of indicators of fungal exposure failed to identify the causative agents. In the scientific literature, several quantitative and qualitative methods are described to assess the exposure to airborne fungi. To date, few studies of comparison of these different techniques are available. In this context, the objective of the present work was to describe quantitatively and qualitatively the fungal aerosol and to compare results obtained with the different techniques of analysis in parallel.
**Methods:** The biological collection efficiencies of 3 selected portable air samplers were studied in a controlled setting in an experimental room in the first part of the study. The second phase of the project was the sampling in 36 mouldy indoor environments. Samples were collected during 24 hour periods to describe both quantitatively (count of cultivable fungi, determination of ergosterol and (1,3)-beta-D-glucan) and qualitatively (fungal identification by culture and PCR-D-HPLC) the fungal aerosol. Moreover, ergosterol and 3 mycotoxins (sterigmatocystin, ochratoxin A and deoxynivalenol) were detected after 7 day sampling periods. The mycotoxins were chosen for their sanitary effects proved by inhalation and their presence in homes. Finally, Microbial Volatile Organic Compounds (MVOC) were detected after 7-days samplings, in order to calculate a Fungal Contamination Index developed by CSTB, which gives an indication of the presence or absence of an active mould growth.
**Results:** The average concentrations of cultivable fungi, glucan and ergosterol were consistent with the published data. Significant associations were observed between the cultivable fungi and the glucan, and also between the cultivable fungi and the ergosterol measured on 7 days. On the contrary, there was no significant link between the culture results and the 24-hour ergosterol concentrations, or between glucan and ergosterol. Also, the 24 hour ergosterol concentrations were not associated with the 7 day ergosterol concentrations. From a qualitative point of view, fungal species identified by culture were classical airborne fungi of humid indoor environments, with a predominance of Aspergillus versicolor and Penicillium chrysogenum. In the 7 dwellings where qualitative results were obtained by culture and PCR-D-HPLC, the identified species or genera were generally not similar. Concerning the 3 targeted mycotoxins (sterigmatocystin, ochratoxin A and deoxynivalenol), only the sterigmatocystin was detected in air samples of 2 dwellings, thus confirming that, under certain growth conditions, fungal contamination of homes may be associated with inhalable mycotoxins aerosol. The MVOC index was positive in all cases, except one. It is coherent with the choice of mouldy dwelings for the sampling campaign. Furthermore, no significant difference was observed between the different categories such as housing can describe the questionnaire data (surface moldy, musty, wet sensation, signs of moisture), whatever the quantitative measurement implementation (cultivable fungi, glucans, ergosterol 24 hours and 7 days).
**Conclusions:** In conclusion, this study demonstrated that the different tested techniques provide complementary information. None can alone give a complete assessment of the exposure tofungal aerosols, in terms of toxicity, inhaled biomass and biodiversity.

6th September 2012
IN.3
**Reducing harmful emissions indoors with the surface emissions trap (cTrap)**

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**Objectives:** Emissions from building materials may cause adverse health effects among individuals residing in water-damaged buildings. These emissions may include volatile organic compounds and microbiological particles which may contain e.g. endotoxins and mycotoxins. Here we describe a new product for stopping such emissions. The product is a surface emissions trap (cTrap) consisting of a thin, flexible covering with a semipermeable barrier and one or several adsorbent(s) and/or absorbent(s) attached. The trap is applied directly at water-affected walls, floors, ceilings etc or at chinks or cavities, such as along skirting boards etc, from where the moisture-related emissions may enter into the living spaces.
**Methods:** An experiment was designed to simulate emissions through a narrow slit, such as a skirting board, into indoor air. A 20-ml aliquots of a 5-82 µM solution of 20 volatile organic compounds (VOC) frequently encountered in water-damaged buildings (ketones, alcohols, furans, aldehydes, terpenes) were placed in a plastic box which was then closed with a lid with a 14-cm long and 1-cm wide slit. In subsequent experiments the slit was either left uncovered or covered with the cTrap, stored for up to 72 h, and placed in a closet where, after different time intervals, air samplings were performed through cartridges containing Tenax or activated charcoal following gas chromatography-mass spectrometry analysis. In a second experiment a part of a concrete floor (2m²) was contaminated by spraying 50 ml of the chemicals solution, then the floor was covered by the cTrap. Air samples were taken both before and after applying the cTrap. This experiment was designed to simulate emissions from a floor contaminated by chemical spills or through water damage. Finally, a strain of Aspergillus versicolor was cultivated on two malt extract agar plates (MEA), then one plate was transferred to a glass beaker and covered with the cTrap. A parallel plate was transferred in the same way but left uncovered. Passive samplings were performed for 72h by using Tenax cartridges. Experiment was performed to show that the cTrap stops VOC, produced by microorganisms during growth.
**Results:** With the slit left uncovered air concentrations of 10-878 µg/m$^3$ (toluene equivalents) of the chemicals were found. Use of the cTrap resulted in up to 100% reduction of the air concentrations of the VOC. Air concentrations of the studied VOC from contaminated floor were reduced by from 92.1% (styrene) up to 98.6% (benzaldehyde). The average emission reduction for the analyzed compounds was 95.2%. 1-Octen-3-ol (17 µg/m³), 2-methylfuran (2.9 µg/m³), 2-methyl-1-propanol (2.6 µg/m³), and 2-methyl-1-butanol (4.2 µg/m³) were found in the air above the uncovered plate with Aspergillus versicolor. After the plate had been covered with the cTrap the concentration of 1-octen-3-ol was reduced by 88%; the remaining compounds were reduced by up to 100%. – Separately we also demonstrated that the cTrap blocks efficiently mycotoxins, and radon.
**Conclusions:** In conclusion, the cTrap (www.ctrap.se) is a new product with the ability to efficiently stop unwanted emissions from surfaces.

6th September 2012
IN.4

**Contamination of the indoor environment with bacteria and fungi in Tertiary Health Care Centre**

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**Objectives:** The micro flora of any habitat varies with host type, environmental condition and relations among them. Hospitals, Health care centres are most sorted places for they give life or at least alleviate pain. Good ventilation refreshes life in the health care centre. The sole reason behind hospitalization and medical procedures is to speed up the process of healing but at times this meticulous process unintentionally introduces several pathogenic microorganisms into the body and initiate nosocomial infections and they cause serious medical problems particularly in intensive care units.
**Methods:** An investigation of the air quality and the quantity of airborne microbes was conducted in a private and a government tertiary health care centre of Davanagere in the month of November, 2011 to assess the level of air borne pathogens. Using a Merk microbial air sampler, MAS-100NT samples were collected in the morning and in the evening from the different environs viz., Operation theatres, Medical intensive care unit (MICU), Pediatric Intensive Care Unit (PICU).Neonatal Intensive Care Unit (NICU) and Cardiac Care Unit (CCU) of the PRIVATE and Government tertiary health care centre. The microbial air sampler was operated at an air flow rate of 100 lts/min. The total volume of air that was aspirated onto the agar plate was 50 lts. The media used for the study of fungi was Sabaroud agar (SDA) Aspergillus sps, Curvularia sps, Alternaria sps, Penicillium sps, Rhizopus sps, Nigrospora sps, Fusarium sps were found in common in either of the tertiary health care centre. However Asergillus sps was dominant in the Government hospital, Alternaria sps and Curvularia sps were dominant in the private tertiary health care centre. The concentration level of airborne bacteria was measured in a private and a government tertiary health care centre. For the bacteria quantitative enumeration was done using Soybean Casein Digest Agar [SCDA] and selective media like Escherichia coli & coli form agar [ECC] & Urinary tract infection agar [UTI] were used in qualitative enumeration.
**Results:** Selected pathogens like Escherichia coli, Klebsialla pneumoniae, Pseudomonas aeruginosa, Salmonella enteritidis, Staphylococcus aureus, Proteus mirabilis, Entirococcus faecalis were found in common in either of the tertiary health care centre. The infrastructure, the surroundings, closed areas play a pivotal role in the spread of microorganisms. Variation in the operating personnel number and activities leads to the particle concentration fluctuations. Biological aerosols of the infected person which contain bacteria, viruses, yeasts, molds and fungal spores may also add up to the onslaught of infections. With reference to fungi and bacteria maximum numbers of organisms were isolated from emergency ward and general ward of government health care centre and were least in the operation theatres.

6th September 2012
AM.2

**Airborne grass pollen and ambient Phl p 5 aeroallergen in Évora (South Portugal), 2009-2011**

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**Objectives:** Grass pollen is an important source of aeroallergens worldwide and consequently a major cause of pollinosis. Phl p 5 is one of the main allergen widely distributed among the Poaceae family. It has been assumed that the pollen count is a representative parameter for allergen exposure, however, variability in the allergen content of pollen has been demonstrated for other taxa and the presence of allergen in submicronic particles remains controversial. Thus, allergen loadin the air remains elusive and its distribution among bioaerossol particles is still unclear. The aim of this work were: i) to estimate the correlation between daily airborne grass pollen count pollen and the aeroallergen in ambient air; ii) to evaluate the annual variation of pollen potency in a Mediterranean environment.
**Methods:** Aeroallergens in ambient air were collected between 2009-2011 using a ChemVol high-volume cascade impactor. The air flow was adjusted to 800 L/min and was kept constant with a rotameter controlled high-volume pump (Digitel DHM-60). Prewashed polyurethane foam served as impacting substrate. Particulate matter (PM) in ambient air was fractioned into PM>10µm (XL) and 10µm>PM>2.5µm (M). Phl p 5 was quantified by ELISA method. Airborne Poaceae pollen was simultaneously monitored with a Burkard Seven-Day Recording Volumetric SporeTrap®. Both samplers were placed side-by-side, the air inlet at the same level.
**Results:** Between 2009 and 2011, ≈90% of the airborne allergen was found in the PM > 10µm stage. The allergen and pollen profiles overlapped in every season but were also found. Airborne pollen counts varied (5643, 17107 and 22649 grains/$m^3$ in 2009, 2010 and 2011) and so did the aeroallergen load (11497, 25849 and 34543pg/$m^3$). The Phl p 5 mean release per pollen grain was 2.0pg, 1.7pg and 1.3pg, respectively. Yearly Phl p 5/pollen was negatively correlated with yearly pollen sum.
**Conclusions:** These results show that Phl p 5 is preferentially associated with pollen grains, although a small percentage may also be found in smaller particle sizes. It was recorded a yearly variation in airborne pollen and Phl p 5. The highest potency pollen was recorded in 2009 but the highest load in aeroallergen was registered in 2011. In conclusion, aeroallergen quantification together with airborne pollen counts, may contribute to a better understanding of the exposure levels to airborne pollen allergens.

6th September 2012
AM.1

**Detection of pollen allergens in the air**

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**Objectives:** Pollen grains contribute to the development of the vegetation by ensuring Oxygen regeneration and playing a vital role in food. However, 10 to 20% of the population suffers from allergenic rhinitis, conjunctivitis or asthma, caused by pollens. The increase of this kind of allergy, which would have doubled in 10 years, justifies the control of air quality.
**Methods:** A biochip, especially designed to detect pollen allergens has been developed. In this study we focused on tree (birch and olive tree) and grass (timothy) pollens which are known to contain allergenic proteins and glycoproteins. The different allergens were detected in real-time by Surface Plasmon Resonance imaging (SPRi). Owing to this optical technique, the interactions between pollen allergens and the allergen-specific antibody were monitored. The affinity between the antibody and the allergen was calculated from the kinetic curves. The quantity of each allergen in one pollen grain was determined from a calibration curve. This quantity depends on the place and the time where the pollen was collected but also on the extracting method. For the birch pollen allergen the results were compared to those obtained by ELISA by Buters et al. [1, 2]. We can confirm that ELISA and SPRi techniques give globally the same result. For now, no device is able to estimate, in real time and without labeling the biomolecules, the amount of allergen collected in a particular environment. Existing devices are based on colorimetric or fluorescence detection and need labeling antibodies as ELISA or Luminex technology. Thus, there is a great interest in a device that would be able to perform this kind of measurement online.
**Conclusions:** We demonstrate here, the interest of the SPRi technology, which is a multiplexed label-free technique for the detection of allergens simultaneously from pollen grains. The determination of the pollen quantity of each studied species in the air will quickly notify allergic patients to the presence of specific pollens in a particular area and correlate the pollen exposure to the health impact.
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6th September 2012
AM.3

**Characterization of major & minor allergens of three airborne Aspergillus species and heterogeneity of IgE response of allergic patients to them**

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**Objectives:** Airborne Aspergillus species are important inhalant allergens. Current diagnostic modalities employ crude allergen extracts which only indicate the source, to which the patient has been sensitized. However, clinical sensitivity of a patient depends on the number and type of allergens against which they have developed IgE antibodies. We report a study on the identification of major/minor allergens and heterogeneity of patients' IgE response to three Aspergillus species- A fumigatus, A flavus and A niger.
**Methods:** Skin prick tests (SPT) were performed on 300 patients of bronchial asthma/allergic rhinitis and 20 healthy volunteers with the three Aspergillus extracts. Allergen specific IgE in patients' sera was estimated by enzyme allergosorbent test (EAST). EAST binding and EAST inhibition (with homologous extract) were performed using individual sera to study heterogeneity of patients' IgE response to various allergenic proteins of Aspergillus extracts. Immunoblots were performed with multiple sera (n=12-21) to confirm this heterogeneity and identify major/minor allergenic proteins.
**Results:** Positive skin responses in patients were: A fumigatus-19.7%, A flavus-17% and A niger-14.7%. Corresponding EAST positivity was 66.7%, 69.2% and 68.7%. In immunoblots, 5-12 allergenic proteins were identified, major allergens being: A fumigatus- 90, 83, 34, 20 kd; A flavus- 13.3, 34, 37 kd and A niger- 49, 55.4, 81.5 kd. Slopes and positions of binding and inhibition lines in each Aspergillus EAST using multiple sera individually varied from patient to patient, suggesting heterogeneity of patients' IgE response to various allergenic proteins of these extracts. Results of immunoblots gave definitive evidence for this observation as different patients' sera demonstrated distinct allergen binding IgE profiles with each Aspergillus extract. Further, analysis of IgE-binding protein profiles of A niger and A flavus hypersensitive patients revealed that two patients in each set were exclusively hypersensitive to respective minor allergens of these extracts. Thus, allergens which were designated as 'minor' on the basis of study population were the 'major' ones in individual cases.
**Conclusions:** Allergenic potential of A fumigatus was the highest followed by A fumigatus, A flavus and A niger. Major/minor allergenic proteins varied from species to species. Patients demonstrated heterogeneity of their IgE response to these allergenic proteins in various permutation and combinations. These findings emphasize the importance of component resolved diagnosis i.e. identification of allergen binding IgE profile of an individual. This patient-tailored diagnosis will be helpful in identifying actual disease eliciting molecules in an individual and may improve allergen-specific immunotherapy.

6th September 2012
AM.4

**Ambient Ole e 1 aeroallergen and pollen counts of Olea europaea L. from 2009 until 2011 in Évora (South Portugal)**

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**Objectives:** Airborne pollen of olive trees (Olea europaea L.) is a major source of aeroallergens in Portugal and a frequent ethiologic factor of pollinosis in mediterranean region. Ole e 1 is a major allergen widely distributed among the Oleaceae family that highly contributes for the olive pollen allergenic potency. It has been assumed that pollen is a representative parameter for allergen exposure, however, variability of allergen content of the pollen has been demonstrated for other taxa and the presence of allergen in submicronic particles remains controversial. The aim of this work was: i) to evaluate the bioaerossol fraction with higher concentration of Ole e 1; ii) to estimate the correlation between daily airborne olive pollen and the aeroallergen in ambient air; iii) to evaluate the annual variation of pollen potency in south Portugal with a meso-mediterranean climate.
**Methods:** Aeroallergens from ambient air were collected between 2009-2011 using a Rupprecht and Patashnick ChemVol®2400 high-volume cascade impactor (Albany, NY, USA). Flow was adjusted to 800 L/min and was kept constant with a rotameter controlled high-volume pump (Digitel DHM-60, Ludesch, Austria). Prewashed polyurethane foam served as impacting substrate. Particulate matter (PM) in ambient air was fractioned into PM>10 µm (XL) and 10 µm>PM>2.5 µm (M). Impacting substrates were extracted with 0.1 M NH4HCO3 pH 8.1 with 0.1% BSA. Ole e 1 was quantified by ELISA. Airborne Olea pollen was simultaneously monitored with a Burkard Seven-Day Recording Volumetric SporeTrap®. Both samplers were placed side-by-side with the air input at the same level.
**Results:** Annual pollen index of Olea in 2009, 2010 and 2011 was respectively, 12524, 7240 and 10499 grains/m$^3$. More than 90% of the airborne allergen was found in the PM>10 µm stage. The allergen and pollen profiles overlapped in every season but deviations between pollen counts and allergen load were found. Aeroallergen load varied between14591, 18818 and 13340 pg/m$^3$. Ole e 1 mean release per pollen grain was 0,80 pg, 2,64 pg and 1,13 pg in 2009, 2010 and 2011, respectively. Yearly Ole e 1/pollen was negatively correlated with the total amount pollen.
**Conclusions:** These results show that Ole e 1 is preferentially associated with pollen grains, although a small percentage may also be found in submicronic particles. It was recorded a yearly variation in airborne pollen and Ole e1. The highest potency pollen and the highest allergen index were recorded in 2010, a season with the lowest pollen index. In conclusion, aeroallergen quantification may contribute together with airborne pollen counts, to a better understanding of the exposure levels to airborne pollen allergens.
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6th September 2012
RMP.1

**Spatial and temporal changes of exposure to airborne ragweed pollen, characterized by pollen indicators in Hungary, 1999-2011**

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**Objectives:** Ragweed pollen exposure is one of the major health-related problem in Hungary, about 1.5 million people have ragweed pollen allergy. We aimed to investigate the spatial and temporal changes of ragweed pollen exposure and assess the population impact for the period of 1999-2011.
**Methods:** Airborne pollen concentration has been measured by the Hungarian Allergy Network for 20 years. To characterise the ragweed pollen seasons, population exposure in space and time, special pollen indicators were elaborated within UNIPHE (Use of Sub-national Indicators to Improve Public Health in Europe) project and harmonised with the indicator methodologies developed for the WHO European Environment and Health Information System (ENHIS). The start/end date, length of ragweed pollen season, annual sum of daily pollen counts and value of maximum concentration (pollen/m$^3$/given year) were evaluated. Population exposure to ragweed pollen was characterized using the following sub-indicators: (i) Population-weighted proportion of days in a specific year with pollen concentrations ≥30 pollen grains/m$^3$ (ii) Population-weighted average concentration of ragweed pollen in a specific year, defined as the population-weighted sum of all daily concentrations during a specific year divided by the total number of days in the year (iii) Population-weighted duration of the ragweed pollen season in a specific year, estimated as the cumulative sum of daily concentration of pollen grains/m$^3$ within the entire time period of flowering at a specific station. These daily cumulative sum data were used to determine days corresponding to the 1$^{st}$ and 99$^{th}$ percentiles of the cumulative distribution. The length of the pollen season is the period between these days. The data were retrieved from the UNIPHE database (http://data.uniphe.eu). Meteorological data (temperature, precipitation) were used to characterise the seasons. Population data were collected from a circle area within 17.5 km radius from pollen monitoring stations.
**Results:** The annual pollen load showed a cyclic character depending on the meteorological variables, the national average was between 2800-8000 pollen/m$^3$ in wet years and between 100-9000 pollen/m$^3$ in dry years. The mean population weighted duration of the seasons varied between 14-20 days, it was shorter in the southern part of the country compared to north, and most of the "allergic" concentration days (≥30 pollen/m$^3$) were typical also in these regions. However in some central and northern areas the population weighted exposure was lower, in spite of the higher SUM (16000 pollen/m$^3$ in 1999, Kecskemét) or MAX values. In the region of Budapest, the patients have to tolerate long seasons with relatively moderate exposure. In the wetter regions the population weighted pollen concentration is relatively lower in the years with rainy summer, than in dry years. But in the typically drier regions, the relative difference is small.
**Conclusions:** The new indicators can be applied to characterize the pollen season in time and space, its intensity and the rate of population exposed to allergic daily pollen concentration. The analysis of longer time series allow to monitor the impact of climate change.

The study was sponsored by UNIPHE project - EC DG Sanco No2008-1304.

6th September 2012
RMP.2

**20 year survey of Ambrosia allergy rates in Legnano (Italy) – what do the results mean for Ticino (Switzerland)?**

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**Objectives:** Ambrosia is spreading invasively in many European countries. Therefore, surveys showing the long-term consequences of the sensitization prevalence and allergy rates are needed. In this study we can show the development of Ambrosia sensitization and clinical symptoms over a period of 20 years among the patients of the allergy unit of the hospital in Legnano together with the measured pollen concentrations. Legnano is situated near Milan in a region in northern Italy, known for its high Ambrosia pollen loads. Moreover this region is neighbouring Ticino (southern part of Switzerland), where a considerable part of the measured Ambrosia pollen is transported with southwest winds from the Milan region.
**Methods:** In Legnano, the sensitization of patients to Ambrosia and other aeroallergens was tested by a skin prick test. The patients were interviewed about their clinical symptoms and the time of incidence of the symptoms. On average, 1100 patients per year were included in this study in the years 1989-2008. The daily pollen concentration was measured with volumetric Hirst type pollen traps in both countries. To evaluate the sensitization risk in Ticino, the Swiss pollen data (from the measuring stations Lugano, Locarno, Cadenazzo, Mezzana) were compared with those of Legnano.
**Results:** In Legnano, the sensitization rate to Ambrosia increased from 24% to over 70% among the patients whose skin prick tests were positive to pollen. In 1989, about 45% of the Ambrosia sensitized patients suffered from respiratory symptoms (rhinitis and/or asthma) in late summer. After 5 years, this percentage increased to 70% and finally reached 90%. The prevalence of asthma was initially 30% among the Ambrosia sensitized patients and increased slightly to 40%. The average seasonal pollen index (SPI) in Legnano was 4800, in Mezzana 1800 and in Lugano 400. The average number of days per year with a high Ambrosia pollen concentration (≥11 pollen/m$^3$) is for Legnano 47 days, for Mezzana 24 days and for Lugano 10 days.
**Conclusions:** The extent of the consequences of high Ambrosia pollen concentrations is not ascertainable over the short term. Sensitization rates have constantly increased over a period of more than 15 years in Legnano, and moreover the incidence of allergy is delayed during the first years. In Lugano the sensitization rate apparently experienced no important changes, and is considerably lower than in Legnano. In Mezzana a higher allergy risk is expected than in Lugano; but patients data are lacking until now. However, regardless of the sensitization risk of the measured Ambrosia pollen concentration, it is important to start efficient containment measures, as soon as the first Ambrosia plants appear, as the invasive spreading of Ambrosia makes a later containment very difficult.

6th September 2012
RMP.3

**Assessment of common ragweed (Ambrosia artemisiifolia L.) biometrical characteristics**

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**Objectives:** In Lithuania, ragweed is attributed to late-emerging weeds. The highest number of this species' representatives was identified during the 1985-2000 period, while currently only sporadic individuals are being found. The current study was aimed to assess biometrical characteristics of ragweed grown in a cultivated soil in Lithuania and to establish the interrelations between these attributes.
**Methods:** In April 2011, ragweed seeds were sown under laboratory conditions in order to ensure earlier emergence of seedlings and to protect them from frosts. After the seedlings had produced true leaves, the plants were transferred to the greenhouse. At the end of June, ragweed seedlings were transplanted in a cultivated soil in a permanent cultivation site where environmental conditions were not controlled at any of the growth stages. Plants cultivated in three 10 m$^2$ experimental field with 10 common ragweed plants per plot. 3 plants from the each field were taken for analysis by using random sampling method. Plant anthers were collected at the beginning of September. The average number of pollen grains per stamen was established having assessed stamens collected at different plant heights. Ragweed pollen productivity was calculated based on literature data on the number of male flowers per flower head and on biometrical data collected during the study. At the end of October, the plants were transferred to the laboratory for assessment. Two methods were used. The first assessment method is based on the rank of branches. The second assessment method is based on the analysis of biometrical indicators according to plant part. The average number of pollen grains per stamen was established having assessed stamens collected at different plant heights. Ragweed pollen productivity was calculated based on literature data on the number of male flowers per flower head and on biometrical data collected during the study. Statistical analysis was used to evaluate the results of biometrical data.
**Results:** Having estimated biometrical indicators of ragweed grown in a cultivated soil in 2011 it was found that an average plant height is 134 cm (SD=15.41). A strong relationship was obtained between ragweed inflorescence length and number of male flower heads ($r>0.85$, $p<0.01$). The longest male inflorescences (14.46±8.28 cm) are formed on the tops of branches of the 1st rank and the number of male flower heads is the highest (140±50) in them. A ragweed plant grown in a cultivated soil produces approximately 36000 flower heads. One anther was found to generate 3408±2127 pollen grains. In the conditions favourable for ragweed development the plant produces about 7.4E+09 pollen grains. In the upper part of plant, there was established a strong correlation ($r>0.75$, $p<0.01$) between the number of clusters of female flowers and number of seeds. One ragweed branch has on average 5-6 clusters of female flower heads, in which from 1.6±0.3 to 2.3±0.7 seeds are formed depending on the position of branch on the plant.
**Conclusions:** Common ragweed formed shrubby and high productivity plants cultivated in the cultural soil in Lithuania. One ragweed plant produces from 26298 to 52037 male flower heads that release billions of pollen grains in the atmosphere. It was found that one plant can produce 6906±1692 seeds with an average weight per seed of approximately 3 mg (SD=0.72) and it is vital to carry out monitoring in the sites where ragweed has been recorded and especially ragweed overgrowths.

6th September 2012
RMP.4

**The most abundant Ambrosia pollen count is associated with the southern, eastern and the northern-eastern Ukraine**

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**Objectives:** In accordance with the data of Quarantine State Inspection of Ukraine the area contaminated by ragweed in 2011 is 34.6 times increased from 1973. Presence of this allergenic weed is currently noted in every from 25 Ukrainian regions. More contaminated with this weed are Eastern region of Ukraine. Government reports the largest area of Ambrosia in Zaporizhz'ka, Donetska and Dnipropetrovska oblasts.
**Methods:** Study was conducted in Vinnitsa, Poltava, Donetsk, Dnepropetrovsk, Odessa and Sympheropol in 2010. Sampling was performed with the Burkard spore trap. Samples were taken from the 1st of March till the 15th of October.
**Results:** Despite the area of Ambrosia in Donetsk' region is considered to be the 32% of total territory contaminated in Ukraine, study shows the most abundant ragweed pollen count for the Dnepropetrovsk (11% of ragweed area in Ukraine). The peak concentration for 1491 pg/m$^3$ was seen for Dnepropetrovsk on September, 2. The count constitutes 30% from total ragweed pollen collected for Ukraine in 2010. The second massiveness of the pollen count (20%) recorded for Sympheropol. The peak day was September, 6 with the concentration of 629 pg/m$^3$. Pollination level was similar for Odessa – 20% of total count. Peak day was seen on August, 29. However, Odessa was characterized with the largest number (63) of the days with a count for more than 15 pg/m$^3$. Poltava whose official records show ragweed for less than 1% of territory was characterized with massive Ambrosia season (14% of total count). The peak for 1427 pg/m$^3$ was the second highest in Ukraine. This peak was recorded on August, 28. Number of days with a count more than 15 pg/m$^3$ was 49, the 5th position from 6 cities. Donetsk showed just the 5th massiveness for Ambrosia with 13% of total pollen count. The peak for 297 pg/m$^3$ was seen in Donetsk on September, 6. Count was more than 15 pg/m$^3$ for 52 days. However, ragweed season for Donetsk was the longest. It lasted for 108 days while the season for Dnepropetrovsk was for 102 days. The shortest pollination period was recorded for Simpheropol (87 days). Vinnitsa was characterized with the lowest count (3% from total) and with the lowest peak (103 pg/m$^3$) for Ukraine in 2010. Number of days (24) with a 15 pg/m$^3$ count and more was the lowest as well. But the peak was the earliest (August, 13) among all cities.
**Conclusions:** Ambrosia shows the largest pollen count in Eastern and Southern Ukraine. These regions are characterized with the most abundant (Dnepropetrovsk) and the longest (Donetsk) ragweed pollination seasons. The shortest period was noted for Simpheropol (Crimea peninsula, South) while the poorest one occurred in Vinnitsa (Western Central part of Ukraine). Odessa (South) was characterized with the highest number of days with a count exceeding 15 pg/m$^3$. Region of interest can be associated with Poltava (Northern Eastern Ukraine). It's showing the sharply increasing ragweed pollen count. The highest levels of ragweed pollination are seen in Ukraine from the August, 28 till September, 6 mostly.

6th September 2012
RMP.5

**Influence of meteorological parameters on Artemisia pollen concentration in Latvia in the period 2003-2011**

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**Objectives:** This study describes the relationship among concentration of Artemisia pollen and meteorological variables during 9-year pollen seasons (2003-2011). Aerobiological monitoring was carried out in the Riga City, capital of Latvia, located in central part of Country (56°57'2"N, 24°6'58"E). Artemisia pollen in Latvia has been observed during the summer time (when average daily temperature is higher than 15°C).
**Methods:** The volumetric measurement point (Burkard sampler) was located at a height of 23 m above ground level on the roof of University of Latvia. Meteorological observation (maximum and mean temperature (°C), relative humidity (%) of the air, precipitation (mm), and wind speed (m/s)) was made 1000m to the NW from Burkard trap at 2 m above ground level. Pollen sum was count using light microscope with 400x magnification. Slides were examined using vertical sweeps counting method. Pollen concentration was defined as amount of pollen grains per cubic meter of air. The main pollen season was obtained by using 95% method. Statistical analysis for comparing aerobiological and meteorological data were performed by means Microsoft Excel and SPSS 19.0.
**Results:** There are three main species of Artemisia L. (A.vulgaris, A.absinthium, A.campestris) in Latvia whose were detected in observations by biologists. In the period 2003-2011 the beginning of Artemisia pollen season was observed between 22nd June (in 2004) and 18th July (in 2005). In the same time the beginning of main pollen season was detected between 18th July (in 2008) and 31st July (in 2004 and 2005). The obtained results show the average length of main pollen seasons approximately 35 days. The annual sum of Artemisia pollen concentration is between 220 and 979 grain/m$^3$ per pollen season. The highest diurnal Artemisia pollen concentration was observed in the first decade of August with absolute diurnal maximum value 133 grains/m$^3$ (in 2011). Analyzed meteorological values can be divided into two parts – first part, connected to the emission of pollen (temperature, humidity, precipitation) and second part, which influences the concentration of pollen and regulates the time of presence in the airflow (precipitation, wind speed, atmospheric stability, atmospheric pressure).
**Conclusions:** In process of summarizing study results the location of aerobiological sampler should be taken into account, because of differences in vegetation and temperature regime of urban and rural areas. In case of Riga urban environment has effect on temperature of air and that is why influence the beginning and the length of pollen season.

6th September 2012
RMP.6

**Influence of meteorological parameters on Artemisia concentrations in Wrocław (Poland)**

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**Objectives:** Pollen of Artemisia is one of the main causes of pollinosis in late summer in Europe. The pollinating season starts in July and lasts until September. In Poland, the highest concentrations of Artemisia grains are recorded in the first half of August. The main purpose of this paper is to study, by means of short-term statistical analysis, the effect of meteorological parameters on airborne Artemisia pollen concentrations. The study was carried out in Wroclaw, which is a city in the south-western Poland, on the Odra River, in the centre of Silesian Lowland. The aerobiological and meteorological data were collected over a period of ten years (from 2002 to 2011).
**Methods:** The studies were carried out involving volumetric method (Burkard trap) and the aerobiological data areexpressed as average daily pollen concentrations per cubic meter of air. The start, peak and end dates (98% method), duration, maximum daily concentration and SPI were used in order to characterise the pollen seasons. The relationship between pollen concentration and meteorological condition was studied using daily meteorological data. The data of pollen concentration and meteorological factors were statistically processed. The pollen data were standardized, and the ln (P+1) was used for calculation of P (number of pollen grains). The analysis of various meteorological factors was used for determining the complex influence of weather condition on the pollen concentration in air.
**Results:** Over the study period, the Artemisia pollen season started in July, except at 2002, when the pollen season began already on the 27th June and lasted until around 250th day of the year (beginning of September). Duration of the pollen seasons ranged from 34 in 2009 to 71 days in 2006. The lowest maximum daily concentration occurred in 2005 (51 P·m$^{-3}$), and the highest one in 2008 (223 P·m$^{-3}$). The statistical analysis has indicated the influence of monthly air temperature and humidity of early spring on the intensity and the start date of the pollen season. Correlations between day-to-day variation of pollen concentration and meteorological factors were significant ($p<0.05$) but weak ($r=0.3$). Stronger positive correlations ($r>0.5$) were found between the cumulative meteorological factors or pollen concentration and 20 or 30-days average maximum and minimum temperature, vapour pressure and negative (weaker but significant) with sunshine duration.
**Conclusions:** Artemisia pollen levels in the atmosphere are a function of three processes: production, release and disbursal. Various meteorological parameters have different importance according to these stages. Statistical analysis has indicated that air temperature, especially daily extreme temperatures and vapour pressure have been most important. Moreover, the correlations between meteorological factors and concentration of pollen have varied strongly from year to year.

6th September 2012
CC.1

**Increasing long-term trends in airborne pollen concentrations: an underestimated trigger to allergy?**

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**Objectives:** Climate change has been affecting the ecology of plants, with flowering phenology and pollen production being frequently characterized as bio-indicators of such alterations. For example, the rate of production of pollen has been increasing with pollen seasons occurring earlier and lasting longer. Previous research on changes in airborne pollen levels in Thessaloniki, Greece has been conducted for the period 1987-2005; it was then found that for a wide spectrum of pollen types exponentially increasing trends in airborne pollen concentrations were present. Such alterations are usually considered the result of parallel modifications in climate, particularly air temperature and rainfall; in our case, the only meteorological factor displaying systematic increasing trends in average yearly values over the same period was that of air temperature components. Judging by the fact that for pollen the frequency and the severity of allergic reactions in sensitised individuals have been found to increase over the last decades, probably as a result of the increase of the airborne pollen concentration, it is considered very important to assess and evaluate the most recent potential risks of the atmospheric presence of pollen, under the ongoing climate change.
**Methods:** We examined the long-term trends in atmospheric levels of pollen in Thessaloniki, Greece from 1987 until 2010. We estimated trends for a wide spectrum of taxa, each of whose contribution to the total atmospheric pollen concentration was at least 0.5%. We also tested for trends towards earlier, longer or more highly peaked pollen seasons.
**Results:** The salient feature of these data is that the levels of pollen have been increasing, clearly exponentially and with trends being more evident in the cases of woody plants; this is true for the majority of the individual taxa examined (11 out of 16) and for their aggregate. On average, the atmospheric pollen concentration is doubling every decade, but for some species the rate is much higher, with doubling times less than 5 years. Among the taxa with the highest rate of long-term trend in atmospheric pollen concentration, four belong to the group of woody plants (Cupressaceae, Quercus, Platanus, Pinaceae) and only one to that of herbs (Urticaceae). For the pollen-season-related attributes (onset, peak, end and duration), there was no systematic tendency and the changes were more nuanced. The observed increase in pollen abundance coincide with a rise in air temperature, which is the only meteorological factor to have experienced a sustained and significant change over the same period in Thessaloniki.
**Conclusions:** Our results suggest that changes in pollen distributions are dominated by increases in pollen production rather than changes in phenology and that several species showing strong trends might serve as bioindicators of expected climate change.

6th September 2012
CC.2
**Do airborne pollen data from Catalonia (NE Spain) reflect the climate change effects on vegetation?**

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**Objectives:** Nowadays aerobiological data series stand as a very powerful tool to study the climate and its associated variability. This work aims to contribute to a better description and understanding of the ecological effects of climate change in the region of Catalonia, North-eastern Spain, through the study of the airborne pollen data series of the eight sampling stations (Barcelona, Bellaterra, Girona, Lleida, Manresa, Roquetes-Tortosa, Tarragona and Vielha) of the Aerobiological Network of Catalonia (Xarxa Aerobiologica de Catalunya, XAC).
**Methods:** Nine pollen taxa were selected (Pinus, Quercus, Betula, Fagus, Corylus, Pistacia, Artemisia, Poaceae and Chenopodiaceae/Amaranthaceae) coming from relevant plants in the diverse landscapes of the area under study. The aerobiological sampling was carried out over an eighteen-year period (1944-2011), following the standard norms accorded by the Spanish Aerobiology Network (Red Española de Aerobiología, REA). Meteorological data were supplied by the Meteorological Service of Catalonia (Servei Meteorologic de Catalunya, Meteocat) and the Spanish Meteorological Agency (Agencia Estatal de Meteorología, AEMET). Different statistical analyses were performed (Wilcoxon, $R^2$ and Spearman, among others) to test several hypotheses.
**Results:** Pollen records can act as a very sensitive climate indicator in Catalonia, according to the different degrees of correlation found between the Annual Indexes and the mean temperature during the pollen season (i.e. $R^2$=0.507, Corylus, Vielha), the average rainfall in the months prior to the pollen season (i.e. $R^2$=0.8318, Pinus, Vielha), or even with the winter NAO-index (i.e. rs=-0.437, Quercus, Barcelona). Large-scale climate variability seems to exert an influence on the intensity of the pollination season of several taxa, although the sign of it varies from one pollen type to another (rs=0.578, Corylus, Bellaterra; rs=-0.869, Chenopodiaceae/Amaranthaceae, Roquetes-Tortosa). The trends of the Annual Indexes show a general increase in the amount of pollen recorded for most of the tree taxa (particularly Pinus and Quercus) and a general decrease on the herbaceous pollen types. Anthropic actions in the last years such as the urban sprawling, or the abandon of fields in inner Catalonia could be hiding the climatic signal of aerobiological records in many cases.
**Conclusions:** Although there is still limited evidence on it, our results show the potential of bioaerols as climatic indicators and their importance as parameters recording on a daily basis the recent climate changes.

6th September 2012
CC.3
**Birch pollen as an indicator of climate change**

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**Objectives:** Global warming is a reality and there has been discussion on the magnitude of its effects on pollen and on pollen allergies. The starting day of flowering and flowering intensity are typical indicators for environmental changes. Northern Scandinavia and Finland are extreme growth environments for many plants and therefore their success is a tool for analyzing environmental effects. The birch family (Betulaceae) and especially Betula spp. are the main allergenic plant group in Finland. Their growth area extends as north as the mountainous areas in Lapland. The main birch species there are B. pubescens and its bush-like subspecies B. pubescens ssp czerepanowii. The footprint analyses of Bet v 1 allergen concentration/pollen grain have indicated that the pollen grains of northern origin might be less allergenic than the grains originating from more southern areas [1].
**Methods:** We studied the start of flowering at different sampling stations in Finland: Turku (22°28E, 60°32N), Kuopio (27°38E, 62°53N), Oulu (5°31E, 65°04N), and Kevo (27°01'E, 69°45'N). The SSBAS results were used to calculate yearly Betula pollen allergen loads.
**Results:** The change in the onset of birch flowering in Turku from 1974 to 2011 was almost two weeks on average, roughly 10 days in Kuopio (between 1980-2011), but only 2-3 days in Oulu (1976-2011), and there were no statistical changes at Kevo (1974-2011). In southern Finland the changes are prominent. The trend lines of yearly pollen sums (sum of daily averages per cubic metre of air) have changed in the same way: increasing in south, decreasing in north. The yearly allergen load is rather stable and not entirely dependent on the pollen sum.
**Conclusions:** When looking for trends, the pollen statistics have to cover some tens of decades, otherwise there is a serious risk of drawing incorrect conclusions. The temperatures in the northernmost Lapland have risen, but at the same time the snow cover has also become thicker due to higher precipitation, and therefore it takes a longer time for the snow to melt, and the general growth period has not extended in the last decades. It seems that the further north we go the more stable the situation is. The high and low pollen years were not synchronized throughout the country as expected. The yearly variations are large, especially at the southern latitudes. However, the allergen concentration of the yearly pollen load does not change as much as might be expected based on pollen sums only.
**Reference:**
1. Buters JTM, Thibaudon M, Smith M, Kennedy R, Rantio-Lehtimäki A, Albertini R, Reese G, Weber B, Galan C, Brandao R, Antunes C, Jäger S, Berger U, Celenk S, Grewling L, Jackowiak R, Shauliene I, Weichenmeier I, Pusch G, Sarioglu H, Ueffing M, Behrendt H, Prank M, Sofiev M, Cecchi L, The HIALINE working group. Release of Bet v 1 from birch pollen from 5 European countries. Results from the HIALINE study. Atmospheric Environment 2012; 55:496-505.

6th September 2012
CC.4
**Aerobiological data and biodiversity conservation: the missing link?**

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**Objectives:** Plant biodiversity conservation faces with the complex task of identifying the information on the ecology of species and evaluating their respective causes of threat. Along this line is placed the approach of aerobiology to gather the biological information necessary for the development of plant recovery guidelines. In this work, we aim to discuss the role of airborne pollen monitoring in providing relevant data for the protection of flowering plants and its possible applications to the management of plant biodiversity.
**Methods:** Pollen sampling and analyses were performed in the aerobiological stations of Barcelona, Bellaterra, Girona and Vielha (Catalonia, NE Spain) and Granada (Andalusia, SE Spain), for the period 1994-2011, following the methodology proposed by the Spanish Aerobiological Network (Red Española de Aerobiología, REA).
**Results:** Four study cases have been addressed in this study: a) Aerobiological data as an early indicator of the spread of new invasive species: early detection of the introduction of an invasive harmful plant such as Ambrosia sp. in Catalonia is possible through a systematic monitoring of the airborne pollen concentrations; b) Aerobiological impacts of climate change on mountainous vegetation: the length and timing of the phenological cycle of plants has a great importance for forest management schemes, since changes in the flowering of some tree species are being recorded in the Pyrenees and have implications in reproductive terms and regarding their vulnerability to early or late frosts; c) Study of gene flow through pollen and its application to the forest management strategies: a proper understanding of pollen dispersal is crucial for the management and conservation of plant species in increasingly fragmented landscapes. The study of long-range transport episodes of Fagus sylvatica in Catalonia can be fundamental for the management of forest genetic resources in this region; d) Pollen records and their application on the programs of recovery of Threatened Flora: the success and efficacy of the Programs of Recovery of threatened Artemisia species in Sierra Nevada, Granada, have been tested at an aerobiological level, considering that aerobiological records act as an indicator of the conditions of the floral development and, therefore, the status of the populations.
**Conclusions:** Aerobiological data have rarely been used for conservation purposes. This situation should be readdressed through long-term aeropalynological sampling, since airborne pollen records constitute a suitable indicator for evaluating resource conservation of vegetation responding to environmental fluctuations. Long-term pollen databases permit to chart the dynamics, behaviour and response of different plant species to the many components of global change and can provide very relevant information on local plant conservation status.

6th September 2012 POSTERS
P_IN.1
**Airborne fungi in a grain warehouse**

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**Objectives:** Grain industry workers are subjected to a high risk of respiratory diseases due to the large amount of dust generated during the work phases. The aim of this study was to examine the fungi occurring in the air of a grain warehouse in order to assess the extent of health risk.
**Methods:** Air sampling was performed by a non-viable (portable Hirst-type air sampler) and a viable method (Andersen-type air sampler Lanzoni Co Ltd). During the sampling procedure, MEA and DG18 media were exposed to 100 L of air at constant air stream of 28.3 L per minute. The examined grain warehouse is a 13-floored relic building operating since 1928, where storing in and out, aeration and – if necessary – crop fumigation are performed. The crop (winter wheat, maize and sunflower seed) is stored in open-space rooms at each floor. Air samples were collected in replicates at the 3rd and 5th floors as well as outdoors.
**Results:** Using the non-viable method, Alternaria, Cladosporium, Epicoccum, Tilletia and Ustilago spores were detected. A total number of 1811 and 1759 fungal colonies were also isolated on MEA and DG18, respectively. Isolates were identified based on their morphological characters and, where necessary, by the sequence analysis of the internal transcribed spacer (ITS) region. Cladosporium, Penicillium spp. And Aspergillus flavus were found in all indoor samples. Indoor concentration of these species was higher than outdoor concentrations, suggesting that they were possibly introduced with mouldy crop and aerosolized during the material movement processes. Besides the above mentioned species, Alternaria spp., Aspergillus clavatus and Epicoccum nigrum were also frequent. 10.8, 28.7 and 60.5% (MEA) as well as 9.2, 18.6 and 72.2% (DG18) of the total count were present in the fractions >7 µm, 7-3.3 µm and <3.3 µm, respectively.
**Conclusions:** Fungal spores capable of causing farmer's lung disease are present in high quantities in the air of the examined grain warehouse, thus the use of personal protection equipment is recommended.

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6th September 2012
P_IN.2

**Microbial air monitoring in operating theatres at the University Hospital of Parma: an opportunity to debate sampling methods and threshold values**

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**Objectives:** Surgical site infection is a major complication following surgery and is associated with an increase in morbidity and mortality, as well as an increase in costs. The role of air as a vehicle of infection has been an object of much interest and debate. Guidelines for operating theatre design and ventilation have been published and threshold values have been proposed for both ultraclean and conventional theatres. However, there is no international consensus on tolerable limits of microbial air contamination, nor do exist generally accepted methods and frequencies for air sampling. The University Hospital of Parma, has implemented a monitoring programme for operating theatres based on microbiological air sampling that involved empty theatres (during commissioning and after major renovations) and working theatres. The objectives were: a) assessing the microbial air contamination in empty and working operating theatres; b) proposing local threshold limits for microbial air contamination in operating theatres; c) assessing any correlation between active and passive sampling methods.
**Methods:** The microbial monitoring was performed in 29 conventionally ventilated operating theatres, situated in 9 different operating suites. Both active and passive sampling methods were used to assess bacterial and fungal contamination. SPSS 18 PASW package was used for statistical evaluation.
**Results:** In empty theatres, median bacterial values of 12 CFU/m$^3$ (interquartile range: 4-32) and 1 IMA (interquartile range: 0-3) were recorded. During activity these values increased significantly ($p<0.001$), up to 80 CFU/m$^3$ (interquartile range: 42-176) and 7 IMA (interquartile range: 4-13). Maximum recorded values were 166 CFU/m$^3$ and 8 IMA for empty theatres, and 798 CFU/m$^3$ and 42 IMA for working theatres. Considering active and passive samplings, fungi were isolated in 39.13% of samples collected in empty theatres and 56.95% of samples collected in working theatres.
**Conclusions:** A high variability has been observed in air microbial contamination between the different operating suites and the different operating theatres. In some empty theatres, high levels of fungal contamination were observed. The analysis of the problem revealed faults in the structure and management of the ventilation system, which were corrected. This demonstrates that monitoring air quality is important during the commissioning and after all major structural renovations. A wide variation in microbial contamination was also observed during surgical activity in operating theatres that used similar forms of ventilation, suggesting that factors that strongly affect the quality of air (e.g. the number of people in the theatre, their movements, the number of door openings) were not well controlled. One of the aims of our study was to propose a benchmark for microbial air contamination in operating theatres, as a contribution to the global discussion on acceptable values. Our experience shows that microbiological monitoring is a useful tool for assessing the contamination of operating theatres and improving their air quality. This study can be regarded as a contribution toward the standardization of sampling methods and the definition of acceptable levels of biocontamination.

6th September 2012
P_IN.3

**Experience of application of aeropalynologycal data in studying dust in the closed rooms with natural air exchange**

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**Objectives:** Pollen and spores, getting with air flow into living, office and subsidiary rooms with a natural air exchange, accumulate and store together with other household dust and can play a part of a "room passport" in forensic investigations. First of all, in the study of household dust, we were interested in the taxonomic composition of plant pollen and fungal spores and the origin of concomitant particles, the ratio of all components and seasonal dynamics. For resolving these questions we developed simple and accessible methods for rapid analysis. These methods can give preliminary data for further more detailed research.
**Methods:** Dust sampling was carried by means of a transparent double-sided sticky tape, a one-sided sticky tape or by cotton cloth that can be viewed in SEM. Household dust has been studied from various regions of the cities of Minsk, Vitebskand Brest, and collected in flats, balconies, garages and some other kinds of outbuildings. The samples were covered by glycerol-gelatin mixture with fuchsin. The stained pollen was well distinguished among the dust and paper or fabric fibers. For the control we used the data obtained with standard seven-day Burkard trap.
**Results:** We stated that simple cotton fabric and newspaper are the best suitable for the dust sampling. Pollen and spores are difficult to collect from loose materials, while they accumulate on a smooth material badly. We also found that the taxonomic composition of pollen and fungal spores is very similar outdoors and indoors and has seasonal character; however, the levels of their contents can vary significantly depending on the features of air flow. Pollen of pine and birch dominate in all samples, creating a background. Sometimes, during the forensic examination, if the period of pollination of a taxon has not yet come, we can say about the pollen from the previous seasons. The dust of industrial premises and dust in the living quarters near them contain spherical particles with crystallized surface (sized from 1 to 30 microns).
**Conclusions:** Studies have shown the convenience and high enough informational value of the express method for studying pollen and spores in dust in closed rooms with natural air exchange. The advantages of the proposed method are that material is quickly prepared for microscopic examination (fixation and staining of samples take short time) and the all components of household dust are preserved.

6th September 2012
P_IN.4

**Microbiological air quality in farming building in Southern Poland**

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**Objectives:** Presence of potentially pathogenic microorganisms in farming buildings, especially fungi and their metabolic products may be dangerous for human and animal health. Hence, the aim of this study was to characterize microbial quality of farming buildings in southern Poland.
**Methods:** Bioaerosol measurements were carried out over a period of one year – in warm and cold seasons. The air samples were collected in farming buildings of Malopolska province in: cow houses (C1-C9), hen house (H1), barn (B1), granary (B1) and outdoor (OUT) as background (atmospheric) level of microbial concentration. All investigated buildings were naturally ventilated. Bioaerosol samples were collected using a six-stage Andersen impactor. Bacterial aerosol was collected on blood trypticase soy agar and fungal bioaerosol on malt extract agar. After incubation of the samples the qualitative and quantitative analyses of viable microorganisms were carried out. Bioaerosol concentration was calculated as colony forming unit per cubic meter of air (cfu/m$^3$). During sampling, relative humidity (RH) and temperature were measured. Bacterial strains were identified by Gram staining, their morphology and biochemical API tests (bioMérieux, Marcy l'Etoile, France). Fungi determination was based on their morphology with the using several identification keys. Statistical analyzes were performed by Kruskal-Wallis test using Statistica (data analysis software system) v. 7.1 © 2006 (StatSoft, Inc., Tulsa, OK, USA).
**Results:** Bioaerosol concentrations in investigated farming buildings ranged from 1363 to 267454 cfu/m$^3$ and were significantly higher ($p<0.01$) than those measured for outdoor air (from 467 to 6090 cfu/m$^3$). Microbial aerosol concentration observed in investigated premises were significantly different ($p<0.01$). The highest bacterial aerosol levels were observed in cow houses C9 (267454 cfu/m$^3$), C6 (264818 cfu/m$^3$) and C3 (264090 cfu/m$^3$). High levels of bacterial aerosol was also noted in hen house (232400 cfu/m$^3$). The highest differences were observed between granary (7655 cfu/m$^3$) and cow house C3 (243979 cfu/m$^3$). Observed differences in bacterial aerosol concentration depended mainly on premises use. The presence of livestock animals caused significant rise of bacterial aerosol concentration ($p<0.05$). Fungi aerosol concentration in indoor and outdoor environment did not exceed 72000 cfu/m$^3$. The highest fungal aerosol levels were observed in cow houses C3 (71134 cfu/m$^3$) and C5 (62272 cfu/m$^3$). Fungal aerosol concentration in outdoor environment was even 82 times lower than in investigated premises. Statistical analyses of data revealed significant differences between seasons (Kruskal–Wallis test $p<0.05$). Higher bacterial aerosol concentration in indoors premises was observed in summer. Air-tightness of the buildings in winter caused seasonal raise of fungal aerosol concentrations. Qualitative evaluation of the air microflora revealed that Gram-positive cocci (Staphylococcus, Micrococcus), spore-forming Gram – positive bacilli (Bacillus) and fungi (Alternaria, Aspergillus, Cladosporium, Penicillium) were dominant. Most prevalent in studied premises were bacteria from the genus Staphylococcus (4 species) and Bacillus (4 species), and among fungi from the genus Penicillium (4 species) and Aspergillus (3 species). Proper conditions for development of species from the genus Staphylococcus and Bacillus and presence of potential sources of their emission inside farming buildings caused their dominance over other group of microorganisms.
**Conclusions:** Bioaerosol concentration was usually higher in buildings where sanitary standards were not met – lack of excrement's removal, increased air humidity and air-tightness. These conditions may be hazardous for staffs and animals. Hence, the constant control of sanitary conditions is a key factor. These results suggest that natural ventilation is inefficient in such premises and mechanical ventilation should be introduced.

6th September 2012
P_IN.5

**Integrated approach of biological and microclimate monitoring in cultural heritage environments for the preventive conservation of artworks and the protection of operators' health**

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**Objectives:** Cultural property preserved in indoor environments such as museums, libraries and archives is subject to deterioration by biological agents, with considerable economic damage and cultural loss. Furthermore, certain classes of airborne biological particles contain allergens and are potentially toxic, and may pose a danger to operators and visitors. Monitoring the biological contamination of air and surfaces is essential to assess contamination levels and evaluate any potential risk, forming the basis of a successful preventive strategy. Several methodologies and measuring techniques have been adopted so far, but a standardized and universally accepted method that can guarantee reliability, reproducibility and comparison of results has yet to be found. Based on experiences gathered in other fields characterized by high risks of contamination and infection, we propose an interdisciplinary approach to the study of biological pollutants in indoor air and on the surface of heritage objects associated with the study of microclimatic conditions using a thermo-fluid dynamic analysis based on Computational Fluid Dynamics (CFD). The project "Art and health: biological monitoring for the preventive conservation of artworks and the protection of operators' health" has been funded by the Fondazione Cariparma with the main aim of performing a pilot study on the proposed approach.
**Methods:** The air microbial monitoring will be carried out by active sampling, using a DUOSAS 360 to measure the concentration of viable particles in the air (colony forming units per cubic meter, CFU/m$^3$), and passive sampling, measuring the rate at which particles settle on surfaces (Index of Microbial Air Contamination, IMA). The sampling of surfaces will be carried out with a non destructive method, using nitrocellulose membranes to measure the Microbial Buildup (MB) and Hourly Microbial Fallout (HMF). A Hirst spore trap will be used to directly detect viable and non viable fungal spores and pollens, and to evaluate the temporal distribution of particulates. The sampling of allergens in air and dust will be carried out using a volumetric sampler and a vacuum cleaner fitted with MITEST filters. An immunoenzymatic assay will be performed to determine the concentration of different allergens. A particle count will determine the number and size of different-diameter particles/m$^3$. To improve the conservation status of indoor cultural heritage and assess the risk of contamination by biological agents, transient simulations based on CFD will be carried out using the Finite Element Method (FEM) approach. Multiple data acquisition devices or multi-data loggers will be used in indoor environments to measure key physical parameters (temperature and relative humidity of air and surfaces, lighting levels, speed and direction of air movements).
**Conclusion:** The proposed approach wants to be a contribution toward the definition of standardized methods for assessing the biological and microclimatic quality of cultural heritage environments. CFD simulations based on experimental data can provide reliable information on indoor microclimate dynamics, indoor air quality, thermal field and pollutant concentration. This integrated approach will allow researchers to define biological and microclimatic standards to preserve cultural heritage, while at the same time protecting the health of operators and visitors.

6th September 2012 POSTERS
P_RMP.1
**Ragweed and mugwort pollen diffusion: a comparison from different areas in Northern Italy**

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**Objectives:** Short ragweed and mugwort pollen are two recognized sources of respiratory allergies during the late summer in Northern Italy. Since the middle of the 1980s an increased prevalence of allergy to ragweed has been assessed in the North-Western Milan area and South Varese area where ragweed is widespread. Public health primary prevention measures have therefore been taken. In surrounding areas sporadically infested by Ambrosia plants, a significant increase in ragweed pollens diffusion and a contemporaneous significant correlation between its concentrations and the increase in sensitized subjects have been observed. Many papers have focused on the ragweed issue, whilst little attention have been paid to the mugwort related situation, despite the fact that clinical and serological studies have shown that ragweed and mugwort sensitization are often linked and this poses relevant clinical problems in patients affected by pollinosis. The aim of the present study is to analyze the ragweed and mugwort pollen distribution between 2003 and 2011 in the Northern Italian area which includes eleven monitoring stations (Sondrio, Vertemate-Minoprio, Giussano, Casatenovo, Gallarate, Busto Arsizio, Legnano, Rho, Magenta, Pavia and Parma) and to propose a first classification to assess the ragweed benchmark.
**Methods:** The study was carried out in a geographical region located between latitude 46°10'11"N, longitude 9°52'12"E, 307 m a.s.l. and latitude 44°48'15"N, longitude 10°19'0"E, 52 m a.s.l. Pollen was collected with Hirst type pollen traps and the counts were performed according to the standard methods of the Italian Aerobiology Association. For each monitoring station the Seasonal Pollen Index (SPI) and the daily maxima were assessed. The data were analyzed using SPSS Statistic 19.0 software.
**Results:** According to percentile analysis for this geographical area we propose a first classification of ragweed pollen distribution based on SPI: <50.3=absent; 50.4-650.0=low; 650.1-1851.0=medium; 1851.1-5428.0=high; >5428.1=very high. As a result the monitoring centers are classified as follows: Busto A, Magenta: very high; Gallarate, Giussano, Legnano, Rho: high; Casatenovo, Pavia, Vertemate-Minoprio: medium; Parma and Sondrio: low. In addition, we observed a wide variability in ragweed pollen spread (SPI median: 61-6946 and peak value median: 7.0-583.0), whilst in the case of mugwort, the results are much more homogeneous (SPI median: 120-475 and peak value median: 9.1-50.5).
**Conclusions:** The population of Northern Italy, in particular inhabitants of the Busto Arsizio and Magenta surroundings, are exposed to high ragweed pollen values; indeed the prevalence of ragweed allergy is high. Whilst mugwort is much less present and few patients were found mugwort-sensitive. Constant attention to ragweed and continuous monitoring of its diffusion are therefore required in order to reduce its impact on public health and health costs. A wider collection of data is needed to define reliable benchmark and implement appropriate preventive measures. As ragweed and mugwort belong to the same habitat, we propose mugwort as an indicator of loss biodiversity in this habitat. Further research could estimate the impact of ragweed control measures on biodiversity.

6th September 2012
P_RMP.2
**Southern Russia as a source of Ambrosia pollen**

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**Objectives:** Pollen grains of Ambrosia are very potent aeroallergens in central and southern Europe. Identification of source areas of ragweed pollen is important on local and regional scale for monitoring and forecasting of pollen concentration. Botanical surveys in the south of Russia revealed that Ambrosia is one of the most common weeds in the region. Aerobiological monitoring was never performed before in this part of the country. The aim of this study was to investigate ragweed pollen concentration in the atmosphere of two cities in southern Russia.
**Methods:** Daily average of Ambrosia pollen was recorded by a volumetric spore trap during 2010 in Krasnodar (45°02'N, 38°59'E) and Samara (53°11'N, 50°07'E).
**Results:** Single pollen grains of ragweed were observed in Samara air from the beginning of July. The daily count did not exceed 20 pg/m$^3$. Pollen concentration increased after 13 August, daily maximum was observed on 29 August (319 pg/m$^3$). The period of high concentration lasted till 8-9 September. Total yearly pollen count in Samara was 1840 pg/m$^3$. The first pollen grains of ragweed in Krasnodar air were detected in the middle of July and did not exceed 4-6 pg/m$^3$ for the remainder of the month. The start of the pollen season was very sharp. At the beginning of August pollen counts increased up to 200 pg/m$^3$ and continued to increase reaching 600-700 pg/m$^3$ at the end of the month. The peak of concentration was observed on 3 September (1308 pg/m$^3$). The period of high pollen count (over 100 pg/m$^3$) lasted till 24 September. The season ended in the middle of October, but single pollen was observed in the air of Krasnodar till the beginning of November. Total yearly pollen count in Krasnodar was 19000 pg/m$^3$
**Conclusions:** The results of one year monitoring in the south of Russia show that this region is a very important source of ragweed pollen in Europe. It's necessary to continue monitoring and increase the number of monitoring stations.

The present study was initiated and financed by Schering Plough, a subsidiary of Merck & Co., Inc.

6th September 2012
P_RMP.3
**Types of mugwort (Artemisia l.) pollen season depending on the weather conditions in Wrocław (Poland) 2002-2011**

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**Objectives:** Mugwort (Artemisia L.) is a airborne weed of very common occurrence in Europe. Pollen season starts in July and lasts until the end of September. In Poland, the highest concentrations are recorded in the first half of August. Mugwort pollen allergens are the most common cause of pollinosis in Poland. The aim of this study was to find the mugwort pollen season types according to weather conditions. The presented study was conducted in Wroclaw in the years 2002 - 2011.
**Methods:** The studies were carried out using volumetric method (Burkard trap). The start and end dates, duration, maximum daily concentrations and SPI were used to characterize the pollen seasons. The 95% method was applied to determine the start and end dates of the pollen seasons. To classify the pollen seasons, cluster analysis was employed, including the non-hierarchical method of multi-feature clustering, i.e. the k-means method using Statistica software. The meteorological data was gathered at Meteorological Station of the University of Wroclaw. The main climatological and agroclimatological (GDD, SAT, Crop Heat Unit, Selyaninov hydrothermal coefficient) variables for vegetation period were determined in order to evaluate the differences between pollen seasons. Moreover, the synoptic classification was taken into account.
**Results:** In the years under study, three types of mugwort pollen seasons were distinguished on the basis of cluster analysis. Type A includes the seasons 2003, 2005 and 2007. It is marked by high maximum daily concentrations (above 100 P·m$^{-3}$), which are recorded around the 20th day of the season. Short post-peak period was found. Type B comprises years 2002, 2006, 2010, 2011. Relatively low maximum daily concentration (between 50 and 100 P·m$^{-3}$) occurs after 10th day of season. Long post-peak period was found. Type C (years 2004, 2008, 2009) is characterized by short pre-peak and post-peak period. Moreover, the highest maximum daily concentrations were recorded (above 120 P·m$^{-3}$). The seasonal pollen index (SPI) was mainly determined by average temperature for the same period (r=-0.86) and the number of days with more than 10mm of rain (r=-0.70). Season 2010 was excluded due to the flood at the beginning of June. The shift in beginning, dynamic and the duration of the pollen season was affected by thermal and hydrothermal coefficient during vegetation period. The accumulated Crop Heat Units at the range 2000-2100°C described the start of the pollination season. Some shifts (e.g. in 2007) can be explained by rainfall preceding the flowering phase. Significant variation in pollen concentration was caused also by heavy rain (sum above 8-10 mm) and the exchange of air masses.
**Conclusions:** A comparison of particular types of pollen seasons has not allowed us to conclude about the dominant pattern for the mugwort pollen season in Wroclaw. The 10-year period considered (2002 to 2011 inclusive) is too short to provide any characteristic annual pattern in relation to local weather conditions. However, the correct assessment of the pollination's pattern can be used to adjust an optimal model combining the meteorological conditions and the pollen concentrations.

6th September 2012
P_RMP.4
**The long distance transport of ragweed pollen from Pannonian Plain to Scandinavia**

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**Objectives:** Ragweed (Ambrosia spp.) pollen is an important aeroallergen that causes seasonal allergic rhinitis and asthma. This study describes the conditions required for the LDT of ragweed pollen from the Pannonian Plain (PP) to Sweden on the 27-28 August 2011.
**Methods:** Pollen movement from the PP was examined using a combination of daily and bi-hourly pollen count data, the overall synoptic weather situation, 3D analysis of the regional scale orography using Digital Elevation Models, surface meteorological data, satellite observations from Meteosat-MSG, and air mass trajectories calculated using the HYSPLIT model.
**Results:** During the episode, a combination of high pressure (1024-1028 hPa) situated over European Russia and the Black Sea to the east and deep low pressure (~990 hPa) over the British Isles in the northwest resulted in a general southeast-northwest movement of air towards Scandinavia. The 24 and 25 August 2011 were very hot causing large amounts of ragweed pollen to be released and taken high up in the atmosphere through convection. This also resulted in high Planetary Boundary Layers over the entire area. Pollen release and the southeast-northwest movement of air was enhanced by occurrence of the dry and gusty jet-effect Kosava wind, as well as the foehn wind down leeward slopes of the Carpathians into the PP.
**Conclusions:** These conditions facilitated the transport of pollen over areas of low elevation on the Western Carpathians (i.e. the Moravian Gate or Low Baskid passes) northward into Poland and beyond.

6th September 2012
P_RMP.5
**Ambrosia pollen in Central and South-East Slovenia**

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**Objectives:** Most of Slovenian lowlands are infested by ragweed (Ambrosia artemisiifolia L.) mainly along the roads, highways, railways and river banks. We noticed a higher concentration of ragweed pollen in the southeast part of the country on the Croatian border. It was stated that the Zagreb area in Croatia has a high ragweed pollen count, almost 9 times higher than central Slovenia (Ljubljana region). We presumed that the southeast part of Slovenia has similar characteristics as the Zagreb area. So in 2011 we performed measurements in the Krško – Brežiška basin which is directly linked to the Zagreb area and in Novo mesto, which is linked to the Zagreb area through the Krka river valley.
**Methods:** Ragweed pollen data were collected in Ljubljana for a 15 year period (1996-2011) in Novo mesto and the Krško – Brežiška basin (Čatež) in August 2011. For the detailed understanding of measured pollen in the southeast part of Slovenia the two hour concentrations were used.
**Results:** In Slovenia linear trend of pollen index for the past 14 years is slightly increasing. But between 1996 and 2011 a number of days in which pollen concentration exceeds 20 grains/m$^3$ increased. Concentration of 20 pollen grains/m$^3$ is considered as a limit afterwards most of ragweed sensitized people experience allergy symptoms. In the Ljubljana region measurements for August 2011 show the month pollen index of 634 pollen grains, in Novo mesto 2 - 5 times more and in the Krško – Brežiška basin even 5 times more. The comparison among these 3 locations also shows a different number of days, when concentration exceeds 20 grains/m$^3$, in the Ljubljana region it was 10, in Novo mesto 13 and in the Krško – Brežiška basin 24.
**Conclusions:** In the Krško – Brežiška basin concentrations of ragweed pollen were high. Results show that most of the August daily pollen counts exceeds 20 grains/m$^3$. In the future we should investigate how far into central Slovenia high concentration takes effect. Novo mesto is located in the Krka valley where we should also consider local winds, which are constantly present and they can carry pollen grains up the valley.

7th September 2012
ES_I.1
**Ozone affects the viability, the germination rate and the allergenicity of Acer negundo, Quercus robur and Platanus spp. pollen**

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**Objectives:** The increase of allergic respiratory symptoms has been related to the interaction between air pollutants and pollen allergens. Ozone is one of the most relevant air pollutants mainly due to its oxidative potential, both as an active agent and through ozonolysis-generated compounds that may interfere with pollen metabolism. We intended to assess ozone effects on the viability, germination rate, protein content and allergenicity of Acer negundo, Quercus robur and Platanus spp. in comparison to non-exposed control pollen samples.
**Methods:** The three pollen types were collected directly from dehiscent anthers and, after separation of external material, were artificially exposed to ozone at a concentration approximately 4-fold the standard limit value for the human health protection, during two consecutive days in an adapted environmental chamber. The pollen fertility was evaluated by the viability test using Trypan Blue Dye and the germination rate in optimized media for A. negundo, Q. robur and Platanus spp. Biochemical and immunochemical assays were performed in order to analyze changes in the protein content and IgE reactive profiles using sera from pollen sensitized individuals.
**Results:** After exposure to ozone, it was observed a decrease in the viability and in the germination rates for all pollen types assayed. Protein content estimation showed just a slight decrease. Immunochemical assays revealed different IgE recognition patterns for all pollen types studied in comparison to the non-exposed samples that showed lower intensity of protein bands. The most remarkable observations concerning allergen recognition and band intensity were those for A. negundo and Q. robur pollen.
**Conclusions:** In this study, we observed that pollen sensitivity to ozone is species-dependent. Extended ozone exposure induces changes in the metabolism and allergenicity of A. negundo, Q. robur and Platanus spp. pollen. Further oxidative stress assays and molecular biology approaches should be performed for relevant pollen types in order to compare differences on the antioxidant capacity and identify what ozone-mediated changes occur that potentially aggravate pollen allergy.
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7th September 2012
ES_I.2
**Differential uptake kinetics of nitrogen dioxide on various pollen grains**

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**Objectives:** The effects of gaseous pollutants (mainly nitrogen dioxide, ozone and sulphur dioxide) on pollen structure, viability and allergenicity have been widely studied in many pollen species. Despite such extensive works, there is no information available to compare the pollutants adsorption between different pollen species. In this study, we used a chemical kinetic approach to compare the potential sensitiveness of pollen of different species to a $NO_2$ exposure.
**Methods:** Experiments were done with desiccated pollens of birch, timothy grass and cypress and with freshly collected birch pollen. Those materials were exposed for 10 minutes to high doses of NO2 (5,000 ppmv) in a closed cell. The gas phase concentration of the pollutant has been measured online by Fourier Transform InfraRed spectroscopy. In a typical experiment, the $NO_2$ concentration in the cell decreases with different rates depending on the pollen nature and on the quantity of pollen exposed.
**Results:** For all pollen species, the uptake of $NO_2$ was fast and seemed to be non reversible (no desorption was observed). No reaction products have either been detected in the gas phase by means of FTIR spectroscopy. For a fixed mass of pollen (between 65 and 70 mg), the following first order kinetic constants have been measured: k(cypress)=0.0045 s-1, k(timothy grass)=0.0021 s-1 and k(birch)=0.0007 s-1. For the same experimental conditions, those values indicated for example that the $NO_2$ concentration is decreasing six times more rapidly in the presence of cypress pollen compared to birch. Experiments with birch pollen, stored under desiccated conditions and freshly harvested, have shown that pollen freshness increased by a factor of two the kinetic of NO2 uptake. Preliminary work done with pollen more or less dried have shown an increase of uptake with a higher water content of the pollen. So, we suggest that the observed increase with fresh pollen is explainable by higher water content. Finally, we have also shown that the uptake is influenced by the weight of sample. The amount of $NO_2$ uptake per mg of pollen is higher when the weight of pollen sample is diminished. The diffusion of nitrogen dioxide into the pollen powder explains probably that trend.
**Conclusions:** According to our experimental data, it is clear that pollen from different species have different behaviour regarding the uptake of $NO_2$. The sensitiveness of pollen to $NO_2$ is decreasing in the following manner: cypress > timothy grass > birch. Some guidelines could also be drawn from our set of data for further studies implying $NO_2$ exposition. Fresh pollen should be much more sensitive to pollutants than desiccated one and the pollen powder should be mixed of fluidized during fumigation to insure a homogeneous exposure.

7th September 2012
ES_I.3
**Air pollutants influence the NAD(P)H oxidases activity in cypress pollen**

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**Objectives:** The cypress is a genus of evergreen and resistant plants that are adapted well to the Mediterranean climate where they are widely used for reforestation and, above all, as ornamental trees in urban areas, both as individual specimens and as hedges. The most common species in central Italy are Cupressus sempervirens and C. arizonica, morphologically quite different, with pyramidal form and dark-green leaves the first, with a wider crown and grey-blue color that makes it very popular as a single specimen the second. The pollination period covers the whole winter period and the first half of spring period, with a temporal lag of about one month in the beginning: C. arizonica at the beginning of January and C. sempervirens in mid-February. Recently, there has been a significant increase in the cypress pollinosis in Perugia area (Central Italy) perhaps due to an increase of cypress trees as ornamental plants, but also because of amplified allergenicity of a single pollen. Many studies have demonstrated a positive association between air pollutants and increasing incidence of allergy in urban areas. Particularly, ozone and NOx modulate the airway diseases by increasing the release of inflammatory mediators and by producing reactive oxygen species (ROS). In addition to allergenic proteins, pollen grains contain myriads of other proteins with enzymatic activities, as the NAD(P)H oxidases, necessary to pollen tube elongation. They directly induce oxidative stress prior to allergic inflammation.
**Methods:** In the present work we investigated whether ambient levels of pollutants have an effect on the characteristics of cypress pollen that may contribute to its allergenicity. For this purpose we studied the pollen viability, ROS and NO production, NAD(P)H activity, and allergenic protein content in pollen from rural and urban areas of Perugia. The levels of the most important gaseous air pollutants are rising as a consequence of the increase of vehicular traffic in the city.
**Results:** The analyses showed that pollen viability, NO content and ROS release from hydrated pollen grains were not affected by pollutant levels. In contrast, a significant enhance of the ROS-generating enzyme NAD(P)H oxidase activity was evidenced in pollen grains from urban area. SDS-PAGE and immunoblotting analysis of the total protein released from pollen grains harvested in both rural and urban areas, revealed similar profiles with no quantitative difference in the major allergen Cup a 1.
**Conclusions:** These results suggest a positive association between increased incidence of allergy in urban areas and air pollutants, particularly oxides of nitrogen (NOx) and respirable particulates that act through NAD(P)H-oxidase stimulation.

7th September 2012
ES_I.4

**Investigation on the air pollutants of biological origin and its impact on human health**

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**Objectives:** India, is known as a climatically diverse country. Different types of pollen grains, fungal spores and other materials of biological origin are loaded in air as pollutants. That's why the aims of the research work were: i) to determine the peak concentration of dominating airborne pollen grains and their impact on human health, ii) to prepare a health survey report to note allergenic symptoms. iii) to identify the bio pollutants responsible for allergy.
**Methods:** Aerobiological-sampling and survey were done in a site very near to Kolkata city (22°82'N, 88° 20'E) with the help of Burkard Sampler. 200 people around the site were asked about their health following a questionnaire. Skin Prick Test (SPT), SDS-PAGE, IgE specific Immunoblotting were done.
Result: The calendar showed 42 types of pollen grains prevailing in air, where pollen grains of Poaceae were in highest number followed by Lantana camara, Meliaceae, Asteraceae, Trema orientalis, Cocos nucifera, Areca catechu, Phoenix sylvestris, Borassus flabellifer, Petlophorum pterocarpum, Mangifera indica, Carica papaya etc. A number of herbs and shrubs like Amaranthus viridis, Parthenium hysterophorus, Cyperus sp, Justicia simplex, Chenopodium album, Catharanthus roseus grow abundantly in that area. Four distinct seasons namely summer (March to May), monsoon (June to September), post monsoon (October to November), winter (December to February) have been recognized in West Bengal. The temperature fluctuates from 24-38°C during summer whereas 12-27°C in winter. Annual average rainfall is about 1,582 mm per annum (June-September). In health survey, the graph showing age group of 11-30 years was found to be more susceptible to seasonal changes rather than the rest. The females were more susceptible than males. It was noted that there was a positive correlation between the peak concentration of pollen grains and seasonal increase of allergy. The type of fuels, used may affect increasing of allergy symptoms and respiratory troubles. Frequent sneezing, coughing were in highest condition. SPT was done with Lantana pollen as this plant grows abundantly in the locality and also recorded to be present in high concentration in the air. SPT and ELISA were done with Lantana pollen extract which showed +2/+3 response among patients and high antibody titer in ELISA. IgE specific immunoblotting with positive patient sera showed the 38 kDa protein band to be most reactive.
**Conclusions:** There are number of pollen grains & fungal spores in high concentration in air as pollutants causing human health hazards. Results from bio-monitoring showing the significant presence of the exotic Lantana sp. associated with other pollen types in air. Biochemical tests showed its allergenic properties and highly reactive proteins causing mild to severe type-1 hypersensitivity. The missing factors like the way of living, poor knowledge of sanitation, awareness about health hazards etc., led to promote severe level of hypersensitive symptoms to the people. The survey and bio-monitoring results ultimately prove that the pollen grains were also promoting respiratory troubles and allergic symptoms in the locality and Lantana is a highly allergenic plant.

7th September 2012
ES_II.5

**Airborne pollen levels of the eleven most planted tree species in the streets of Barcelona and sensitization of the population**

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**Objectives:** The selection of the plants used as ornamental in streets, parks and gardens is based, usually, on aesthetic criteria and resistance to contamination, among other characteristics, but rarely on public health aspects such as the capacity of their pollen to elicit sensitization or allergy in the population. The objective was to determine the prevalence of sensitization of the inhabitants of Barcelona to the pollen of the eleven most planted ornamental trees in the streets of the Barcelona city.
**Methods:** The list of the 11 most abundant trees in the streets of Barcelona was provided by Parks and Gardens of the City Council and resulted in: Platanus, Celtis, Sophora, Ulmus, Tipuana, Robinia, Brachychiton, Populus, Melia, Ligustrum and Palm trees. Not included in this list because not used in streets but in gardens and squares and also abundant in the city were Olea and Cupressus. 427 patients older than 18 years and visiting the Units of Allergy at eight Hospital Units in Barcelona with a suspicion of asthma or rhinitis were enrolled. Prick tests were performed with standard extracts when existing and with extracts prepared for this study. The sampling and analyses of the Barcelona airborne pollen from 1994 to 2011 followed the methodology proposed by the Spanish Aerobiological Network (Red Española de Aerobiología, REA).
**Results:** Four of the most planted trees (Sophora japonica, Tipuana tipu, Brachychiton populneus, Melia azedarach) did not appear in the airborne pollen spectrum [aps] and it was really difficult to obtain pollen from their flowers, thus it was impossible to determine the sensitization. The rest of the trees showed sensitization capacity [sen] to rhinitis [rh] and/or to asthma [as]: Platanus(37% sen (39% rh-32% as); 34% pt; 37% aps), Olea (37% sen (30% rh-37% as); not Known pt; 3% aps), Ligustrum (22% sen ( 23% rh-27% as); 2,2% pt; 0,04% aps), Cupressus (14% sen (16% rh-0% as); not known % pt; 16% aps), Palm trees (6% sen (7% rh-10% as); Celtis (6% sen (6% rh-7% as); 11,6% pt; 0,06% aps), Robinia pseudoacacia (6% sen (6% rh-5% as); 4% pt; 0% aps), 1,7% pt; 0,5% aps), Ulmus (5% sen (5% rh-5% as); 4,4% pt; 0,3% aps); Populus (3% sen (3% rh-2% as); 3% pt; 0,8% aps). Almost all (97%) of the patients sensitized to Ligustrum were sensitized also to Olea, suggesting the importance of Ole e 1. All but one of the patients sensitized to Robinia pollen showed polisensitization (Olea, grasses and Platanus pollen), suggesting the role of profilin, polcalcin and 1-3 β-glucanase in this sensitization. All but two of the patients sensitized to Palm pollen showed polisensitization (Olea, grasses and Platanus pollen), suggesting the role of profilins in this sensitization.
**Conclusions:** There was a positive association between the detection of airborne pollen and the percentage of sensitizations. The use of Sophora, Tipuana, Brachychiton and Melia as ornamental trees is highly recommended. Palm trees, Celtis, Robinia, Ulmus and Populus could be used as ornamental if avoiding important concentrations. Platanus, Olea, Ligustrum and Cupressus should be avoided near the human settlements.

7th September 2012
ES_II.6

**Index of allergenicity of urban green zones: a new tool for planning and designing**

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**Objectives:** As Urban Green Zones are of strategic importance for the quality of life in today´s urbanized societies, it is necessary to adopt measures to make them places of recreation, amenities and well-being. This work outlines an index to quantify the potential allergenicity of urban green zones by considering both intrisic plant factors and parameters and other elements dependent on the landscape and urban design. To show the application of the index, an urban park of the city of Granada, south-eastern Iberian Peninsula was selected.
**Methods:** The index has been constructed by considering the following parameters: allergenic potential, pollen emissions linked to strategy of pollination, duration of the pollination period, surface occupied by species and number of individuals per species. The index is a function of the maximum values of allergenicity that could be recorded in a place of similar characteristics. Lanscaping and architectural features in and around the park has been evaluated as they might influence the accumulation of pollen.
**Results:** The Index of Allergenicity of Urban Green Zones (I UGZA) for the case-study considered is 0.117, resulting from a combination of species with taxonomic (771 trees from 65 different taxa), morphological (form, size) and biological (different strategy of pollination, different pollination period) diversity. Some of the negative aspects is the presence of several genera of the same family as cross-reactions may occur due to the presence of shared allergens. Other aspects to be considered are the formation of plant screens and monoespecific tree-lined avenues due to they act as important sources of pollen emissions. The built-up environment of the park also determines the extent to which biological particles can join the airflow and thus, be dispersed.
**Conclusions:** The index for quantifying allergenicity proposed constitutes an useful tool at time to estimate potential allergenicity of urban green zones. The index also allows the establishment of corrective measures driven to minimize the impact of pollen allergy. The index permit as well the comparisons between green spaces of similar characteristics in the same city, and even between spaces in different cities.

7th September 2012
ES_II.7

**Assessing the effects of the meteorological conditions on the pollen wall by EPMA**

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**Objectives:** Nowadays, air quality is a major concern. Pollutant emissions are aggravating respiratory diseases and increasing pollen allergies. Platanus, Acer and Pinus are three plant genera whose pollen is abundantly present in the atmosphere of Porto in early spring, having different levels of allergenicity. Porto city is bounded on the west by the Atlantic Ocean. The aim of this study was to characterize and compare the chemical changes that the wall of the three pollen types undergoes while in the atmosphere, using EPMA.
**Methods:** We compared pollen that was collected directly from the anthers to pollen that was captured from the atmosphere. For the airborne sampling, we used a 7-day Hirst-type volumetric spore trap, set on the roof of the Faculty of Sciences of Porto. Samples from four days, with different weather conditions, were studied. Analyses were performed with a Field Emission Electron Probe Microanalyser (EPMA) JEOL JXA-8500F. The chemical elements (N, O, Na, Mg, Si, P, S, Cl, K, Ca) were chosen by EDS qualitative analyses and WDS quantitative analyses were then performed at 6kV, 15nA.
**Results:** The control Pinus pollen wall showed major differences in chemical composition when compared to the other two pollen types. Control Platanus and Acer pollen did not present significantly different compositions, except for the amount of Mg and Ca. Airborne pollen showed alterations in elemental proportions, compared to the control pollen. These alterations consisted mostly of an increased amount of Mg, Cl, Na, Si, K and P. On the other hand, no Ca was added to the pollen wall while airborne. Mg, Cl and Na contents increased with relative humidity and decreased with temperature. On the studied days, wind blew predominantly from North/East or Southwest and it was on this latest situation that Si contents were higher. In spite of K and P increased contents in airborne pollen, no relation was found between the amount of these elements and meteorological conditions. S only increased in Acer and Platanus pollen and just in the 2 days when relative humidity was higher and temperature was lower. The deposition of sea spray ions ($Mg^{2+}$, $Cl^{-}$, $Na^{+}$ and $SO_4^{2-}$) on the pollen wall was more evident on the days with higher relative humidity/lower temperature, regardless of wind speed or direction. This indicates that, in Porto city, the pollen wall composition may be affected by the sea and that this effect is highly influenced by relative humidity and/or temperature.
**Conclusions:** The chemical composition of the pollen wall is altered when pollen grains circulate in the atmosphere. Changes are more significant when the meteorological conditions are favorable: high relative humidity/low temperature and prevailing wind direction from the shore. Platanus and Acer pollen walls tend to adsorb external elements in a greater extent than Pinus pollen wall.
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7th September 2012
ES_II.8
**Microbiological components in cigarette tobacco and smoke**

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**Objectives:** Cigarette tobacco is an agricultural product known to contain a multitude of bacteria and fungi. Microorganisms colonize tobacco plants naturally. The bacterial metagenomic of cigarette tobacco was characterized recently using a 16S rRNA-based taxonomic microassay. More than 90% of the studied samples of tobacco contained Acinetobacter, Bacillus, Burkholderia, Clostridium, Klebsiella, Pseudomonas, and Serratia spp; other potentially pathogenic bacteria include Campylobacter, Enterococcus, Proteus, and Staphylococcus. By using culture additional microorganisms, such as Pantoea, mesophilic bacteria, thermophilic bacteria, and fungi such as Aspergillus, have also been identified. Bacterial and fungal components have also been found in cigarette smoke. In 1999 it was shown that cigarette smoke contains biologically active endotoxin, e.g. toxic components of gram-negative bacteria. Later, it was demonstrated that the endotoxin is a true lipopolysaccharide (LPS) and that also ergosterol (Erg), a fungal membrane lipid, and muramic acid, part of bacterial peptidoglycan, are present in the smoke. In the present study we further studied LPS and Erg in cigarettes and smoke.
**Methods:** Mainstream and sidestream smoke, generated in contained systems, were collected on filters. Second hand smoke particles were collected by pumping air (20 L/min, 8 h) through Teflon filters (37 mm i.d., 5 μm pore size). Gas chromatography-mass spectrometry was used for measuring Erg and 3-hydroxy fatty acids (3-OH FAs), markers of respectively fungal biomass and LPS, in the smoke and in the cigarette tobacco. In brief, the materials (filters, tobacco) were transferred to Teflon-lined screw caps and heated in alkaline (Erg) or acid (3-OH FAs) methanol for hydrolysis or methanolysis, respectively, whereafter the analytes were converted to trimethylsilyl derivatives for analysis.
**Results:** American cigarettes of ten different brands purchased in the USA were similar in microbial marker composition as cigarettes of international brands purchased in two European and three Asian countries. Tobacco of local Chinese, Korean, and Vietnamese cigarettes typically contained much less of microbiological material. Sidestream smoke particles collected by "smoking" one American cigarette without any puffing contained 0.3-1.1% of the studied microbial compounds in relation to the amounts in the tobacco of a parallel cigarette. Mainstream smoke particles collected by using continuous suction of a lighted cigarette contained 10-20 times more of the microbial compounds than sidestream smoke of a parallel cigarette. Significant differences were found between rooms with and without ongoing smoking. At a studied worksite the LPS concentrations in a room without and with ongoing smoking were 0.6 (no smoking) and 23 (smoking) pmol/$m^3$. Corresponding levels of Erg were 0.03 (no smoking) and 29.6 (smoking) ng/$m^3$. There was a linear correlation ($R^2$=0.96) between Erg and LPS in the collected second hand smoke particles.
**Conclusions:** The microorganisms and microbial products which are present in tobacco and tobacco smoke may be responsible for some of the health effects of smoking. Public awareness that cigarette smoke exposure entails inhaling toxic and inflammatory microbial compounds may help individuals make informed choices with respect to smoking and exposure to second hand smoke.

7th September 2012
ES_II.9
**Efficient characterization and quantification of airborne pollen using DNA sequencing: a progress report**

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**Objectives:** Monitoring of airborne pollen provides valuable information for both research and hay fever patients. Currently, such monitoring involves visual recognition of captured pollen, which is labour-intensive, time-consuming and cannot discriminate all pollen species (e.g. different grass species cannot be distinguished visually). There is an urgent need for a more efficient and sensitive methodology. Therefore, we are developing a DNA-based approach to monitor pollen.
**Methods:** Purified pollen of Populus deltoides, Quercus robur, Plantago lanceolata, Artemisia vulgaris, Betula verrucosa and Dactylis glomerata were obtained from HAL Allergy (Leiden, the Netherlands). Pollen in suspension were lysed using a pressure cycler. The success of this procedure was determined by microscopic evaluation. DNA was isolated according to the CTAB method. So-called 'barcoding' loci (e.g. rbcL and trnL sequences in chloroplast DNA) were amplified by PCR and sequenced using next-generation sequencing. The DNA sequences of these loci were used to identify plants at different taxonomic levels, depending on the locus.
**Results:** Approximately 93% of the pollen were lysed using the pressure cycler. Sequence analysis of the trnL locus allowed correct identification of four species within the mixed pollen sample (Populus, Quercus, Betula and Artemisia). Dactylis was not identified using trnL locus.
**Conclusions:** We have shown that species identification of pollen using DNA sequencing is feasible. Remaining challenges include the optimization of the DNA extraction method and the choice of barcoding loci. Complete lysis of all pollen in a sample is crucial for quantitative pollen monitoring. Although the current method results in a 93% lysis, we intend to optimize the method further. Four out of five genera were identified using the chloroplast DNA locus trnL. Dactylis was not detected, which may be due to absence of chloroplasts in these pollen. To overcome this problem, we are experimenting with nuclear DNA loci for identification.

7th September 2012
RM.1
**Pollen loading from southeast border of EU**

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**Objectives:** Allergy from aeroallergens mounts up to 45% of all allergy cases and the prevalence is steadily increasing. Changes in the severity and frequency of rhinitis, conjunctivitis and asthma depending on the biogeographical and meteorological factors have been highlighted by many researchers. Interactions of variables such as diversity and the number of plant species, atmospheric pollutants and climatic factors are important parameters in the evaluation of vegetation-originated allergens and the allergic diseases caused by these allergens. Climatic diversity within Turkey is quite astonishing. On a somewhat smaller scale all climatic zones of Europe can be found. The Black Sea coast is humid all the year round. South of the Pontic Range rainfall drops abruptly and in Central Anatolia dry and winter-cold conditions prevail. Approaching the southern and western coasts, the climate turns more and more Mediterranean, with mild but very rainy winters and dry, hot summers.
**Methods:** In this article 63 publication were reviewed and aeroflora of the regions in Turkey were identified. In reviewed articles gravimetric and volumetric pollen samplers were used by researcher.
**Results:** Depending on all bioclimatic and geographical variety, aeroflora and pollination period of plants varies by region. The first study for aeroflora in Turkey had been done by Ozkaragoz in 1968 and until today in total 63 studies were done by various researchers. In this presentation, all of the aerobiological studies was reviewed. Aeroflora of the regions were presented. The most important allergenic pollen types for all of Turkey Cupressaceae/Taxaceae followed by Graminae and Olea sp. in the Mediterranean region.
**Conclusions:** Allergy is one of the major health problems observed all over the world. The complex interactions between genetic and environmental factors are suggested to be responsible for allergies and aeroallergens are considered among the main culprits. Knowledge about regional aeroflora and transportations of grains will be important for treatments and patients.

7th September 2012
RM.2
**Variability of grass pollen concentration during the 9 year period (2003-2011)**

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**Objectives:** In Latvia Poaceae pollen season continues from June to September, however the highest concentrations have been reached in the first half of July. It is related to the second highest pollen maximum in air over Riga, which has been stated at the end of June and beginning of July. In Latvia is little known about the variations between different grass pollen the start and throughout the Poaceae pollen season.
Method: This paper presents a preliminary study of the seasonal fluctuations of grass pollen data from aerobiological monitoring sites in Riga, Rezekne and neighbouring town in Lithuania Šauliai by 7-day Burcard trap, which allow get information about pollen concentration in the air. The origin data of pollen monitoring is the pollen count, which is a measure of the number of pollen grains of a certain type per cubic metre of air sampled, averaged over 24 hours. The pollen forecasts are produced by the aerobiologists using the pollen counts measured each day at the pollen monitoring sites, together with information about the weather, growing seasons and the flowering times of the plants.
**Results:** The highest concentrations in Riga usually have been reached in the first half of July, when grass pollen reaches their maxima, except year 2006, when the highest grass pollen concentrations has been observed from 14th to 21st June. Grass pollen peaks do not reach very high values (58 to 168 pollen/$m^3$) and are accompanied by large diversity of other herb pollen. Peaks of grass pollen are not well expressed. Comparison of grass pollen concentration and meteorological data allow to conclude that concentration do not depend from temperatures, but they decrease is related to the precipitation. New increase depends from sandy and windy weather conditions. The comparison of grass pollen concentration with pollen data from Rezekne ans Sauliai allow to suggest that in smaller cities grass pollen concentration is higher and pollen season are little bit longer.
**Conclusions:** Concentration of grass pollen grains in the air depends not only from meteorological parameters, but also from vary in flowering of different Poaceae family plants and in some way long year records of concentration reflect changes in plant growing conditions.

7th September 2012
RM.3

**Daily and hourly comparisons of airborne pollen concentration among 8 stations in central and southwestern Spain**

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**Objectives:** Castilla-La Mancha and Extremadura are two regions in the centre and southwest of Iberian Peninsula. They have similar Mediterranean-continental climate and April and May are the months with the highest amount of airborne pollen along the year. The aim of this work is to compare daily and hourly concentrations among the stations studied for the main pollen types and evaluate differences at a regional scale.
**Methods:** Airborne pollen from eight locations was studied: Albacete, Toledo, Talavera and Ciudad Real in Castilla-La Mancha and Badajoz, Plasencia, Santa Amalia and Zafra in Extremadura. The distances in straight line between pairs of stations range from 69 to 440 km. Pollen was recorded with Hirst type spore traps. We compared daily concentrations of the most abundant pollen in April and May 2011: Quercus, Poaceae, Olea and Plantago. Hourly data from ten continuous days including the peaks of concentration were analysed, 5-14 April and 5-14 May. Non parametric correlation was used to compare stations. Correlation coefficients were compared with distance among stations.
**Results:** Sums of daily pollen counts of the four pollen types selected in the two month studied ranged from 6687 in Albacete to 37182 in Badajoz. Quercus pollen type was the most abundant except in Ciudad Real, where Olea was the most abundant. The second was Olea, except in Plasencia, where Poaceae was the second. The third pollen type was Poaceae and the last one Plantago. Comparison between pair of stations using daily data showed correlation statistically significant and positive in different ways in 23 cases for Quercus and in 20 cases for Plantago. Hourly data showed more differences between stations. Statistically significant correlations appeared only in 7 cases for Olea, 6 cases for Poaceae, 3 cases for Quercus and only one case for Plantago. Correlation coefficients between stations showed a high negative correlation with distance in straight line.
**Conclusions:** Comparing the total pollen recorded from the stations studied, it seems that there is a geographical decrease in pollen from West to East and from South to North, in part in accordance to dominants winds. Daily pollen data showed more similarities among stations than hourly data. This could mean that hourly variations depend much more on local conditions. Olea and Poaceae airborne pollen show a similar pattern in the stations studied, nevertheless Quercus and Plantago even more, seem to depend more on local environmental conditions than on differentiate locations.

7th September 2012
RM.4

**Pollen concentration of allergenic plant taxons at three different sampling sites of southern and central Poland – the evaluation of the 9-year period (2003-2011)**

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**Objectives:** Pollen research have practical applications in prophylaxis and monitoring of patients with pollen allergy as well as in other sciences, such as biology and geosciences. The aim of the study was the analysis of long-term trends in the dynamics of 20 taxons of plant pollen carried out in three cities in central and southern Poland.
**Methods:** Concentrations of pollen were determined with a volumetric method in three cites: Lodz (Łódź) [central Poland, (the distance from other two cites was about 200 km)], in Krakow and in Sosnowiec [southern Poland, (the distance – 60 km)]. For the everyday data description was used General Line model with the $\log_n$ function, which made the model independent of non-linear associations. The variables were transformed with Cox-Box method to make them similar to the normal distribution.
**Results:** There were no trends that would point to an earlier start of pollen seasons. Annual average pollen concentrations of the 20 studied taxons analyzed in three cities were different in different seasons $p<0.0001$. The highest concentrations of the 20 taxons were noted in Krakow, and were lower in Lodz (Łódź) and in Sosnowiec $p<0.0001$. Having compared the percentage of the studied taxons of tree pollen in the three cities over the period of nine years, the researchers confirmed, that birch pollen constituted the highest percentage (42.3%). Next were: the pine family (22.5%) and the alder (10.6%). In Krakow birch pollen constituted 29.6%, pine family pollen - 20.8% and alder pollen – 11%. In Lodz (Łódź) and Sosnowiec the results were similar: the birch – 47.7% and 46.3% respectively; the pine family: 22.9% and 23.2%; the alder – 11.6% and 8.9%. With regard to herbal plants, the nettle demonstrated the highest concentration in the three cities, i.e. 67.2%. In Krakow and Lodz (Łódź) the concentration was 50.9% and in Sosnowiec – 57.1%. Next was the grass – 26.1% (in Krakow – 21.3%, Lodz (Łódź) – 30.5% and Sosnowiec – 26.7%) and finally – the sagebrush – 6.4% (in Krakow – 5.1%, Lodz (Łódź) – 6.9% and Sosnowiec – 6.8%). No statistical differences were noted in the concentration of ambrosia (the taxon of the indicative character) measured over the period of nine years in these three mentioned cities ($p=0.1$).
**Conclusions:** We did not observe any trends which would be distinctly connected with global warming in cities of central and southern Poland, within the period of nine years. The analysis of the concentrations of the 20 studied taxons of plant pollen confirmed the highest level of nettle and birch. There were similarities in the modes of discharging pollen in Lodz (Łódź) and Sosnowiec despite the fact the cities are located at a different latitude.

7th September 2012
RM.5

**Comparative study of airborne pollen counts located in different areas of the city of Córdoba (South-Western Spain)**

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**Objectives:** Airborne pollen counts are mainly determined using a volumetric suction sampler based on the impact principle, i.e. a Hirst-type spore trap. As a consequence of their volumetric nature, samplers detect pollen from a wide area and therefore a single sampler is frequently used so as to acquire information on airborne pollen counts for the whole city. The main goal of the present study was to compare airborne pollen counts at two sites located at opposite ends (south-west vs. north-east) of the southern Spanish city of Córdoba, to assess the advantages and disadvantages of using more than one sampler in the city. Also, a comparative study was carried out using two samplers at the same site (south-west), in order to confirm the efficiency of the samplers.
**Methods:** The study was carried out from 2006 to 2010, using two Hirst-type volumetric spore traps, separated 9 km apart. The methodology developed by the Spanish Aerobiology Network was used to obtain the average daily airborne pollen variations (pollen grains/m3). The study focused on the seven most common airborne pollen types in Córdoba: Cupressaceae type, Olea europaea, Platanus hispanica, Poaceae type, Populus type, Quercus type and Urticaceae type (including Urtica membranácea Poir.). To look for statistical differences between pollen counts at the two sites, Pearson correlation analysis and t-test was applied to pollen data recorded at the two sites (south-west and north-east) as well as to data obtained from samplers at the south-west site, to test for possible differences between variations and means of the data recorder at each site. A Wilcoxon test was applied to check for differences in pollen-count distribution between the two sites throughout the season. Finally, an ANCOVA analysis was performed in order to analyze the effects between localization and pollen count. To analyze the clinical implication of the pollen concentration results in each area, pollen counts have been classified using a threshold system. These levels are useful to determine the biological quality of the air. Percentages of similarity in both areas have been calculated using these thresholds.
**Results:** Comparison of data obtained by the two samplers running at the SW site indicated that potential inter-site differences could not be attributed to differences in sampler efficiency.
Pollen counts for each of the taxa studied over the season should display similar trends at the two sampling sites tested. However, inter-site differences were observed in mean counts and distribution. No major inter-site differences were found for pollen-season start and end dates. Differences recorded for certain pollen types – including Platanus, Quercus and Urticaceae – confirmed the influence of surrounding natural and ornamental vegetation on airborne pollen counts at each trap.
**Conclusions:** In summary, one volumetric sampler  located within a city as the characteristic of Córdoba  is sufficient to establish the main airborne pollen types, the pollen seasons involved and the timing of peak counts. Even, from an allergological point of view, when the threshold-values for the allergic reaction are reached, even large quantitative differences has little consequence.

7th September 2012
RM.6

**A comparison between airborne Betula pollen counts in the northwest of Germany and the Netherlands (1982-2011)**

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**Objectives:** One aim of the present study was to look for similarities and differences in airborne pollen load between neighbouring and far away monitoring sites in low areas of Northwest Germany and the Netherlands. Another central aspect was the question, if there are already recognizable effects of climate change on time and amount of pollen catch. The investigation focused on Betula because of its allergenicity and the prevalence of one species (B. verrucosa).
**Methods:** For the present study data were used that were collected using Burkard traps at three monitoring sites in northwest Germany, and two in the Netherlands. The three sites in Germany were Delmenhorst (city centre, close to Bremen, 1982-2011), Ganderkesee (rural site; 8 km west of Delmenhorst, 1994-2011) and Vechta (university campus; 40 km south of Delmenhorst, 1997-2011). The two sites in the Netherlands were Leiden (270 km west of Delmenhorst; Northsea coast) and Helmond (250 km southwest of Delmenhorst), both covering 1982-2011.
**Results:** During the observation period (1982-2011), at all three long-term sites (Helmond, Leiden and Delmenhorst) the pollen season reached its average peak (based on 9 days running means) within 3 days in April (Delmenhorst and Helmond 22nd, Leiden 24th). The mean onset of the pollen season (passing 5% of seasons sum) occurred within only 2 days in April (Helmond and Leiden 2nd, Delmenhorst 3rd). The end of the season (passing 95% of seasons sum) covers more space of time in May (Helmond 3rd, Leiden 9th, Delmenhorst 6th). The highest degree of homology in the pollen season was reached in years with a late onset of the pollen season. In years with an early onset and high pollen counts, time of peak) covers 9 days in April (Helmond 8th, Leiden 13th, Delmenhorst 16th). Mean total annual counts (82-11) are similar in Delmenhorst and Helmond, whereas in Leiden only one third of those counts was found. From 1995 up to 2007 there is a synchronous biennial rhythm in annual totals at all monitoring sites. Comparison of consecutive collecting periods (1982-1996 and 1997-2011) at the three long-term sites reveals earlier main peaks in the later period (difference of 17 days for Helmond, 5 days for Leiden and 3 days for Delmenhorst) and higher averaged maximum of temperature (Helmond 14.1/15.0°C, Leiden 13.3/14.0°C). The three German sites (1997-2011) show a large similarity in peak of birch pollen season: April 19th for Vechta and April 21st for Delmenhorst and Ganderkesee. As to the mean total annual counts the German sites were at a ratio of 2 (Delmenhorst): 1 (Ganderkesee): 0.7 (Vechta).
**Conclusions:** The better chronological agreement in Betula pollen season at the three German sites is most likely due to their proximity and therefore their minor differences in climate. The differences in time of pollen emission between Delmenhorst and the Netherland sites may reflect the differences in climatic conditions. Higher temperatures in the period before flowering between these sites may be the cause for an earlier main peak of Betula pollen season in Helmond. Different annual totals of Betula pollen are mainly due to the frequency of birch trees in the neighbourhood of the traps.

7th September 2012
FM.1

**Episodes of the long-distance transport of birch pollen to Poznań, Poland**

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**Objectives:** Trees from the genus Betula produce large amounts of pollen grains that, in Central Europe, are rated one of the most important aeroallergens. In 2006 and 2008 elevated daily average birch pollen concentrations (>1000 P/m$^3$) were recorded both before and after the local birch flowering period. It was hypothesized that this phenomena were caused by the long distance transport of pollen (LDT).
**Methods:** Daily average Betula pollen counts (2006-2010) were collected in Poznań by two volumetric spore traps of the Hirst design. One sampler was sited in the city centre and another on the outskirts of the city. The limits of the pollen season were calculated by using the 95% method, whereby the season starts when 2.5% of the total catch was achieved and ends when 97.5% is reached. Phenological observations of Betula pendula flowering were conducted in Poznań simultaneously with aerobiological monitoring. Four phenophases were observed: F1- beginning of flowering (first flowers release pollen), F2- full flowering (>25% of flowers release pollen), F3- decline of flowering (<25% of flowers release pollen), F4- end of flowering (no flowers release pollen). Air mass trajectories for every day analyzed were calculated using the HYSPLIT (HYbrid Single-Particle Lagrangian Integrated Trajectory) model via NOAA ARL READY Website.
**Results:** In 2006 the full flowering phase of B. pendula in Poznań lasted from 22-27 of April. The last trees liberating pollen were noticed on 5 May. Between 5-10 of May very high concentrations of pollen were observed in the air. During this period over 30% of seasonal sum of pollen was recorded. Back trajectory analysis showed that the air masses arriving at Poznań on these days came from the north-east direction, mainly from Belarus, Lithuania and Latvia. In 2008 the onset of birch pollen season occurred at 13April, one week before the start of local B. pendula flowering. During that period about 20% of the seasonal sum of pollen was recorded in the air. The highest concentrations of pollen were noticed in the night between 01:00 a.m. and 03:00 a.m. According to the HYSPLIT model the air masses arrived from south directions (Czech Republic) during this period.
**Conclusions:** The study suggests that the elevated concentrations of birch pollen grains can be transported to Poznań from the distance sources before and after the local trees flowering periods. The potential sources of pre-seasonal Betula pollen are the Czech Republic and post-seasonal peaks are related to air masses coming from the east Baltic region. During these episodes the pollen level can exceed values that may elicit symptoms of allergy in sensitized individuals therefore the information about the LTD episodes should be taken into account during allergy treatment.

7th September 2012
FM.2

**Pollen-climate correlations based on 13 years of monitoring pollen deposition in south-eastern Poland (Roztocze region)**

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**Objectives:** Pollen accumulation rates (PARs) obtained in the course of on-going monitoring into Tauber-style traps in the Roztocze region are presented against the background of the temperature and precipitation data.
**Methods:** Nine pollen traps have been operating along a N–S transect from natural forests of the Roztocze National Park to open situations. In the past pine was supplanted in the habitats of beech forests and nowadays is the most widely widespread tree together with birch which overgrows abandoned fields in semi-agricultural landscape around the Park. PARs of the following trees have been analysed: Betula pendula, Pinus sylvestris, Alnus glutinosa, Fagus sylvatica, Abies alba, Carpinus betulus, Picea abies, Quercus sp. in the period of 13 years (1998-2010).
**Results:** Great year-to-year variation in annual PARs is controlled mainly by physiological rhythms and climatic factors such as summer temperature of the year before pollen emission and humidity. Betula and Alnus show more or less biannual rhythm in abundant flowering, sometimes the abundant year follows two low years of two years of moderate deposition. No rhythm is noticeable in Pinus sylvestris. Climate signal was observed several times when every few years there occur abundant flowering years of Fagus sylvatica, Abies alba, Picea abies, Quercus sp., Carpinus betulus. In the Roztocze region it is easy observable in cases of Fagus and Abies – which form tree stands. High flowering year is reflected in PARs in most of nine pollen sites, especially in "regional" traps situated in open landscape.
**Conclusions:** Earlier findings on controlling role of temperature and precipitation during the summer prior to pollen emission were confirmed especially in case of Fagus, Abies and Pinus. The best results of correlation coefficient were obtained for trees most abundant in the vegetation.
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FM.3

**Studies of vegetation, modern pollen "rain" and fossil pollen composition from raised bog monitoring sites in Latvia**

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**Objectives:** In Latvia mires cover about 10% from entire territory. Mire vegetation has been changed during comparatively short time in result of both natural and human impact. It is important to forecast it further development, but for it is important to know it's character in the past. Usually it is studied and interpreted from fossil pollen records, however it is important to understand how fossil pollen reflect present vegetation. There are not enough information about vegetation dynamic in the raised bogs. Therefore pollen monitoring has been carried out in several large raised bogs. Tauber traps of pollen monitoring sites are located in different geographical areas. The modified Tauber trap sites are located in the three different areas of each bog, including open areas and margin of the bogs.
**Methods:** Investigations of pollen and vegetation in raised bogs (Teici, Suda, Kemeri mires) were carrier out by standard methods according to Pollen Monitoring Program guidelines [1] and fossil pollen analysis by Berglund and Ralska-Jasiewiczowa [2].
**Results:** As one of most representative study area is Teici Mire, which is the largest raised bog massif in Latvia and is located at the Eastern Latvia Lowland. Pollen monitoring in Teici is carried out since 1997. Pollen traps are located in on the bog-forest or boundaries; however there are significant differences in vegetation composition. Pollen trap TC-1 is located in the peaty pine forest, which in the western direction has border with grass transition mire and microlandscape Sphagnum hillocks with Andromeda polifolia, Chamaedaphne calyculata, Salix sp., while TC-2 is located at the boundary of bog, forest and agricultural lands, mainly pastures. At the TC-3 the surroundings of site are characterised by raised bog vegeation represented mainly by Sphagnum hillocks with Calluna vulgaris, Rubus chamaemorus, Empetrum nigrum, Eriophorum vaginatum and Andromeda polifolia. Pollen data reflect some changes during last 14 years vegetation composition. In trap TC-1 decrease of pine and significant increase of birch pollen proportion in composition has been observed. In composition of local vegetation e.g. herbs and dwarf shrubs are drawn decrease of Poaceae and Cyperaceae pollen and some increase of Calluna vulgaris and Ledum palustre. The results are contrary to data from earlier investigations both pollen "rain" monitoring and fossil pollen and probably are caused by local factors, including meteorological factors. Part of nonboreal pollen is represented by Ericaceae, Poaceae, Cyperaceae and Chenopodiaceae pollen.
**Conclusions:** Comparison of the obtained pollen data from raised bogs show best conformity of pollen "rain", fossil pollen and surrounding vegetation from the Teici Mire.
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7th September 2012
FM.4

**14 years of modern pollen monitoring in Latvia**

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**Objectives:** Monitoring pollen deposition, using modified Tauber traps following PMP protocols has been in progress in Latvia since 1997 in oldest trap sites: Taurene, Teici and Rucava. Although the financial crisis the Rucava traps have been stopped to monitored. Tauber traps of pollen monitoring sites are located in different physical geographical and geobotanical regions of Latvia. Teici trap sites are located in raised bog - Teici Mire (TC-1, TC-2 and TC-3) in the Eastern Latvia Lowland. Taurene (TR-1 and TR-2) in the Vidzeme Upland, Rucava (RU-1 and RU-2) monitoring sites are located in the western part of Coastal Lowland. In each of these areas are at least two traps one for open area, other one for closed forested area. Some years latter more traps were monitored in Kemeri, Suda and Seda mires. The main aim of study is to find out how pollen "rain" reflects dynamics of surrounding vegetation in bog areas.
**Methods:** Pollen monitoring were carrier out by standard methods following to Pollen Monitoring Program guidelines [1], including pollen analysis of trap and moss polster, vegetation mapping and landscape estimation, as well as, fossil pollen analysis were carried out in all sites.
**Results:** Pollen monitoring in Taurene, Teici and Rucava is carried out since 1997. At the beginning of monitoring modified Tauber traps were put in open, partly open, usually on the bog-forest boundaries and in closed forested areas. The most problematic were monitoring from open areas traps. In spite of very careful choice of trap site, traps very rare were preserved until next autumn. Traps in forested and partly open areas were preserved well and continuous data row were obtained for Taurene and Teici traps. Pollen data from traps at Taurene site reflect some changes in vegetation composition during the last 12 years. The main tree pollen in the surroundings of traps is Pinus sylvestris, Picea abies and Betula pendula. Among pollen spectra Pinus and Betula pollen prevail. Significant increase of birch pollen is characteristic for the last 5 years. In both traps (TR1 and TR2) decrease of pine and significant increase of birch pollen proportion in composition has been observed. In composition of local vegetation e.g. herbs and dwarf shrubs are drawn decrease of Poaceae and Cyperaceae pollen and some increase of Ledum palustre and Vaccinium, which can be explained by forest development and decrease of open areas. Fossil pollen data from the upper 50 cm of section close to trap as well as $^{14}$C dates indicate very slow peat deposition during last 3500 years. Fossil pollen composition from this interval reflects surrounding vegetation composition very well. Significant changes in trap pollen composition greatly depend from pollen productivity and meteorological conditions during pollination period. Monitoring data from Teici, Seda and Kemeri Mire show similar tendency.
**Conclusions:** Surrounding vegetation composition and openness has been changed during long years pollen of monitoring and make problems to compare data. Each year data from modified Tauber traps are variable, while average values of them and pollen production calculations show good agreement with trap pollen composition and the surrounding vegetation.
**References:**
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