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Intermuseum network for conservation of the artistic heritage: MUSA PROJECT

De Nuntiis, P.[1]; Bitelli, L.[2]; Guaraldi, C.[3]; Mandrioli, P.[3]; Monco, A.[3] & Salvi, A.[2]

[1] Università di Urbino, Facoltà di Scienze Ambientali, Urbino, Italy.
[2] Regione Emilia-Romagna, Istituto per i Beni Artistici, Culturali e Naturali (IBC), Bologna, Italy.
[3] Consiglio Nazionale delle Ricerche, Istituto di Scienze dell'Atmosfera e del Clima (CNR-ISAC), Bologna, Italy.

MUSA project's order word is "preventive conservation". MUSA project was born from the necessity of conserve exhibits in the best possible condition into the museums, art galleries, libraries, churches and underground archaeological sites. Unfortunately objects are not "naturally" preserved but tend to deteriorate. So it's very important to survey the quality of the air "enveloping" works of art displayed in museums controlling the physical, chemical and biological parameters of the air by target analysis campaigns and the aid of microclimatic instrumentation. Also recent norms and laws establish the standards and targets of quality that museums, libraries and historical archives will have to achieve in the near future, in particular the Ministerial decree dated 10/05/2001 that stimulated the project.

MUSA project has created a network that exploits Internet and wireless communication technology to monitor buildings containing works of art using a remote-controlled system. The experimental phase, lasted about two years, is finished on 31/12/03 and has involved three pilot sites in the Emilia – Romagna region, Italy.

The network offers museum curators and technical staff a practical means of tackling preservation of the cultural heritage by automatically measuring the physical parameters of peripheral sites. The parameters measured are those fixed in the decree over cited: Temperature and Relative Humidity for physical parameters, Bacterial, Fungal and Total Microbial load for biological parameters. The aerobiological measurements are carried out with the Andersen sampler (6 stages) in different seasons and in the rooms with risk situations. The data of Bacterial load, Fungal load and Total Microbial load are expressed as Colony Forming Units per cubic meter of air (CFU /m^3). Other parameters like the concentration of chemical pollutants will also be monitored in the future. The main philosophy of MUSA project is to verify the resistance of various type of materials related to the environmental conditions.

The system will be particularly useful for those sites without conservation experts to report situations at risk or ongoing hazards. Infact all parameters monitored are transmitted in real time from the peripheral sites to a central archive (database) providing analyses and forecasts on the trend of environmental conditions.
The graphic interface of the database consists of a web site, www.isac.cnr.it/musa, a useful tool for connecting remote sites with the operation centre (CNR-ISAC).

Will come shown the results obtained in the experimental phase: the biological data in relation with the main microclimatic parameters.

In conclusion, project's next phase will be concentrated on the study of relation between materials and biological and phisical parameters and the research of threshold in which works of art must be mainteined for their optimal conservation in relation to their constituent materials.

Session c7

APPLIED AEROBIOLOGY: CLIMATIC CHANGES

The impact of recent climate changes in Europe on the start of *Betula* (birch) pollen seasons in seven countries

Emberlin, J.[1]; Detandt, M.[2]; Gehrig, R.[3]; Jaeger, S.[4]; Laaidi, M.[5]; Nolard, N.[2]; Rantio-Lehtimäki, A.[6] & Stach, A.[7]

[1] National Pollen Research Unit, University College, Worcester WR2 6 AJ, UK.
[2] Ist Sci Sante Publique Louis Pasteur, Mycologie, Juliette Wystmanstraat 14, B-1050 Brussels, Belgium.
[3] MeteoSwiss, Kraehbuehlstrasse 58 CH-8044 Zuerich, Switzerland.
[4] Dept of Otorhinolaringology, University Hospital, Währinger Gürtel 18-20, A-1090 Wien Austria.
[5] Laboratoire Climat et Santé, Centre Universitaire d'Epidémiologie de Population, BP 87900 - 21079 DIJON Cedex –France.
[6] Aerobiology Unit, FIN-20014 University of Turku, Finland.
[7] Instytut Badan Czwartorzedu I Geoekologii, Uniwersytet im.A. Mickiewicza ul Wieniawskiego 17/19 61-713 Poznan, Poland.

*Betula spp.*pollen is an important aeroallergen over large areas of NW Europe. It is a notable cause of symptoms of hayfever and asthma. *Betula* allergens cross react with many other closely related taxa including *Alnus*, *Corylus* and *Carpinus* spp. and also with some foods such as apples. Changes in the start dates of Betula pollen seasons are significant as they have an impact on the length of the " allergy " season and have consequences for health care. The timing of Birch pollen seasons is known to depend mostly on a non linear balance between winter chilling required to break dormancy, and spring temperatures. Consequently trends in start dates can give a clear indication of a biotic response to climate changes. Previous work (Emberlin *et al.* 1997) has shown a recent trend for the seasons to begin progressively earlier in the UK by about 5 days per decade. A comparative analysis of long term records (1982 to 1999) from six sites across Europe (Emberlin *et al* . 2002) revealed marked regional differences in trends in relation to the features of temperature profiles.

The research reported in this paper extends these investigations over a wider geographical area and includes data up to 2003 in order to examine the most recent situation. The data for the start dates of pollen seasons are also compared to early spring phenophases for *Betula* and related taxa with the aim of identifying relationships that could be applied to a larger regional coverage than that available from pollen monitoring sites. In particular the work investigates relationships between the changes in pollen season start dates and changes in spring temperatures over approximately the last twenty–two years.

Daily Birch pollen counts were used from Kevo, Turku, London, Brussels, Zurich, Vienna, Paris, Lyon and Poznan for the core period 1982 to 2003. The sites represent a range of biogeographical situations from just within the Arctic Circle through to North West Maritime and Continental Europe. Pollen sampling was taken with Hirst type Volumetric spore traps. Weather data (daily mean, max and min temperature and rainfall) was obtained from the nearest sites to the pollen traps. Pollen season start dates and monthly mean temperatures for January through to May were compiled to five year running means to examine trends. The start dates for the next ten years were calculated from regression equations for each site, and information from the latest climatic predictions. The analyses show regional contrasts. For example, the most northerly site, Kevo shows a marked trend towards cooler springs and later starts. Turku exhibits cyclic patterns in start dates. A current trend towards earlier starts is expected to continue until 2007, followed by another fluctuation. London, Paris, Lyons, Brussels, Zurich, Vienna and Poznan show similar patterns in the trends towards earlier start dates but with some regional differences. If the trend continues the mean start dates at these sites will become earlier by about six days over the next ten years. The relationships with phenophases have been established where data is available. This information could assist forecasting start dates. The results of this study not only have implications for allergy sufferers and health care providers but also for the assessment of the biotic impacts of climatic changes.

EMBERLIN, J., MULLINS, J., CORDEN, J., MILLINGTON, W., BROOKE, M., SAVAGE, M., JONES,J. 1997 The trend to earlier Birch pollen seasons in the UK.:A biotic response to changes in weather conditions? **Grana** 36: 29-33

EMBERLIN, J., DETANDT, M, GEHRIG, R., JAEGER, S., NOLARD, N., RANTIO-LEHTIMÄKI, A., 2002 Responses in the start of *Betula* (Birch) pollen seasons to recent changes in spring temperatures across Europe. **Int J of Biometeorology** 46. 159-170

Global warming and the earlier start of Japanese-cedar (*Cryptomeria japonica*) pollen season in Toyama, Japan

Teranishi, H.[1]; Katoh, T.[1]; Kenda, K.[1] & Hayashi, S.[2]

[1] Department of Public Health, Faculty of Medicine, Toyama Medical and Pharmaceutical University, Toyama 930-0194 (Japan).
[2] Department of Agricultural Technology, Toyama Prefectural University, Toyama 939-0398 (Japan).

The global warming becomes to be an important problem all over the world. However, its effects on the organism and the health have not been sufficiently clarified. In this study, we investigated relationships between the current changes of Japanese cedar (*Cryptomeria japonica* D. Don; *C. japonica, Sugi* in Japanese) pollen season and the climate changes in Toyama Japan.

Atmospheric pollen surveys were conducted at Toyama Medical pharmaceutical University, Toyama, Japan. Airborne pollens were collected using a Durham sampler (gravity method) over the last 20 years form 1983 to 2003. The airborne pollens were also collected and counted using a Hirst-type volumetric spore trap (Burkard, Englnad) from 1996 to 2003. The changes of Japanese-cedar pollen season were evaluated by these two methods, the gravity method and the volumetric method. Dispersion start day was shown as number of the days from January 1. Meteorological data were obtained from Toyama meteorological station.

By the gravity method, beginning day of the pollen season was shown to be clearly advanced from 1983 to 2003. Although the pollen dispersion started on the 73rd day in 1983 and the 80th day in 1984, the dispersion started earlier on the 52nd day in 2002 and the 47th day in 2003. The current trend was confirmed by the data obtained by volumetric method, though some other fluctuations were also observed.

By the meteorological data, it was demonstrated that the temperature elevation in February was the most remarkable. Monthly mean temperature of February changed from 1.3 degrees C in 1983 to 3.4 degrees C in 2003. The temperature raised by 2.1 degrees C in February and 0.8 degree C in March during the 21 years. Significant correlation coefficients were obtained between the mean temperature and the start day of pollen season at the 5% level: r□0.88 in February and r□0.70 in March.

In conclusion, the global warming, especially the temperature changes in February, influences the earlier start of the pollen dispersion of *C. japonica*.

Role of meteorological factors on pollen production of *Ambrosia*

Juhász, M.[1]; Makra, L.[2] & Juhász, I. E.[3]

[1] Archeological Institute of HAS, H-1014 Budapest (Hungary).
[2] Department of Climatology and Landscape Ecology, University of Szeged, H-6701 Szeged (Hungary).
[3] Department of Botany, University of Szeged, H-6701 Szeged (Hungary).

Ambrosia (ragweed) arrived in Hungary from the ports of Adriatic Sea in the 1920s, and by the end of the 20[th] century it has become widely distributed. Szeged is counted among the most polluted cities in the Carpathian Basin regarding the *Ambrosia* pollen. The highest pollen loads in Southern Hungary (together with those of the northern part of Serbia-Montenegro) are at least one order of magnitude higher than those in the rest

of Europe. *Ambrosia* has the most aggressive pollen of all. According to clinical investigations, its allergenic pollen results in the most massive, most serious, and most long-lasting pollinosis.
The aim of our study was to analyze how ragweed pollen concentrations are influenced by meteorological elements in Szeged, in Southern Hungary.

The data base consists of daily ragweed pollen counts and averages of 11 meteorological parameters for a five-year daily data set collected between 1997-2001. The latter parameters are as follows: the mean air temperature (T_{mean}, °C), the maximum air temperature (T_{max}, °C), the minimum air temperature (T_{min}, °C), the daily temperature range ($\Delta T = T_{max} - T_{min}$, °C), relative humidity (RH, %), irradiance (I, W/m^2), wind speed (WS, m/s), vapor pressure (VP, mb), saturation vapor pressure (E, mb), potential evaporation (PE, mm) and the dew point temperature (T_d, °C).

It is represented that no any meteorological parameters have significant trends in the examined five-year period. Daily pollen concentrations show significant negative correlations with relative humidity of the former day and the same day (r = –0,30 and r = –0,25, respectively). It should be mentioned that daily pollen concentrations indicate a slight positive connection with the irradiation of the former day and the same day, as well as the potential evapotranspiration. The physical background of the here-mentioned relationship is obvious. Namely, if the irradiation rises, then, on the one hand, relative humidity decreases owing to the rising temperature; on the other hand, because of the rising deficiency of the saturation vapor pressure the potential evapotranspiration increases.

Average variability of the standard deviations of the 11 meteorological parameters (difference of the minimum and maximum standard deviations in the examined five years, expressed in the unit of the five-year average standard deviation) was also determined. This value was the highest for the earlier mentioned relative humidity and the potential evapotranspiration (0,63 and 0,69, respectively). Furthermore, T_{max} (= 0,49), ΔT (= 0,45) and E (= 0,46) are worth to mention. However, correlation of these elements with daily ragweed pollen concentrations is not significant.

The application of the Makra-test indicates the same period for the highest pollen concentration that has been established by the Main Pollination Period. After performing factor analysis for the daily ragweed pollen counts and the examined 11 meteorological variables, 4 factors were retained, which explain 90.0 % of the total variance of the original 12 variables. Assessment of the natural logarithm of the daily pollen number was performed with multiple regression analysis, which explains 89.0 % of its total variance. Both factor- and regression analysis confirm that, among meteorological variables, maximum air temperature and vapour pressure have the most important role in increasing daily pollen counts.

JUHÁSZ, M. & MAKRA, L. 2002: Change of ragweed pollen concentration in Szeged city in the function of meteorological elements. **Proceedings of the 9[th] Symposium on Analytical and Environmental Problems**, Szeged (Hungary), 239-243.

VITÁNYI, B., MAKRA, L., JUHÁSZ, M., BORSOS, E., BÉCZI, R. & SZENTPÉTERI, M. 2003. Ragweed pollen concentration in the function of meteorological elements in the south-eastern part of Hungary. **Acta Climatologica et Chorologica Universitatis Szegediensis,** 36-38, 121-130. ISSN 0563-0614.

Spring germination date and CO_2 concentration influences pollen production in ragweed (*Ambrosia artemisiifolia* L)

Rogers, C. A[1]; Wayne, P.[2]; Muilenberg, M. L.[1]; Wagner, C.[1]; Bazzaz, F.[3] & Epstein, P.[4]

[1] Environmental Health, Harvard School of Public Health, [2] New England School of Acupuncture,
[3] Organismic and Evolutionary Biology, Harvard University, [4] Center for Health & Global Environment, Harvard Medical School.

Several alterations to current climatic conditions are predicted to occur due to impending global climate change which will have impacts on biological systems at several scales. Two conditions most likely to occur are an increase in the length of the growing season and an increase in atmospheric CO_2. The current study examines the potential implications of these changes on pollen productivity in ragweed (*Ambrosia artemisiifolia*).

Ragweed plants were released from dormancy at three 15 day intervals to simulate spring climate variability. Plants (n=144) were grown in glasshouses at either ambient or twice ambient CO_2 levels (350ppm or

700ppm). Open top polyethylene bags were placed over 3-5 inflorescences per plant (n=477) to capture pollen. Allometric measurements on each plant were made at harvest. Pollen production per inflorescence was measured by washing each bag and spikelet and counting pollen grains from the wash solution using a hemocytometer. The lengths of all inflorescences (n>18,000) were measured and whole plant pollen productivity was obtained from regression analysis relating pollen production to inflorescence length.

Ragweed plants released from dormancy early acquired a greater biomass, including a higher average weight per inflorescence. Plants grown in high CO_2 showed greater biomass than in those in low CO_2. Total pollen production per plant under ambient CO_2 was higher in the early spring cohorts than those released later. However at high CO_2, the later cohorts had higher total pollen production than similar cohorts at ambient CO_2 (46% and 63% greater for the middle and last cohorts, respectively).

These results indicate that warmer spring periods that allow for early germination of ragweed plants will result in higher pollen productivity. With a concomitant increase in atmospheric CO_2, total pollen production will also increase with later-spring seasons even though the growing season is shorter. Clearly, changes in climate due to global warming may increase the abundance of allergenic pollen and pose a significant health risk.

Impact of an extreme heatwave and drought on ragweed (*A. artemiisifolia*) pollination in Middle Rhone valley (France)

Penel, V.[1] & Sanjuan, B.[2]

[1] Laboratoire des Pollens et du Micro-environnement – 13, Rue Farnerie – 26000 Valence (France).
[2] Groupement d'Allergologie et d'Immunologie Clinique du Rhône-Moyen 226, Boulevard Ch. De Gaulle F-07500 Guilherand-Granges (France).

The GAICRM (Group for Clinical Allergology and Immunology in the central Rhone region) manages two pollens traps in Rhône valley (Valence-Etoile and Montélimar-Ancône (countryside), Cour type) with a focusing interest on ragweed, due to the spread of this weed in our region. A Hirst trap (RNSA - Réseau National de Surveillance Aérobiologique) is also settle on the roof of the laboratory (Valence downtown).

Summer 2003 was marked by an extreme heatwave and drought in the middle Rhône valley, mostly in the southern part (Montélimar, cumulative average temperature, week 32: 209), with a deep impact on estival pollination. That was how the *Urticaceae* (mostly nettle) pollens, commonly abundant during August only reached 48 grains/m^3 this year in Montélimar-Ancône (week 31) and 13 grains/m^3 in Valence-Etoile. Concerning the August period, mugwort pollination was also very lower than usual values.

As for ragweed, they succeed nevertheless to resist to the meteorological conditions, in spite of a low and laborious beginning of pollination. During week 35, usual period for ragweed pollination maximum in this region, the pollen level only reached 80 grains/m^3 in Montélimar-Ancône. This may be compared to 266 grains/m^3 observed in 2002 or to 402 grains/m^3 in 1999 (week 35). In Valence-Etoile, that week, the pollen level reached 180 grains/m^3, although this result may appear high for this extreme summer, it stayed much lower than the 2002 level (450 grains/m^3) or the 1999 level (690 grains/m^3).

Week 36 usually marks the beginning of a decreasing ragweed pollen concentration, but this year the pollen concentration presents an increase. In 2003, ragweed presents a surprising restarting of pollination with a pollen peak (maximum of pollination) during week 37 in Montélimar-Ancône (270 grains/m^3) and weeks 36 & 37 in Valence-Etoile (276 & 263 grains/m^3). If compared to average values, this weed presents a pollination deficit during August, and presents a clear excess during September.

Hirst trap presents two isolated peaks on August (highest: 198 grains/m^3, August 28 – week 35), and a restarting of pollination from September 4 (80 grains/m^3, week 36) to a new peak on September 14 (102 grains/m^3, end of week 36). This can't be compared to other values: 2003 is the first year for Hirst pollen monitoring in Valence downtown.

This shows the amazing ragweed adaptability to extreme parameters. In a debated global warming background, summer heatwave and drought may become more and more frequent. This could delay the risk season for ragweed sensitised people and must be known by allergologists.

Climatic changes: which effects on pollination

Frenguelli, G.; Dioguardi, D. & Tedeschini, E.

Department of Plant Biology and Agroenvironmental biotechnologies, University of Perugia, Italy.

In the past decades, changes in climate have been observed which seem to have an effect on plants as demonstrated by long-term phenological observation records. It is expected that the timing of phenological processes will continue to change under a change in climate with consequences for agriculture, biodiversity and human health (Menzel, 2000).

In Central Italy the average annual temperature has increased by about 0.8°C compared with the mean of 1960-1980 period and, on average, there has been 15 days of rain less during the years but the similar annual quantity. This scenario determines evident variations in the time and behaviour of phenophases, such as the pollination, of many perennial plants which are directly dependent on the corresponding air temperature (Frenguelli, 2002).

The pollination of many taxa is regulated by the temperature in the immediately preceding months: for winter pollinated plants, it is the temperature of the December-February period which has a significant influence on the date of onset, while for spring pollination, it is the average temperature of March and April period to influence the beginning of the season.

In Central Italy, where there are many taxa with anemophilous pollination which are capable of responding significantly to variations in temperature, the pollen of Cupressaceae, *Pinus* and *Castanea* seem to be very sensitive to this parameter because, when the temperature increases, they show not only a significant earlier pollination, but also significant reductions in duration of the main period of pollination and characteristic trend of the pollen presence in the atmosphere. In the sub-mediterranean climatic belt the behaviour of the pollination of these or other taxa, calculated by historical series of at least 15-20 years, could be taken into consideration as bioindicators of the climatic changes and in particular to monitor changes in temperature of the air (Tedeschini, Dioguardi, Frenguelli, 2003).

We can not forecast if these climatic trends towards an increase in mean annual temperatures are part of short or long-term fluctuations, and if this trend will continue to increase at this rate. It is however clear that the changes observed in the last 20 years in Central Italy, and in line with what was found in other European and American regions, have significant effects on the pollination of many taxa. This should encourage us to monitor the aerospora carrying out aerobiological monitoring continuously; only in this way we will be able to register time variations of the qualitative and quantitative contents of airborne pollen in the atmosphere which could be found as a consequence of the response of plants to climatic change.

MENZEL, A. 2000. Trends in phenological phases in Europe between 1951 and 1996. **Int J Biometeorol** 44: 76-81.

FRENGUELLI, G. 2002. Interactions between climatic changes and allergenic plants. **Arch. Chest. Dis.** 57(2): 141-143.

TEDESCHINI, E.; DIOGUARDI, D. & FRENGUELLI, G. 2003. Pollen monitoring of some anemophilous taxa to monitor climatic change in Central Italy. In: **Abs. Third European Symposium on Aerobiology, Worcester (UK)**, 33.

The influence of the hot and dry summer 2003 on the pollen season in Switzerland: Does it show a future scenario of climate change?

Gehrig, R.[1]; Clot, B.[2] & Köhler, B.[1]

[1] MeteoSwiss, Kräbühlstrasse 58, CH-8044 Zurich, Switzerland.
[2] MeteoSwiss, Les Invuardes, CH-1530 Payerne, Switzerland.

The year 2003 was 1.6 to 2 °C warmer than the mean of the climate period 1961-90. In the region of the Lake of Geneva, in Valais and in Southern Ticino it was the warmest year since the beginning of climate measurements in 1864. In other parts of Switzerland the year 2003 belongs to the four warmest years ever measured together with 1994, 2000 and 2002. A record-breaking heat wave affected the European continent in summer 2003. In Switzerland, the temperature in June, July and August exceeded the 1961-90 mean by about 5 °C. Water balance was negative from March during almost the whole summer. The summer 2003 was exceptional and its reoccurrence is at the moment statistically extremely unlikely. But new models of climatologists show that in the future, climate variations will increase and that in the period 2071-2100 about every second summer could be as warm or warmer and as dry or dryer than 2003 (Schär Ch. et al, 2004).

These extreme temperatures had significant effects on the pollen production and on the airborne pollen loads. Especially concerned was the grass pollen season, which started one to two weeks earlier than in the mean. During May and the first part of June the grass pollen production and dispersion was favoured by the warm and dry weather and many days with high pollen concentrations were registered. The dryness increased in June so that the grasses stopped to grow. The grass pollen season ended 11-18 days earlier than normal. For many of our stations of the Swiss pollen network this had never occurred as early as in 2003. The other herbaceous plants were not affected as much as the grasses. We measured very high *Chenopodium* pollen concentrations, about normal concentrations of *Urtica*, *Rumex* and *Plantago* and slightly lower *Artemisia* concentrations than normal. Only in Ticino, where the period with negative water balance started already in February, extremely low pollen concentrations of *Rumex*, *Urtica* and *Artemisia* were measured. Additionally, the year 2003 showed unusual high Seasonal Pollen Index (SPI) of *Fraxinus* and *Betula*. If this phenomenon was also influenced by the extreme climate of the year 2003 will have to be checked.

The summer 2003 gave us a still extreme example of possible climate change. In central Europe we will expect in the future higher temperatures, more frequent heat waves, lower precipitations in summer and higher precipitations in winter, with bigger variations from year to year. It will be our future challenge to model pollen occurrence and pollen loads with changing climate conditions.

SCHÄR CH., VIDALE P.L; ÜTHI D., FREI CH., HÄBERLI CH., LINIGER M.A., APPENZELLER CH. The role of increasing temperature variability in European summer heatwaves. Nature, published online 11. January 2004; doi:10.1038/nature02300.

Comparison of Betula and Fraxinus pollen season's start in Europe 1980 to 2003

Jaeger, S. (ed.) & the members of the European Aeroallergen Network (EAN)

ENT-Clinic, Medical University of Vienna.

A general overview, presented at the ICA in Montebello, Canada 2002, has shown that pollen counts reflect a climate change in Europe. Whilst an earlier timing of the pollen season was most clearly pronounced in taxa of the winter and spring period, the summer flowering taxa had a trend towards a prolongation of their pollination period, and especially late flowering taxa revealed a clear increase of the intensity of the pollen season.

More detailed investigations have now proven these trends, but have also shown that essential differences exist as concerns different climatic regions and elevations above sea level.

Daily *Betula* and *Fraxinus* pollen counts for the period 1980-2003 from over 250 European pollen monitoring sites have been chosen for comparison. This resulted in about 2800 annual cycles of *Betula* pollen or over 2000 cycles of *Fraxinus*, respectively. The start of the season was defined with the day when the daily count first time exceeded 1% of the annual total.

As a clear turning point, for both *Betula* and *Fraxinus*, the year 1989 could be defined. Comparing the mean values of the start dates before 1989 and those of the years 1989 until 2003, *Fraxinus* pollen seasons started as much as 29.01 days earlier in the second period than in the first period ($p < 0.001$), and *Betula* seasons were 17.4 days earlier, but without significance ($p = 0.279$).

The start of *Fraxinus* was earlier than in the first observation period in all investigated climates and elevations. It was 30.15 days in the Mediterranean area ($p = 0.025$), 20.73 days in Alpine climates (n.s.), 18.64 days in Atlantic climates ($p = 0.025$), 15.28 days in sub-Atlantic climates ($p < 0.001$), and 13.38 days in continental climates (n.s). *Fraxinus* pollen have not been reported from boreal climates.

At elevations below 50 m a.s.l., the start was 26.46 days earlier (n.s.), 23.68 days in altitudes between 50 and 500 m ($p < 0.001$), 29.13 days between 500 and 1000m ($p < 0.001$), and 21.09 days in advance above 1000 m (n.s.).

Betula pollen approached only 18.11 days earlier in the atlantic influenced climates, 16.73 days in the Mediterranean, 16.38 days in the Alpine climates, 8.23 days in continental climates, 5.77 days in sub-Atlantic, and 5.72 days in boreal climates. None of these differences of the means were significant.

At elevations below 50 m, birch pollen appeared 22.24 days earlier ($p = 0.010$), between 50 and 500 m 14.30 days (n.s.), 13.17 days at 500-1000 m ($p = 0.018$), and 18.73 days at sites above 1000 m (n.s.).

These results indicate that *Betula* – although flowering nearly synchronous with *Fraxinus* - has shown less response to the warmer climate in terms of its pollen season start than *Fraxinus*. However, in elevations between 500 and 1000 m as well as at sea level, the most impressive changes have been observed.

I wish to thank all contributors to the EAN database for providing their valuable data.

The impact of warming on pollen and seed production in spruce (*Picea abies*) of Austrian forest regions

Litschauer, R.[1] & Jäger, S.[2]

[1] Federal Office and Research Centre for Forest, Vienna.
[2] Medical University of Vienna.

Since 1987 forest tree reproduction processes (flowering and seed production) of certain forest standings are documented and investigated in reaction to the impressions of forest decline and global warming. Spruce (*Picea abies*) the main forest tree species of Middle- and Northern Europe is in the centre of interest of forest economy.

Examinations of intercorrelation between pollen production, female flower development and weather conditions shall allow a prediction of expected seed production of forest tree species in the following autumn and / or winter season.

By means of both volumetric and gravimetric pollen traps, pollination periods (start, peak and duration) of anemophilous forest tree species are investigated in various regions and altitudes. In some investigation stations falling seed is collected by passive samplers according to fruit weight of trees. All these traps are brought out and managed in a special forest monitoring network. The necessary completion of essential data was possible by using results of European Allergic Network (EAN) up from 1980.

We divided the Austrian territory into four climatic regions: Centre alpine; North, East and South of the alpine ridge.

Timing - Trend analyses revealed a significantly earlier start of flowering seasons in all four regions ($p < 0{,}01$). The peak day was clearly earlier in the South and in the East ($p < 0{,}01$); also earlier in the Alpine region ($p < 0{,}05$) whereas in the North no significant trend was observed. The end of season was significantly earlier both in the East and South ($p < 0{,}01$) and in the North ($p < 0{,}05$), but there was no significant trend in the Alpine region.

Duration: In the eastern and southern regions a trend for shorter seasons is clearly visible ($p < 0{,}01$), to some extend also in the north ($p < 0{,}05$).

Intensity - No significances could be observed except of a slight increase of big pollen values in the Southern regions ($p < 0{,}05$).

The warming explains quite well the trends for earlier start, peak and earlier end of seasons, but would also suggest a higher pollen production or prolongation of the season respectively. The study of the fluctuations between mast years and years with lower seed productivity showed that the frequency of mast years was clearly lower before 1988 in comparison to the past 15 years, whilst the amplitudes were higher in earlier years and degreased in favour of more frequent "half mast years" especially in regions south of the alpine ridge and altitudes < 1000 m above sea level.

Acknowledgement: We are thankful to the members of the Austrian pollen information network for using their precious pollen data material.