The Pollen Monitoring Programme (PMP); the first two decades

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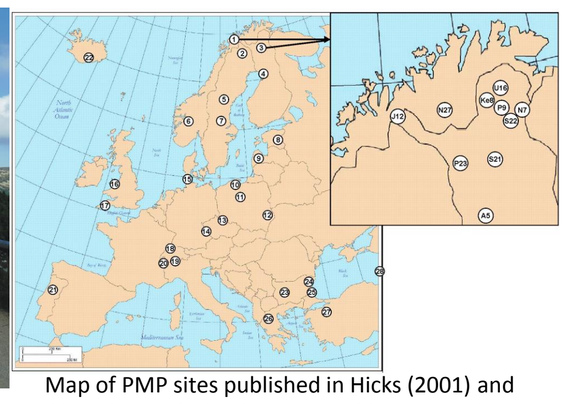
Foundation and development of the PMP



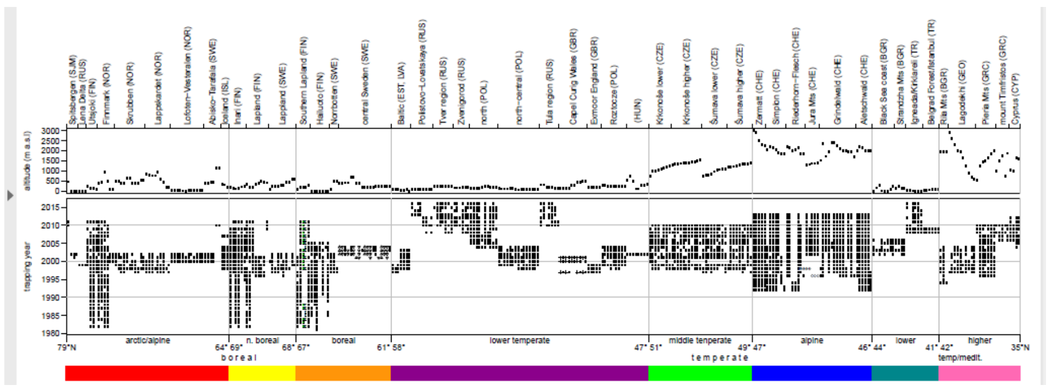
Map of PMP sites published in Hicks (2001) and Giesecke *et al*. (2010) (prepared by J. Jarosz)

The Pollen Monitoring Programme (PMP) was founded in 1996 by Dr Sheila Hicks. The PMP aims to investigate surface pollen deposition, to gain insights into the pollen-vegetation relationship and factors influencing production, dispersal and deposition. The ultimate goal is to improve the interpretation of past pollen records.

The PMP is essentially a group of collaborating palynologists, managing a network of surface pollen monitoring sites. At many sites, including Finland, Poland, Switzerland, Bulgaria, Georgia and Wales, surface pollen deposition has been monitored annually for over 20 years, producing invaluable long records (see Giesecke *et al*. 2010).

The PMP employs modified Tauber traps to provide absolute estimates of pollen deposition for each taxon. The trap data also provide a basis for comparison with other sampling media including lake sediments and soil samples.

The PMP database; applications and potential

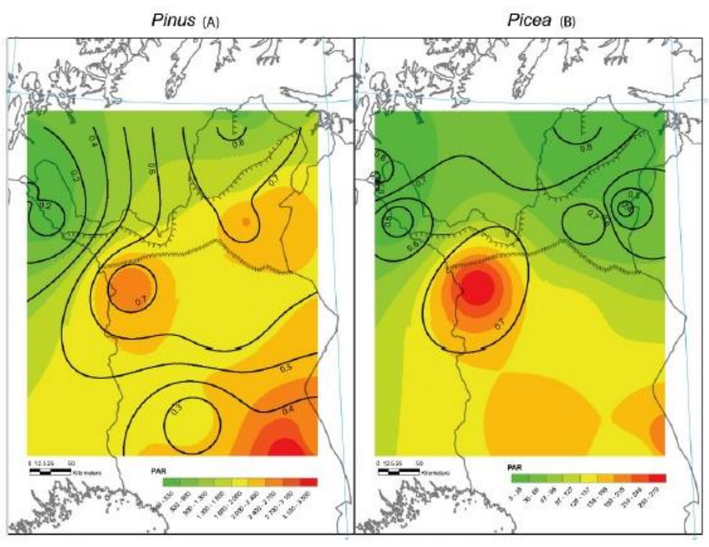


A summary of pollen data in the PMP database (prepared by V. Abraham)

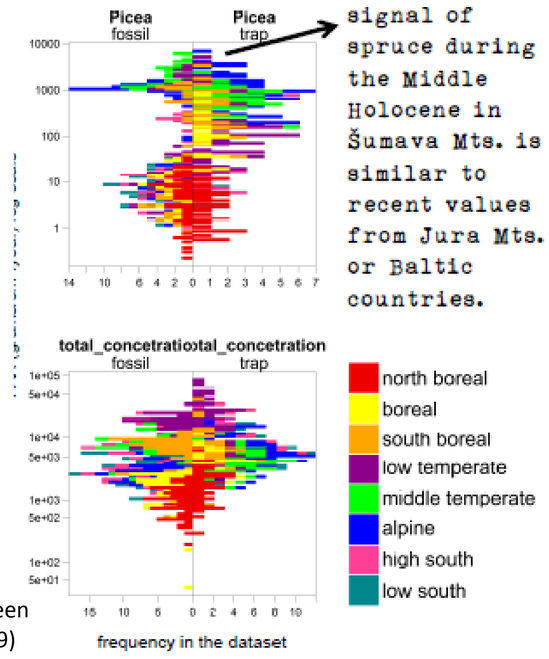
The PMP database includes almost 2000 samples from 14 countries. Samples have been collected from a wide range of plant communities including continental coniferous forest, temperate deciduous woodland, high altitude alpine communities and maritime grassland communities. PMP data are organized in the PostgreSQL relational database, which consists currently of four principal tables: counts (80000 rows), samples (1833 rows), trap sites (263 rows) and pollen taxa (961 rows). The database is currently managed by Dr Vojtěch Abraham of the Charles University, Prague.

The intention is to incorporate these data into the multiproxy database Neotoma (www.neotomadb.org). PMP data have been employed to answer a variety of questions and over 70 papers have been published. The network of PMP monitoring sites is still expanding and there are many innovative studies across Europe using and contributing to this unique dataset.

Using PMP data to understand climate and environmental change



An example from northern Fennoscandia showing the correlation between July temperatures and *Pinus* and Picea PAR (see Huusko and Hicks 2009)



Comparison of PMP surface pollen samples and fossil samples (Abraham *et al*. in prep)

PMP data has been used in several studies relating changes in surface pollen deposition to climatic and environmental variables.

For example, Hicks (2001) and Huusko & Hicks (2009) identified the relationship between high values of surface pollen deposition for *Pinus* and *Picea* and high temperatures in the spring of the previous year. van der Knaap *et al*. (2010) developed this research, demonstrating the relationship between pollen accumulation rates and climatic variables at sites across Europe and the Caucasus.

In further studies, Lisitsyna *et al*. (2011) studied pollen threshold values as an indication for the regional presence of major European trees and Ertl *et al*. (2012) assessed the proportion of long distance-transported pollen of *Pinus sylvestris* L. in northern Finland

Abraham *et al*. (2016) provided a pollen-based quantitative reconstruction of Holocene vegetation in order to update a perspective on natural vegetation in the Czech Republic and Slovakia. They compared also composition of this reconstructed Holocene vegetation with the composition of potential natural vegetation. Abraham *et al*. (in prep) have compared Middle Holocene fossil samples from the Šumava Mountains in the Czech Republic with samples from the PMP database. They have found that the high values of *Picea* found in the fossil samples are similar to recent values from the Jura Mountains.

There is enormous potential to use data in the PMP database to elucidate the relationship between surface pollen deposition, vegetation, climatic variables and the environment. Published studies have compared PMP data with the results of aerobiological pollen monitoring by volumetric samplers. PMP data can also contribute to modelling future climate and environmental change and provide modern analogues for past plant communities.

Find out more about the PMP

Further information about the latest developments can be found on the PMP's Researchgate Project page (researchgate.net/project/Pollen-Monitoring-Programme-PMP-facilitating-quantitative-estimates-of-past-vegetation-and-climate?) and there is also information on the PMP webpage which is currently being updated (http://www.pollentrapping.org/). A link to the full list of PMP publications may be found on the Researchgate Project page.

The PMP group meets every two years. The next meeting will be held in Riga, Latvia in 2019. Anyone interested in monitoring surface pollen deposition is welcome to attend.

References

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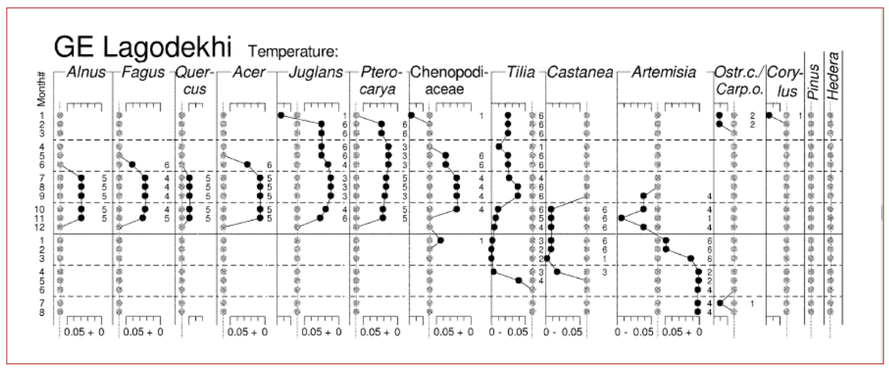

An example from Georgia showing the relationship between temperature and the month of highest pollen accumulation rates (see van der Knaap *et al.* 2010)

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