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Forecasting the weather
- ensemble techniques
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Case studies of pollen spread within a Central European Forest canopy

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The scientific project "ROSALIA", carried out in co-operation between ZAMG and the Austrian Federal Research and Training Centre for Forests, Natural Hazards, and Landscape, investigated the meteorological impacts on pollen emission and spread in a typical Central European forest of mixed deciduous and coniferous trees. The study area is the "Lehrforst Rosalia" of BOKU University approx. 60 km south of the city of Vienna in undulating terrain (300 – 750 m altitude). Pollen counts are conducted on three levels of a meteorological tower situated in a narrow tree-covered valley at 370 m height for the flowering period of spring flowering tree species in 2009. The tower is located directly within the crowns of a mixed stand of European beech, Sessile oak, Norway spruce, Silver fir and Common ash. The first upper sampling unit measures the pollen concentration above the canopy, the second sampling unit is installed in the crown sphere of the stand, and the third sampling unit measures the pollen concentration at the forest ground. In order to sample pollen from all directions and to account for the potential turbulence within the canopy, a cylindrical pollen separator as suction device and the conventional Burkhard pollen impactor with a 24 hour drive as impactor and detection device are applied.

For days of enhanced pollen production, meteorological conditions within and above the canopy are studied in detail and related to the pollen concentration measures. The days with the highest pollen production for oak (April 21), Norway spruce (April 25), and Scots pine (May 2) are analyzed in detail. The meteorological parameters wind direction, wind speed, vertical velocity, and vapour pressure deficit at the three levels of the tower are mainly used to interpret the time course of pollen concentrations at the same levels. From this investigation, it is difficult to relate single meteorological variables or a combination of them to enhanced levels of pollen emission. Nevertheless, some conclusions can be drawn. The vertical velocity seems to be a good indicator of pollen transport within the canopy. Peaks of pollen release of especially Scots pine seem to be directly related to a strong increase in VPD within the canopy. A generalization of these findings is, however, not possible. The mechanisms of pollen release for the single species investigated seem to be different, too, which is revealed from the daily courses of pollen concentrations of oak (with high values over several hours) and Norway spruce and Scots pine (with frequent short peaks of pollen concentration).

The results achieved indicate a more complex relationship between pollen release and meteorological conditions as originally assumed during the preparatory phase of the experiment. Future research will be needed. A new experiment should be done in a more homogeneous environment, thus avoiding various interactions of slope and valley winds as well as vertical exchange masking the interpretation of pollen release.