Analysing *Ambrosia* pollen concentrations in Szeged, Hungary

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In Central and Eastern Europe, pollen from *Ambrosia* is the most important cause of allergy-associated respiratory diseases. The role of the Hungarian Great Plain, with Szeged in its geographical centre, is unique due to its worldwide highest diurnal and annual ragweed pollen counts per m^3 of air. Clinical researches confirmed that the pollen of *Ambrosia* is the main reason of the most serious and most persistent hay fever.

Atmospheric circulation pathways influencing *Ambrosia* pollen levels at Szeged, Hungary have been identified using atmospheric backward trajectories. 4-day, 6-hourly three-dimensional backward trajectories arriving at Szeged at 12:00 GMT were produced for each day over a 5-year period using the HYSPLIT model. A k-means clustering algorithm with the Mahalanobis metric was applied in order to develop trajectory types. A cluster having the highest pollen levels, and associated with slow moving air masses is rather typical over the Carpathian basin, which represents a specific key region for *Ambrosia*. Hence it may be regarded as a local cluster for Szeged. Trajectories corresponding to origins of North-western Europe, North-eastern Europe and Northern Europe indicating very high pollen levels at Szeged are associated with low concentrations at their origin, but slowly passing over the Carpathian basin they add other sources to local pollen levels. A statistical analysis showed that local origin and from short to medium-range transport is substantially more important than large-scale transport in the formation of *Ambrosia* concentrations. Therefore, there is rationale to estimate daily local *Ambrosia* pollen concentrations with local meteorological variables and previous-day concentrations. A time-dependent extended log-normal first order autoregressive (AR(1)) model was developed for the purpose. The probability distribution of daily concentration is conditioned on previous-day concentration and previous-day meteorological variables (daily global solar radiation on rainy days and daily mean temperature for dry days) via log-normal distributions. Using root mean square error, the percentage variance of the ragweed pollen concentration level accounted for by this extended AR(1) model is 53.5%, while the mean absolute error produced by the model is 32.2 pollen grains m^{-3}. Note that this latter value is really low as compared to the peak concentrations of several hundreds of pollen grains m^{-3}. The probability of exceeding critical daily pollen concentration thresholds obtained from the model fits well the observed exceedance events.