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Investigating atmospheric transport of Ambrosia pollen from the Pannonian Plain towards the Balkan region with DEHM-Pollen

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The pollen grains of Ambrosia spp. are considered to be important aeroallergens. The threshold value for clinical symptoms for ragweed pollen grains for the majority of sensitised patients is below 20 grains/m3. Ambrosia pollen appears to induce asthma about twice as often as other pollen. Each ragweed plant produces millions of pollen grains that are small (18-22 μm) and suitable for long-range transport when conditions are favourable. In this study we use DEHM-Pollen to investigate if the Pannonian Plain could be the source area for observed episodes of Ambrosia pollen in the Balkans.

A possible Ambrosia pollen inventory for various regions in the Pannonian Plain was constructed using detailed land cover data from Serbia, Hungary, Austria, Croatia, Bosnia-Herzegovina, Slovakia, Romania and Czech Republic in combination with measurements of the annual load of Ambrosia pollen in the source areas. A simple unified pollen release model (SUPREME) was calibrated against daily measurements from Novi Sad in Serbia and implemented in DEHM-Pollen with the Ambrosia pollen inventory. Model simulations was then performed with DEHM-Pollen for the months August and September 2007 and compared with measurements from stations outside the Pannonian Plain.

The simulations several times indicate regional scale transport from the Pannonian Plain towards the Balkan region including the 26th – 27th of August and the 1st and 2nd September. During these episode air masses passed over parts of Bosnia and Herzegovina, Southern Serbia, Albania and Macedonia. The verifying measurements at Skopje (Macedonia) show episodes of elevated Ambrosia pollen concentration the 26th -27th of August and for the 1st and 2nd of September.

The model experiments with DEHM-Pollen strongly indicate that the Pannonian Plain alone can be a source to significant Ambrosia pollen concentrations in the Balkans. The methods and the model results look promising with respect to future numerical forecasting of Ambrosia pollen in this region. The methodology included the first production of an emission inventory for the region and also showed that the modelling of atmospheric transport of Ambrosia pollen is possible with atmospheric transport models on the regional scale.