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Assessing birch pollen levels in Belgium by integrating spaceborne observations of vegetation activity into an air mass transport model

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Air quality is primordially affected by anthropogenic emissions. Worldwide, air pollution causes more than 6 million premature deaths in 2015. Apart from anthropogenic emissions also biogenic emissions of aerosols such as pollen may impact the human wellbeing. In Europe, a quarter of the population suffers from pollinosis, whereas in some countries the prevalence is over 40%. Air pollution can influence both allergens and allergic citizens by increasing the immune reaction, and/or by intensified biogenic emissions.
To date, pollen of various trees and grasses in Belgium are monitored on daily basis at five stations by the Belgian Scientific Institute for Public Health (SIPH). This sparse sampling cannot cover the spatial distribution of airborne pollen. Chemistry Transport Models (CTM's) are therefore an interesting tool to both quantify and forecast its spatial and temporal distribution.
Here we show the results of the spatio-temporal modelled birch pollen levels over Belgium using SILAM (System for Integrated modeLling of Atmospheric coMposition). Transport of air masses in SILAM is driven by ECMWF meteorological data. A MACC-3 birch tree fraction map provides the model with the spatial distribution of potential pollen sources. Pollen release is based on the temperature degree days approach.
We provide an update of the birch tree fraction map based on the most recent Flemish and Walloon forest inventory data. Moreover, by integrating spaceborne vegetation activity derived from MODIS observations we aim at providing an annual update of birch activity. The SIPH pollen observations are used to update the starting and ending dates of the birch pollen season. By updating the birch tree map and the starting and ending dates the correlation (R^2) between the SIPH observed and SILAM modelled birch pollen time series over the station in Brussels increased with $\sim$20% (from 0.45 to 0.54). Backward trajectory analysis suggests that surface air masses originating from regions in Middle Europe with high birch fractions contribute to locally observed high pollen peaks.