Modeling of birch pollen concentrations using Enviro-Hirlam

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Investigation of temporal and spatial evolution of biological aerosols such as pollen has a high interest especially from its health effect point of view.

Birch pollen is the most common aeroallergen. About 20 per cent of population in Europe suffers allergenic reactions from pollen and this number is constantly increasing.

Therefore people need to know where and when there will be high pollen concentration. For this reason, a model for forecasting of birch pollen concentrations has been developed as a part of Enviro-Hirlam and used in operational mode for several years (Mahura et al. 2007, 2009, Rasmussen 2002, Baklanov et al. 2008). The latest version of the model includes growing degree hour parameterization for start of flowering, birch forest distribution, birch pollen emission from local sources, dry and wet deposition of particles in the atmosphere.

Two modelling domains have been proposed in this study: the first one includes the most part of Europe and Denmark as well, the second one includes North-West region of Russia, part of Finland and Estonia.

Birch forest distribution maps have been created for both modeling domains. The maps are result of combining of three GIS databases: Global Land Cover (GLC) (landcover.usgs.gov/glcc/), European Forest Institute (EFI) (Päivinen et al. 2001) and Tree Species Inventory (TSI) (Skjøth et al. 2008).

Birch pollen emission module is meteorology-dependent and based on correcting linear functions (Sofiev et al. 2012). Dry and wet deposition processes for pollen particles are parameterized in the same way like for simple aerosols. Wet deposition parameterization considers evaporation of raindrops in the atmosphere as well.

Assessments of influence of meteorological parameters on birch pollen emission have been obtained. The results of Enviro-Hirlam simulations for both domains are discussed.

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