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Influence of 2-meter temperature bias on birch pollen season and concentrations in the Enviro-HIRLAM

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Forecasting the start of the birch pollen season as well as birch pollen concentrations is a challenging task from a modeling point of view. The start of birch pollen season is commonly determined by so-called Growing-Degree-Days (GDD) parameterization. GDD is based on accumulation of 2-meter daily mean air temperatures above a given threshold and supposes that birch flowering starts as soon as the accumulated temperature reaches a certain value depending on geographical location. Therefore, even a minor bias (for example, 0.5 °C) of 2-meter air temperature forecasted by a numerical weather prediction model can lead to an error of several days for simulated start of the birch pollen season. Moreover, birch pollen emission is strongly dependent on such meteorological parameters as 2-meter temperature and relative humidity, 10-meter wind speed and direction, and accumulated precipitation. So, 2-meter air temperature biases can also influence the modeled birch pollen emissions and, consequently, modeled atmospheric birch pollen concentrations.
In our study, the online-coupled meteorology chemistry model Enviro-HIRLAM (Environment - High Resolution Limited Area Model) was employed to simulate birch pollen emissions, atmospheric transport, dispersion and deposition for the European domain with 15-km horizontal resolution. Model runs were performed for a case study of birch pollen season 2006 with and without attempts to correct for 2-meter air temperature biases and related changes in relative humidity.
The modeled birch pollen concentrations were compared with aerobiological observations for European measurement sites. The influence of 2-meter air temperature bias correction on the start of birch pollen season and magnitude of birch pollen concentrations turns out to be important and should be included in operational setups.