Enviro-HIRLAM Birch Pollen Modelling for Denmark
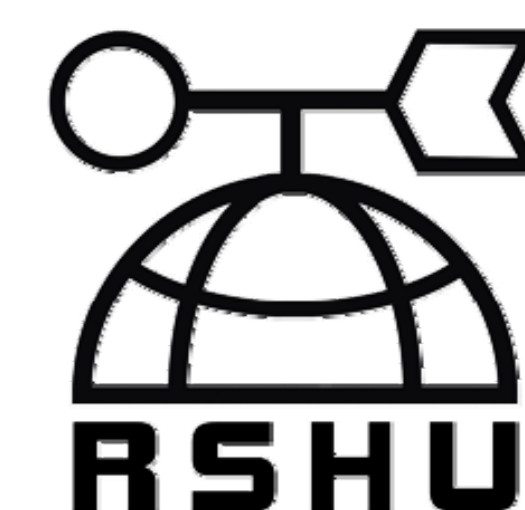
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REGION OF INTEREST AND INPUT DATA

The model runs were performed to simulate birch pollen concentrations for European domain (154 x 148 grid horizontal points; 40 vertical hybrid levels) at 0.15° horizontal resolution with focus on Denmark (shown in Fig. 1a). In order to assess pollen sources the birch forest map (see Fig. 1b) has been derived for the selected modelling domain. The map is represented by birch forest fraction in each model grid cell. Three GIS based databases were used in deriving procedure: 1) Global Land Cover (http://landcover.usgs.gov/glcc/), 2) European Forest Institute (Päivinen et al. 2001) and 3) Tree Species Inventory (Skjøth et al., 2008).
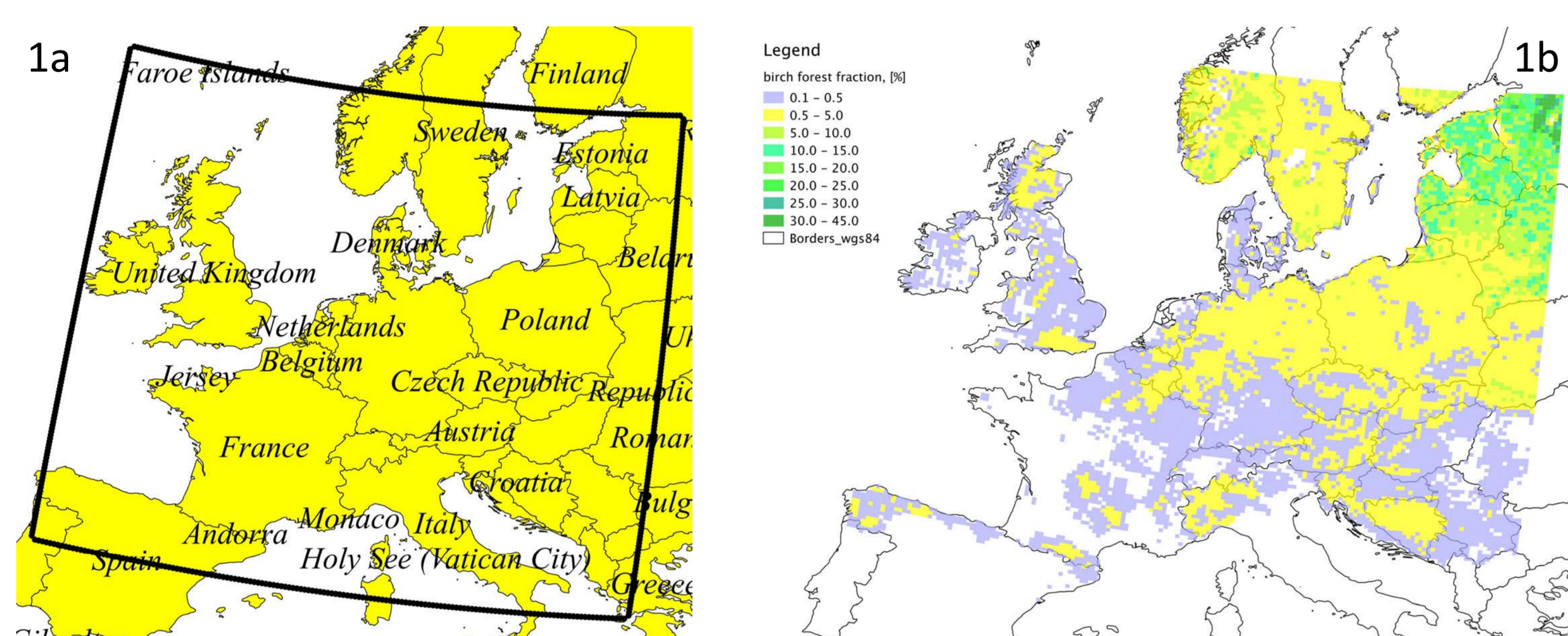

Figure 1. Modelling domain (1a) and spatial distribution of birch forest fraction (1b).

ENVIRO-HIRLAM-POLLEN

Birch pollen emission is strongly meteorology dependent, and it is essential to forecast pollen episodes by coupled meteorology - air pollution models. The Enviro-HIRLAM (Environment - High Resolution Limited Area Model; Korsholm, 2009, Baklanov et al., 2008, Nuterman et al., 2013) online-coupled meteorology-chemistry model was applied in the study. The main model components are presented in Fig. 2.
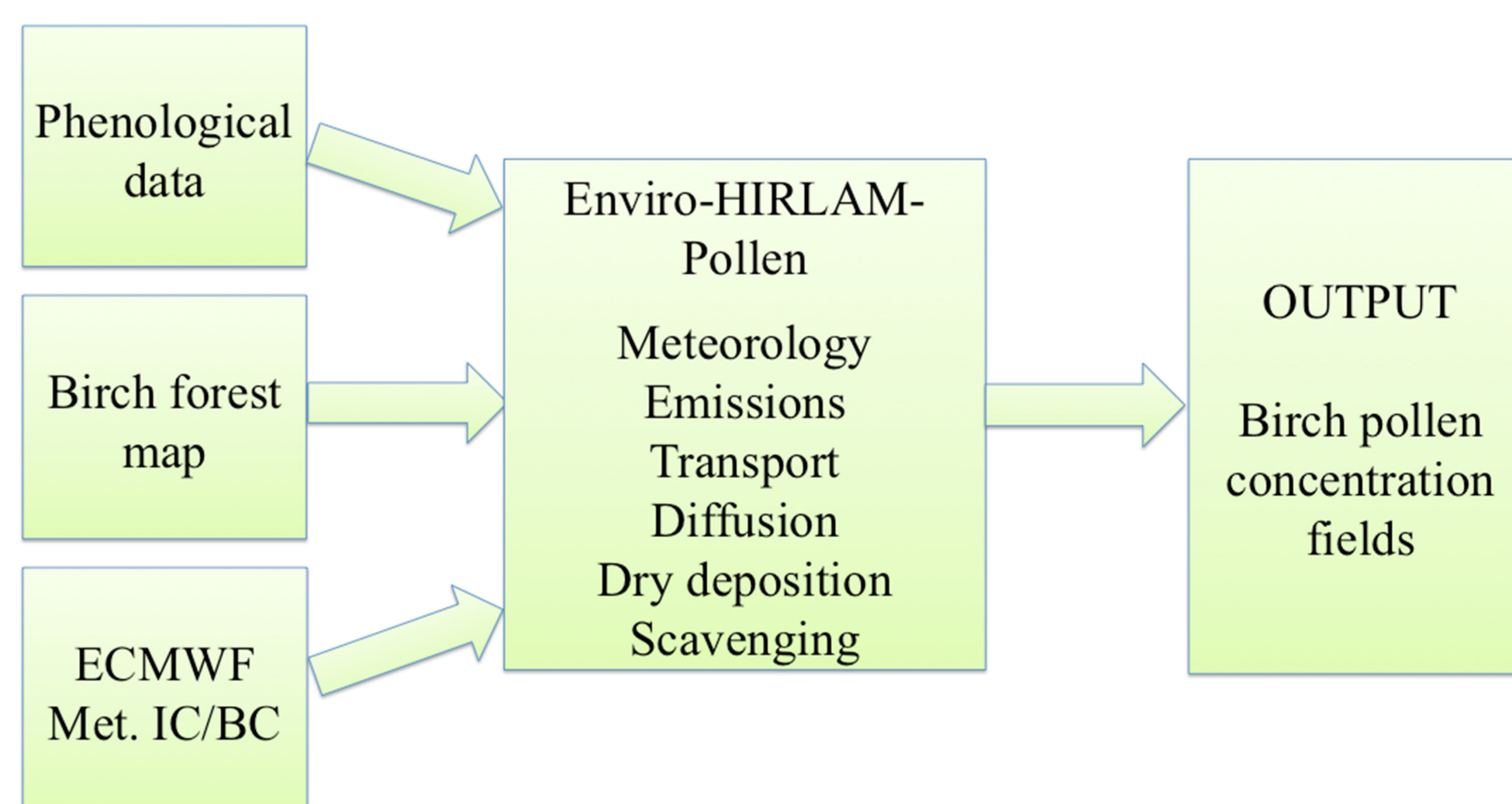

Figure 2. Overall structure of Enviro-HIRLAM birch pollen forecasting system.

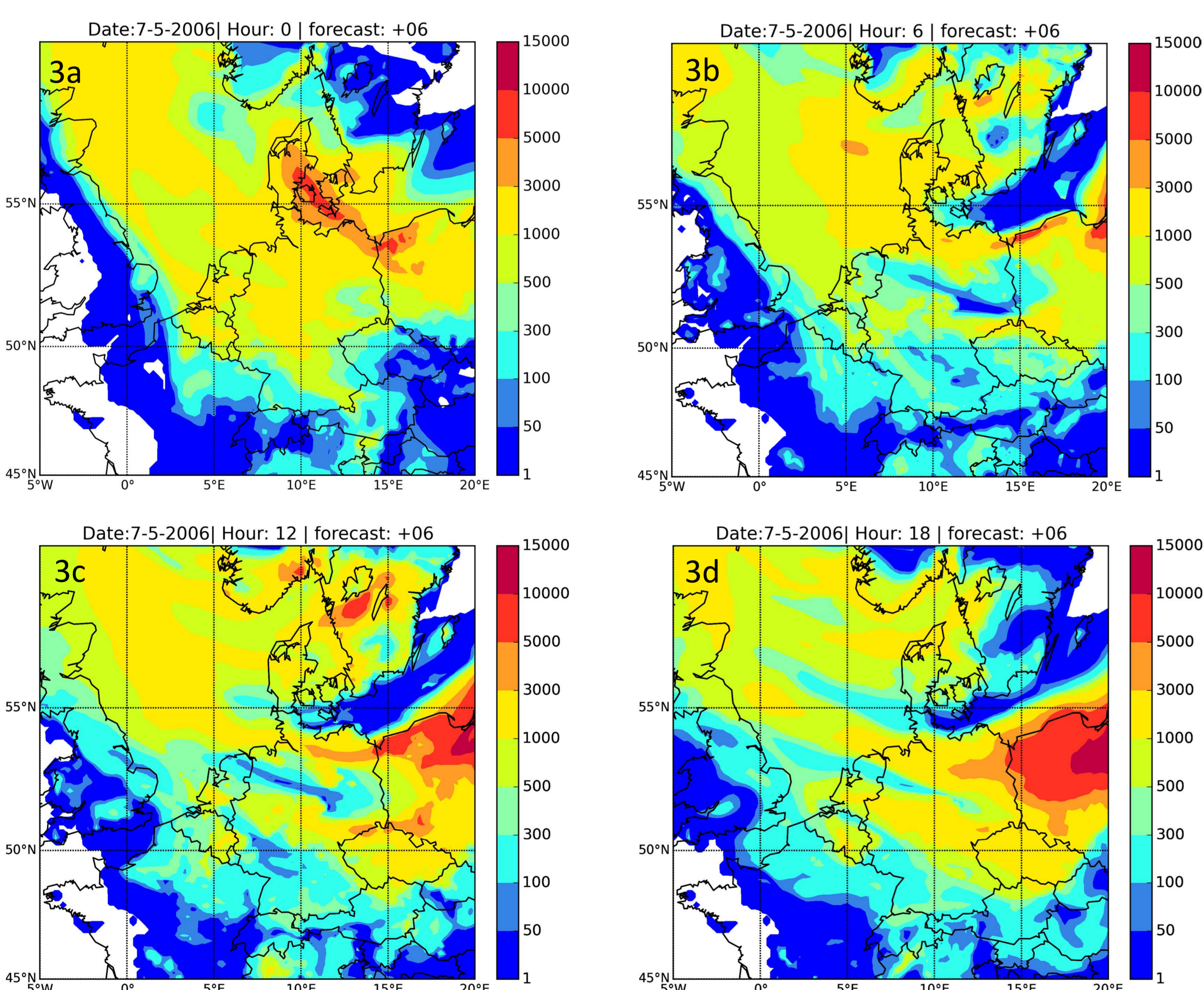## MODELLED POLLEN CONCENTRATIONS

Figure 3. Birch pollen concentration (in grains/m³) simulated by Enviro-HIRLAM on 7th May, 2006 for 06 UTC (3a), 12 UTC (3b), 18 UTC (3c) and 8th May, 2006 for 0 UTC (3d). Forecast length – 6h with surface meteorological data assimilation only.
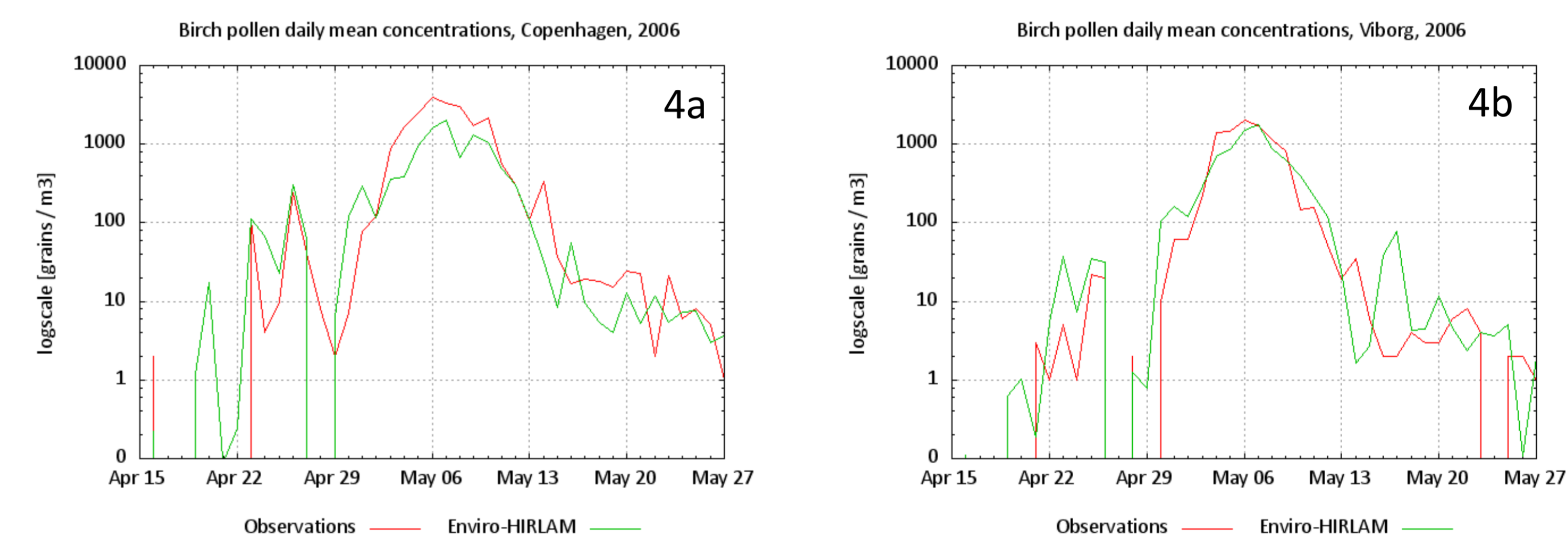
MODEL VS. OBSERVATIONS

Figure 4. Birch pollen concentrations observed (red) vs. modelled (green) at Danish measurement sites: Copenhagen (55°43' N and 12°34' E) (fig. 4a) and Viborg (56°27' N and 9°24' E) (fig. 4b).

CONCLUDING REMARKS

✓ Preliminary evaluation for both modelled and observed birch pollen concentrations (see Fig. 4) showed high values (daily averages more than 100 grains/m³) for Copenhagen and Viborg stations, and especially during 2-12 May 2006 episode.

✓ Phenological evidence in combination with observed concentrations for both Danish measurement sites for the period of 15 – 30 April 2006 showed that long range transport did dominate the pollen concentrations. This is supported by the modelling.

✓ Underestimation of modelled concentrations, especially for the occurrence of maximum concentration for Copenhagen measurement site, was caused by underestimation of modelled air temperature and overestimation of modelled relative humidity at the beginning of the pollen season.

✓ It is suggested that further improvement of modelled pollen concentrations can be achieved through improvement of modelled meteorological parameters using Enviro-HIRLAM version taking into account urban effects.

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