Pollen-inferred quantitative reconstructions of Holocene land-cover in NW Europe for the evaluation of past climate-vegetation feedbacks – methods and first maps of the cover of plant functional types at 6000, 3000, 600, 200 and 0 BP.

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Quantitative estimates of land-cover changes during the Holocene have become increasingly important for a better understanding of the earth surface-atmosphere feedbacks, and refining climate models. The LANDCLIM project and research network (sponsored by the Swedish [VR] and Nordic [NordForsk] Research Councils) (see Gaillard et al., CL 1.22) have the objective to quantify human-induced changes in regional land-cover in NW Europe during the Holocene, and to evaluate the effects of these changes on the regional climate through altered feedbacks. We use the REVEALS model to estimate the percentage cover of groups of taxa (plant functional types, PFTs) from fossil pollen data. The past cover of PFTs will be compared with the outputs of the LPJ-GUESS, a widely-used dynamic vegetation model, and applied as an alternative to the simulated LPG-GUESS vegetation to run the regional climate model RCA3 for the past. The REVEALS model requires raw pollen counts, site radius, pollen productivity estimates (PPEs), and fall speed of pollen (FS). PPEs and FS are available for 34 taxa in the study area.

The study area is divided between four principle investigators within the LANDCLIM project. A protocol was established in order to standardize the strategy and methods applied to prepare the pollen data and run REVEALS. It includes instructions for both data contributors and users on 1) chronologies, 2) pollen taxa and harmonization with the PPEs available, and 3) number of pollen taxa and datasets of PPEs to use in alternative test runs. New age-depth models were performed for several records to ensure consistency in the chronologies. The pollen records are selected from pollen databases, i.e. the European Pollen Database (EPD), the Czech Pollen Database (PALYCZ) and the Alpine Pollen Database (ALPDABA), as well as obtained directly from the authors.

Using the pollen records of the Czech Pollen Database, the effect on the REVEALS estimates of 1) basin type (lakes or bogs), 2) number of pollen taxa, 3) PPEs dataset, and 4) number of dates per record used to establish the chronology (≥ 3 or ≥ 5) was tested (see Mazier et al. CL 1.21). Following the results of these tests, the first maps are based on REVEALS runs using pollen records from both lakes and bogs with ≥ 3 dates, 24 taxa (entomophilous taxa excluded), and the mean of all PPEs available in the study area. The maps are produced for 10 PFTs (LPJ-GUESS) and 3 PFTs (RCA3) at a spatial resolution of 1o x 1o for five selected time windows of the Holocene with contrasting human-induced land-cover (0-100 cal BP, 100-350 cal BP, 350-700 cal BP, 2700-3200 cal BP and 5700-6200 cal BP).

The maps of PFTs show significant changes in the degree of human-induced vegetation openness through the Holocene over most of the study area. There are large discrepancies between these first quantitative land-cover maps and earlier maps based on pollen data and other methods such as biomization and the modern analogue

approach.

Sugita, S. 2007. The Holocene, 17, 229-241.