



## **Pollen-inferred quantitative reconstructions of Holocene land-cover in NW Europe for the evaluation of past climate-vegetation feedbacks –Evaluation of the REVEALS-based reconstruction using the Czech Republic database**

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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) aim to quantify human-induced changes in regional vegetation and land-cover in NW Europe during the Holocene in order to evaluate the effects of these changes on the regional climate through altered feedbacks (see Gaillard et al. CL 1.22). We use the REVEALS model (Sugita 2007) to estimate the percentage cover of groups of taxa (Plant Functional Types – PFTs) from fossil pollen data at the 10 x 10 scale for 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 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.

Parameters required for REVEALS applications are: raw pollen counts from well-dated pollen sites, pollen productivity estimates (PPEs), fall speed of pollen (FSP), and site size. PPEs and FSP are currently available for 34 taxa in NW Europe (Broström et al, 2008). Large sites (> 100-500 ha) are preferable for estimating regional vegetation composition using REVEALS. However, pollen data from large sites are limited, and bogs and mires have been often used, particularly in mountainous areas.

In this study, we use pollen data (Kuneš et al, 2009) from variously-sized sites in each 1°x1° grid cells in the Czech and Slovak Republics. Different methodological alternatives are tested in order to evaluate their impact on the REVEALS-based estimates of the regional vegetation: 1) basin type (lakes or bogs), 2) number of taxa (with or without entomophilous taxa), 3) PPEs dataset (PPEs from southern Sweden or mean of all PPEs available), and 4) chronological accuracy (i.e. number of dates per record used to establish the chronology  $\geq 3$  or  $\geq 5$ ).

Because multiple sites of different sizes and types in each cell are used, propagation of errors can be large. Therefore, the Spearman rank correlation test was used to compare the REVEALS estimates between the different alternatives, i.e. the difference in ranking of PFTs in terms of percentage cover was tested. The results show that there are no significant differences between REVEALS estimates from lakes and bogs ( $p=0.05$  and  $rs>0.7$ ). The number of taxa, the PPEs dataset used, and the number of dates do not affect the REVEALS outcomes significantly.

Accordingly, a protocol (see Trondman et al CL 1.22) was established for the LANDCLIM project in order to minimize the number of model runs and produce a first land-cover description (expressed in PFTs). Because the number of dates used for the chronology does not influence the results significantly, all sites (lakes or bogs,

small or large) with  $\geq 3$  dates are selected in order to increase the number of sites used to run REVEALS, which is important for the spatial cover of REVEALS estimates in the study area. REVEALS is run using 24 taxa (entomophilous taxa excluded) and mean PPEs.

Broström, A. et al .2008. *Vegetation History and Archeobotany* 17, 461-478; Kuneš, P. et al. *Preslia*, 81, 209-238; Sugita, S. 2007. *The Holocene*, 17, 229-241.