Fossil forest limits / tree-lines as temperature indicators: a re-evaluation of the pollen evidence

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Vegetation is commonly used as a proxy for climate. Tree-lines and/or forest limits, in particular, frequently mark out a temperature or precipitation threshold. When delimiting past tree-lines or changes in tree abundance as proxies of past climate parameters pollen assemblages and pollen profiles play a central role. Such is the case in the EuroCLIMATE 'DECVEG' project, where the models and reconstructions rely strongly on pollen data. Here we consider the nature of this pollen evidence by looking at a modern pollen reference set and its calibration with both vegetation and temperature. The sampling sites used form a network crossing the northernmost forest limits of spruce, pine and birch, in Fennoscandia. Each of these trees has specific climate requirements and each plays an important role in the Holocene time windows on which the DECVEG project focuses. Pollen data have been extracted from pairs of moss polsters and pollen traps (monitoring period 1982 – 2004). The moss polsters provide percentage data of the same type that are available from the fossil profiles used in the reconstructions. The pollen traps, however, additionally provide pollen accumulation rate (PAR) data which allows the abundance of each tree species to be considered individually and quantitatively rather than as a percentage of the regional vegetation. PAR data can also be used to evaluate the precision of the percentage pollen values. By comparing the two an assessment is reached of the spatial imprecision inherent in the percentage values. It is suggested that, wherever possible PARs should be used to supplement percentage data in order to pinpoint the location of the critical tree-line boundaries more exactly.