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Integrating terrestrial vegetation records and models - a climate modeller's point of view

C. Kubatzki

Alfred Wegener Institute for Polar and Marine Research, Bremerhaven, Germany
(ckubatzki@awi-bremerhaven.de)

There are different methods used for the integration of terrestrial vegetation records and climate or Earth system models. Firstly, the record can be used to reconstruct past climates, i.e. variables like temperature of the coldest month or precipitation. These variables can then be compared with a climate model output. This is a rather indirect approach of comparing model results and data. Secondly, the data can be directly introduced into the model by prescribing past vegetation distribution, for example. Again, the climate model output can be compared with the data in terms of temperatures etc. This procedure allows, e.g., to estimate climatic differences resulting from different vegetation reconstructions. Thirdly, terrestrial vegetation distribution can be dynamically simulated in the climate model and then be compared with the pollen or macrofossil record. The same can be done for certain isotopes and different substances whose concentrations are linked to the state of the biosphere. This method is the most immediate approach to link models and data.

Here, we will show some examples from our modelling work for the three above approaches. Simulations were performed with models of different complexities mostly for the late Pleistocene and the Holocene. Conclusions will be presented that can be drawn from our simulations but we will also give an outlook on what, in our opinion, is missing and might be done in the future to closer link vegetation data and models.