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Reconstructing Holocene climate using a climate model: Model strategy and preliminary results

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An Earth system model of intermediate complexity (Planet Simulator; PlaSim) is used to reconstruct Holocene climate based on proxy data. The Planet Simulator is a user friendly general circulation model (GCM) suitable for palaeoclimate research. Its easy handling and the modular structure allow for fast and problem dependent simulations. The spectral model is based on the moist primitive equations conserving momentum, mass, energy and moisture. Besides the atmospheric part, a mixed layer-ocean with sea ice and a land surface with biosphere are included. The present-day climate of PlaSim, based on an AMIP II control-run (T21/10L resolution), shows reasonable agreement with ERA-40 reanalysis data.
Combining PlaSim with a socio-technological model (GLUES; DFG priority project INTERDYNAMIK) provides improved knowledge on the shift from hunting-gathering to agropastoral subsistence societies. This is achieved by a data assimilation approach, incorporating proxy time series into PlaSim to initialize palaeoclimate simulations during the Holocene. For this, the following strategy is applied: The sensitivities of the terrestrial PlaSim climate are determined with respect to sea surface temperature (SST) anomalies. Here, the focus is the impact of regionally varying SST both in the tropics and the Northern Hemisphere mid-latitudes. The inverse of these sensitivities is used to determine the SST conditions necessary for the nudging of land and coastal proxy climates. Preliminary results indicate the potential, the uncertainty and the limitations of the method.