

Mid-Holocene climate change over China: model-data discrepancy

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The mid-Holocene period (MH) has long been an ideal target for the validation of Global Circulation Model (GCM) results against reconstructions gathered in global datasets. These studies aimed to test the GCM sensitivity mainly to the seasonal changes induced by the orbital parameters (precession). Despite widespread agreement between model results and data on the MH climate, some important differences still exist. There is no consensus on the continental size of the MH thermal climate response, which makes regional quantitative reconstruction critical to obtain a comprehensive understanding of the MH climate patterns. Here, we compare the annual and seasonal outputs from the most recent Paleoclimate Modelling Intercomparison Projects Phase 3 (PMIP3) models with an updated synthesis of climate reconstruction over China, including, for the first time, a seasonal cycle of temperature and precipitation. Most of the models provide a linear response driven by the seasonal forcing (warmer in summer, cooler in winter), which disagrees with the new seasonal data reconstruction over China. We show that to capture the seasonal pattern reconstructed by data, it is critical to assess surface processes. These results pinpoint the crucial importance of including the non-linear of the surface water and energy balance to vegetation changes.