EGU22-5749
https://doi.org/10.5194/egusphere-egu22-5749
EGU General Assembly 2022

Evaluating atmospheric simulations of the Last Glacial Maximum using oxygen isotopes in ice cores and speleothems

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Our goal is to investigate the structural uncertainty in the isotope-enabled atmospheric general circulation models iCAM5 and ECHAM6-wiso. In order to reduce all other sources of uncertainties, in particular, those that stem from different boundary conditions, we forced the two models by the same sets of pre-industrial (PI) and Last Glacial Maximum (LGM) surface boundary conditions; the latter were taken from GLOMAP (Paul et al., 2021), which in turn were based on the MARGO project (MARGO Project Members, 2009) and recent estimates of LGM sea-ice extent. We compared our model results to reconstructions from ice cores (cf. Risi et al., 2010) and speleothems (cf. Comas-Bru et al., 2020). This comparison showed to what degree realizations of the atmospheric state of the LGM obtained from different models, due to different model set-ups and parameterizations, are in agreement with the proxy data. For example, the precipitation during the LGM was generally less depleted in the ECHAM6-wiso as compared to iCAM5, and as it turned out, the iCAM5 simulation produced only a rather weak LGM anomaly during summer (June-July-August, JJA) over the South Asian monsoon region.