EGU24-20074, updated on 20 May 2024
https://doi.org/10.5194/egusphere-egu24-20074
EGU General Assembly 2024
© Author(s) 2024. This work is distributed under
the Creative Commons Attribution 4.0 License.

The water isotope signature for the Last interglacial in three water isotope enabled climate models.

Rahul Sivankutty, Louise Sime, Alexandre Cauquoin, Martin Werner, Allegra N.LeGrande, Sentia Goursaud, and **Irene Malmierca Vallet**
British Antarctic Survey, Cambridge, UK

The stable water isotope ratios of water trapped in polar ice cores have been used to make inferences about temperatures and precipitation of the past. Coupled climate models with the capability to simulate these stable water isotopes and their distribution throughout the hydrological cycle, are a valuable tool to help us understand the relationship between the isotopic signature and the climate state. Here we compare the Last interglacial (LIG) climate and the isotopic signature simulated by three models with embedded water isotope diagnostics (ECHAM6, NASA-GISS and HadCM3). We look at these model's ability to simulate polar climate, both Arctic and Antarctic, and show how the isotope signature compares with available ice core estimates. All the models simulate a warming and heavier precipitation in Arctic for the LIG, compared to their corresponding preindustrial control simulations. There are however differences in the magnitude and pattern of these changes. In Antarctica, there are considerable differences in PI to LIG warming and precipitation patterns between models. We decompose the δ18O changes, showing that the impact of seasonality changes in precipitation on δ18O are similar in the models. However, changes in δ18O due to other changes, particularly those driven by source impacts including sea ice changes, are more variable between the models. Finally, we analyse LIG North Atlantic water hosing experiments run using HadCM3. A 0.25Sv hosing in the North Atlantic leads to a shutdown of Atlantic meridional overturning circulation. This prevents North Atlantic heat loss and leads to a warmer Antarctica. The δ18O signature in these hosed runs has a closer match to the ice core observations, compared to the standard (non-hosed) LIG simulation.