Evolution of oxygen isotope during the last deglaciation: An Update on iTRACE

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Major results

What is iTRACE?
The iTRACE is a transient climate-isotope simulation in fully coupled general circulation model (iCESM1.3) of the last deglaciation. The incorporating water isotopes in CESM enables us to simulate the δ18O directly and perform more direct comparisons against the isotopic signals.

Data-Model comparison

Fig. 1 Climate forcing (a) and evolution at Greenland (GISP-2, b), East Asia (Hulu cave, c), Antarctic (Dome-C, d) and the AMOC (e) during the last deglaciation. In (a), solar radiation at 60N (red), CO2 concentration (green), and melt water forcing (blue NH, orange SH). In (b), surface air temperature (red), precipitation (blue), simulated δ18O (purple), and ice-core δ18O (black). In (c) and (d) as in (b) but for Hulu and Dome-C. In (e), the AMOC index and Pa/Th.

Fig. 2 speleothem δ18O (grey) and simulated δ18O in 23 caves around the globe (see cave locations at right).

Simulation Configuration

Model:
1. Ice Sheets and Paleogeography (ICE)
2. Orbital Forcing (ICE+ORB)
3. Greenhouse Gas (ICE+ORB+GHG)
4. Melt Water Forcing (ICE+ORB+GHG+MWF)

LGM Initial Condition (spinup):
Physical State: ~3500 yrs;
Water Isotope: ~1000 yrs;
Radiocarbon: >5000 yrs.

Fig. 3 δ18O response between H1 and LGM (H1-LGM). Red circles corresponds to observational responses from ice-cores and speleothem, where data is available.

Primary Conclusion
1. The δ18O evolution at Asia is well reproduced during the last deglaciation.

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