Speleothems of South American and Asian Monsoons Influenced by a Green Sahara

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Mid-Holocene (6 ka)

- Warmer than preindustrial
- More NH summer insolation than preindustrial
- Green Sahara

Experiment Design

- iCESM1.2 (Brady et al., 2019)
- 3 simulations
  - Preindustrial control (PI)
  - 6-ka GHGs and orbital ($\text{MH}_{\text{DESERT}}$)
  - 6-ka + “Green Sahara” ($\text{MH}_{\text{VEGE}}$)
δ¹⁸O of precip responses

• Isotopic response with 6-ka GHGs (MH\textsubscript{DESERT}) and orbit produces little change in monsoon regions

• Addition of a Green Sahara (MH\textsubscript{VEGE}) amplifies the signals, in better agreement with speleothem records
Model-Proxy comparison

• Improved comparison at almost every location
• Both δ\textsuperscript{18}O and annual temperature work to improve comparison
Austral Summer Precipitation

- A Green Sahara shifts the Atlantic ITCZ northward
- Less efficient precipitation in Brazil drives $\delta^{18}O$ enrichment with a Green Sahara
Boreal Summer Precipitation

- 6-ka orbit leads to more NH summer insolation, which drives the ITCZ north
- Intensified Asian monsoon sources more distant moisture, driving $\delta^{18}O$ depletion
Thank you!

• If you have questions, please contact me.
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Annual Temperature

• Lower GHG concentration at 6-ka results in cooling
  • Helps explain model-proxy disagreement

• Inclusion of a Green Sahara results in warming
  • Helps explain model-proxy disagreement