A fully coupled isotope-enabled Earth system model ensemble dataset under historical and future forcing

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Motivation

- Isotope-enabled ESMs allow for direct simulation of water isotopologues within Earth system
- Combining isotope ratios with numerical water tracers will build a better understanding of how relationships between evaporative sources, moisture transport, and isotope ratios are expected to manifest in the real world
- Isotope ratios may provide a larger signal-to-noise ratio than more conventional metrics like precipitation, thereby enabling earlier detection of atmospheric water cycle change
- We present a new ensemble dataset from the fully coupled isotope-enabled version of the Community Earth System Model version 1.2 (iCESM1.2; Brady et al. 2019), run with historical and RCP8.5 forcing

Available Data

Monthly:

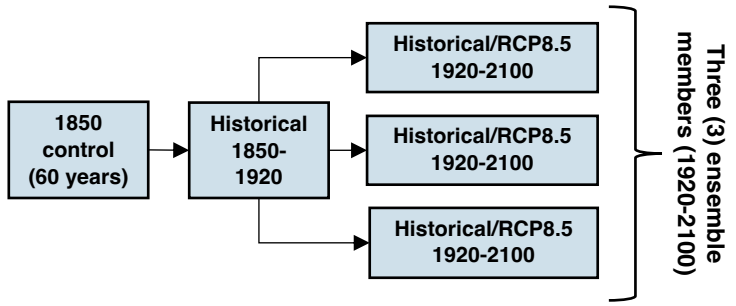
- Default CESM atmosphere, ocean, land, sea ice outputs
- Water isotopologues in atmosphere and precipitation
- Water isotopologues in land system
- Water tracers

Daily:

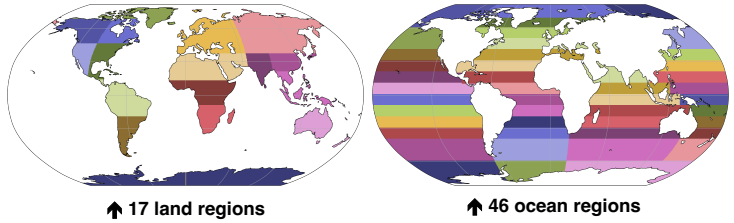
- Water isotopologues in vapor and precipitation
- P, E, U, V, Omega, PS
- Water isotopologues in soil, soil and canopy evaporation, canopy transpiration

Experimental Setup

- **Spatial resolution:** 0.9° x 1.25° (atm/lnd)
- **Forcing:** Historical and RCP8.5
- **Simulation:**

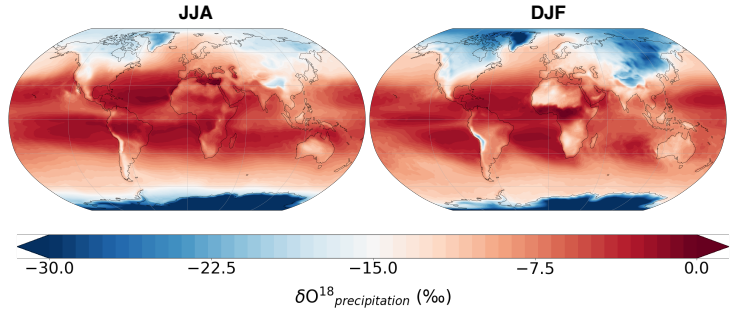


- **Water tracers:**



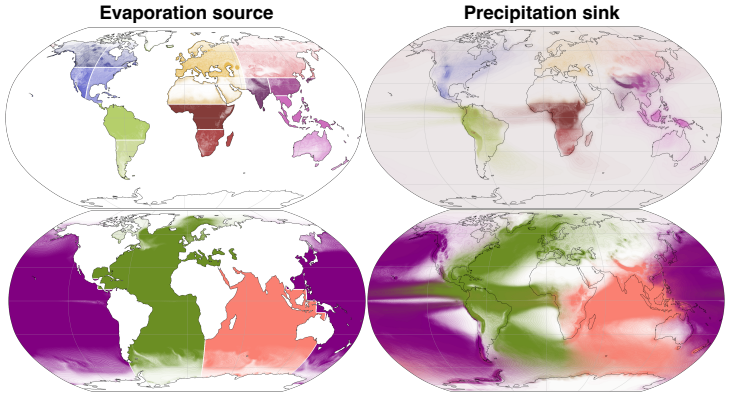
63 tagged land and ocean regions

Simulating Water Isotopes



*30-year seasonal means from 1850 control

Tracking Moisture Transport



Atmospheric moisture and precipitation can be traced back to its evaporation source region

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References:

Brady, E., Stevenson, S., Bailey, D., Liu, Z., Noone, D., Nusbaumer, J., et al. (2019). "The connected isotopic water cycle in the Community Earth System Model version 1". *Journal of Advances in Modeling Earth Systems.*