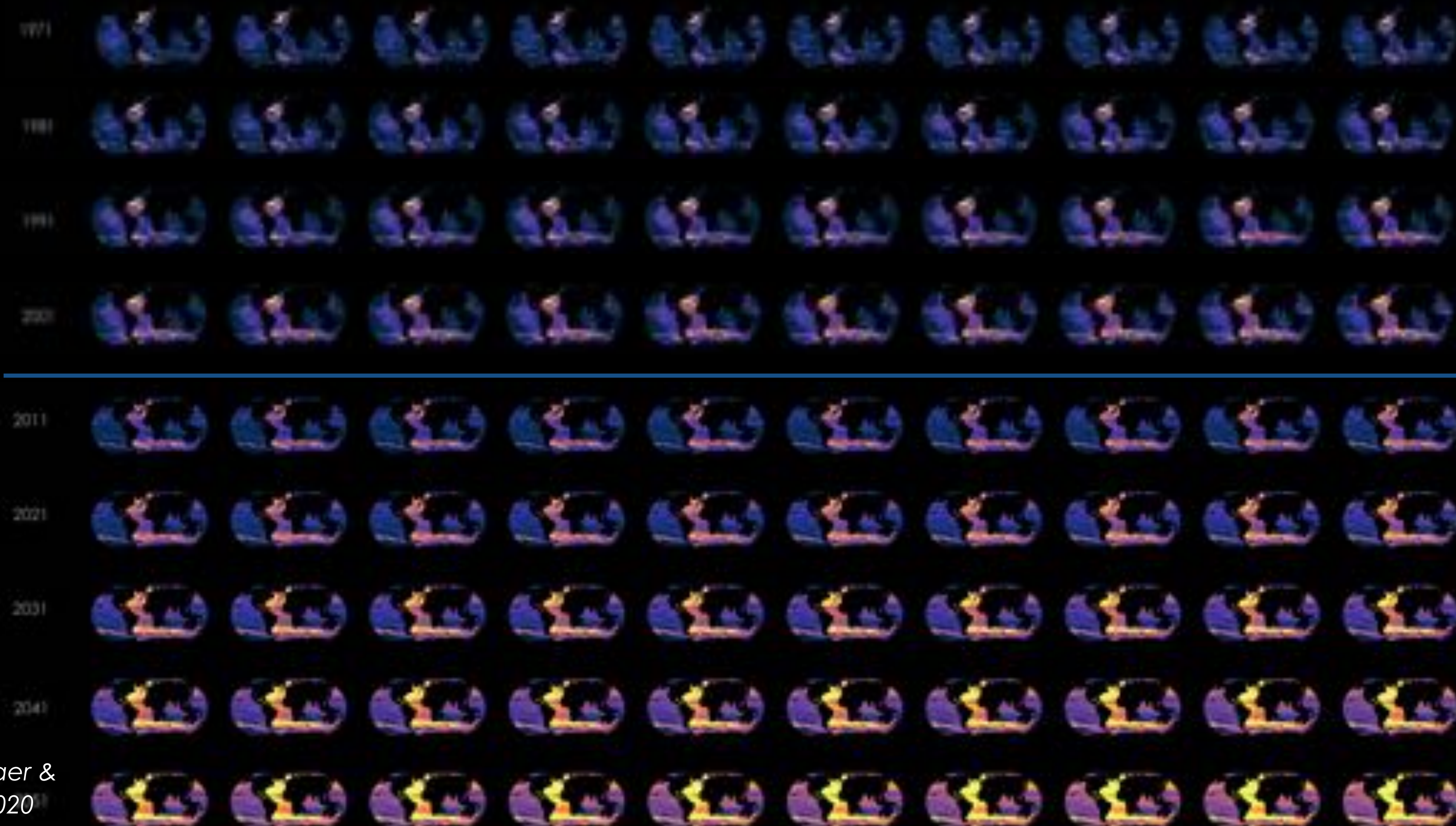


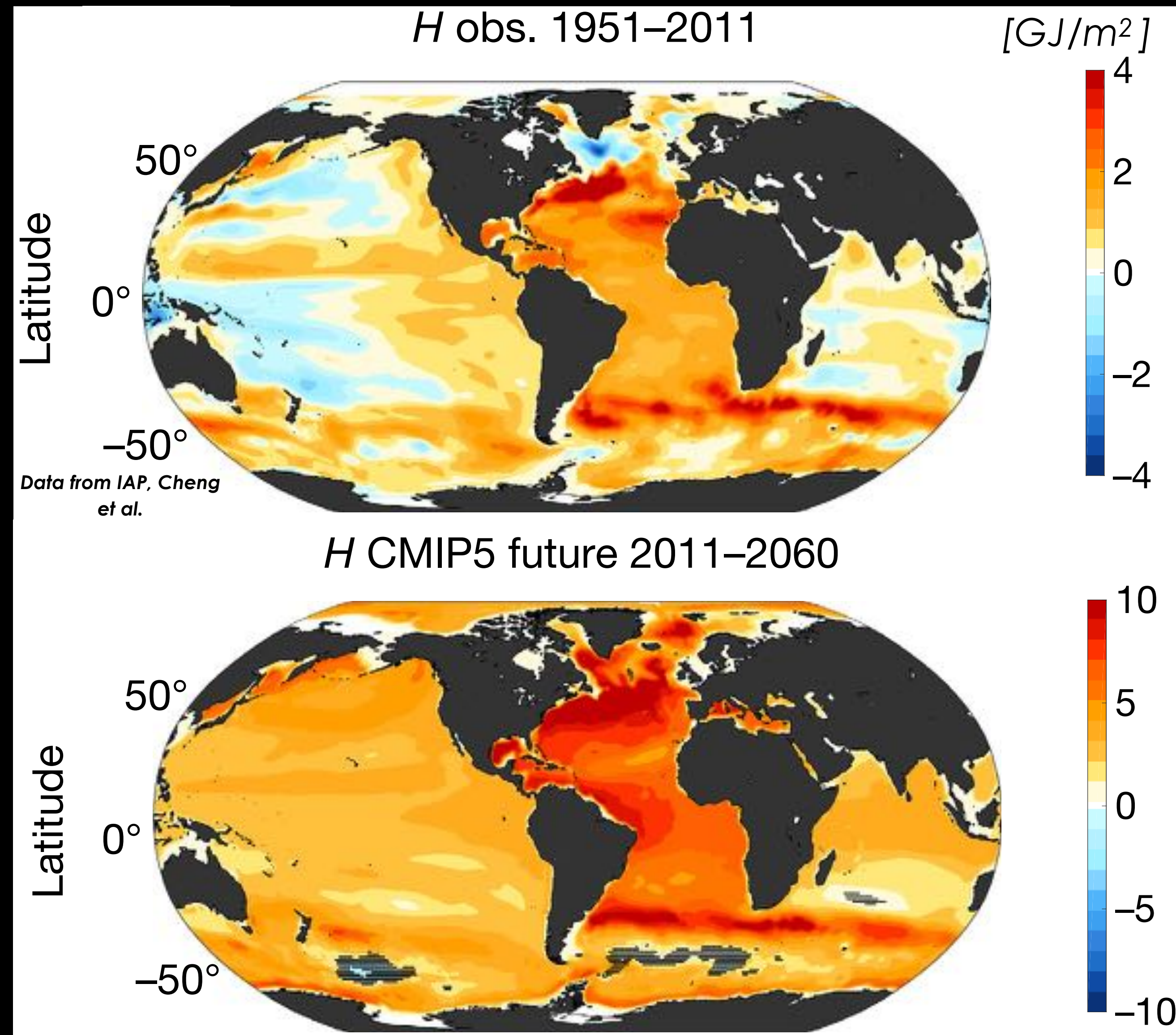
Patterns of Ocean Warming & Sea Level Rise

Laure Zanna, Courant Institute, NYU

with Ben Bronselaer, Alex Todd, Matt Couldrey, Jonathan Gregory & many TICTOC+ FAFMIP colleagues

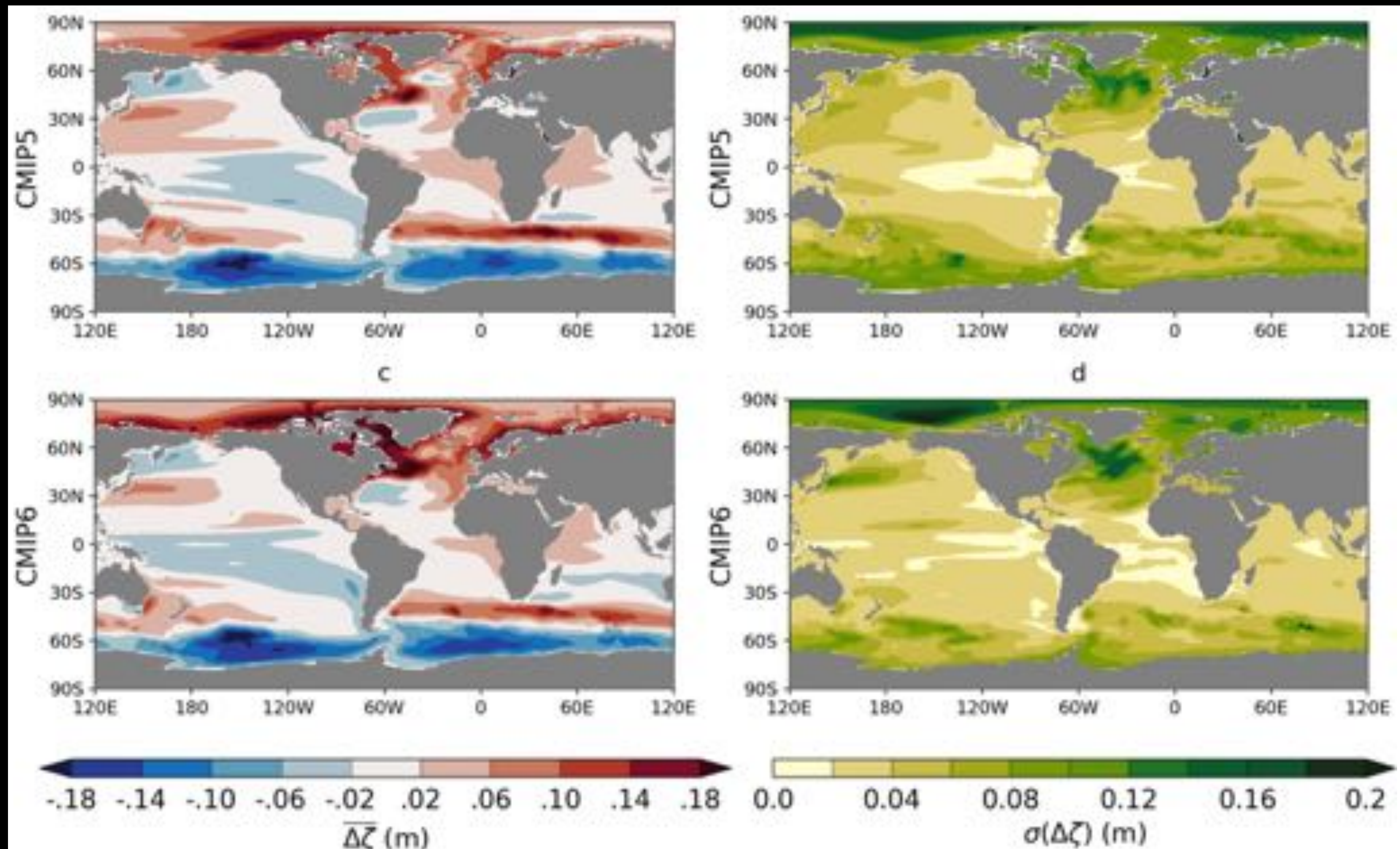


Which processes set the patterns of ocean warming & sea level?



- I won't discuss the methodologies but happy to discuss during the discussion sessions

Which processes determine the spread in projections?



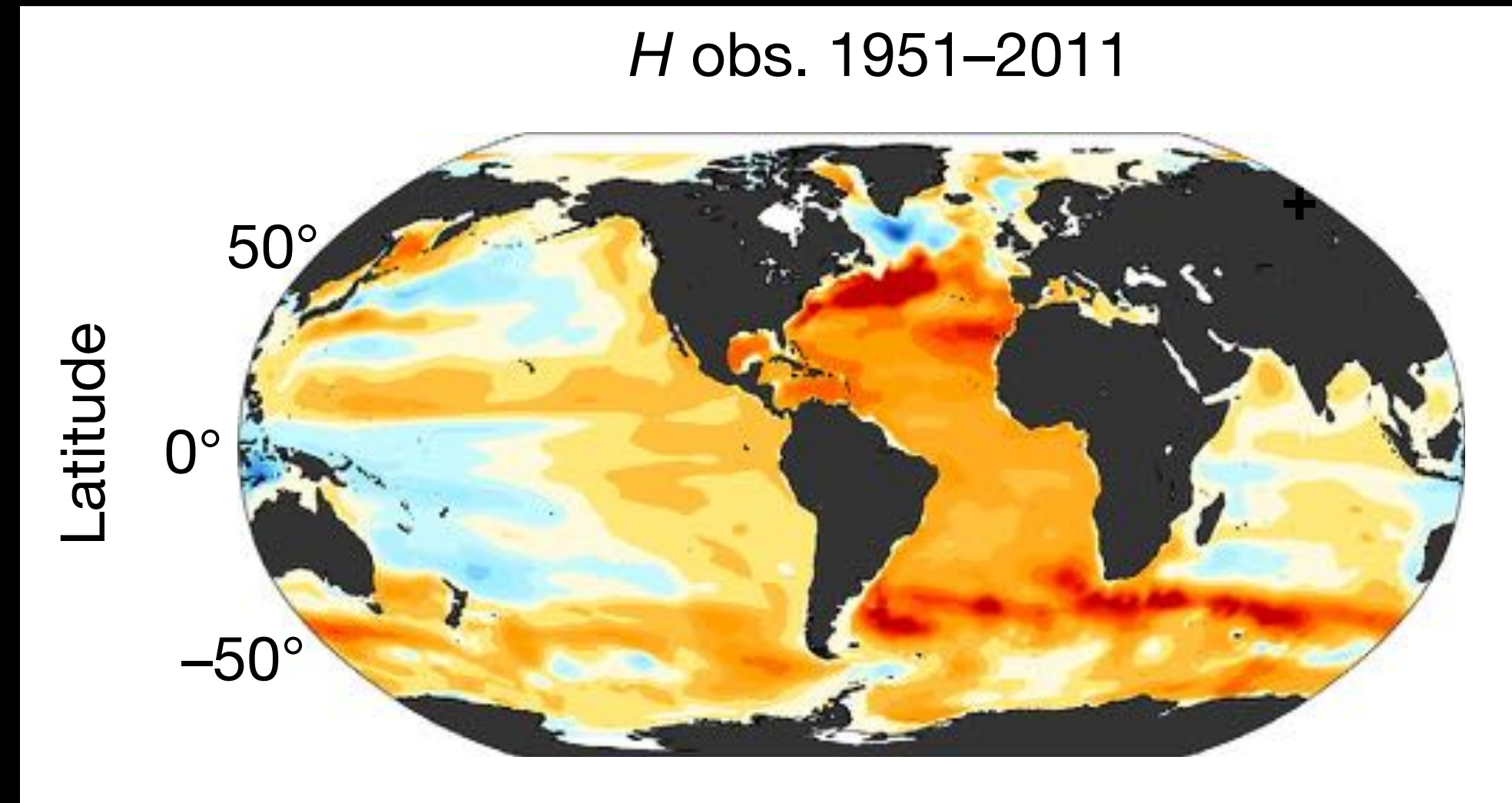
Couldrey et al.,
2020

- I won't discuss the methodologies but happy to discuss during the discussion sessions

Inferred fixed-circulation & redistribution in obs

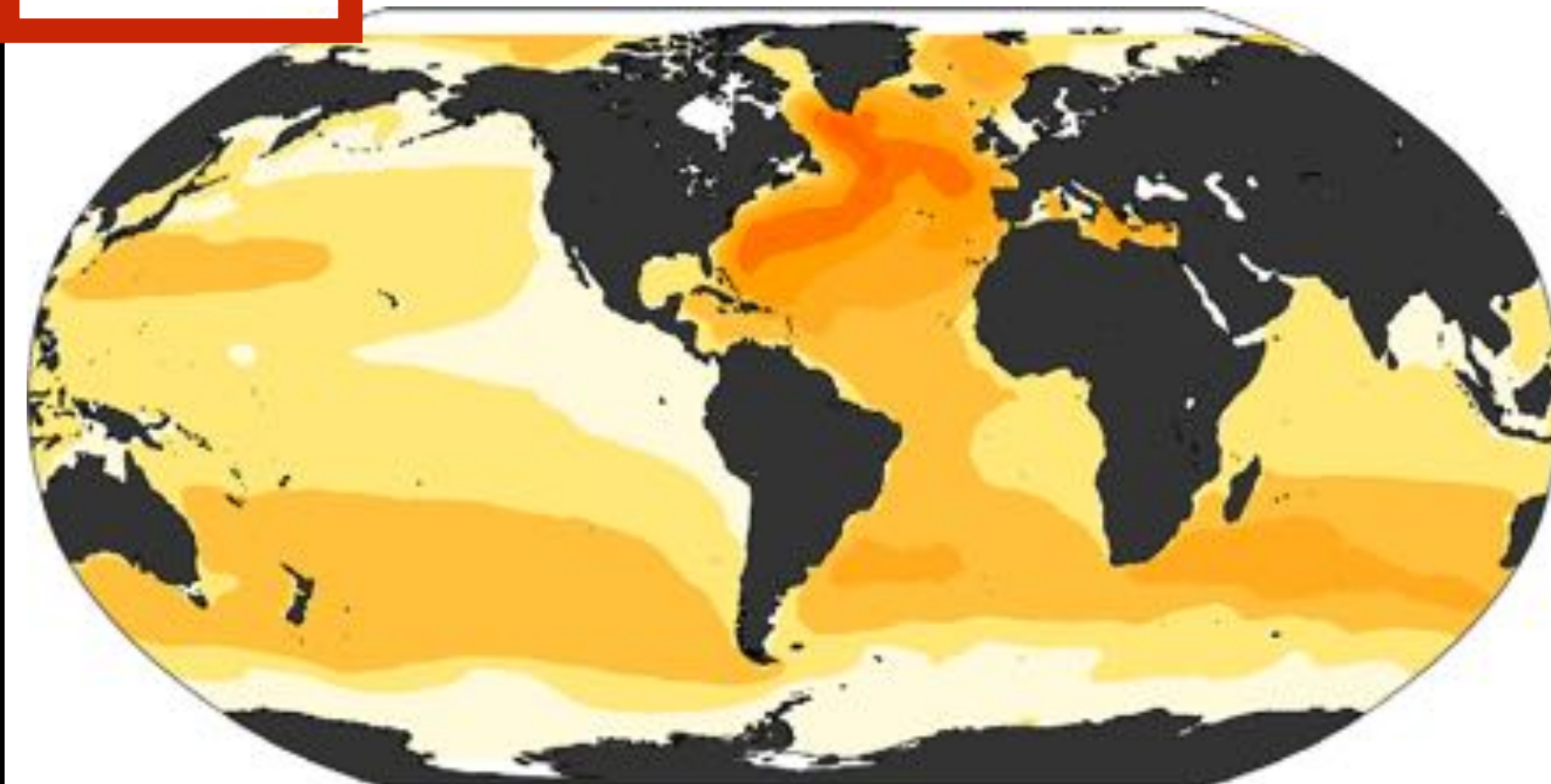
Significant redistribution signal over the historical record

Total storage



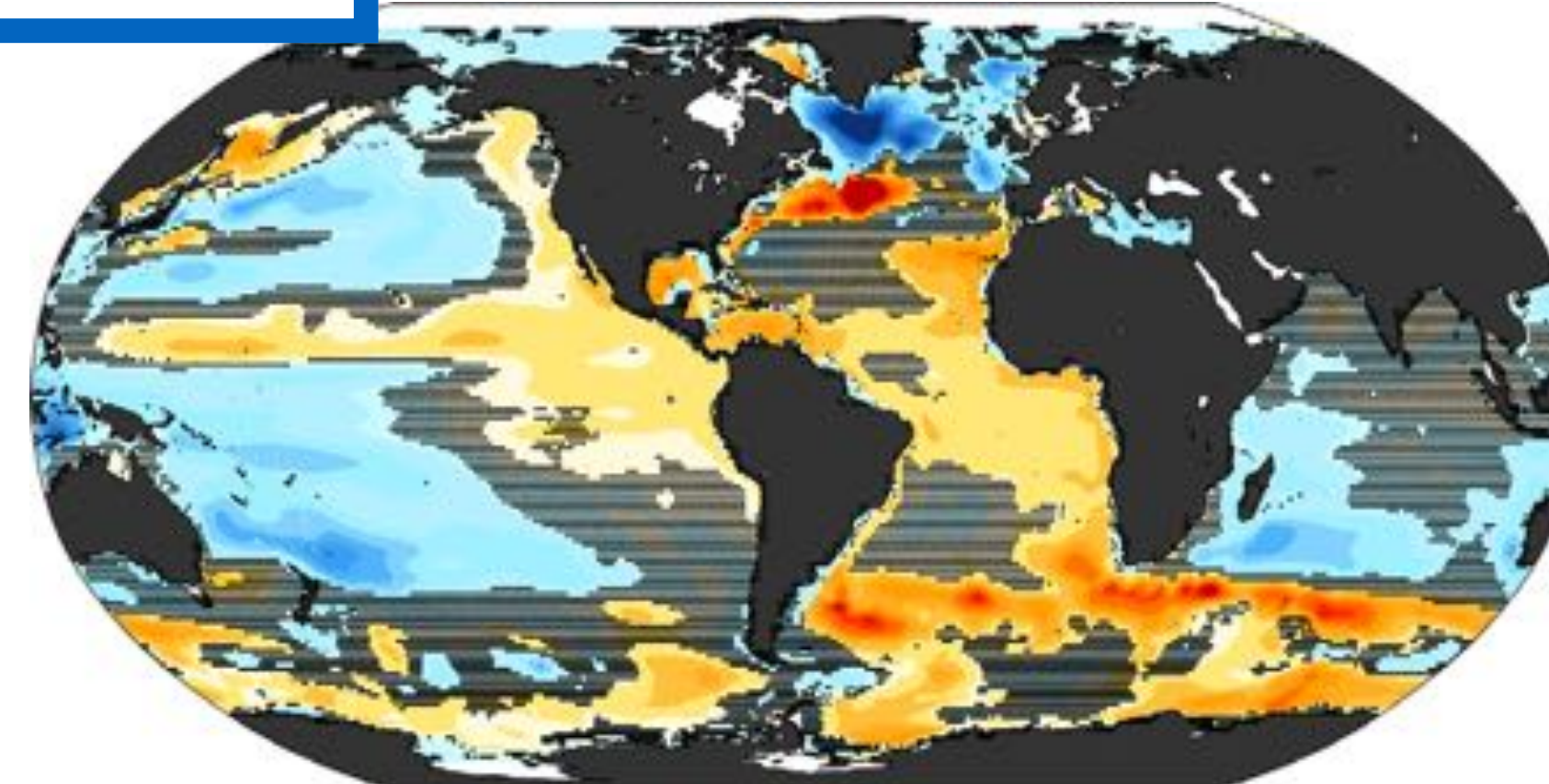
Passive Heat

H_{ad} obs. 1951–2011

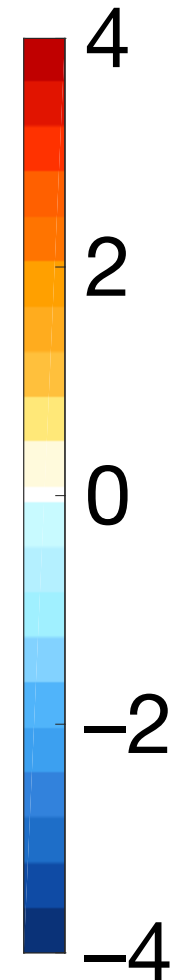


Changing circulation

H_r obs. 1951–2011

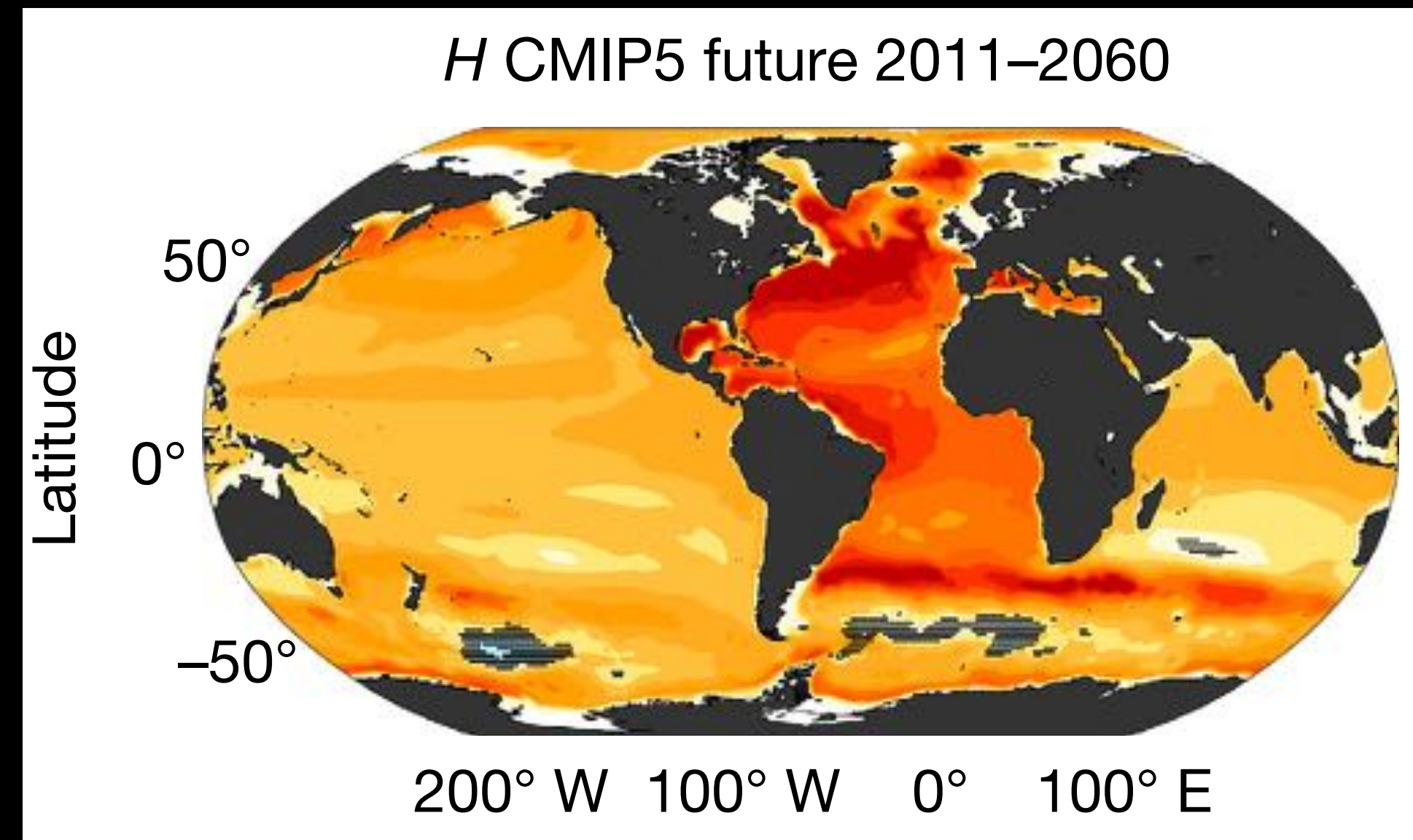


[GJ/m²]

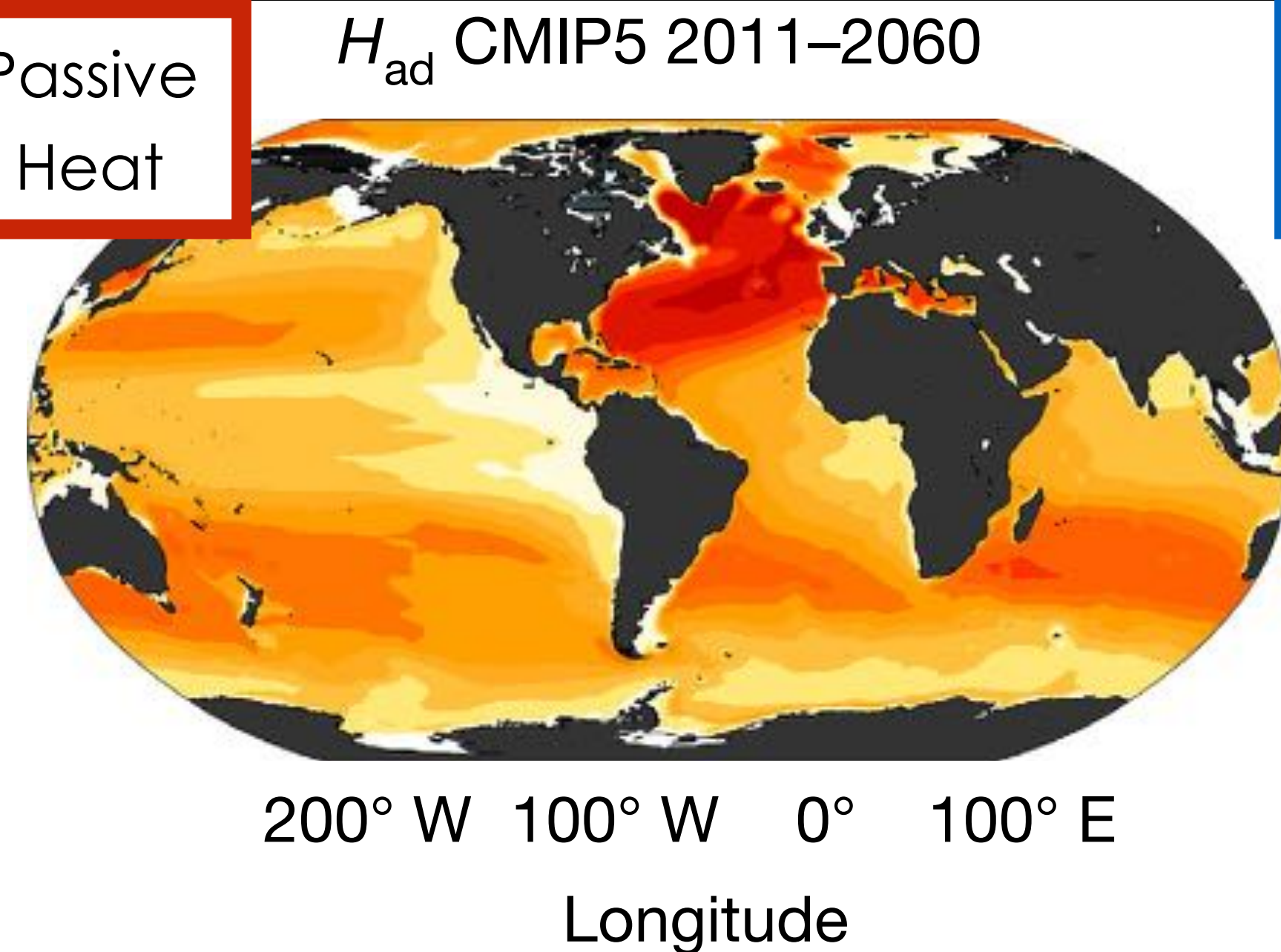


Inferred Heat Content Changes in Future Scenarios

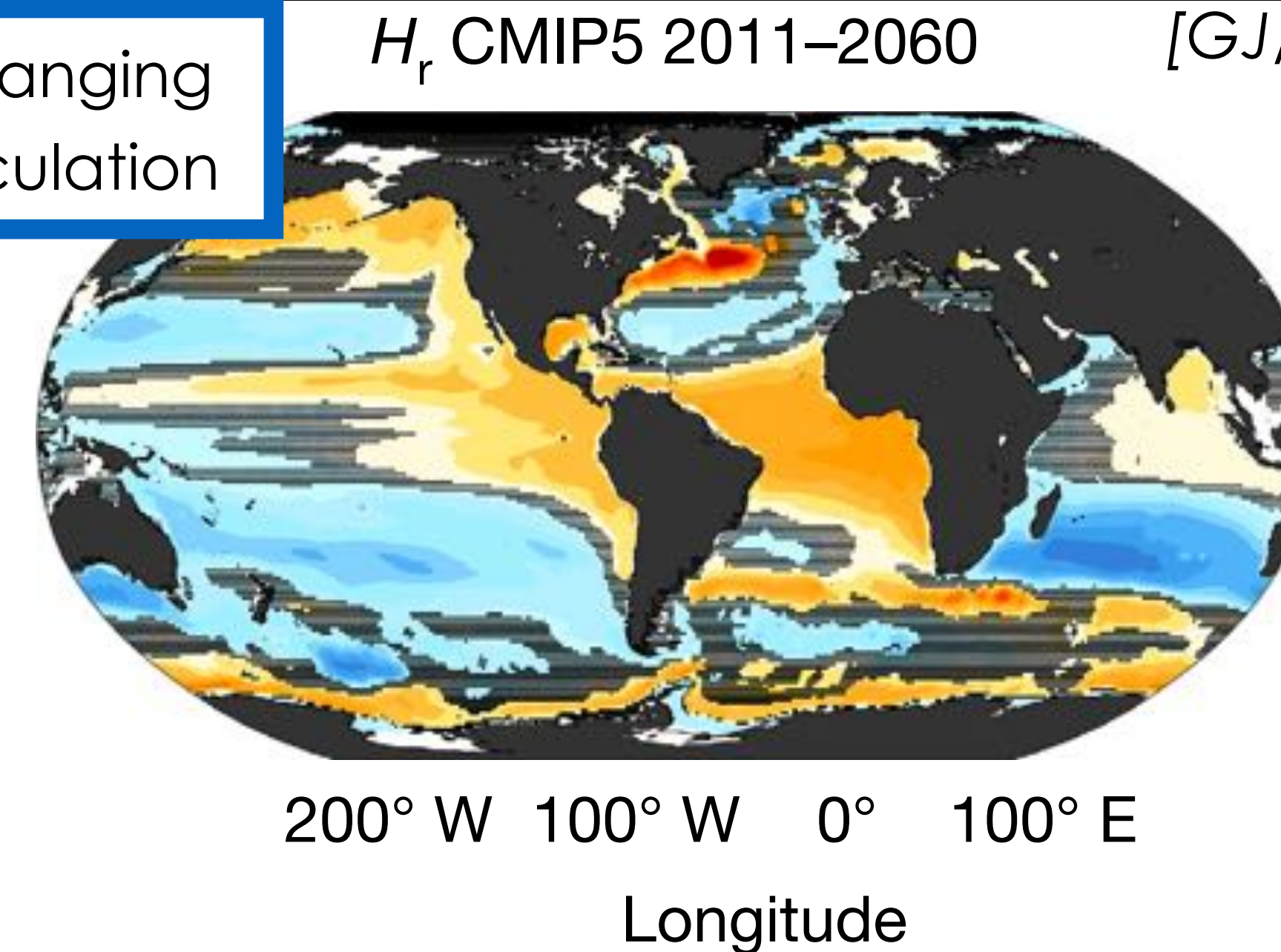
Total storage



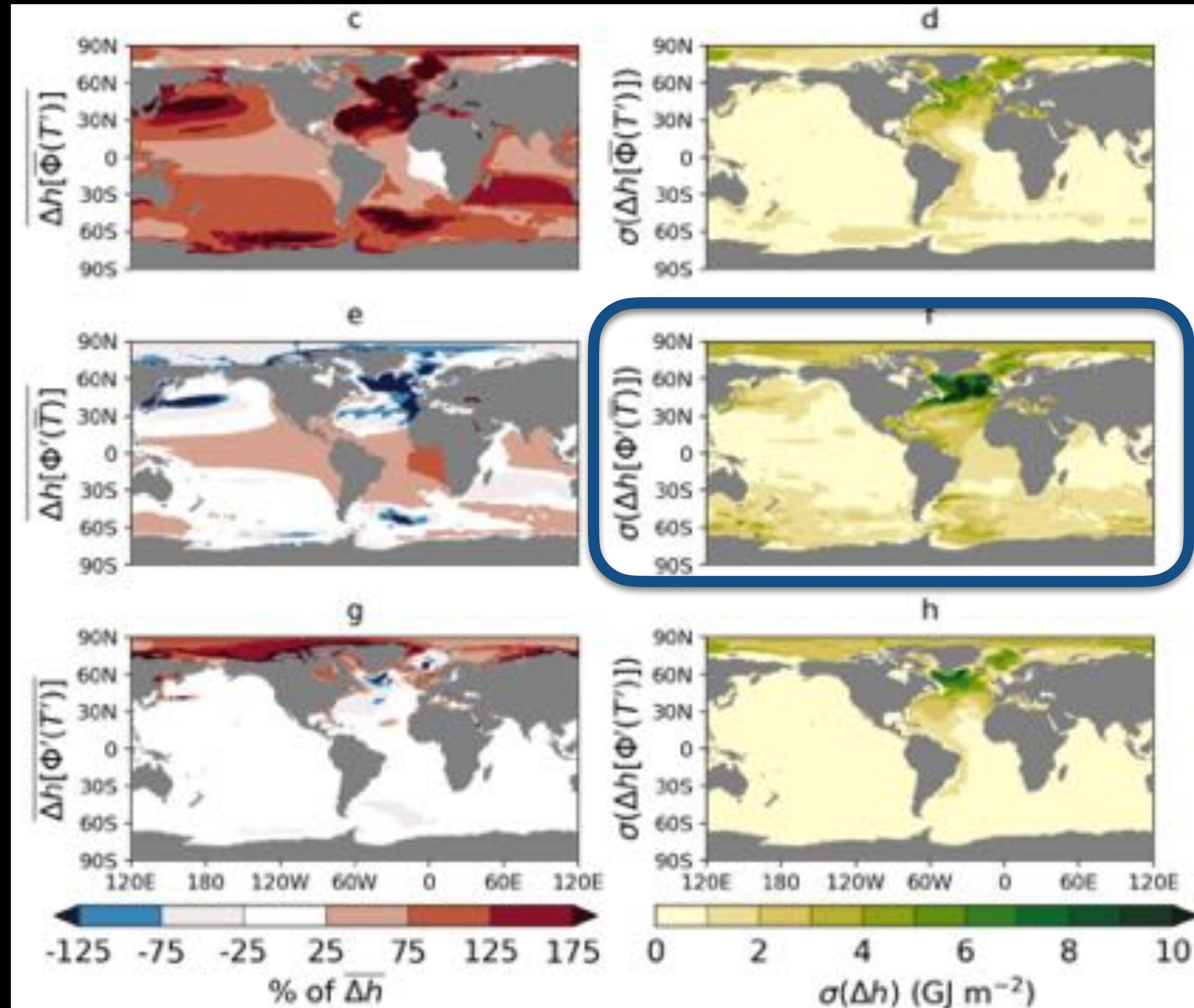
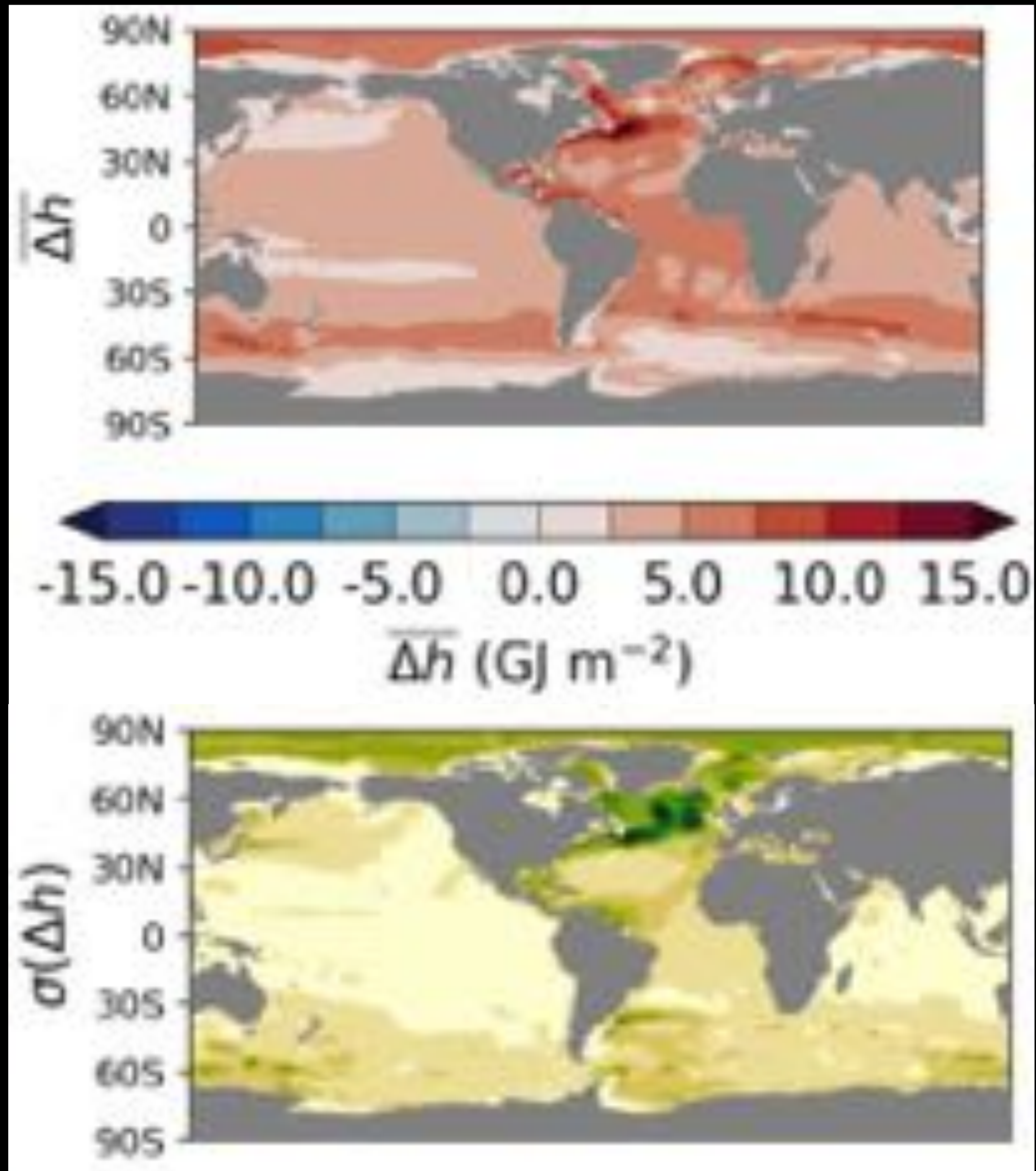
Passive Heat



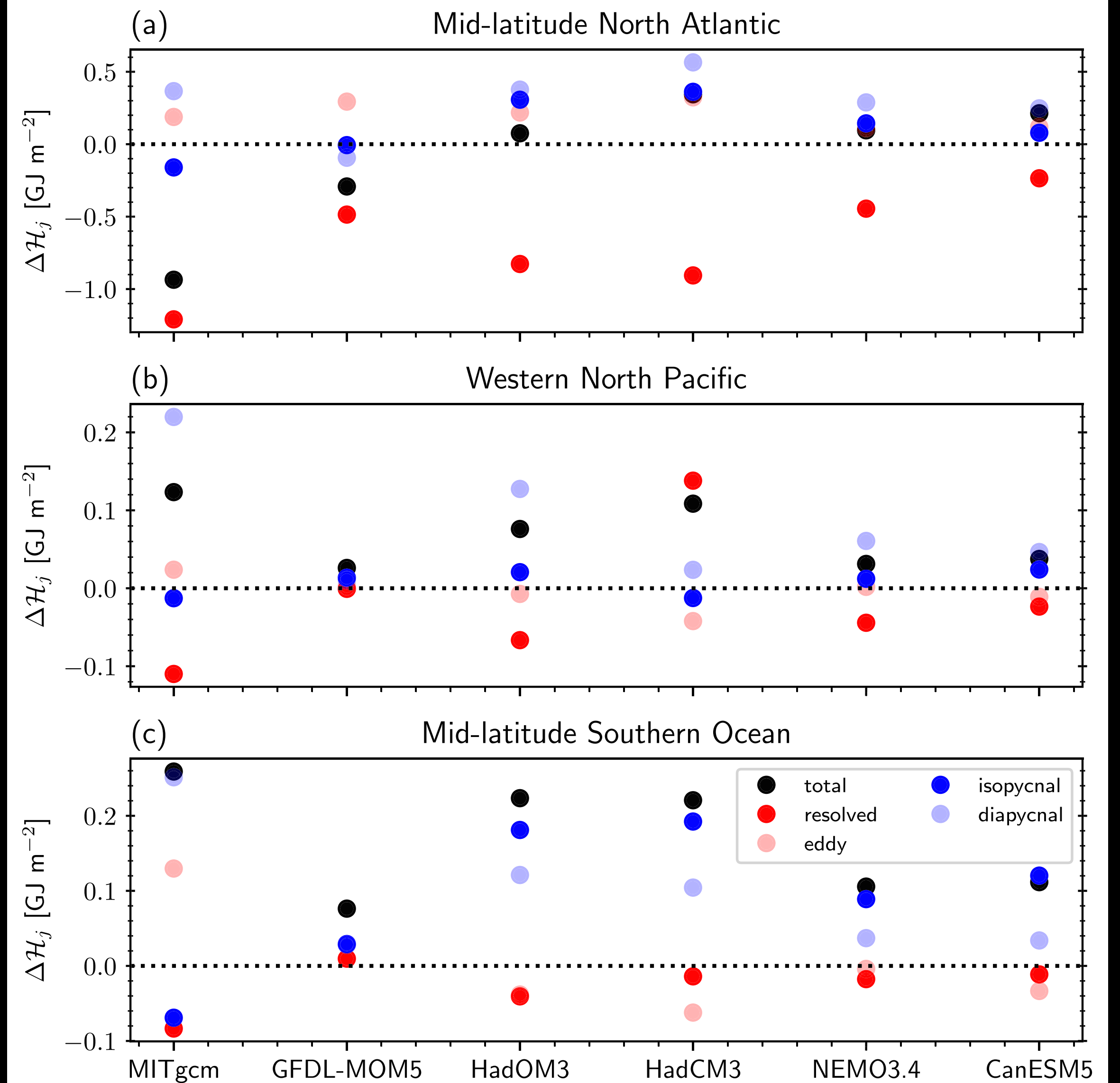
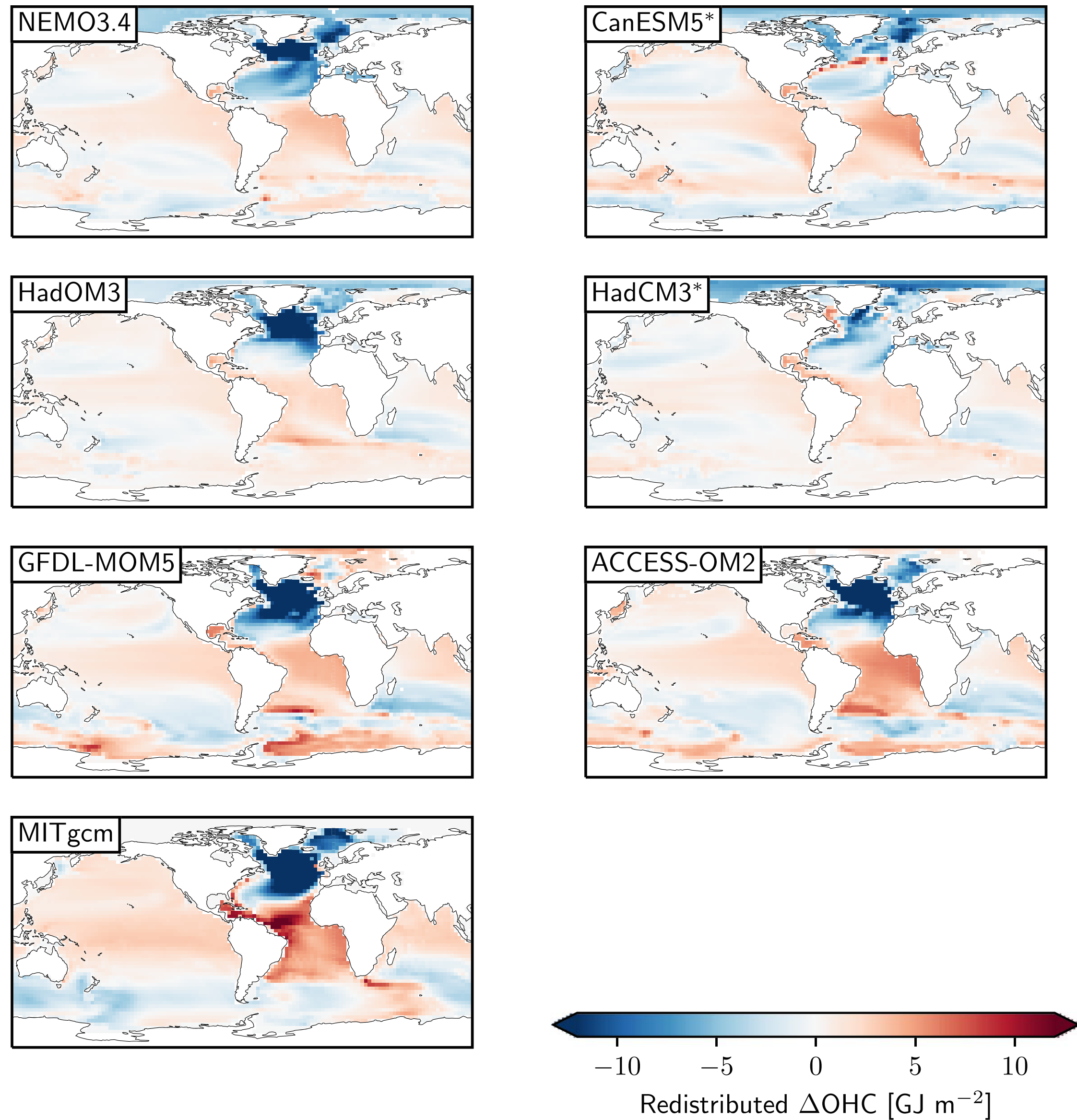
Changing circulation



Projected Thermosteric Sea Level Patterns - FAFHeat



Heat Content Changes in Ocean-only 1%CO₂ Scenarios



Summary

- **Patterns of heat storage (and thermosteric sea level):**
 - **Historical period:** observed trends dominated by redistribution; mixed results in CMIP-models
 - **Future trends:** dominated by passive heat uptake (at least in coarse-resolution models)
- **Uncertainty in projections**
 - Redistribution plays a large role in North Atlantic in particular
 - North Pacific: similar patterns but not mechanisms
 - Southern Ocean: passive but mixing processes contribute to the spread
- **What's next?**
 - Effect of resolution vs. parameterizations on patterns + spread
 - Relating interior changes to coast

