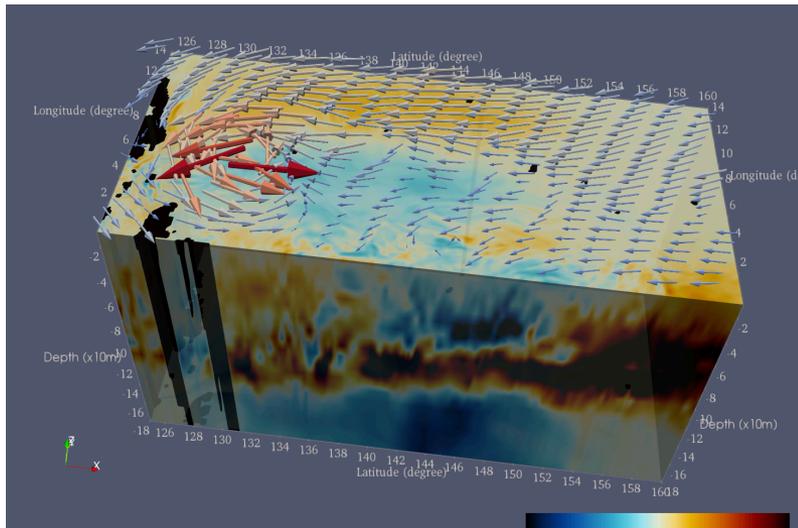


Impact of Tropical Cyclones on the Climate

Investigating TCs' role within the fully-coupled CESM



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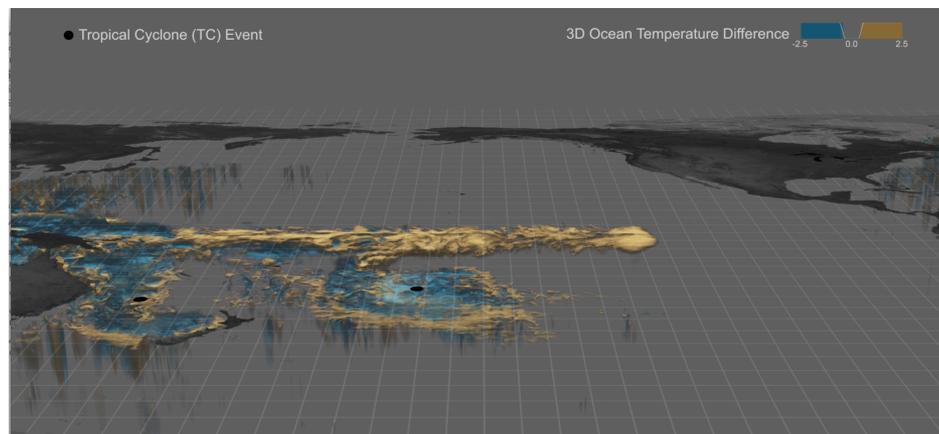
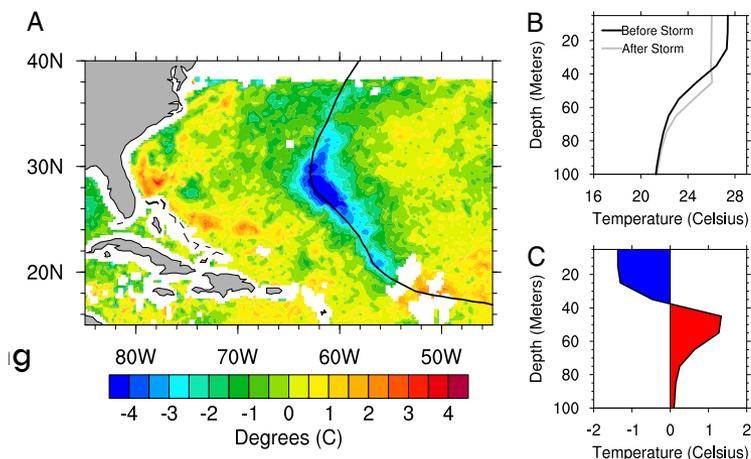


catalyst



Motivation

- Tropical cyclones (TCs) are transient, yet **extremely powerful** weather events that can cause devastating socioeconomical consequences on coastal areas.
- TCs can play an **active role** in the climate system:
 - Strong TC wind can cause vigorous **ocean mixing**.
 - TCs can alter global surface and subsurface **ocean temperature** patterns and seasonality, **ocean heat content and transports**, and the large-scale **circulation patterns**.



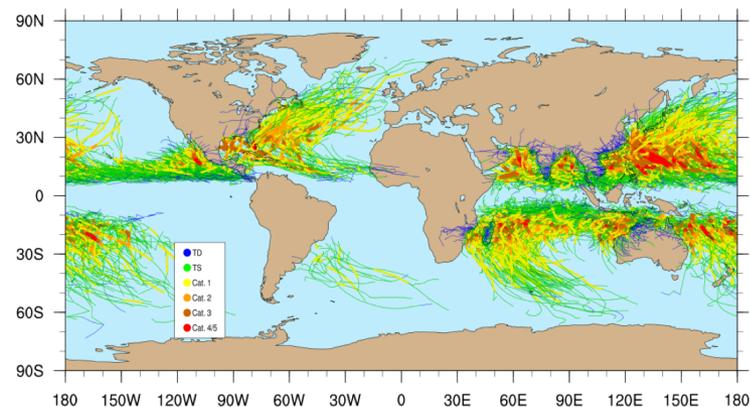
- As climate models are moving toward TC-resolving resolutions, how do models' self-generated TCs impact the large-scale fully coupled climate system?



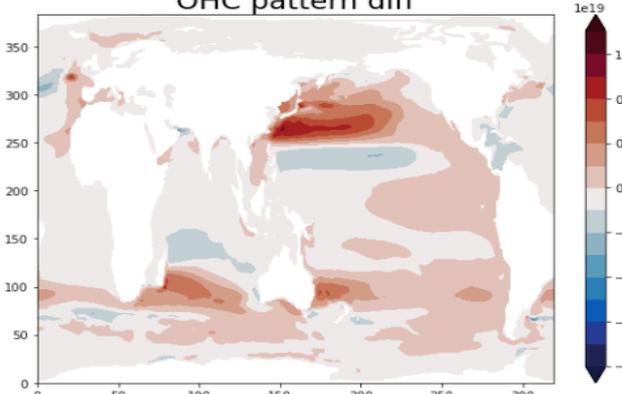
Methods and Results

Add TC wind forcing from the high-res (0.25°) model to the low-res (1°) coupled model:

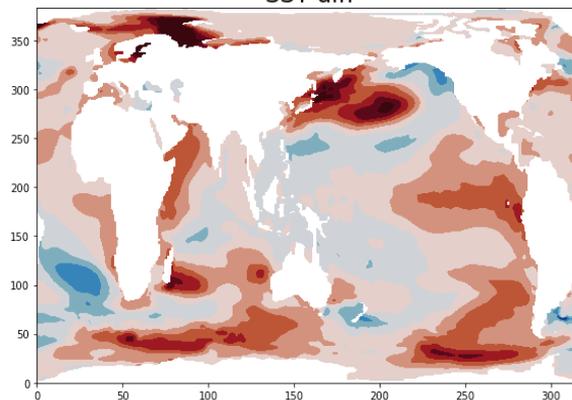
- Track TCs from the high-res model
- Extract atmospheric bottom wind stress related to TCs
- Add TC features to the coupler
- 6-hourly coupling frequency



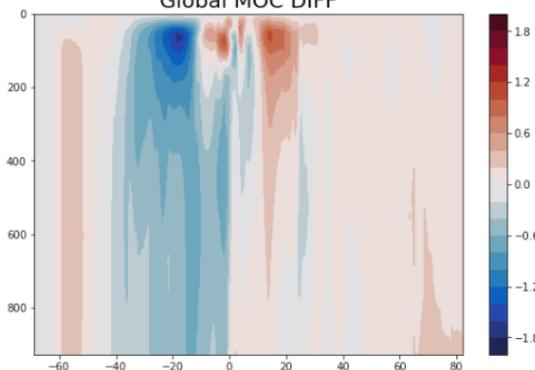
OHC pattern diff



SST diff



Global MOC DIFF





Summary

- As climate models move toward “weather-resolving” resolution, it is important to understand the **upscaling processes and potential feedbacks** from the resolved weather events to large-scale climate, in order to **constrain model uncertainties** in simulating climate mean state and variability.
- Here we aim to advance our understanding about fundamental physical processes and model dynamics of the multi-scale interactions between TCs, ocean dynamics, and large-scale circulations.
 - In the fully-coupled modeling framework, the added TC winds can significantly alter the surface radiative and turbulent heat fluxes, leading to changes in global temperature, precipitation, ocean heat content and circulation patterns.
 - TCs can significantly contribute to global ocean heat content. The magnitude of ocean heat uptake is ~ 8 times larger than in the ocean-only simulations.