GEOS-MITgcm coupled atmosphere-ocean simulation for DYAMOND

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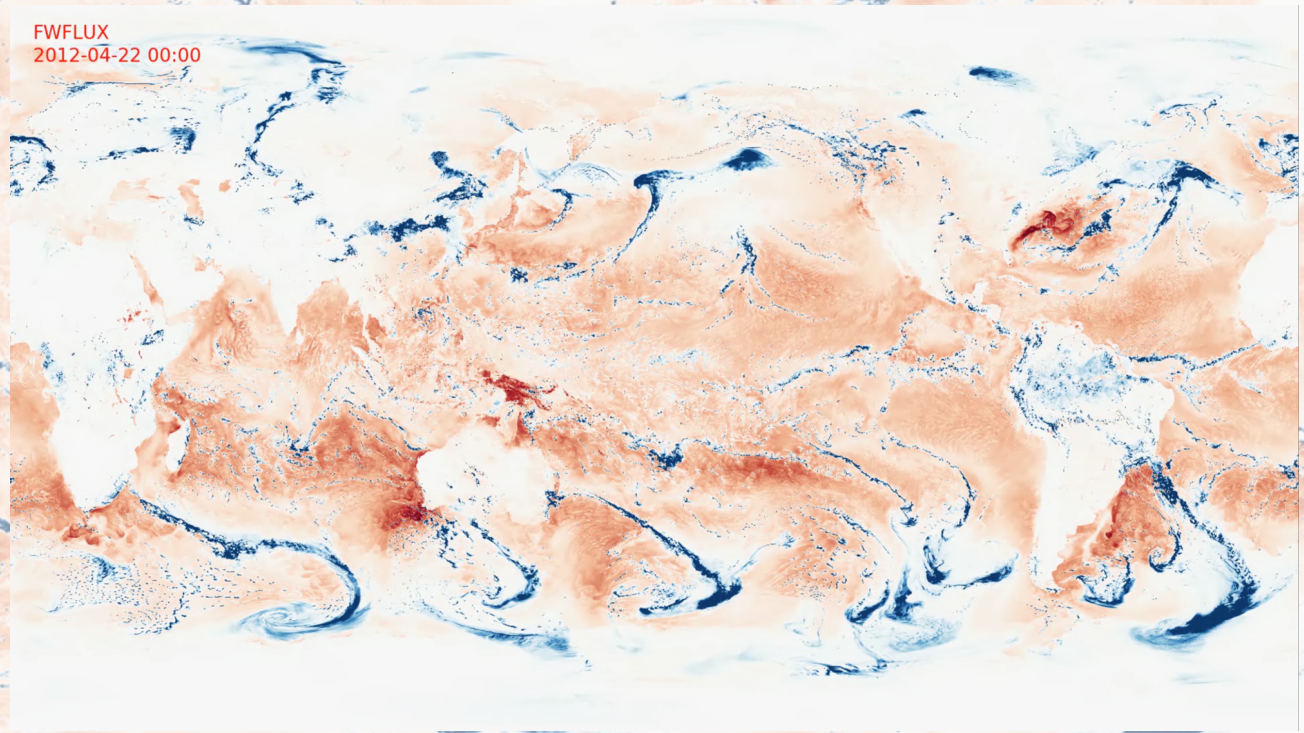
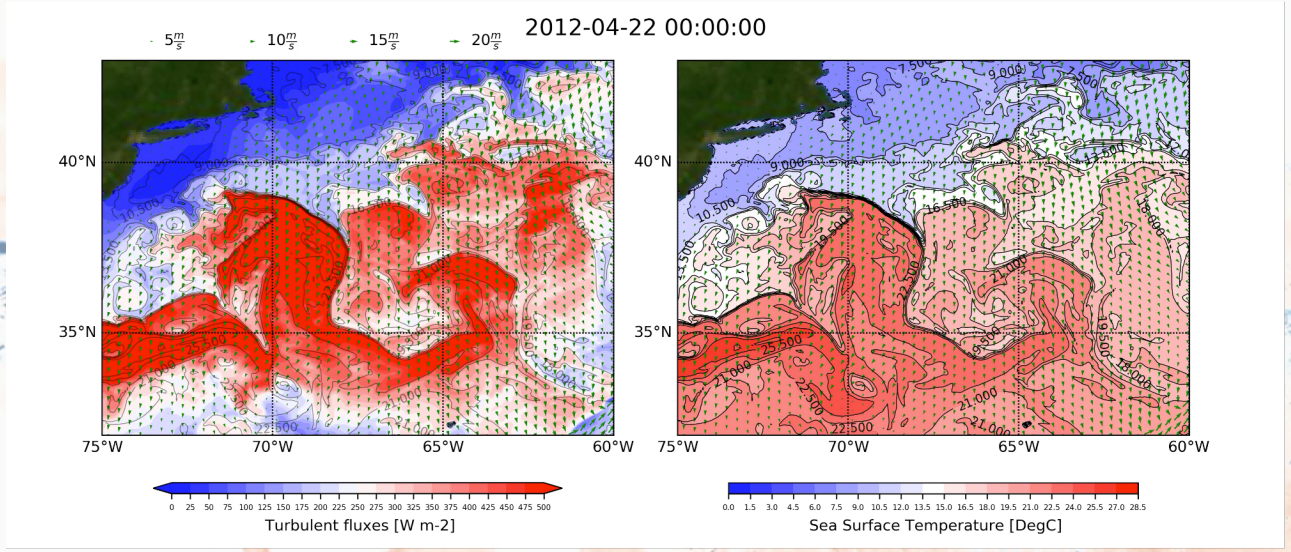
- **6km atmosphere, 4km ocean: integrated for 14 months running on ~8000 cores (3 model days per day).**
- **Dynamic/thermodynamic sea-ice.**
- **Ocean include tidal forcing.**
- **Exchanging data every timestep.**

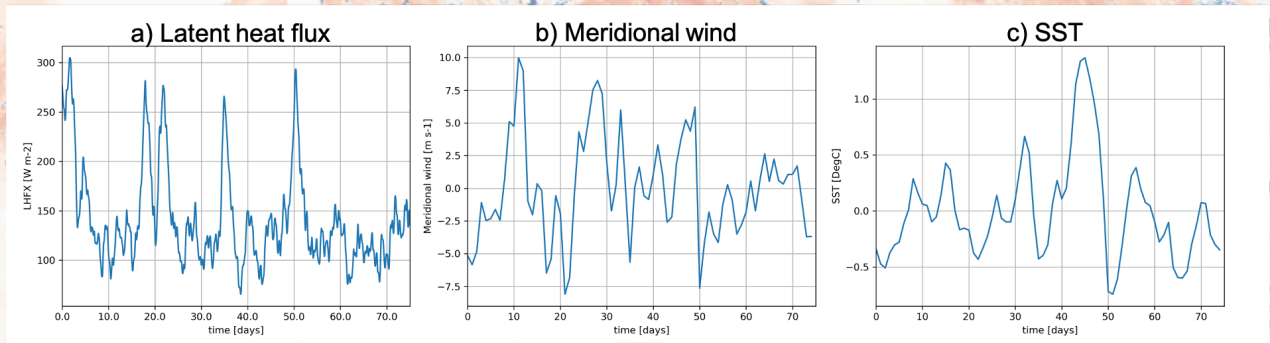
The output from this simulation can be used to study air-sea exchange processes, to provide synthetic training data for Bayesian and machine-learning-based climate model parameterization schemes, to serve as nature run for observation system simulation experiments, and to guide the development of new satellite, in-situ, and data assimilation missions.

Preliminary animations are available here: https://data.nas.nasa.gov/viz/vizdata/DYAMOND_c1440_llc2160/GEOS/index.html
Simulation output is being made available through public DYAMOND, XSEDE, and NAS repositories, e.g., https://data.nas.nasa.gov/ecco/





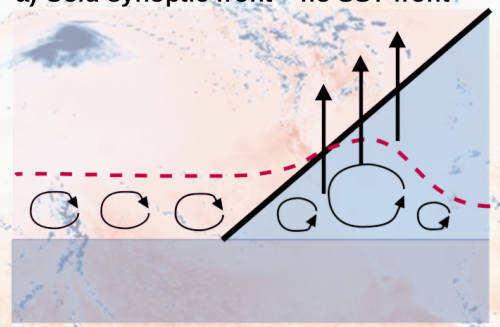
Sharp gradients in SST and turbulent fluxes (shading) are seen in regions of high near surface winds (vectors). This demonstrates the air-sea exchange mechanism wherein the ocean exerts influence over the atmosphere, as shown in Chelton et al (2010).



Latent heat burst are observed during strong north-to-south surface wind conditions

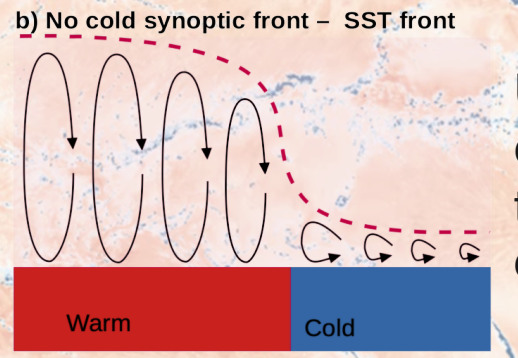
Secondary circulation during cold-to-warm air flow

a) Cold synoptic front – no SST front



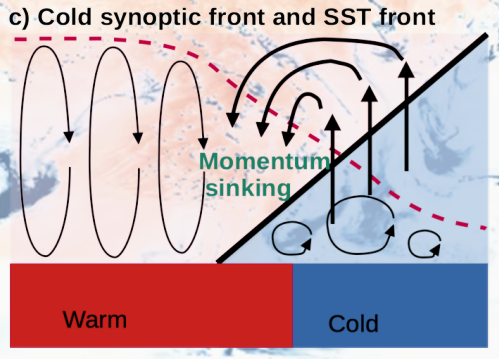
Under no sst-front conditions, propagation of cold synoptic air will result vertical motion

b) No cold synoptic front – SST front



Under no synoptic-front condtions, sharp turbulent flux discontinuity is formed

c) Cold synoptic front and SST front



Under cold synoptic front and SST front conditions, a secondary circulation is forming.