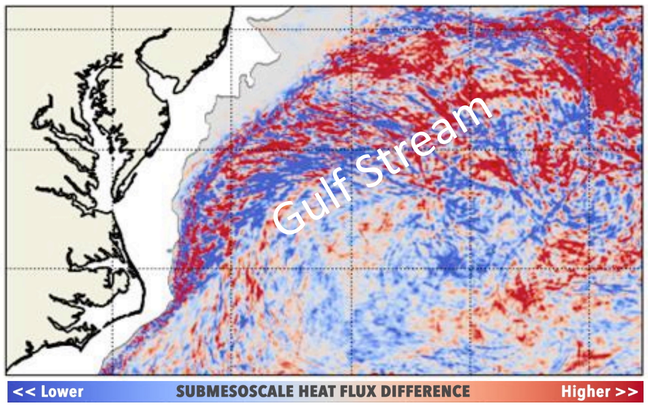
Surface Currents Modify the Ocean's Vertical Structure

How do ocean surface currents change the vertical transport of energy in the ocean and into the atmosphere?

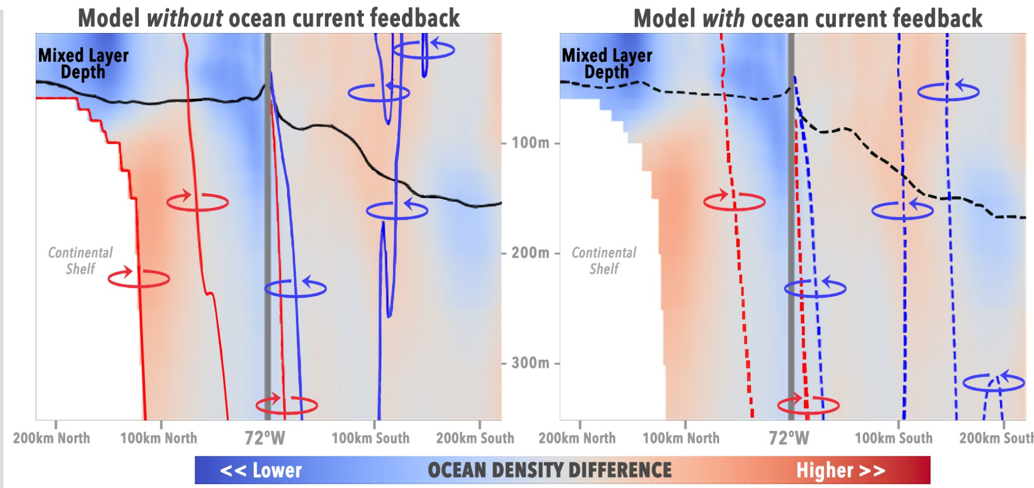
A high-resolution coupled ocean-atmosphere model is used to **examine the impacts of total surface currents on the ocean and atmosphere.** We find that physical processes such as current-induced changes in surface stress **modify vertical sub-mesoscale and mesoscale ocean motion**. This, in turn, **changes the vertical structure of temperature, salinity and density**.

Colors on this map show differences in **heat surface fluxes** averaged over one winter season. **These changes are large enough to impact weather.**



Submesoscale processes change ocean density structure – which depends on temperature and salinity – in a manner that is organized by mesoscale rotation:

- Current-induced patterns of temperature and salinity have **added submesoscale structure**
- These changes and the related vertical motions ***are very likely to be important for ocean biology and biogeochemical processes***



Cross sections above show how coupling winds and currents:

- Change the ocean density structure (background colors)
- Align with modeled ocean current curl / vorticity (arrows)

The density response is a **better match to the *model with current and wind coupling.***

May, J.C., and Bourassa, M. A. (2024) ***Upper Ocean Thermodynamic Response to Coupling Currents to Wind Stress over the Gulf Stream***, *J. Marine Science and Engineering*, 12 (11), 1994.

Visit the interactive story: https://arcg.is/1XCrX1

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