Contribution ID: **5** Type: **Talk**

The vertical Lagrangian-remap method, hybrid vertical coordinates, and the prospect of eliminating the spurious mixing problem in ocean climate models

Thursday, 30 January 2020 09:00 (30 minutes)

For 20 years, the ocean climate modeling community has been confronted with the pernicious problem of uncontrolled spurious mixing that arises from numerical truncation errors in the discrete advection operator. These errors can accumulate over climate time scales to degrade the simulated pycnocline and contribute to sizable water mass drifts and spurious heat uptake. The errors generally worsen when allowing the grid Reynolds number to be larger than unity, which is commonly the case in eddying simulations designed to aggressively optimize eddy energy. In this talk, we revisit the spurious mixing problem in the context of the vertical Lagrangian-remap method and hybrid vertical coordinates used by MOM6 and HYCOM. We offer a tutorial on the vertical Lagrangian-remap method that removes much of its mystery, and then argue that the method provides an ideal means to isolate the spurious mixing problem to the vertical direction, thus allowing for higher-order accurate schemes to greatly reduce spurious mixing when combined with a suitable vertical coordinate choice. We display a direct comparison from the GFDL OM4 global ocean/ice climate run at nominally 1/4-degree resolution and 75 vertical degrees of freedom, whereby the choice of vertical coordinate (geopotential versus hybrid isopycnal-geopotential) has a huge impact on the heat uptake and model drift.

Do you need an official invitation letter?

Yes

Primary authors: GRIFFIES, Stephen (NOAA/GFDL and Princeton University); ADCROFT, Alistair (NOAA/GFDL and Princeton University); HALLBERG, Robert (NOAA/GFDL and Princeton University)

Presenter: GRIFFIES, Stephen (NOAA/GFDL and Princeton University)

Track Classification: COMMODORE conference