Comparison of two ways of assimilating SWOT observations using NCODA-4DVAR

We investigate two different methods for assimilating sea surface height (SSH) observations within a four-dimensional variational (4DVAR) data assimilation (DA) system. The current operational method for assimilating altimetry observations for the US Navy is by transforming the SSH into synthetic profiles of temperature and salinity. This approach relies on statistical relationships between SSH and subsurface temperature and salinity. It also multiplies the number of SSH observations by twice the number of vertical layers in the model, which in turn impacts the convergence of the 4DVAR, and could be problematic with spatially dense SSH observations as will be provided by NASA's wide-swath Surface Water Ocean Topography (SWOT) altimetry satellite. Previous studies have assimilated SSH observations directly with 4DVAR, exploiting the ability of the adjoint and tangent linear models to project SSH observations to subsurface temperature and salinity. In this study, both ways of assimilating SSH observations will be compared using an Observing System Simulated Experiments (OSSE) based on a high resolution model of the Northeast Atlantic. We apply JPL's Swot Simulator to provide simulated SWOT track locations and observations. Preliminary results comparing the impacts on analysis and forecast accuracy, along with computational expense between the two methods will be shown.

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