Submesoscale resolving ocean simulations with multiple ocean mixing parameterizations

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Motions with higher degree of ageostrophy appear in the oceanic simulations when sub-mesoscale eddies and associated boundary layer processes begin to be resolved in ocean models. These are quintessentially related to horizontal density gradients related to oceanic fronts. These motions have O(1) Rossby and O(1) Richardson numbers, much larger vertical exchange than their large scale counterparts and appear at O(1-10 km) scales in the ocean. There has been much recent interest in their interaction with both relatively smaller and larger scales. We focus on the former.

We have conducted simulations for forced submesoscale eddy resolving simulations using multiple ocean mixing closure schemes using a non-hydrostatic three dimensional process study ocean model (PSOM) including k-epsilon models and K-Profile parameterization, for both mid-latitude deep ocean mixed layers (e.g. North Atlantic) and spicy subtropical oceans with shallow mixed layers but higher density gradients (e.g. Indian ocean). We show that ocean mixing matters for the sub-mesoscale as the rate of re-stratification near oceanic fronts is sensitive to the ocean mixing parameterization. We discuss both its physical and ecosystem implications.

Keywords: submesoscale, ocean fronts, mixing parameterization

