Large Eddy Simulations of Mixed Layer Instabilities and Sampling Strategies

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The ocean's surface mixed layer is notoriously complex due to high spatial and temporal gradients of density and velocity fields. The surface mixed layer also exhibits sub-mesoscale instabilities which are challenging to observe due to their small scale and fast temporal evolution. Nevertheless, the small and sub-mesoscales represent the range of scale of naval operations and thus anomalous currents and perturbations in the acoustic and optical environment that can affect a variety of naval operations. Understanding the motion in this range of scales is therefore critical to help improve the predictive capability of the existing ocean models.

In this preliminary study, large eddy simulations of an idealized mixed-layer problem are conducted using a spectral element model. Characteristics of the different phases of the evolution of a mixed-layer front, as well as the sensitivity of the solution to model parameters are described. The fields are then sampled using tracers and Lagrangian particles, and relative dispersion statistics are discussed.