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Characteristics and Evolution of Passive Tracers in the Oceanic Mixed Layer KATHERINE SMITH, PETER HAMLINGTON, University of Colorado Boulder, BAYLOR FOX-KEMPER, Brown University — Ocean tracers such as CO_2 and plankton reside primarily in the mixed layer where air-sea gas exchange occurs and light is plentiful for photosynthesis. There can be substantial heterogeneity in the distributions of these tracers due to turbulent mixing, particularly in the submesoscale range where partly geostrophic eddies and small-scale 3D turbulence are both active. In this talk, LES spanning scales from 20km down to 5m are used to examine the role of turbulent mixing on nonreactive passive ocean tracers. The simulations include the effects of both wave-driven Langmuir turbulence and submesoscale eddies, and tracers with different initial and boundary conditions are examined. Tracer properties are characterized using spatial fields, statistics, multiscale fluxes, and spectra, and results show that passive tracer mixing depends on air-sea flux rate, release depth, and flow regime. The results indicate that while submesoscale eddies transport buoyancy upward to extract potential energy, the same is not true of passive tracers, whose entrainment is instead suppressed. Early in the evolution of some tracers, counter-gradient transport occurs co-located with regions of negative potential vorticity, suggesting that symmetric instabilities may act to oppose turbulent mixing.

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