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Effects of Submesoscale Turbulence on Tracer Evolution in the Oceanic Mixed Layer KATHERINE SMITH, SPENCER ALEXANDER, University of Colorado - Boulder, LUKE VAN ROEKEL, Northland College, BAYLOR FOX-KEMPER, Brown Univeristy, PETER HAMLINGTON, University of Colorado - Boulder — Ocean tracers such as CO_2, nutrients, and plankton evolve mainly in the mixed layer where light and air-sea gas exchange occur. It is known from prior studies there can be substantial heterogeneity in tracer distributions due to vertical and horizontal turbulent mixing across a range of scales. The contribution of submesoscale turbulence to these distributions is not entirely understood, particularly in the sub-kilometer range where both large-scale, nearly 2D and small-scale, 3D turbulence are active, resulting in dynamical complexity from which heterogeneity can arise. In this talk, results from large eddy simulations of a large temperature front evolving are used to examine effects of multi-scale turbulence on idealized tracer distributions from scales 20km to 5m. Simulations include the effect of Langmuir turbulence by solving the wave-averaged Boussinesq equations with an imposed Stokes drift velocity. Tracers with different source and boundary conditions are examined to understand the role of both small-scale, near-surface vertical mixing and larger-scale upwelling motions typically associated with submesoscale eddies. Tracer evolution is characterized using spectra, multi-scale fluxes, and probability distribution functions, and implications of the results are outlined.

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