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Dispersion and transport of tracer particles at an upper ocean front VICKY VERMA, SUTANU SARKAR, University of California San Diego — Turbulence resolving simulations of upper-ocean fronts show the formation of thin filament structures during the evolution of baroclinic instability. The filaments develop large vertical vorticity and vertical velocity; furthermore, long filaments roll up to form coherent submesoscale eddies. The role of coherent structures, i.e. the vortex filaments and the eddies, in vertical and lateral transport and dispersion of particles has been studied for a submesoscale mixed layer front using tracer particles which advect with the local fluid velocity. The time evolution of tracer particles reveals stirring across the front, as well as vertical transport directed by the coherent structures. There are vortex filaments on both the heavier and lighter sides of the front that provide direct pathways for vertical transport. The filament on the heavier side downwells the local (heavier) fluid particles to the bottom, spiraling around the eddy, while the filament at the lighter side upwells the local (lighter) fluid particles to the surface. Subsequently, the downwelled and upwelled particles slowly adjust to a smooth stable profile. The effect of coherent structures on the dispersion of particles is studied using single-particle, two-particle and multi-particle dispersion statistics.

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