Abstract View

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The Vertical Motion of Submesoscale Coherent Vortices across Neutral Surfaces

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ABSTRACT

Submesoscale coherent vortices (SCVs, “meddies” or “bullets”) are shown not to move along either potential density surfaces or neutral surfaces, due to the compressibility of sea water being a function of potential temperature and salinity. While it has been recognized that SCVs may make an important contribution to *lateral* property fluxes in the ocean, it is shown in this paper that they can also cause significant *vertical* fluxes across neutral surfaces. Since they represent the slow vertical translation of macroscopic water masses, these fluxes are not measurable with microstructure measurements of the dissipation of kinetic energy, but are nonetheless real. These vertical fluxes of heat and salt can be either down-gradient or up-gradient, corresponding to either a positive or a negative vertical diffusivity. The magnitude of the effective diffusivity for salt is different from that for heat. Formulae are derived for estimating the mean vertical velocity of SCVs through neutral surfaces.