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Parameterization of turbulent diffusivity in stratified flows using microstructure observations and DNS[1] BENJAMIN MATER, SUBHAS VENAYAGAMOORTHY, Colorado State University — In oceanic flows, the eddy diffusivity of density, K_d, is commonly approximated using the Osborn-Cox model with a constant mixing efficiency, Γ. Many have sought to improve upon the accuracy of this approach by parameterizing the variability in Γ using the buoyancy Reynolds number ($Re_B{=}\varepsilon/\nu N^2$). In this study, we point out that $Re_B{=}Fr^2 Re_L$ (where $Fr{=}\varepsilon/kN$ and $Re_L = k^2/\varepsilon\nu$) and is, thus, a mixed parameter that obscures explicit dependencies on the more fundamental parameters involving turbulent kinetic energy, k. Using microstructure observations, we demonstrate this non-uniqueness of Re_B and explore the independent effects of Fr and Re_L. Because k is not readily available from microstructure measurements, however, we investigate alternative methods to infer its value from measured Thorpe scales, L_T. Through physical reasoning, we argue that L_T should scale with a length scale dependent on k and not solely on dissipation ε. We test this reasoning using DNS of decaying grid turbulence.

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