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Relevancy of the buoyancy Reynolds number in stably stratified turbulence[1] BENJAMIN MATER, SUBHAS KARAN VENAYAGAMOORTHY, Colorado State University — The buoyancy Reynolds number, $Re_b = \epsilon/(\nu N^2)$, has become a widely popular parameter with which to describe turbulent mixing in the stratified environment of the open ocean. This popularity has arisen largely on the practical grounds that the constituent quantities are available through common measurement techniques: estimates of turbulent kinetic energy dissipation (ϵ) are available from observations of fine-scale shear, and the buoyancy frequency (N) can be determined from profiles of density. Despite practical appeal, however, Re_b is ambiguous in that it fails to distinguish between regimes of weak stratification and strong turbulence. This becomes obvious in the formulation $Re_b = Re_L(Fr_k)^2$, where $Re_L = k^2/(\epsilon\nu)$ is a turbulent Reynolds number, $Fr_k = \epsilon/(Nk)$ is a turbulent Froude number, and k is the turbulent kinetic energy. In considering both Re_L and Fr_k independently, the time scale of the turbulence, $T_L = k/\epsilon$, is made explicit. We explore the duality of Re_b in describing mixing efficiency using a $Re_L - Fr_k$ parameter space and argue the importance of T_L in parameterization of flow behavior. Data from direct numerical simulations, laboratory experiments, and field observations are considered.

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