Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

An analysis of diapycnal mixing efficiency in stably stratified turbulent flows[1] AMRAPALLI GARANAIK, SUBHAS KARAN VENAYAGAMOORTHY, Colorado State University, DEREK STRETCH, University of KwaZulu-Natal — In order to estimate turbulent diapycnal mixing in stably stratified flows such as in oceanic flows, two key quantities are required namely the diapycnal mixing efficiency R_f^* and the dissipation rate of turbulent kinetic energy ϵ. The focus of this study is to investigate the variability of R_f^* by considering oceanic turbulence data obtained from microstructure profiles in conjunction with data from laboratory experiments and DNS. The analysis of the field data was performed on turbulent patches which were identified using the Thorpe sorting method for potential temperature. The turbulent kinetic energy k contained within a turbulent patch was inferred based on the flow regime following the methodology proposed by Mater and Venayagamoorthy (Physics of Fluids, 26, 036601, 2014). The analysis shows that high mixing efficiency can persist at high buoyancy Reynolds numbers ($Re_b = \epsilon/\nu N^2$, where N is buoyancy frequency and ν is the kinematic viscosity), contrary to the notion that mixing efficiency decreases in a universal manner beyond $Re_b > 100$. These findings clearly show that Re_b based parameterizations that are obtained from low-Reynolds number experimental/DNS studies are not universal and/or appropriate for geophysical flows.

[1]Funded by ONR and NSF.

Subhas Venayagamoorthy
Colorado State University

Date submitted: 03 Aug 2015 Electronic form version 1.4