Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Generalized quasilinear simulations of strongly stratified Kolmogorov flow ADHITHIYA SIVAKUMAR, GREGORY CHINI, University of New Hampshire — Generalized quasilinear (GQL) theory provides self-consistent approximations for the small-scale dynamics of various flows. The approximation is performed by specifying a threshold wavenumber Λ that separates state variables into large and small scales in spectral space and then removing select nonlinear interactions. The resulting equations respect the conservation laws of the original PDEs and enable a systematic homotopy between quasilinearity ($\Lambda = 0$), i.e. the mean field limit, and full nonlinearity ($\Lambda \to \infty$), i.e. DNS. When $\Lambda > 0$, nonlinear interactions among the large scales and small scale energy transfers via interaction with the large scales are captured. These physical processes are particularly important for shear flows with highly anisotropic structures. Here, we investigate these interactions by performing DNS and GQL simulations of strongly stratified Kolmogorov flow, comparing results across a range of computational domain sizes, buoyancy Reynolds numbers, and threshold wavenumbers.

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Date submitted: 03 Aug 2020 Electronic form version 1.4