Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Effects of stratification on the equilibration of shallow fronts HIEU PHAM, SUTANU SARKAR, University of California, San Diego — Turbulence at frontal zones in the upper ocean is influenced by shear and density stratification that can vary in both lateral and vertical directions. The present study uses large eddy simulation to investigate the evolution of turbulence at a shallow front that consists of a geostrophic jet and stratification in both directions. The density gradient is represented by a hyperbolic-tangent profile in the lateral direction and a linear profile in the vertical direction. The vertical density gradient is varied among cases to explore the dynamics that evolve in different regimes of Richardson number, Ri_g. In the cases with $Ri_g < 0.25$, the turbulence rapidly develops throughout the surface layer and spreads laterally outward from the middle of the front. The front is quickly equilibrated within a fraction of an inertial period. In the cases with $0.25 < Ri_g < 1$, turbulence is initiated in a thin layer of elevated shear that forms near the surface. The turbulence that occurs in patches in the lateral direction spreads downward across the surface layer. The budgets of momentum, potential vorticity and energy are discussed to illustrate the different processes leading to the equilibration of the front.

Hieu Pham
University of California, San Diego

Date submitted: 29 Jul 2016 Electronic form version 1.4