Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

On the Orientation of Turbulent Structures in Stably Stratified Shear Flows FRANK JACOBITZ, ADAM MOREAU, JOYLENE AGUIRRE, University of San Diego — The orientation of turbulent structures in stably stratified shear flows are investigated using the results of a series of direct numerical simulations. The Richardson number is varied from $Ri = 0$, corresponding to unstratified shear flow, to $Ri = 1$, corresponding to strongly stratified shear flow. The evolution of the turbulent kinetic energy changes from growth for small Richardson numbers to decay for strong stratification. The orientation of turbulent structures in the flows is determined by the three-dimensional two-point autocorrelation coefficient of velocity magnitude, vorticity magnitude, and fluctuating density. An ellipsoid is fitted to the surface given by a constant autocorrelation coefficient value and the major and minor axes are used to determine the inclination angle of turbulent structures in the plane of shear. The inclination angle is observed to be fairly unaffected by the choice of the autocorrelation coefficient value. In was found that the inclination angle decreases with increasing Richardson number. The structure of the turbulent motion, as characterized by the inclination angle, is therefore directly related to the eventual evolution of the turbulence, as described by the growth or decay rate of the turbulent kinetic energy.

Frank Jacobitz
University of San Diego

Date submitted: 26 Jul 2016 Electronic form version 1.4