Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

LES of stratified turbulent wake with temperature and salinity dependent density stratification[1] REETESH RANJAN, SURESH MENON, Georgia Institute of Technology — Large eddy simulation (LES) based investigation of doubly-diffusive stratified turbulent wake flow is performed in this study. Such flows are observed in underwater naval applications, where the density stratification usually depends upon two scalar fields, namely, temperature and salinity through a linear/nonlinear equation of state. A disparity in the range of scales associated with these scalars and differential diffusion effects leads to exorbitant computational cost, thus making LES a viable alternative. In this study, LES is performed by employing the dynamic one-equation based eddy viscosity model, which has been extended for stratified flows. The extended LES formulation is first assessed for its predictive capabilities by comparing with the reference direct numerical simulation results. Afterward, the effects of doubly-diffusive turbulence on the temporal evolution of the wake structure are examined by comparing two cases with stable/unstable stratification of temperature/salinity fields, while still maintaining an overall stable density stratification, where the density is determined by a linear equation of state. The results from these cases are compared with reference results employing density stratification dependent upon only one scalar field.

[1]Office of Naval Research

Reetesh Ranjan
Georgia Institute of Technology

Date submitted: 01 Aug 2017 Electronic form version 1.4