Detached eddy simulation of separated flow in the near-wake of a sphere moving through a stratified fluid[1] T.S. ORR, J.A. DOMARADZKI, University of Southern California, G.S. CONSTANTINESCU, University of Iowa — Separated turbulent flows generated by submersed bodies in stratified fluids have been investigated in numerous experiments and numerical simulations. At high Reynolds numbers the numerical simulations are unable to resolve both a flow around the body and in the far-wake, which is the region of interest in such investigations. Because of that, in the far-wake simulations, the body is not simulated directly, but an initial condition is constructed using limited information from experiments for the near-wake properties. However, such initializations suffer from the lack of information about density field, which is difficult to measure. To obtain such information we perform DES of a flow around a sphere moving through a stably stratified fluid employing a body-fitted viscous flow solver in generalized curvilinear coordinates. The DES method based on the Spalart-Allmaras turbulence model is used to model the momentum equation as well as the density perturbation equation in the Boussinesq approximation. The simulations are validated by comparison with experimental data collected at USC at a $Re = 5000$ and $Fr = 4$ and then parameter space is extended to cover several other values of Re and Fr of interest.

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