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Coherent structures and enstrophy dynamics in highly stratified flow past a sphere at Re = 3700 KARU CHONGSIRIPINYO, ANIKESH PAL, SUTANU SARKAR, Univ of California - San Diego — Vortex dynamics of flow past a sphere in a linearly stratified environment is investigated. Simulations are carried out for a flow with Reynolds number of 3700 and for several Froude numbers (Fr) ranging as low as 0.025. Isosurface of Q criterion is used to identify vortical structures whose cross-section and orientation are found to be affected by buoyancy. At low $Fr = 0.025$, pancake eddies and surfboard-like inclined structures emerge in the near wake and have a regular streamwise spacing that is associated with the frequency of vortex shedding from the sphere. Similar to turbulent kinetic energy, the enstrophy in the near wake decreases with decreasing Fr (increasing stratification) until a minimum at $Fr = 0.5$ but the trend reverses in the low-Fr regime. Vortex stretching by fluctuating and mean strain are both responsible for enhancing vorticity with relatively small contribution from the baroclinic term. Decreasing Fr to $O(1)$ values tends to suppress vortex stretching. Upon further reduction of Fr below 0.25, the vortex stretching term takes large values near the sphere.

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