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Particle dispersion in stably stratified open channel flow SALVATORE LOVECCHIO, Dipartimento di Ingegneria Elettrica, Gestionale e Meccanica, University of Udine, FRANCESCO ZONTA, ALFREDO SOLDATI, Centro Interdipartimentale di Fluidodinamica e Idraulica and Dipartimento di Energetica e Macchine, University of Udine — Many geophysical flows are influenced by stable stratification effects. In terrestrial water bodies, the vertical distribution of temperature produces a thermocline (a region where large gradients occur) which strongly influences mixing. In this study we analyse the effect that the formation of the thermocline has on particle dispersion in stably stratified turbulence in an open channel flow using Direct Numerical Simulation and Lagrangian Particle Tracking. The parameter that characterizes the physical problem is given by the ratio Gr/Re_τ^2, where Gr is the Grashof number and Re_τ the Reynolds number. This parameter represents the relative importance of buoyancy and inertia (namely of stratification). We perform a parametric study, considering different stratification levels (i.e, different values of Gr/Re_τ^2) and particles with different inertia. Preferential concentration is quantified using the correlation dimension and Voronoi diagrams. Results indicate that the thermocline in the upper flow layers influences the dynamics of the coherent flow structures by reducing the frequency with which upwelling/downwelling motions of fluid are formed. This in turn decreases particle dispersion and segregation at the flow surface.

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