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Numerical simulations of the transport of passive scalars around obstacles in tidal flows HYEYUN KU[1], SUBHAS VENAYAGAMOORTHY, Colorado State University — This research is centered on understanding the mixing and transport of passive scalars around obstacles with and without drag in tidal flows. High-resolution two- and three-dimensional numerical simulations were performed of a passive scalar in an idealized domain to study the effects of drag and different flow conditions (tides and currents) on the evolution of a passive scalar. The horizontal dispersion coefficient is quantified as a function of three non-dimensional parameters namely: the drag coefficient, C_d (imparted by the obstacle); the ratio of the tidal to mean flow velocity amplitudes, U_T/U_M; and an oscillatory tidal excursion length parameter, $2U_T/\omega D$, where ω is the frequency and D is the diameter of an obstacle.The drag exerted by a porous obstacle blocks the flow partially and causes the deceleration of the flow, the shedding of vortices and the formation of a downstream wake. Results of the scalar field with and without drag for both uni-directional and oscillatory flow fields are presented. The simulation results highlight the complex dispersion patterns around submerged obstacles and provide an understanding on pollutant dispersion in the atmosphere such as urban cities and in water bodies such as the coastal ocean where vegetation tends to obstruct flow.

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