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Interaction of a tidally modulated stratified current with an isolated obstacle[1] PRANAV SURESH PUTHAN NADUVAKKATE, MASOUD JALALI, GENO PAWLAK, SUTANU SARKAR, University of California, San Diego — Three-dimensional obstacles on the ocean bottom are progenitors of turbulence and mixing. A numerical study of a flow past an idealized conical obstacle with height h and bottom diameter D is undertaken using the large eddy simulation (LES) technique. The flow is composed of two components: a uniform current (U_c) and a sinusoidal tidal modulation ($U_t \sin(\omega t)$). The velocity ratio $R = U_t/U_c$ is systematically varied (by varying U_t while U_c is constant) in the study keeping ω constant at M2 tidal frequency. The background stratification is strong so that the Froude number ($Fr_c = U_c/Nh$) based on the current is small. The cycle-averaged value of turbulent dissipation (ε), even when normalized with U_m^3/D (where $U_m = U_c + U_t$ is the maximum barotropic velocity attained by the flow), increases with increasing R. The spatial and temporal variability of ε during the tidal cycle is quantified to further understand the behavior of ε. Analysis of vortex dynamics reveal the formation of vortex dipoles during flow reversal, triggered by strong lateral flow and upstream acceleration of fluid in the recirculation zone. The characteristics of the internal wave field are also altered on varying R.

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