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Tidal modulation of lee vortices in stratified flow past an isolated abyssal hill: a LES study PRANAV SURESH PUTHAN, GENO PAWLAK, SUTANU SARKAR, University of California, San Diego — A numerical study of flow past an idealized conical hill with height h and bottom diameter D is undertaken using the large eddy simulation (LES) technique. The abyssal flow is composed of two components: a uniform current (U_c) and an oscillatory tidal modulation ($U_t \sin(2\pi f_t t)$). A class of flows with strong stratification (Froude number, $Fr_c = U_c/Nh = 0.15 < O(1)$) and weak rotation (Rossby number, $Ro_c = U_c/2\pi f_i D = 5 > O(1)$) is examined. The wake shows cyclical shedding of coherent lee vortices and broadband turbulence. The velocity ratio (U_t/U_c) is fixed at unity and the ratio of natural shedding frequency $f_{s,c}$ in steady flow to the tidal frequency, $f^* = f_{s,c}/f_t$, is varied from 0.1 to 1. The flow exhibits different regimes, based on the presence or absence of synchronization of the vortex shedding from the body to the tidal forcing or its subharmonic. The control on the vorticity injected into the wake by tidal forcing is elaborated by examination of the temporal and spatial structure of the wake.

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