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Numerical Simulation of Bottom Boundary Layer Turbulence under an Internal Solitary Wave of Depression[1] TAKAHIRO SAKAI, University of Southern California, PETER DIAMESSIS, Cornell University, GUSTAAF JACOBS, San Diego State U. — The turbulent bottom boundary layer (BBL) under a mode-1 internal solitary wave (ISW) of depression is examined using spectral multidomain-based implicit large eddy simulations. The ISW propagates in a two-layer stratification in either quiescent waters or against an idealized barotropic current augmented with an idealized laminar Blasius boundary layer. Various nontrivial aspects of this highly expensive numerical process study are examined with the focus on the effectiveness of various strategies aimed towards establishing a self-sustained near-bed turbulent wake. Such a near-bed wake is considered to be the 3-D extension of the corresponding 2-D global instability observed in the ISW footprint by previous investigations. To this end, in analogy with recent aerodynamics studies, the incorporation of localized volumetric forcing aft the separated BBL under the ISW appears to be the optimal choice. Following a characterization of the structure and dynamics of the ISW-induced BBL, we discuss key differences with related laboratory experiments, assess the relevance of volumetric forcing to both the laboratory and field and speculate on whether numerically simulated self-sustained near-bed turbulence is indeed possible for a pure no-slip bottom.

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