Abstract Submitted
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An Immersed Boundary Method for the simulation of turbulent stratified flows over rough topography NARSIMHA RAPAKA, SUTANU SARKAR, Univ of California - San Diego — An Immersed Boundary Method (IBM) is developed to simulate stratified flows over rough topography using a Cartesian grid. The solver is validated in the problem of tidal flow over a laboratory-scale (order of few meters) smoothed triangular ridge. The results including phasing of turbulence, statistics and baroclinic wave flux agree well with the those obtained using in the DNS studies of Rapaka et al. (JFM 2013) and Jalali et al. (JFM 2014) performed with a body-fitted grid. The bottom drag is parameterized using the DNS data and tested for simulations using coarser grids. The beam thickness is increased with the boundary layer being under-resolved but the baroclinic wave flux agree well. Phasing of turbulence is qualitatively similar at both low and high Excursion numbers (Ex). Integrated TKE and dissipation are of the same order as in the DNS. Large Eddy Simulations (LES) are performed on a large scale topography, of the order of few kilometers, with the same Ex and the criticality parameter but significantly larger Reynolds number. The baroclinic response is stronger than the laboratory scale model owing to the larger length of critical slope. The baroclinic flux as well as turbulence energetics and phasing are studied.

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