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Numerical Simulation of Internal Waves in the Andaman Sea

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The interactions of barotropic tides with irregular bottom topography generate internal waves with high amplitude known as large-amplitude internal waves (LAIW) in the Andaman Sea. These waves are an important phenomena in the ocean due to their influence on the density structure and energy transfer into the region. These waves are also important in submarine acoustics, underwater navigation, offshore structures, ocean mixing, biogeochemical processes, etc. over the shelf-slope region.
In the present study, energetics analysis of M2 internal tides over the Andaman Sea is carried out in detail by using a three-dimensional MIT general circulation ocean model (MITgcm). In-situ observations of temperature, conductivity and currents with high temporal resolution are used to validate the model simulations. From the spectral energy estimate of density, it is found that the peak estimate is associated with the semi-diurnal frequency at all the depths in both observations and model simulations. The baroclinic velocity characteristics, suggests that a multi-mode features of baroclinic tides are present at the buoy location. To understand the generation and propagation of internal tides over this region, energy flux and barotropic-to-baroclinic M2 tidal energy conversion rates are examined. The model simulation suggests that the internal tide is generated at multiple sites and propagate off of their respective generation sources. Most of the energy propagation in the Andaman Sea follows the 1000m isobath. The maximum horizontal kinetic energy follows the energy flux pattern over the domain and the available potential energy is found to be maximum in the north of the Andaman Sea.