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Spectral analysis of internal waves generated by tidal flow over topography

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The primary goal of this work was to provide a description of the energy cascade in internal waves generated by tidal flow over topography.We have carried out several sets of numerical experiments to model the dynamics of the velocity field in the deep ocean. A two-dimensional finitevolume model solving the nonhydrostatic equations of motion was used. The experiments were performed for different latitudes and various types of topography. Thorough spectral analysis of the obtained data was performed. In particular, the evolution of the two-dimensional spectra for the developing flow was calculated. The spectra of the time-series associated with points fixed in Lagrangian and Eulerian reference frames were also computed. The results were compared to several previous works in the field and appeared to be essentially different from those obtained by J.A. MacKinnon and K.B.Winters [1] who used a three-dimensional spectral model to investigate spectral evolution. The distinction between their and our approach lies in the way we model the bottom forcing. In their case, they use a flat bottom ocean and generate internal waves with an upwardly propagating internal tide via a forcing term in the momentum equations, whereas in our simulations we explicitly consider the wave generation process by introducing topography.

[1] J.A. MacKinnon and K.B. Winters, Spectral Evolution of bottom-forced internal waves, Presentation given at the 13th Aha Huliko a Hawaiian Winter Workshop, 2003.