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Comparison of computed tidally generated internal waves in the deep ocean with turbulence observation

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Internal tides, internal gravity waves generated in the stratified ocean by the interaction of barotropic tidal currents with bottom topography, play a role in vertical mixing in the deep ocean. The deep circulation is chiefly due to vertical mixing caused by internal waves generated by wind or tides. Internal tides cause significant displacements of density interface in the ocean interior that has a major effect on various phenomena such as sediment transport and dynamics. In addition, the breaking of internal tides cause small scale turbulence that ends up mixing in the deep ocean and dissipation of energy of tides. Hence, both numerical and analytical studies of internal tides are of the great importance and has recently received interest in view of observation and regarding the fact that breaking of such waves play a indispensable role in large ocean circulation.
A rigorous computation of how much energy is converted into internal waves when a barotropic tides encounter bottom topography by using analytical method has been a challenging problem and key issue for several years. The difficulty in computing energy conversion of barotropic tide to interval waves lies in the fact that for the supercritical bottom slope, i.e. when the slope is greater than internal wave rays, linear theory is not valid. However, for the subcritical bottom topography several computations have been performed. In this study, the computation of energy flux from barotropic tide to internal tide is conducted by virtue of a method which is based on convolution integral. The input data used in this computation are the bottom topography, the barotropic tidal velocity field and stratification of the ocean. The outcome of this computation is used for comparing the computed internal waves with turbulence measurements. In a general sense, the existing global computations of the tidally generated internal waves agree with measurements. For example, the generated internal wave energy is two orders of magnitude larger over the rough topography of the western flank of Mid-Atlantic Ridge than the extended plain in the Brazil Basin. However, a detailed comparison has not yet been made. This will now be done, using experimental turbulence data at the experiment sites and computed energy flux from barotropic tide to internal tide.