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Comparison of calculated internal tide energy flux with microstructure measurements

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A comparison of the model-derived vertical energy flux from the internal tide with micro-structure measurements is undertaken. The latter data set originates from two field surveys during the Brazil Basin Tracer Release experiment (BBTRE1, BBTRE2) as well as from a third field cruise of the LArval Dispersal along the Deep East-Pacific Rise project (LADDER3). The model for estimating the time-dependent vertical energy flux is based on linear wave theory, and takes into account the the finite depth of the ocean, the spatial variations of the bathymetry and the spatio-temporal variations of the barotropic tide. The temporal average of the vertical energy flux over a limited period (a few days) immediately before the observational time is compared with the depth-integrated observed energy dissipation rate. A rather good correlation was found between the theoretical predictions and the microstructure data from the BBTRE2 field survey, while the comparison made for the BBTRE1 survey yields a low correlation, The model-based estimates of the vertical energy flux are of the correct order of magnitude, and imply that about one third of the internal wave energy dissipates locally. In the case of LADDER3, the comparison between the observations and the model predictions shows a significant correlation, whereas the modelled energy flux is much higher than the observed dissipation, implying a very low dissipation efficiency. A possible explanation is that the sharp topography at the East-Pacific Rise consists of a few isolated seamounts, which should mean that the general background level of internal wave energy is low. If nonlinear wave interaction is essential for wave dissipation, the wave dissipation should then be less local in this region than in the eastern Brazil Basin, with very extended rough topography.