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Numerical evaluation of energy transfers in GM-like wave spectra

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The energy spectra of internal gravity waves in the ocean show over wide regions a fixed spectral shape which is called the Garrett-Munk (GM) spectrum. The weak interaction assumption (e.g. Hasselmann, 1962) allows to predict the rate of change of the wave energy for a given spectrum by non-linear wave-wave interactions using the so-called scattering integral or kinetic equation. We numerically evaluate the scattering integral for resonant and non-resonant interactions for GM-like wave energy spectra at high computational costs. Parameter of the wave spectra such as bandwidth and spectral slopes are varied as well as spectral resolution and wave parameters such as Coriolis and stability frequency for these evaluations.

In agreement to previous studies, we find in all cases indeed a forward energy cascade towards smaller vertical and horizontal wavenumbers, which allows now to better quantify the regions of wave forcing and dissipation in wavenumber space, but we also find deviations from results of the previous analytical studies in terms of the energy transfer by wave-wave interactions in frequency space.