1. Introduction

The state-of-the-art parameterization of mixing leaves 70% of the generated internal tides unspecified. This part is related to low modes, whose dissipation provides a substantial amount of mixing energy. So far, our knowledge about these waves is still limited.

Concurrent simulation of the ocean circulation and tides is crucial for studying these low-mode internal tides, since satellite altimeters provide only integrated properties.

In this study, we aim to identify the low-mode wavelengths, their large-scale characteristics and various factors that affect them, using the 1/10° STORMTIDE model that is based on the MPIOM and has been proved to have skill in simulating the M_2 internal tide (Müller et al., 2012).

2. Methods

To comprehend simulated internal tides, the STORMTIDE wavelengths are compared with those of the Sturm-Liouville and the WKB-simplified eigenvalue problems.

1) STORMTIDE simulation

Wavelengths L_{ST,1} (m=1,2 mode number) derived from wavenumber spectra S(k,l) and S(k) using simulated M_2 baroclinic tidal velocities for overlapping 15°x15° boxes, with k, l and k^2 = k^2 + l^2 being the zonal, meridional and horizontal wavenumbers, respectively.

2) Sturm-Liouville eigenvalue problem

Numerically solving the eigenvalue problem for the same boxes without taking eddies and circulation into account, but using simulated box-averaged stratification N to obtain wavelengths L_{SL,1} a function of N via eigenvalues and of the Coriolis parameter f.

3) WKB-simplified eigenvalue problem

Simplifying the eigenvalue problem using the WKB approximation to avoid numerical solutions, and to derive wavelengths L_{WKB,1} directly using the vertical integral of N.

3. Results

3.1 Wavenumber spectra

4. Conclusions

• L_{ST,1} range within 100-150 km, while L_{SL,1} within 45-75 km.
• L_{ST,1} are determined jointly by local stratification N and the Coriolis parameter f, whereas L_{SL,1} are dominantly determined by N only.

References:

• Li, Z., J.-S. von Storch, M. Müller, 2014: The M_2 internal tide simulated by a 1/10° OGCM, submitted