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Abstract Information

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Abstract Information

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Abstract Body Preview

Recent theory [Glazman, JPO 1996] of baroclinic inertia-gravity (BIG) wave spectra, which accounts for resonant four-wave interactions, has yielded simple analytical expressions for a case of a constant flux of energy supplied to these waves by external forcing. The latter is provided, for example, by the semi-diurnal barotropic tide scattered by ocean floor irregularities. Apart from the "Kolmogorov" constant of proportionality, these spectra contain three oceanographic parameters that fully define their shape: the Coriolis frequency, the Rossby radius of deformation, and the rate of spectral transfer of wave energy to smaller scales. The present study pursues two goals: (1) validate the theoretical spectrum of the kinetic energy of wave motions by comparing it with observed frequency spectra of horizontal velocities, (2) estimate the energy transfer rate down the spectrum based on this theoretical model and field data. Since this important quantity is presently reasonably well known (based on alternative, well-established approaches), the latter task at this stage provides an additional validation of the theory. The range of frequencies covered in our study corresponds to wavelengths from about 50km and up to several hundreds km. Within a large part of this range, our theoretical spectra exhibit an excellent agreement with observations, and the energy transfer rate agrees with earlier measurements and alternative estimates. Comparison with the Garrett-Munk spectrum is also presented.

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