Abstract View

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Time Scales of Resonant Interactions Among Oceanic Internal Waves

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ABSTRACT

Transfer rates and times of nonlinear resonant interactions within the oceanic internal wave field are evaluated analytically for the mechanisms which dominate the transfers within the Garrett-Munk spectral models (the elastic scattering, the induced diffusion, and the parametric subharmonic-instability mechanism). The analytic transfer rates assume that the interacting wave components are widely separated in wavenumber and/or frequency, and they are shown to agree well with the exact numerically calculated transfer rates. The analytic expressions are used to discuss conveniently and explicitly possible equilibrium states and the extent to which high-wavenumber internal waves can be treated in the weak-interaction limit. The Garrett-Munk spectral models are in equilibrium with respect to the elastic scattering, close to equilibrium with respect to the induced diffusion, and not in equilibrium with respect to the parametric subharmonic-instability mechanism. For an overall dissipation time scale of 30 days, waves with wavelength down to 5 m are weak.