Numerically reproduced quasi-stationary internal wave spectra in the deep ocean

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A two-dimensional numerical model is forced equally by winds and M2 internal tides that are believed to be the main energy sources for the deep ocean internal wave field. After about 5 years of spin-up, a quasi-stationary internal wave field with characteristics of the Garrett–Munk-like internal wave spectrum is successfully reproduced.

Furthermore, we carry out additional numerical experiments by changing the strength of tidal forcing relative to wind forcing. It is demonstrated that the Garrett–Munk-like internal wave spectrum is created and maintained only when energy is supplied from both winds and M2 internal tides, and not when the energy is supplied by either winds or internal tides. So long as both energy sources are available, nonlinear interactions among internal waves occur such that the resulting quasi-stationary internal wave spectrum becomes close to the Garrett–Munk-like spectrum irrespective of the ratio of the supplied energy from internal tides to that from winds.

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