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Vertical Kinetic Energy of Internal Gravity Waves and Turbulent Dissipation in the Ocean

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Internal gravity waves in the ocean are closely associated with turbulence and mixing. The relationship between IGWs and turbulence is usually interpreted in the framework of the Garret-Munk model, a prescription for open-ocean internal-wave energy as a function of several environmental parameters. Here, we evaluate the relationship between internal-wave energy and turbulence directly, using more than 250 joint profiles of turbulent dissipation from microstructure, and vertical velocity from CTD/LADCP measurements. The observations include profiles from a wide variety of dynamical regimes and latitudes between the equator and 60°. In most profiles, finescale vertical kinetic energy (VKE) varies as k_z^{-2}, where k_z is the vertical wave number. Scaling VKE with dissipation collapses all off-equatorial data-set average spectra to within $\sqrt{2}$ or better. The dissipation-normalized spectrum can be interpreted as a new single-parameter (dissipation) model for internal-wave VKE, which is considerably simpler and more accurate than the corresponding Garrett-Munk model.