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Experiments with mixing in stratified flow over a topographic ridge[1] ROSS GRIFFITHS, Australian National University, YVAN DOSSMANN, Ecole Normale Superieure de Lyon, MADELEINE GAMBLE ROSEVEAR, ANDY MCC. HOGG, GRAHAM HUGHES, MICHAEL COPELAND, Australian National University — The interaction of balanced abyssal ocean flow with submarine topography is expected to generate lee waves, which can carry energy into the ocean interior, as well as local turbulent mixing near the boundary. We report observations of lee waves and turbulence, and measurements of the mixing rate, in laboratory experiments with a topographic ridge towed through a density stratification. The experiments span three parameter regimes including linear lee waves, nonlinear wave radiation and an evanescent regime in which wave radiation is not possible. The stratification evolves from an initially uniform buoyancy frequency to a mixed boundary layer and pycnocline. Full field density measurements provide the depth-dependence of energy loss to turbulent mixing. The ratio of the local mixing in the turbulent wake and remote mixing by wave radiation takes a nearly constant value that is not sensitive to the stratification or dynamical regime; the average value $q_{mix} = 0.90 \pm 0.06$ in the linear lee wave regime, is three times larger than that assumed in parameterizations of internal wave-induced mixing in the ocean. The results suggest that mixing by local nonlinear mechanisms close to abyssal ocean topography may be much greater than remote mixing by lee waves.

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