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Observations and Models of Low Mode Internal Waves in the Ocean

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Internal gravity waves in the ocean are generated by tides, wind, and interaction of currents with the seafloor. Models predict a global energy supply for the internal waves of 0.7-1.3 TW by the conversion of barotropic tides at mid-ocean ridges and abrupt topographic features. Winds acting on the oceanic mixed layer contribute 0.3-1.5 TW and mesoscale flow over topography adds 0.2 TW. Globally, 1-2 TW are needed to maintain the stratification of the deep ocean by diapycnal mixing that results from breaking internal waves. Ocean circulation models show significant impact of the spatial distribution of internal wave dissipation and mixing on the ocean state, e.g. stratification and meridional overturning. Observations indicate that the local ratio of generation and dissipation of internal waves is often below unity and thus the energy available for mixing must be redistributed by internal tides and near-inertial waves at low vertical wavenumber that can propagate thousands of kilometers from their source. Eddy-permitting global ocean circulation models are able to quantify the sources of energy input and to simulate the propagation of the lowest wave modes. However, the variation of the internal wave energy flux along its paths and its ultimate fate by dissipation remains to by parameterized.