



Standing internal tides in the Tasman Sea observed by gliders

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Low-mode internal tides are generated at tall submarine ridges, propagate across the open ocean with little attenuation, and possibly shoal at or reflect from distant continental slopes. Such a semidiurnal internal tide beam emanates from the Macquarie Ridge, south of New Zealand, crosses the Tasman Sea, and impinges on the Tasmanian slope. The beam is identified in previous altimetric observations and modelling.

Spatial surveys by two autonomous underwater gliders with maximum profile depths of 500-1000 m estimate the mode-1 incident and reflected flux magnitudes to be 1-2 kW/m. Uncertainties on the glider-measured mode-1 flux magnitude are 40-90% (arising from both a limited profiling depth and angular resolution of the gliders' survey pattern, which is treated as an internal wave antenna). The direction of the incident internal tides are consistent with altimetry and modelling, while the reflected tide is consistent with specular reflection from a straight coastline. Refraction by the offshore East Tasman Plateau may focus the incident waves on the steepest part of the slope.

The steep slope reflects almost all of the incident energy flux into a reflected wave to form a standing wave. Reflectivity is 0.8-1 at the steep slope in the beam (i.e. the area with greatest energy density), with the remaining fraction (0-0.2) of the incident energy either lost to mixing at this steep slope or transmitted onto the shelf. Starting from the slope and moving offshore by a half wavelength, kinetic energy density displays a node-antinode-node structure, while potential energy density shows an antinode-node-antinode structure. Observations of standing internal tides are few in number.