Diffraction and Reflection of the Internal Tide on the Tasman Continental Slope

An internal tide impacts the region of the Tasman continental slope, as evidenced by numerical simulations and satellite altimetry. The character of its reflection is discussed here using a suite of observations and simulations. A pair of glider antennae find compelling evidence of a standing wave pattern along the slope, with at least 70% of the incoming energy being reflected. They also find stronger reflectance at southern end of the slope. Standing patterns are also found by fitting plane waves to satellite altimetry. A wide lateral beam (>500 km) impacts the region. Intriguingly, the response is split into two reflected beams. 1-km resolution numerical simulations bolster these observations. The incoming beam is prescribed in the model. It diffracts around the Tasman Rise, a 100-km radius and 1000-m high plateau just upstream of the continental slope. The diffraction leads to two peaks of internal tide energy reaching the continental slope, one directly downstream of the incoming beam, and a second lobe projected further north. These two lobes explain the reflected pattern seen in the altimetry. The peaks of the diffraction pattern are about 200-km wide, so mooring arrays and large-scale plane wave fits are challenged to resolve it.