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Adaptive mesh modelling of the interaction of oceanic internal gravity waves with idealised and realistic bathymetry

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Internal gravity waves can provide sufficient energy to activate strong diapycnal mixing near sloping bathymetry, which can account for a significant portion of vertical mixing in the oceans. They can also be responsible for the transport of colder nutrient rich water up onto continental shelves, with important implications for bioproductivity.

We present two– and three–dimensional results of numerical investigations of internal wave interaction with idealised and realistic bathymetry using the Imperial College Ocean Model (ICOM), a non–hydrostatic, finite–element model that includes anisotropic mesh adaptivity. The ability of the model to focus resolution where it is most needed in response to the evolving flow makes ICOM an ideal tool to study the small–scale processes that result from the interaction of oceanic internal gravity waves with bathymetry.

We examine: (1) the waveform and turbulence generation associated with large amplitude shoaling internal solitary waves in the South China Sea in two dimensions; (2) the interaction of internal gravity waves with continental margins and comparison with observational results in two and three dimensions; and (3) the effect of water depth on the transport of colder nutrient rich water up onto the continental shelf.