



## **Generation of weakly nonlinear nonhydrostatic internal tides over large topography: a multi-modal approach**

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Evolution equations are presented for the modal coefficients in a weakly nonlinear nonhydrostatic internal-tide generation problem. The equations allow for the presence of large-amplitude topography, e.g. a continental slope, which is formally assumed to have a length scale much larger than that of the internal tide. However, comparison with results from more sophisticated numerical models show that this restriction can in practice be relaxed. It is shown that a topographically induced coupling between modes occurs that is distinct from nonlinear coupling. Nonlinear effects include the generation of higher harmonics by reflection from boundaries, i.e. steeper tidal beams at frequencies that are multiples of the basic tidal frequency. With a seasonal thermocline included, the model is capable of reproducing the phenomenon of local generation of internal solitary waves by a tidal beam impinging on the seasonal thermocline.