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Scattering of Continental Shelf Waves at a Discontinuity in Shelf Width

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ABSTRACT

An analytical solution is presented for the scattering of a free shelf wave incident upon a discontinuity in shelf width in a barotropic ocean. The discussion of solutions relying on backscattered free-waves with large wavenumbers which may not exist in a realistically stratified ocean is avoided by considering only the range of parameters over which energy transmission is nearly 100%. There is a substantial transfer of energy to modes other than that of the incident wave. The mode most readily excited is that which has the cross-shelf structure most closely coinciding with that of the incident wave. The resultant presence of multiple modes produces a strong alongshelf modulation in flow intensity and phase progression downstream of the scattering region which may affect the interpretation of shelf wave observations. A nondispersive long shelf wave pulse is shown to scatter into a train of pulses of differing mode number, each propagating at its own flee wave speed.

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