Abstract View

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The Transmission and Decay of Barotropic Topographic Rossby Waves Incident on a Continental Shelf

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ABSTRACT

We know that long-period (>1 day) and long-wavelength (>100 km) topographical Rossby waves can be generated by a wind acting directly on a continental shelf (Adams and Buchwald, 1969). Here we examine the characteristics of them waves which can also be produced off the shelf by wind and current eddies and can propagate up to and onto the shelf. We use a shelf model which varies in depth in one direction only and assume that a shelf can be approximated by at most two breaks with the depth varying exponentially. We assume velocity-dependent bottom friction to determine the effect of frictional dissipation. The following results are derived by our analysis. The regression angle of scatter plots for topography-dominated waves should be small and the preponderant direction of the waves determined by the sign. The group velocity directed up the slope possesses an absolute maximum which occurs at a relatively short period. The ability of a wave moving up a slope to overcome friction correlates with this group velocity. The energy flux transmission across one and two breaks can be determined. It is suggested that the product of this flux transmission coefficient and the group velocity component up the shelf be the criterion to determine which wavelengths and frequencies penetrate nearest to shore. It is found, however, that the energy from off the shelf is likely to he decayed completely in bottom depths $\lesssim$25 m. A comparison of some results with data for the New England and west Florida shelf shows a general agreement.

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