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Scattering of Coastal-Trapped Waves on Topographic Irregularities

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Investigation of coastal-trapped waves (CTWs) interaction with a continental shelf/slope topography was performed by means of laboratory experiments. In the case of a uniform (in the along-shelf direction) topography the wave amplitudes reach maximum in the vicinity of the shelf break. The fluid motion is baroclinic over the continental slope and largely barotropic on the shelf. When the topography is interrupted by a single submarine canyon, intense mesoscale flows were registered in the vicinity of the canyon as a result of CTWs scattering. Residual flows may have an eddy-type structure trapped in the canyon depending on the temporal Rossby number, while their velocities are comparable with those of the incident CTWs. This phenomenon was not observed for very large values of the Burger number. Upwelling and downwelling currents in the canyon region were also found to be inhibited by stratification in the latter case. It is concluded that the scattering process is weak for very large Burger numbers. These results demonstrate that mesoscale variability that determines the local fluid motion field in the coastal regions is influenced significantly by stratification and may be realized even when the mean currents are absent or very weak for certain flow regimes.