# Forcing and Variability of Offshore Controlled Rip Currents

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Historically, research regarding rip current dynamics has been dominated by studies of flows generated as a result of alongshore variations in the nearshore bathymetry (i.e. sandbars with incised channels). While other generation mechanisms have been documented to create strong rip currents, they have received limited attention. Specifically, spatial and temporal variations of the incident wave field (i.e. wave groups) and wave spectra refracting over offshore bathymetric irregularities can result in similar flows. In the case of offshore bathymetric forcing, the non-uniform depth contours are stationary but field observations suggest the nearshore rip currents are intermittent and can appear at different alongshore locations. Due to the mobility and intermittency of these non-stationary rip currents, obtaining field measurements of the associated short and long-term dynamics via discrete instruments is difficult at best.

In this study, we develop a numerical model to simulate the nearshore dynamics along a curved section of coastline where alongshore wave height variations result from waves refracting over a submarine canyon with O(100m) undulations in the canyon walls. The model simulates the nearshore transformation of the incident wave spectrum, tide level variations, and depth-averaged nearshore currents. We analyze the hydrodynamics on hourly time scales for one month to capture and understand the daily and weekly rip current variability arising from a variety of observed wave conditions. Modeled wave and circulation results are compared with observations and modeled alongshore rip current positions are verified with visual signatures of rips captured in remote sensing images.