# Predicting rip currents using a 3-D numerical, coupled, wave current model

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Rip currents are well known hazards for beach goers and swimmers. Approximately 80% of all surf zone rescues are attributed to rip currents (USLA). To predict the occurrence of rip currents, empirical forecasting systems are used which often do not take into account bottom morphology, a major reason for rip current formation. Ideal forecasting systems would utilize information on or prediction of 3-D nearshore bathymetry. However this information is something not available at present and extremely difficult to obtain. In order to overcome this limitation a new method for predicting rip current and nearshore hazard probability has been developed that combines existing historical bathymetric data and hydrodynamic numerical modeling.

Empirical Orthogonal Function (EOF) analysis on measured time series of beach profile data is used to determine mean profile, bar height and location. These values are used to construct alongshore barred beach profiles. The profiles are then interrupted by rip channels where the widths of the rip channels and their ratio to rip current spacing and surf zone width are determined from scales found in the literature. This kind of two dimensional beach profile is called Longshore Bar Trough (LBT) morphology and channels in the bar facilitate rip current formation. This morphology is used as an input to a three dimensional numerical system consisting of circulation (ROMS) and wave propagation (SWAN) model that are coupled. This coupled model system has been successfully compared to analytical and laboratory results for rip currents.

A case study based on this technique is presented and discussed for the US Army Corps of Engineering, Field Research Facility (FRF) in North Carolina. Information derived from the model output determines probability of rip current occurrence and the expected strength. Worst case scenarios are also generated by modifying rip channel width and current spacing parameters in the LBT morphology.