



Our innovative GeoCoastal toolset encompasses a suite of models and processing tools in a Geographic Information Systems (GIS) framework to analyze the coastal environment and its inherent risks. These tools allow for the evaluation of natural, nature-based, and structural coastal defenses in assessing the resilience of communities, infrastructure, and facilities to coastal hazards.

The GeoCoastal toolset increases the productivity, level of detail, and quality in coastal hazard and risk assessments. The tools are customized for unique conditions found in complex coastal environments to help inform decisions in coastal planning and adaptive management.

### GeoCoastalCSHORE - Automated Cross-shore Modeling and Analysis

Recently developed for coastal hazard studies being conducted in the Great Lakes and incorporating the CSHORE model, GeoCoastalCSHORE provides increased efficiencies and capabilities to the GeoCoastal toolset in assessing coastal resilience:

- Nearshore wave transformation, erosion, and wave runoff modeling
- Use of process-based CSHORE 1-D model

- Joint-probability of waves and water levels for scenario assessment
- Scaling of storm-surge and wave input conditions
- GIS data integration
- Efficient cross-shore profile development and alternative evaluation
- Assessment of full storm suite (historical or synthetic)
- Integrated statistical analysis of model results and coastal hazards
- Evaluation of risk reduction strategies



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## Single-Storm Scenario or Response-Based Analysis

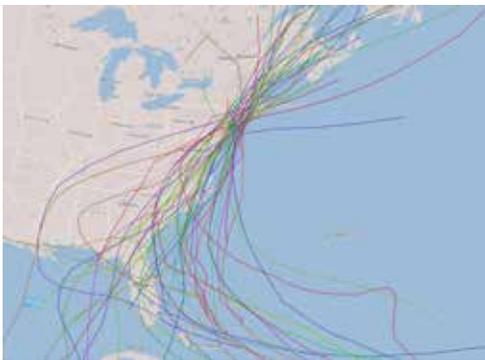
Extreme coastal storm impacts can be evaluated for a single historical storm or a design storm (i.e. one-percent annual chance, 100-year event). Impacts can also be evaluated through the simulation of hundreds of historical or synthetic storm events by evaluating how the profile responds to each event. This modeling is fully automated and utilizes parallel processing to gain efficiencies in model run time and assurances of model input.

## GIS Data Integration

Efficient model pre-processing in ArcGIS with an easy-to-use interface. By using a seamless topography and bathymetry digital elevation model, cross-shore profiles can easily be defined for evaluation over a large geographic area.

## Wave and Cross-shore Evolution Modeling

Wave transformation in the nearshore, erosion, and wave runup on a beach face, bluff, or coastal structure are modeled using CSHORE 1-D. This is a process-based model developed by the U.S. Army Corps of Engineers that can be run efficiently, evolving the profile during a storm and providing wave runup and overtopping assessments.



## Joint Probability Analysis

For coastal environments where both waves and water levels are equally important in contributing to coastal hazards, the joint probability can be calculated for the assessment of different scenarios.

## Integrated Extreme Value Statistics

Integrated tools compute statistics from the model results using the Generalized Pareto Distribution (GPD) or other widely used extreme value distributions.

## Evaluation of Coastal Risk Reduction Measures

A GIS interface quickly integrates proposed natural features, such as beach and dune nourishment, wetlands, coastal and offshore structures, and combinations for evaluation of wave attenuation and risk reduction.