

+ Modeling to Protect North Carolina's Coast

The Issue

The impacts from hurricane storm surge can devastate North Carolina coastal areas. Without effective preparation and evacuation plans, surges can level homes and businesses, cost billions of dollars, and kill thousands of people. Computer modeling can highlight vulnerable areas needing protection or insurance coverage. Information gained from hurricane and storm surge modeling also can help communities plan for evacuations of vulnerable areas and at risk populations.

RENCI Projects

RENCI brought together a team of experts, including oceanographers, statisticians, meteorologists, and computer programmers to assemble a storm surge modeling system capable of simulating hundreds of potential storms that could hit the coast. The many simulated storms represent all the combinations of storm size, tracks and frequency that could occur over hundreds of years. The resulting floodplain maps pinpoint properties located in areas vulnerable to surging water. Simulating these storms requires millions of computer hours on a RENCI supercomputer. Similar work in other states has required much more time and money because no state-supported resource like RENCI was available.

The same storm surge modeling system can be used to forecast storm surge water heights if a real tropical storm or hurricane hits North Carolina's coast. If that happens, the simulation results will be passed along to the National Weather Service for inclusion in their analyses. RENCI also produces complex hurricane models and inland weather models, which complement the storm surge models and provide weather forecasters and emergency managers information needed to predict severe weather and dangerous conditions caused by weather. The models are visualized and color-coded to make them easy to decipher. The RENCI supercomputers used to create these models, machines capable of many trillions of calculations per second, give North Carolina a unique local capability to forecast potential storm impacts well before they occur.

The Expertise

RENCI scientists and software engineers developed a complex automated system capable of simulating hundreds of storm events, analyzing the results, and disseminating the information to weather forecasters and decision makers in various electronic formats. RENCI supercomputers process the data and produce forecasts not only for hurricanes, storm surge and floods but also for icing and other dangerous weather events. RENCI visualization capabilities are also put to use in the process so that complex storm surge and flooding information can be easily communicated to government officials and the public.

The Partners

North Carolina Division of Emergency Management Floodplain Mapping Program
UNC Institute of Marine Sciences
U.S. Army Corps of Engineers
Applied Research Associates, Inc.
National Weather Service in Wilmington
Morehead City and Wakefield, VA
North Carolina State University marine, earth and atmospheric sciences department
UNC Institute of the Environment

The Impact

Each year, North Carolina runs the risk of losing lives and coastal property worth billions due to storm surge, winds and flooding from hurricanes. Avoiding such losses requires knowledge about potential storms, where they could strike, and how deep the water could be. RENCI and its partners have implemented modeling tools that help the state's floodplain management office assess potential problems by creating flood maps for the coastline. These maps also help determine where flood insurance is needed, what areas will be most vulnerable in a storm and provide information useful to developers and property owners. The models are also used to improve forecasting of hurricanes, storm surge, and inland rainfall and give the National Weather Service another tool for dealing with weather emergencies. North Carolina alone has this unique modeling capability thanks to RENCI. The maps can help communities develop disaster mitigation and response plans. The real-time forecasting capability could help save lives, homes and businesses if a storm hits the coast.