Hurricanes

Protecting lives and livelihoods with sharpened planning, forecasts, and warnings

Summer 2013

I. Risks

The United States is highly vulnerable to hurricanes along our Gulf and Atlantic coasts that can inflict tens of billions of dollars in damage and take far too many lives. In 2005, Katrina killed nearly 2,000 people, the largest hurricane death toll in more than 60 years. The New York area saw its worst flooding in modern history following the landfall of Hurricane/Superstorm Sandy in 2012. Many people heeded evacuation warnings, but the complex storm still killed more than 70 people in the U.S.

These heightened impacts point up the need to protect vulnerable populations through improvements in shorter-term hurricane and impact forecasts as well as through longer-term assessments of hurricane risks in a changing climate.

Although hurricane track forecasts have steadily improved in recent years, intensity forecasts have gained little ground. Climate models are now providing peeks into the future for a range of severe weather, including intense hurricanes. But more clarity is required on both the behavior of these weather systems and their damage potential across a range of time scales.

And even when hurricane threats are well defined, it can be challenging to communicate the many risks to officials and citizens in ways that best help to save lives and protect property.

II. Problem-Focused Research

Improved forecasts. The NCAR-based Nested Regional Climate Model (NRCM) and an associated hurricane forecast system have provided targeted information on future hurricane risk, over periods from days to decades, in support of reducing impacts for coastal and offshore facilities across a range of groups and industries. The new Model for Prediction Across Scales (MPAS) simulates weather processes around the globe and locally in very fine detail.
MPAS is now being tested and prepared as a primary NCAR tool for regional climate projections of hurricanes and other high-impact weather.

**New ways to quantify risk and damage.** Projecting damage and vulnerability directly from weather and climate model forecasts provides targeted information to affected communities. This includes estimating the level of potential damages from different types of hurricanes through specialized indicators, as well as estimating losses from specific hurricanes as they approach shore. In both cases, offshore as well as inland risks are evaluated to provide a complete diagnosis of potential damages.

**More effective communication:** NCAR scientists are analyzing how forecasters, local and state officials, and the media communicate hurricane risk, how these messages are interpreted by the public, and how these professionals can work together to improve the hurricane warning system as a whole. This work is closely coupled with the research for forecast improvement and damage assessment.

### III. Advantages and Applications

- Improved forecasts of both individual hurricanes and future activity.
- Better quantification of risk for current and future storms for use by decision makers.
- Database for comparing threats across locations and over time.
- More effective communication of hurricane warning, preparation, and planning messages, informed by social science and the use of a wide range of media.

### IV. Partnerships and Funding

**Primary funders and research collaborators:** National Science Foundation, NOAA, DOE, the insurance and offshore energy industries, university researchers, emergency managers.

**Now seeking additional funding for the following goals**

- **Expanded use of MPAS:** Employing the model to assess all types of severe weather systems via enhanced computing resources and research to improve the model’s capacity to simulate weather extremes.
- **Risk and damage tools:** Acquisition and analysis of damage data; additional modeling/engineering analyses; further tailoring for societal needs.
- **Communication studies:** Research to understand how people with different backgrounds, worldviews, and experience respond to hurricane threats that will guide ways to effectively convey threat information to varied audiences.

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