Researchers develop new metric to measure destructive potential of hurricanes

April 29 2013

Researchers at Florida State University have developed a new metric to measure seasonal Atlantic tropical cyclone activity that focuses on the size of storms in addition to the duration and intensity, a measure that may prove important when considering a hurricane's potential for death and destruction.

Just ask the survivors of Hurricane Sandy.

The 2012 hurricane was only a Category 2 storm on the often referenced Saffir-Simpson scale when it became the largest hurricane on record, killing 285 people in its path in seven different countries and becoming the second costliest in U.S. history. Likewise, Hurricane Katrina was a weaker storm than 1969's Camille but caused much more destruction even though the two hurricanes followed essentially the same path.

The new metric, called Track Integrated Kinetic Energy (TIKE), builds on the concept of Integrated Kinetic Energy (IKE) developed in 2007 to more accurately measure the destructive potential of a storm. IKE involves using kinetic energy scales with the surface stress that forces storm surge and waves and the horizontal wind loads specified by the American Society of Civil Engineers. TIKE expands the concept by accumulating IKE over the lifespan of a tropical cyclone and over all named tropical cyclones in the hurricane season.

"Representing the activity of an Atlantic hurricane season by a number is a very difficult task," said Vasu Misra, an associate professor of

meteorology in the Department of Earth, Ocean and Atmospheric Science and FSU's Center for Ocean-Atmospheric Prediction Studies (COAPS). "TIKE gives a succinct picture by taking into account the number of tropical cyclones in the season, the duration of each tropical cyclone and the time history of the wind force over a large area surrounding each tropical cyclone. This makes TIKE much more reliable as an objective measure of the seasonal activity of the Atlantic hurricanes than existing metrics."

Misra developed TIKE through a collaboration with Steven DiNapoli, a former COAPS data analyst, and Mark Powell, a National Oceanic and Atmospheric Administration atmospheric scientist currently stationed at COAPS who created IKE with a colleague six years ago. Their paper, "The Track Integrated Kinetic Energy of the Atlantic Tropical Cyclones," was published in the American Meteorological Society's *Monthly Weather Review*.

Misra, DiNapoli and Powell calculated TIKE for each hurricane season, including all named tropical cyclones in the Atlantic from 1990 through 2011, and found larger TIKE values during La Niña conditions and warm tropical Atlantic sea surface temperature conditions. The information will help them in developing a model that can predict TIKE for an entire season—a prediction that could help emergency managers, businesses and residents with preparedness.

"I look forward to the global climate models improving enough to allow skillful predictions of storm size, which will help us predict TIKE for an upcoming season," Powell said.

TIKE is not intended as an alternative to existing metrics but as a complimentary tool, the researchers said.

The need for more information about the potential for destruction was

brought home during the 2012 season. The Integrated Kinetic Energy calculation that TIKE is based on was more than 300 terajoules for Hurricane Sandy. The figure, which represents units of energy, was the largest IKE measurement for any hurricane between 1990 and 2006.

"That means that Sandy actually had more wind forcing over a large area than Hurricane Katrina," Misra said. "If the public was aware that this number was so high, which is an indication of the large potential for damage from storm surge and waves, some of them might have been able to make better life- and property-saving decisions."

Provided by Florida State University