Study provides new approach to forecast hurricane intensity

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New research from University of Miami (UM) Rosenstiel School of Marine and Atmospheric Science suggests that physical conditions at the air-sea interface, where the ocean and atmosphere meet, is a key component to improve forecast models. The study offers a new method to aid in storm intensity prediction of hurricanes.

"The general assumption has been that the large density difference between the ocean and atmosphere makes that interface too stable to effect storm intensity," said Brian Haus, UM Rosenstiel School professor of ocean sciences and co-author of the study. "In this study we show that a type of instability may help explain rapid intensification of some tropical storms."

Experiments conducted at the UM Rosenstiel School Air-Sea Interaction Salt Water Tank (ASIST) simulated the wind speed and ocean surface conditions of a tropical storm. The researchers used a technique called "shadow imaging," where a guided laser is sent through the two fluids – air and water – to measure the physical properties of the ocean's surface during extreme winds, equivalent to a category-3 hurricane.

Using the data obtained from the laboratory experiments conducted with the support of the Gulf of Mexico Research Initiative (GOMRI) through the CARTHE Consortium, the researchers then developed numerical simulations to show that changes in the physical stress at the ocean surface at hurricane force wind speeds may explain the rapid intensification of some tropical storms. The research team's

experimental simulations show that the type of instability, known as Kelvin-Helmoltz instability, could explain this intensification.

Haus and colleagues will conduct further studies on hurricane intensity prediction in the new, one-of-a-kind Alfred C. Glassell, Jr., SUSTAIN research facility located at the UM Rosenstiel School. The SUrge-STructure-Atmosphere INteraction laboratory is the only facility capable of creating category-5 level hurricanes in a controlled, seawater laboratory. The nearly 65-foot long tank allows scientists to simulate major hurricanes using a 3-D wave field to expand research on the physics of hurricanes and the associated impacts of severe wind-driven and wave-induced storm surges on coastal structures.

The SUSTAIN research facility is the centerpiece of the new $45 million Marine Technology and Life Sciences Seawater Complex at the UM Rosenstiel School where scientists from around the world have access to state-of-the-art seawater laboratories to conduct an array of marine-related research.

The study, titled "The air-sea interface and surface stress under tropical cyclones" was published in the June 16 issue of the journal *Nature Scientific Reports*. The paper's lead author was Alex Soloviev of the UM Rosenstiel School and Nova Southeastern University Oceanographic Center and its co-authors include: Mark A. Donelan from the UM Rosenstiel School; Roger Lukas of the University of Hawaii; and Isaac Ginis from the University of Rhode Island.

Provided by University of Miami