Storm killers: Earth Scan Lab tracks cold water upwellings in Gulf

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Complex interactions between the ocean and overlying atmosphere cause hurricanes to form, and also have a tremendous amount of influence on the path, intensity and duration of a hurricane or tropical weather event. As researchers develop new ways to better understand and predict the nature of individual storms, a largely unstudied phenomenon has caught the attention of scientists at LSU's Earth Scan Laboratory, or ESL. Cool water upwellings occurring within ocean cyclones following alongside and behind hurricanes are sometimes strong enough to reduce the strength of hurricanes as they cross paths.

"Ocean cyclones are areas of upwelling, meaning that cold water is not far from the surface as compared to the water surrounding it," said Nan Walker, ESL director. "The Gulf of Mexico is full of ocean cyclones, or cold water eddies, many of which move rapidly around the margin of Gulf's Loop Current, which is the main source of water for the Gulf Stream."

While the upwelling is important to Gulf fisheries because it delivers nutrients into the surface waters, causing algal blooms and attracting marine life to the areas, oceanographers have recently begun to realize that these cyclones intensify currents near the surface and along the bottom of the ocean in areas of gas and oil exploration.

"Now," Walker added, "our research has shown that ocean cyclones also provide temperatures cold enough to reduce the intensity of large Gulf of Mexico hurricanes."

Walker's research team has been looking into the upwelling phenomena since 2004, when they were able to use satellite data received at the ESL to view ocean temperatures soon after Hurricane Ivan's Gulf crossing.

"Clear skies gave us a rare opportunity to really analyze the oceanic conditions surrounding the wake of Ivan," said Walker. "We saw abnormally low temperatures in two large areas along the storm's track, where minimum temperatures were well below those required to support a hurricane, about 80 degrees Fahrenheit." This suggested to Walker that areas of extreme cooling could be providing immediate negative feedback to Gulf hurricanes, decreasing their intensity.

"In Ivan's case, we found that its wind field increased the counter-clockwise spinning of the ocean cyclones in its path, catapulting cold water to the surface, which in turn reduced the oceanic 'fuel' needed for the hurricane to maintain its strength," said Walker. She observed that Ivan's intensity decreased as it moved toward the Mississippi/Alabama coast, despite the presence of a large warm eddy, a feature generally known for its potential to increase hurricane strength. Thus, the impact of the cold eddies overwhelmed that of the warm eddy.

"Cool wakes are most beneficial when the storm occurs later in the season because the Gulf doesn't warm as rapidly in fall and may not have time to warm back up," said Walker.

The research being conducted at ESL could eventually lead to novel new weather study techniques.

"Our research, in collaboration with Robert Leben at the University of Colorado, is providing an advanced monitoring system so that likely ocean impacts can be assessed in advance of the Gulf crossing," said Walker. "However, it is important to remember that we don't predict; we provide valuable information that serves as tools for those in the business of predicting, such as the National Hurricane Center."

Of course, this is only one facet of the work done at LSU's ESL. The lab has played a major role in mapping hurricane-related flooding, tracking oil spills and determining causes for the size and location of dead zones in the Gulf of Mexico, along with many other tasks employing satellite imagery.

Source: Louisiana State University (news : web)

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