Hurricanes pack a bigger punch for Florida's west coast

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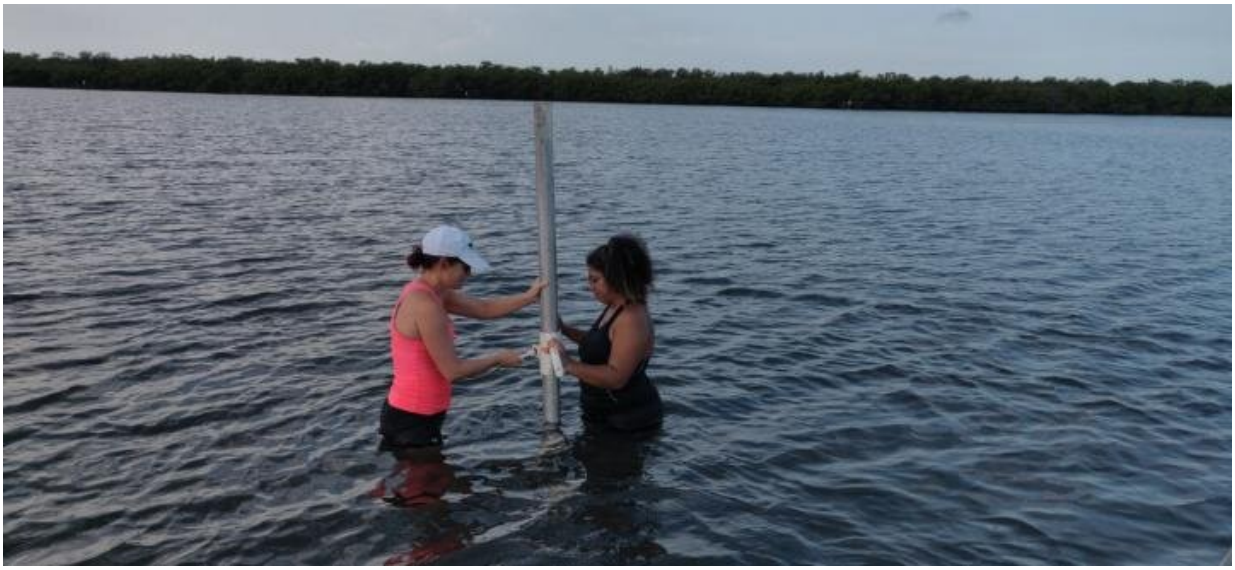

Dr. Joanne Muller (left) and Ilexxis Morales (right) using a hand coring technique, with a 3-meter core and core candles around the aluminum pipe, in Florida's Indian River Lagoon. Credit: James Javaruski.

Boulder, Colo., U.S.: Hurricanes, the United States' deadliest and most destructive weather disasters, are notoriously difficult to predict. With the average storm intensity as well as the proportion of storms that reach category 4 or 5 likely to increase, more accurate predictions of future hurricane impacts could help emergency officials and coastal populations better prepare for such storms—and ultimately, save lives.

Such predictions rely on historical records that reveal cyclic changes, such as the El Niño-Southern Oscillation, that can affect hurricane frequency. But the short observational records that exist for many regions, including Florida's East Coast, are inadequate for detecting climate patterns that fluctuate over longer timeframes.

Now new research presented Wednesday at the annual meeting of The Geological Society of America is extending Florida's hurricane record thousands of years back in time—and hinting at a surprise finding.

"There has been little to no research done on the hurricane record for Florida's East Coast," explains Ilexxis Morales, a graduate student in the Environmental Science program at Florida Gulf Coast University and the study's lead author. "The national hurricane database for this area currently only extends back to the 1850s," she says.

But what that record suggests, says Morales, is quite intriguing, especially with respect to intense (category 3-5) storms. "It shows that at least for the past 170 years, Florida's Atlantic Coast has been hit by fewer intense hurricanes than the state's Gulf Coast," she says.

One of the sediment cores sampled from just north of New Smyrna beach. There are at least two coarser and lighter-colored tempestites visible near the top (right) side. Credit: Ilexxis Morales.

To better understand this discrepancy, Morales and her Florida Gulf Coast University co-authors, Joanne Muller and James Javaruski, collected sediment cores from a series of lagoons tucked behind narrow barrier islands along the state's eastern coast. Their analysis shows that in contrast to the dark organic matter that comprises most of the cores, hurricanes leave behind a coarser deposit distinctive enough to be called a "tempest".

"When a large storm comes through the area," says Morales, "it picks up light-colored sand from the beach and deposits it in the lagoon." Because the grains of sand deposited by large storms are coarser than the organic-rich muds, the researchers can detect ancient tempest deposits using simple grain-size analyses.

After identifying the tempest deposits (called tempestites), the team used a variety of methods, including a Lead-210 germanium detector and radiocarbon dating, to determine their ages. While still preliminary, the results from the seven cores the researchers have analyzed to date suggest that there are fewer visible tempestites in the East Coast cores compared to those analyzed from the West Coast.

The results hint that the pattern of more major hurricanes hitting Florida's Gulf Coast may extend thousands of years back in time. Morales speculates this difference could be due to the shifting position of the Bermuda High, a semi-permanent ridge of high pressure that can affect a hurricane's direction. "When the Bermuda High is in a more

northeasterly position, hurricanes tend to track along Florida's East Coast and up to the Carolinas," says Morales. "When it shifts southwestward towards the U.S., the high tends to push storms into the Gulf of Mexico instead." Sea-surface temperatures can also help explain the difference, says Morales. "Normally the Atlantic is colder than the Gulf, and this colder water makes it harder for hurricanes to sustain their strength," she explains.

Similar "paleotempestology" studies have been conducted in other locations that are also susceptible to hurricanes, including Texas, Louisiana, New England, and even Australia, and the results have a number of practical applications. "This data will go to the national hurricane database, which will then help meteorologists better predict storm paths," Morales says. The data will also help show which areas are more susceptible to hurricane damage, enabling insurance companies to better adjust hurricane-insurance rates and developers to select building sites less susceptible to storm surge.

Once complete, says study co-author James Javaruski, the longer storm record could help researchers determine whether changes observed in it can be attributed to human-induced climate change. The findings can also offer insight into what could happen in the future. "If we see in other studies that sea surface temperatures were increasing over a certain time frame and find that hurricanes also increased over that same time frame," Javaruski says, "it can give us a good idea of what to expect as we artificially raise sea surface temperatures now."

More information: Paleotempestology of the East Coast of Florida. Online at: gsa.confex.com/gsa/2020AM/meet … app.cgi/Paper/359324

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