

POST ON WEATHER SEA LEVEL RISE

# Florida sites hold clues to steadily rising waters



A bench off Lake Trail near the Flagler Museum in Palm Beach sits surrounded by water from the Intracoastal Waterway as a combination of a full moon, high tide and sea level rise on Oct. 27 caused "nuisance flooding" in the region. South Florida has had 15 such days since May. LANNIS WATERS / THE PALM BEACH POST 2015

## Mangroves, marsh bear witness to scientists' claim man is driving seas higher at an unprecedented rate.

By Kimberly Miller  
Palm Beach Post Staff Writer

South Florida's rich tangle of mangrove coasts holds secrets to sea level rise that a group of researchers with 3,000 years of global ocean data hopes to begin revealing next month.

The international team of scientists, which published a study last week showing oceans are swelling at the fastest pace since the Iron Age, are interested in Florida's unique struggle to keep seas at bay.

The study, which was published Monday in the Proceedings of the National Academy of Sciences, is landmark not only in its centuries-long reach

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into the past, but also in that the authors claim it is definitive proof that humans are directly linked to the ever-rising tides.

In the 20th century, sea levels rose 5.5 inches globally. Current rates have accelerated to about a foot – 12 inches – per 100 years, according to the

study. That's compared with pre-industrialization times, when the seas rose only about 1 to 1.5 inches per century.

The historic record of global mean sea-level rise was built with research that included analyzing deep soil samples

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## POST ON WEATHER: SEA LEVEL RISE

# South Florida sea rise expected to outpace globe

### Sea

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taken at 24 sites around the world. One of the sample sites is in Florida – a salt marsh in the St. Mary's River that separates Georgia and Florida.

But Benjamin Horton, co-author of the study and a professor in the Department of Marine and Coastal Science at Rutgers University, said South Florida's proximity to the Gulf Stream, saltwater intrusion through its porous bedrock and an easily overwhelmed flood-control system likely mean its rate of sea-level rise differs from the mean global average.

"Florida is the poster child for sea level rise in the U.S., but we know very little about how it has changed from the past," Horton said. "Everyone thinks building a sea wall is the answer, but it's behind the beaches where the huge flooding issues are."

#### Studies in the Keys

On March 11, Horton said a team will travel to the Sunshine State to begin collecting information among the mangroves of the Florida Keys. By taking deep-core soil samples near the native vegetation, researchers can look at microscopic organisms that live in high-salinity environments and determine approximate historic sea levels.

The global study was a 10-year endeavor. The result provides a context for the rates of sea-level rise experienced now, offers more confidence in future projections and attributes the rapid increases in the 20th and 21st centuries to humans – largely through greenhouse gases and the burning of fossil fuels.

"It's a very, very important statement that clearly illustrates we are living in an unusual time, where the rates of sea-level rise are the highest we've seen in 28 centuries," Horton said. "These rates are showing up in nu-



Marine Way in Delray Beach was the scene of nuisance flooding Oct. 27 as a combination of a full moon, high tide and sea level rise sent water from the Intracoastal Waterway into the street. A NOAA oceanographer said such incidents are "an indicator of the future." THOMAS CORDY / THE PALM BEACH POST 2015

sance flooding, the loss of coastal homes and freshwater aquifer problems."

In the fall, several months of high-tide flooding, in conjunction with lunar cycles and a seasonal slowing of the Gulf Stream, inundated streets throughout South Florida, including Palm Beach County neighborhoods strung along the Intracoastal Waterway.

In Delray Beach and Boca Raton, brackish water bubbled up through storm grates and overtook aging sea walls that were once able to contain the higher tides. Residents were forced to find other places to park their cars and watched their front yards turn to fish ponds.

Brian McNoldy, a senior research associate at the University of Miami Rosenstiel School of Marine and Atmospheric Science, called it a

"slow-motion crisis" in a blog he wrote during the worst of last year's tidal flooding.

NOAA oceanographer William Sweet said South Florida set a record with 15 days of nuisance flooding since May. The previous record, as measured by a gauge at Virginia Key, was eight days. Sweet's annual measurements run from May through April.

"Looking forward, what is important to recognize is the past is an indicator of the future," Sweet said in reference to Horton's historical study. "You all saw it in October. You saw it in November. Water in your streets, storm sewers not functioning. It's real and tangible."

#### Rise could be 11-22 inches

National Oceanic and Atmospheric Administration measurements taken from a buoy

off Lake Worth show sea levels rising at 3.36 millimeters per year, or 1.10 feet in 100 years. That's similar to readings at Marathon Key that show a 3.34-millimeter increase per year, and Tampa, which is measuring an annual increase of 3.15 millimeters.

In October, the Southeast Florida Regional Compact on Climate Change issued an updated report on sea-level rise estimates through the year 2100.

While South Florida measurements have been similar to global sea-level rise in the past, it is "anticipated to outpace the global average due to ongoing variations in the Florida Currents and Gulf Stream," the report notes.

Between 2015 and 2060, South Florida seas could swell between 11 and 22 inches, based on estimates from the

U.S. Army Corps of Engineers and the Intergovernmental Panel on Climate Change.

By 2100, they could rise from 28 inches to 57 inches – between 2.3 feet and 4.7 feet.

According to Climate Central, about 1 percent of Palm Beach County residents live in areas between sea level and 3 feet above sea level. In Miami-Dade County, 5 percent of residents are below 3 feet.

NOAA computer simulations of sea-level rise show Miami Beach is more vulnerable than areas of Palm Beach County, which doesn't have widespread inland property inundation until the levels rise closer to 3 feet.

At 3 feet, half of Miami Beach is underwater, according to the NOAA simulator.

Colin Polsky, director of Florida Atlantic University's Center for Environmental Studies, said the historical study of sea level rise released this week is critical because it provides a comprehensive look globally rather than spotlight individual stories from singular sites.

"It's very provocative," Polsky said. "It's hugely important for all of coastal North America."

According to the October climate change report, tide-induced flood events in Miami Beach have quadrupled over the past 16 years. But the report also warns that incremental sea level rise will increase areas flooded during hurricanes and severe storms.

In 2012, Hurricane Sandy's strongest winds never reached Palm Beach County, yet sea walls that had protected multimillion-dollar estates on Manalapan gave way to the ocean. Homes lost land and trees, and at least one pool was undermined and cracked into pieces by the waves.

"It's an uncertain future," Sweet said.

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