2004-2005 Hurricanes Fueled Exceptional Red Tide

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According to a recent study, the 2004 and 2005 hurricane seasons did a lot more than spread misery and financial woe above ground in Florida. When four hurricanes crossed the state, the exceptional rainfall may have also fueled the intense 2005 red tide when runoff from a super-charged water-table delivered high amounts of nutrients into coastal waters via submarine groundwater discharges.

Red tide, or the Harmful Algal Bloom (HAB) caused by the organism Karenia brevis, thrives on run-off nutrients such as nitrogen and phosphorus. But many scientists suspected that surface runoff alone could not account for the intensity and expanse of large red tides, especially the unusually wide-spread and persistent 2005 HAB off Florida's west coast.

"In August and September of 2004, Florida experienced four hurricanes and some of the highest precipitation levels in 35 years," said Chuanmin Hu, assistant research professor and executive director of the Institute for Marine Remote Sensing (IMaRS) at the University of South Florida's College of Marine Science. "This led to high discharge by Florida rivers in late 2004 and early 2005. Submarine groundwater discharge (SGD) was also possibly higher than normal after the 2004 hurricane season, adding nutrients to the coastal ocean. We think the combined discharge was responsible for the unusually persistent red tide in 2005 because the nitrogen demands of the 2005 red tide on the west coast of Florida could not have been satisfied by surface runoff alone."

According to limited historical records, many large submarine springs are located off the coast of west central and northern Florida where red tides are commonly found. However, the possible link between SGDs and red tide had not been adequately addressed.

To reach the conclusion that nitrogen input from these SGD may have greatly exceeded runoff from rivers, Hu and fellow researchers, Professor Frank Muller-Karger, USF College of Marine Science and Peter Swarenski, United States Geological Survey, examined the K. brevis blooms and took into account observations and data from a variety of agencies, including the National Weather Service, the U.S. Geological Survey and satellite imagery from NASA.

“Future studies should pinpoint the locations of submarine springs, and measure their flow and the nutrients they carry,” concluded Hu. “The SGDs may delay and modulate the nitrogen input to coastal waters from the soil and the ground through which rainfall penetrates, through increased flow of water originating in precipitation.”

While the total cost of last year’s record red tide is difficult to assess, estimates are that financial losses in Florida from the shorter red tides observed almost every year can amount to $50 million in terms of damage to shellfish, fish, recreation and tourism.

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Source: University of South Florida