



Contact: Ben Sherman
301-713-3066 x178

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New NOAA Model Links Mississippi River Nutrient Outflow to Florida Red Tides

A new NOAA research model indicates nutrients flowing from the Mississippi River may stimulate harmful algal blooms to grow on the continental shelf off the west coast of Florida. The peer-reviewed hypothesis is being published in a special issue on Florida red tide in the journal "Continental Shelf Research."

According to the model, algal blooms form on the Florida coast because of weather and gulf currents. The algae grows offshore, supplied with additional nutrients that appear to have originated from the Mississippi River, in a process driven by normal seasonal wind patterns.

"We found that the concentrations of nutrients needed to start the Florida red tides is much lower than previously suspected," said NOAA oceanographer and lead author of the paper, Richard Stumpf, Ph.D. "The hypothesis means that offshore areas should be examined for both small increases in nutrients and modest concentrations of the algae at the start of the bloom season."

Harmful algal blooms occur in the waters of almost every U.S. coastal state, caused by numerous different species. Their direct economic effects in the United States are estimated to average \$75 million annually, including public health costs, commercial fishing closures, recreation and tourism losses, and in management and monitoring costs.

While outflow from the Mississippi River travels westward most of the year, early summer prevailing winds carry it eastward, bringing nutrients, especially nitrogen, toward Florida. The nutrients then settle into deeper water, where they are taken up by the algae. The blooms, of the red tide species *Karenia brevis*, start on the shelf, and are brought onshore and concentrated by the prevailing wind patterns of late summer and fall. The study has implications for predictions and for monitoring of these blooms, including potential variations in intensity between years and regions. It also finds that even relatively small increases in nitrogen can account for the initiation of the blooms offshore.

NOAA, working in partnership with scientists at Mote Marine Laboratory in Sarasota, Fla., is already beginning to test the hypothesis through the use of autonomous underwater vehicles carrying instruments called "BreveBusters." The vehicles are checking for the presence of *Karenia brevis* blooms further off the coast in deeper Gulf of Mexico waters.

The new hypothesis links results from several extensive research programs conducted in the Gulf of Mexico over the last decade including the NOAA-funded Florida Ecology and Oceanography of Harmful Algal Bloom program. Understanding initiation of red tide should lead to improved monitoring, modeling, and research strategies for these blooms.

Since 2004, NOAA has been providing operational forecasts of harmful algal bloom impacts in the eastern Gulf of Mexico. The new results offer the potential of providing better forecasts of when the blooms start, allowing for more effective monitoring.

NOAA, an agency of the U.S. Commerce Department, is celebrating 200 years of science and service to the nation. From the establishment of the Survey of the Coast in 1807 by

Thomas Jefferson to the formation of the Weather Bureau and the Commission of Fish and Fisheries in the 1870s, much of America's scientific heritage is rooted in NOAA.

NOAA is dedicated to enhancing economic security and national safety through the prediction and research of weather and climate-related events and information service delivery for transportation, and by providing environmental stewardship of our nation's coastal and marine resources. Through the emerging Global Earth Observation System of Systems (GEOSS), NOAA is working with its federal partners, more than 70 countries and the European Commission to develop a global monitoring network that is as integrated as the planet it observes, predicts and protects.

On the Web:

NOAA Coastal Services Center: <http://csc.noaa.gov>

NOAA National Centers for Coastal Ocean Science: <http://coastalscience.noaa.gov/>

Harmful Algal Bloom Forecasts: <http://www.csc.noaa.gov/crs/habf/>