Researchers expect no major red tide outbreaks on Florida's west coast this year

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According to USF marine scientists, in years of the worst outbreaks, red tide has been responsible for millions of dollars in losses in the shellfish, finfish, recreation and tourism industries. Credit: University of South Florida

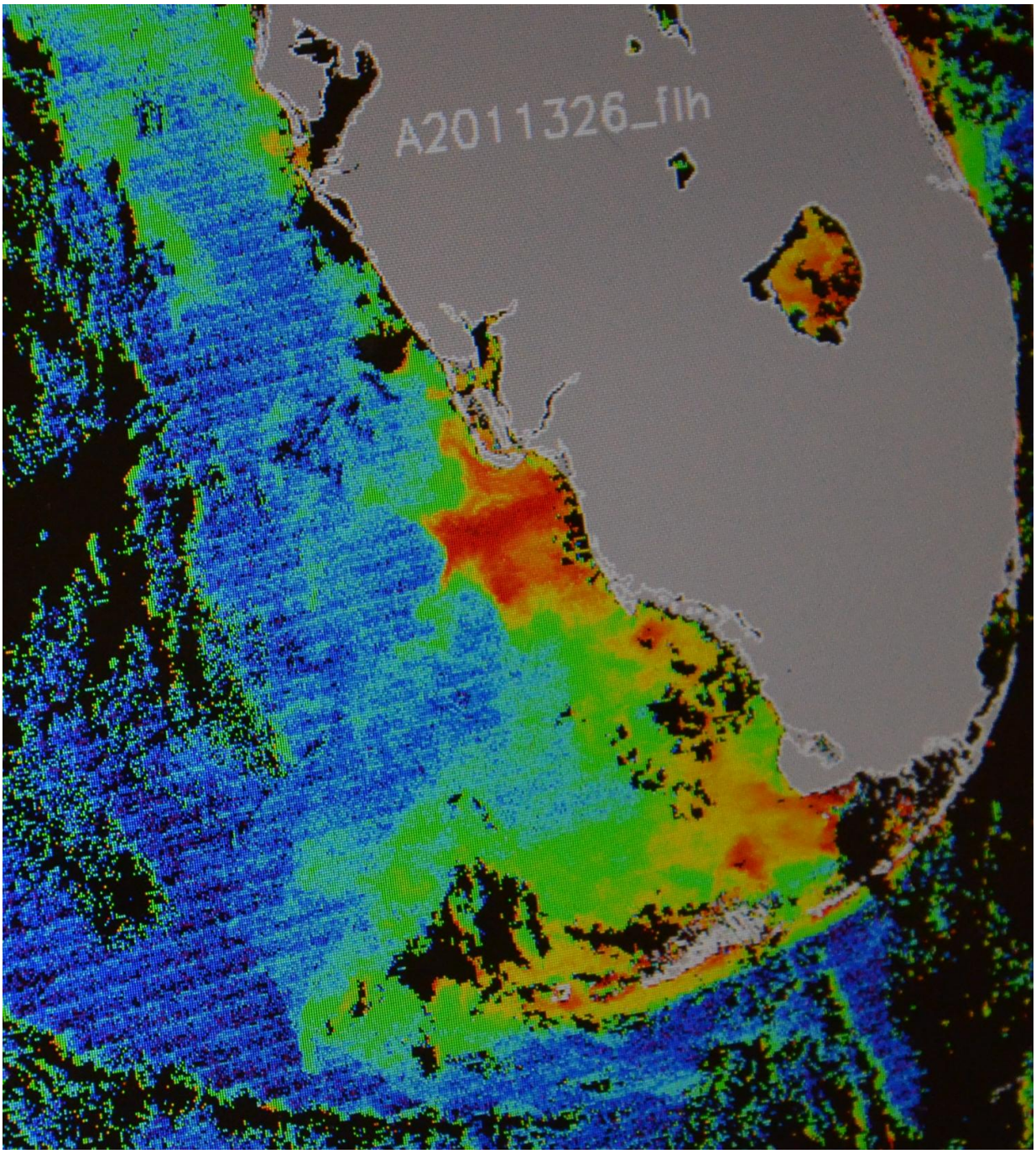
Research conducted by a team from the University of South Florida College of Marine Science and the Florida Fish and Wildlife

Conversation Commission suggests conditions are such that no major red tide outbreaks should be expected along Florida's west coast this year. Their conclusions are based on elevated nutrient levels in the Gulf of Mexico that favor the emergence of organisms other than those related to red tide.

The researchers recently published two papers in the *Journal of Geophysical Research - Oceans* that help to explain how West Florida Continental Shelf water properties are determined by the ocean circulation and how the circulation affects red tide blooms. The first study describes how the West Florida Continental Shelf - the broad, gently sloping region between the shoreline and the deep Gulf of Mexico - may be ventilated from below by deeper Gulf of Mexico water containing elevated nutrient levels and how these new waters are transported toward the coastline. The second study shows how these concepts may be combined with sea surface height measurements by satellites to predict red tide blooms along Florida's west coast.

Red tide blooms are defined as high concentrations of the toxic alga, Karenia brevis, which under certain conditions can outcompete other non-toxic algae. According to USF marine scientists, in years of the worst outbreaks, red tide has been responsible for millions of dollars in losses in the shellfish, finfish, recreation and tourism industries. Red tide toxins that end up in the food web can be transferred to other forms of life, from tiny zooplankton to birds, fish and aquatic mammals. State testing is conducted to ensure that commercially harvested seafood is safe for human consumption. Red tide toxins often cause fish kills, and can become aerosolized, causing human respiratory distress especially in and around surf zones. While red tide occurs naturally in the Gulf of Mexico, knowing when and where a red tide threat may emerge and how it may evolve along the coast is important. Predicting such events on daily to seasonal time scales has both biological and physical dimensions.

"This recently published research provides the basis for understanding why portions of the west Florida coastal ocean may at times be either nutrient-rich, or nutrient-deficient. When nutrient-rich conditions occur in the red tide formative region other non-toxic algae are favored, thereby suppressing red tide bloom development. Conversely, nutrient-deficient conditions there favor the development of red tide blooms," said Dr. Robert Weisberg, Distinguished University Professor of Physical Oceanography at USF.



USF scientists have used their research to develop red tide prediction models. Credit: University of South Florida

The techniques used to forecast the absence of a major red tide bloom this season (late summer to early fall) evolved from explanations of why there was no red tide in 2010 and why the 2012 bloom was more robust than the one in 2013. These findings then led to successful bloom forecasts made for 2014 and 2015.

The researchers also used numerical coastal ocean circulation model simulations to better understand the origins and pathways of water upwelled onto the West Florida Continental Shelf by the Gulf of Mexico Loop Current interactions with the slope, particularly near the Dry Tortugas, referred to as the West Florida Shelf's "pressure point." According to the researchers, prolonged contact at the pressure point, as determined using sea surface height observations by satellite, sets the entire shelf into motion, thereby bringing new, nutrient-rich water onto the shelf and suppressing red tide development. Conversely, years without such prolonged pressure point contact tend to be nutrient-deplete, allowing K. brevis to outcompete other faster growing, benign algae.

"While certainly fallible, in view of the biological complexity of red tide blooms, these techniques appear to have worked in all but four of the past 23 years for which joint, satellite altimetry and K. brevis observations exist," explained Weisberg. "It is important to note that by setting the nutrient state of the shelf, the coastal ocean circulation provides the underpinning for shelf ecology, and that these same concepts for red tide prediction apply to, and are critical for, fisheries and higher trophic levels in general."

"Observations remain the limiting factor in advancing these concepts," Weisberg added. "Only through our better understanding of how the ocean circulation and the biota are related can we are become better environmental stewards of our coastal region where society meets the sea."

Provided by University of South Florida