

By: Sbj/2008 News Staff, -

[An Active Florida Hurricane Season Adds to Red Tide](#)

The 2005 red tide, which lasted an entire year, poisoned the ocean waters and killed fish, turtles, birds, and marine mammals

Scientists believe that Florida's very active 2004 hurricane season may have played an important part in the development of extensive and long-lasting red tide conditions that affected its coastal areas in 2005. The four hurricanes that crossed the Sunshine State in August and September 2004 dumped as much as 27 inches of rain (nearly double the historical values) in central Florida, which increased groundwater levels and rates of surface runoff. These two factors are thought to create conditions ripe for the bloom of a red tide. Red tides, which may or may not be harmful, are primarily caused by the toxic phytoplankton, *Karenia brevis* on the west Florida Shelf. This species of phytoplankton can produce toxins that can kill marine organisms and lead to irritation of the eye and respiratory systems of animals and people. Scientists Chuanmin Hu and Frank Muller-Karger of the University of South Florida, St. Petersburg, Fla., and Peter Swarzenski of U.S. Geological Survey, St. Petersburg, Fla., noted that several factors may have contributed to the 2005 red tide: the 2004 hurricanes and their heavy rain, runoff, and submarine (below the ocean floor) groundwater discharge. The scientists used NASA satellites, as well as observations from ships, buoys from the National Oceanic and Atmospheric Administration (NOAA), and geochemical tracers to study red tide. During the 2004 hurricane season, four hurricanes crossed the state of Florida: Charley, Frances, Ivan and Jeanne. According to NOAA's National Hurricane Center, radar estimates of Charley's rainfall over central Florida were between six and eight inches. Frances produced rainfall in excess of ten inches over large portions of the central and northern Florida peninsula. Ivan produced rainfall totals between three and seven inches in a swath that included Alabama and the Florida panhandle. Finally, Jeanne produced widespread rainfall of up to eight inches across eastern, central and northern Florida, with 11 inches over extreme northeast Florida. Red tides occur in the same area off west-central Florida almost every year, mostly between August and March, from north of Tampa to south of Naples, Fla. The 2005 red tide poisoned the ocean waters and killed fish, turtles, birds, and marine mammals. This red tide was unusual because it lasted an entire year. "Runoff alone provided insufficient nitrogen to support this bloom," said Hu. "Submarine groundwater discharge injects water coming from the water table underneath Florida into the ocean through the ocean floor, below the ocean's surface and off the coast. We believe that submarine groundwater discharge provides the missing nutrients, and may trigger and maintain red tides off west-central Florida." Hu and his colleagues proposed that the unusual number of hurricanes in 2004 resulted in high runoff, and in higher than normal discharge of groundwater that was deposited along the west Florida coast throughout 2005. The groundwater discharge may also explain why the red tides happen in the same area almost every year, but also why they happen in other coastal regions of the Gulf of Mexico, Hu and Swarzenski said. In the past, hurricanes were thought to dissipate red tides. However, a series of hurricanes in summer 2005, including Hurricane Dennis (landed near Florida's Panhandle on July 10, 2005) and Hurricane Katrina (landed in south east Louisiana on August 29, 2005), only caused significant water mixing, and storm surges where dead fish were washed ashore. After sediment settled on the ocean floor, the red tide appeared even more extensive. NASA's MODerate Imaging Spectroradiometer (MODIS) Instrument aboard NASA's Terra and Aqua satellites, and NASA and GEOEye's Sea-viewing Wide Field-of-view Sensor (SeaWiFS) on the OrbView-2 satellite were used to detect the red tide blooms in December 2004. By the end of that month, MODIS showed that the bloom covered 425 square miles (1,100 square kilometers (km²)) immediately off Tampa Bay. By late September 2005 the bloom expanded to approximately 26,062 square miles (67,500 km²). Submarine groundwater in Tampa Bay has been shown to be a larger nutrient source than local rivers. There are also numerous submarine springs off the Florida coast and some are located near where red tides occur every year. Hu, Muller-Karger and Swarzenski suggest that frequent hurricanes result in elevated rainfall that leads to an increase in the surface runoff and possibly discharge of submarine groundwater, which lead to a larger, persistent red tide event. Images: MODIS satellite images show the *Karenia brevis* (red tide) in shallow (less than 50 meters or 164 feet) regions of the west Florida shelf. The colors of dark green, yellow, and red show high concentrations of

algae. The second date on each image indicates the water sample collection time by the Florida Fish and Wildlife Commission (FWC). *Images Credit: USF/NASA/FWC*