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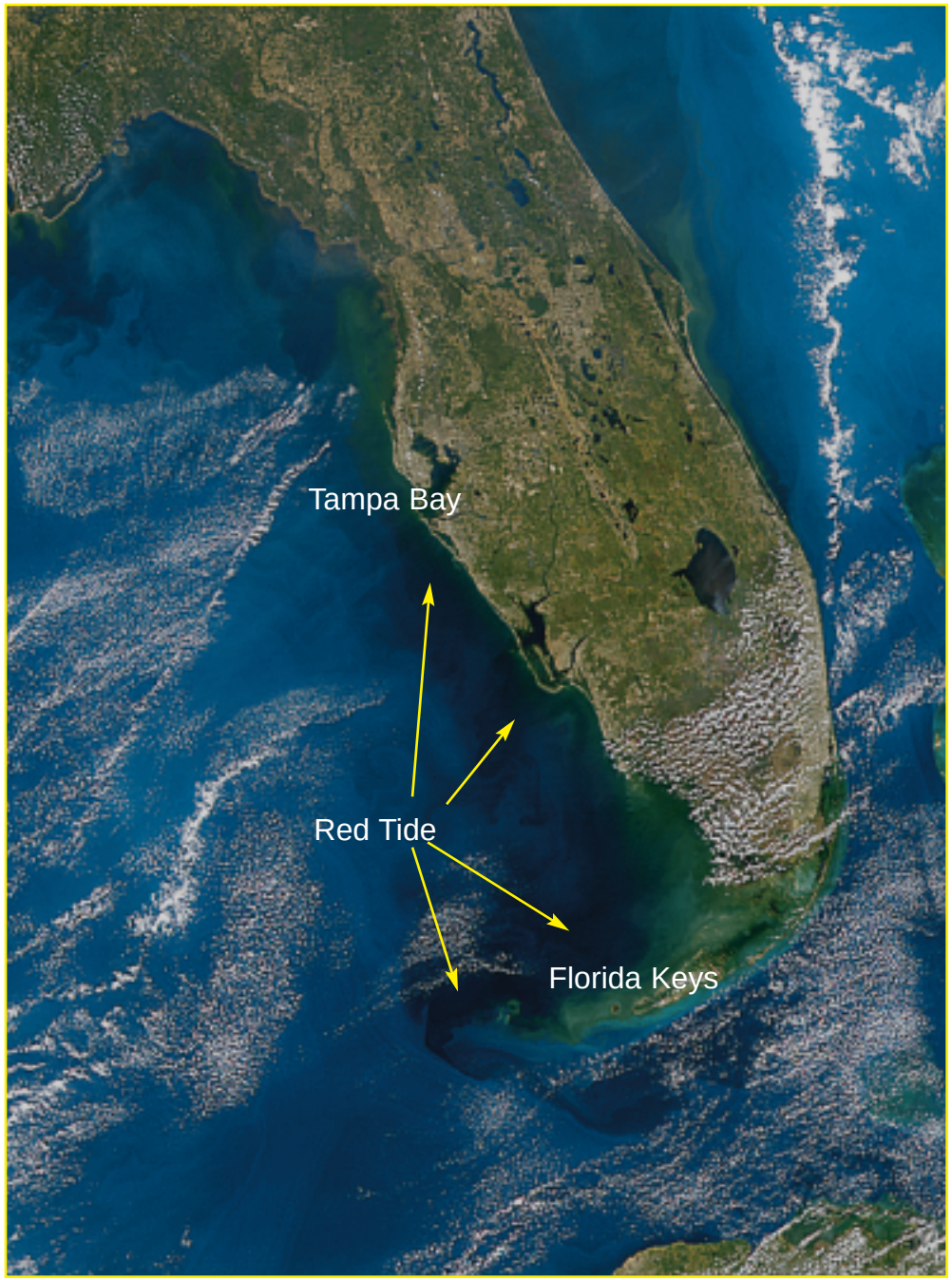
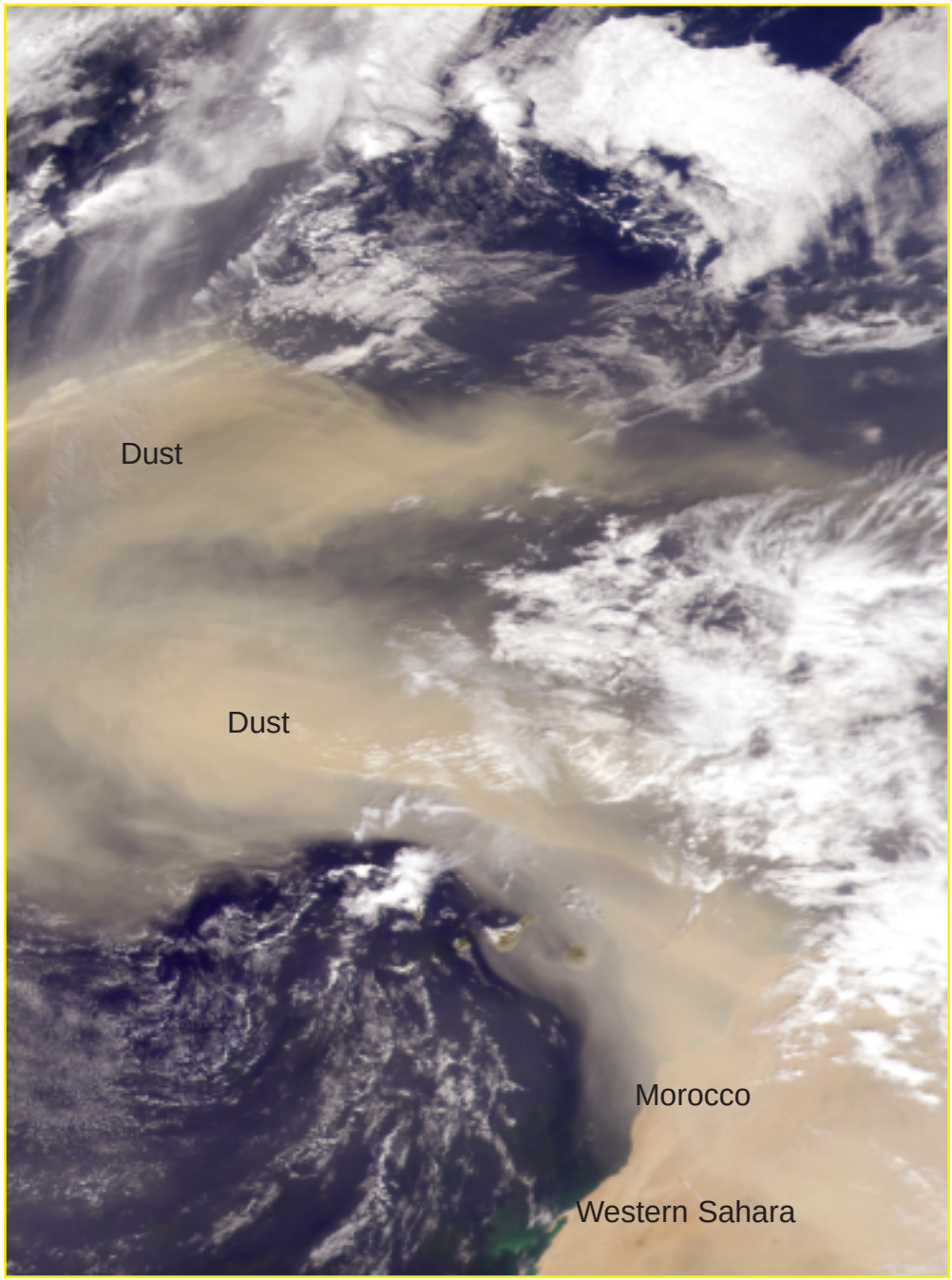
African dust leads to large toxic algal bloom





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Each year, several hundred million tons of African dust are transported westward over the Atlantic to the Caribbean, Gulf of Mexico, Central America, and South America. Thunderstorms and accompanying warm air can lift dust as high as 4575 meters (15,000 feet) above the African deserts, and then out across the Atlantic.

The image on the right shows a gigantic cloud of Saharan dust blowing off the northwest African desert, blanketing hundreds of thousands of square miles of the eastern Atlantic Ocean. The massive nature of this particular dust storm was first seen in this Sea-viewing Wide Field-of-View Sensor (SeaWiFS) satellite image acquired February 26, 2000.

Thunderstorm activity and the rising warm air over the Sahara Desert region generates clouds of dust that originate from fine particles in the arid topsoil. The massive dust cloud is then transported by the easterly trade winds across the Atlantic Ocean and into the Gulf of Mexico, a distance of approximately 6760 kilometers (4200 miles). The dust, rich in iron, is deposited in the waters off the West Florida coast, essentially fertilizing the area. (Iron is a common element in all soils, including those that are the source of Saharan dust).

Plant-like bacteria use the iron to set the stage for red tide, a toxic algal bloom. When iron levels go up, these bacteria, called Trichodesmium, process the iron and release nitrogen in the water, converting it to a form usable by other marine life. The increased nitrogen in the water makes the Gulf of Mexico a friendlier environment for toxic algae. The image on the left shows a red tide event that was seen by the SeaWiFS sensor on August 26, 2001. A huge bloom of toxic red algae, called *Karenia brevis (K. brevis)*, appears on the true-color image as a black area hugging the Florida Gulf Coast from the Keys to Tampa Bay.

The southwest coast of Florida is a hot spot for fishing, aquaculture, and tourism, all of which can be drastically affected by the potent toxins present in a red tide. Humans who swim in the Gulf can experience respiratory problems by breathing toxins from the red algae that get into the air. Also, eating shellfish poisoned by red tides can lead to paralysis and memory problems. Around the Gulf of Mexico, fish kills totaling in the millions and manatee deaths in the hundreds have been recorded from a single red tide bloom.

By using satellites to monitor dust arrivals and toxic algal blooms, scientists may be better able to predict the onset of red tides, and perhaps close beaches and fisheries well in advance of the event.

Images courtesy of the SeaWiFS Project and the Scientific Visualization Studio, NASA Goddard Space Flight Center and ORBIMAGE.

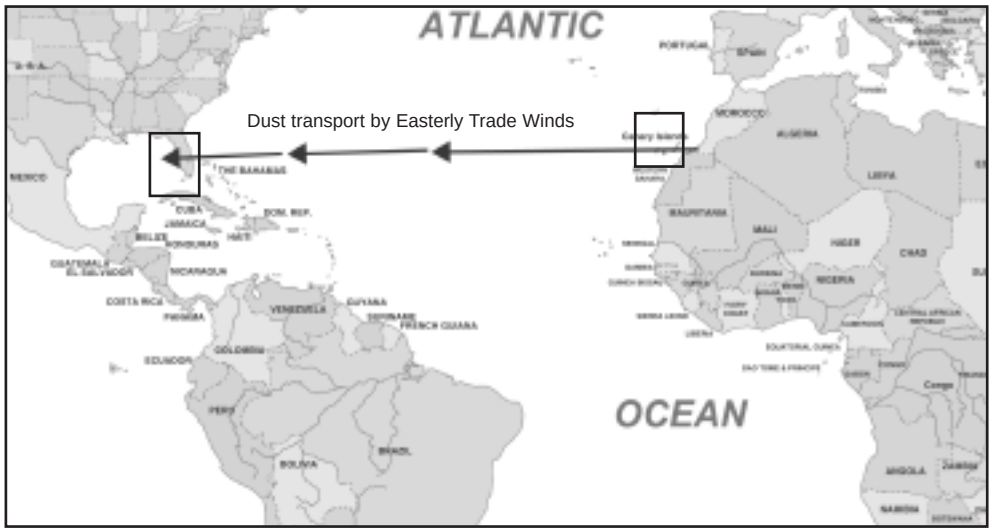
Addtional images can be found at the SeaWiFS homepage at http://seawifs.gsfc.nasa.gov.

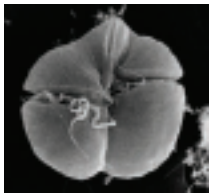
For the Classroom

Algal Blooms: Healthy vs. Harmful
http://www.bigelow.org/foodweb/bloom0.html

NASA's ocean color satellite instruments are more sensitive than the human eye, surveying our global oceans in a few hours. But what are they sensing: Plants? Animals? Something else? Why does ocean color vary in time and place? Can we detect whether microscopic marine organisms are potentially harmful? Follow the link above to discover more about the connections between marine ecology, light's behavior in ocean water, and satellite observations. (*Courtesy of the Bigelow Laboratory for Ocean Sciences.)*

Images courtesy of the SeaWiFS Project and the Scientific Visualization Studio, NASA Goddard Space Flight Center and ORBIMAGE.





The single-celled, plant-like organism that causes red tide in Florida is called Karenia brevis. K. brevis is a type of microalgae known as a dinoflagellate. It has two flagella, or whip-like tails, to help it move through the water. Although K. brevis has come to be known as the Florida Gulf Coast red tide organism, it has been implicated in blooms on Florida's east coast, as well as in Louisiana, Texas, Mississippi, Mexico, and the Carolinas.

NASA Publication Number