Detecting and Monitoring Algal Blooms through NASA Remote Sensing
NASA Langley Research Center
Earthzine/DEVELOP Virtual Poster Session, Summer 2011
Video Transcript

SLIDE 1

"Hello, my name is Lorrin Massengill, I go to George Mason University, I'm a Geology major."

"I'm Chris Cochran, graduate student at the University of South Florida studying environmental science."

"Vivian Tseng, Gaston College of Environmental Studies"

"Conor Collins, Elon Education, Social Science Education"

"Kristen Pyne, University of South Florida, Geology"

"Ron Norasak, Henry Clay high school in Kentucky"

"Ashley Coffin, Clemson University, Environmental Geology, and we are the Atlantic Water Team."

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"We were tasked to utilize NASA remote sensing to monitor Harmful Algal Blooms or HABs along the east coast of the United States. These are of interest because of their impact on the human health and the economy of local communities. Communities that greatly felt the impact were ones that relied on their waterways. Our two areas were the Chesapeake Bay and coastal Florida. This shows our potential partners listed here. The first two on the list are actually for our final product to help improve their current monitoring systems. We would hope that our final product would also help improve legislation in dealing with HABs in the future. We would like to thank our science advisor, Jamie Favors, for his help throughout our project."

SLIDE 3

"So Eutrophication is a significant problem, especially in coastal communities but also sediments, nitrogen and phosphorus contributes to the algal bloom growth, where algae decays and dissolves it lowers the dissolved oxygen content of the water which in turn leads to fish kills and manatee deaths. While there is no real price tag on the ecosystem, the actual economic impact is quite large."

SLIDE 4

"Commercial fisheries and public health costs make up the majority of annual economic impacts of HABs in the United States. Coastal monitoring and management is the lowest at only three million a year. While the estimated economic is 82 million a year, individual outbreaks bring that number to above a hundred million a year."

SLIDE 5

"In support the studies that suggest that there's a direct correlation between population growth and increases in HAB frequencies and intensities, these two graphs show the consistency in population growth within the state of Florida and the Chesapeake Bay watershed study areas for years 1990 projected all the way through 2030. The ease and accessibility to free geospatial data via government websites played a vital role in the success of our project."

SLIDE 6

"All of our imagery was acquired from NASA's GLOVIS, GIOVANNI and WIST data warehouses, and our general cadastral and buoy and demographic data were all acquired free from local state and federal agencies."

"We chose to focus on the Chesapeake Bay because it's the largest estuary in the United States and the third-largest globally."

SLIDE 7

"Two of the most significant problems in the bay include eutrophication and climate change. When excess nutrients enter the water, it can cause turbidity, and poor light penetration, which can harmfully impact aquatic vegetation and shellfish. In terms of climate change, HABs prefer warm shallow water bodies with low salinities, so with increasing temperatures, we can expect more HAB events."

SLIDE 8

"These are images of a biannual bloom that we observed in the upper-most portion of the Chesapeake Bay. The top left corner shows two NDVI from July and November respectively, showing light vegetation on the surface of the water. This is verified by observing the NOAA monitoring system of the bay, showing a light to medium concentration of algae. We matched this with an NDVI to the right showing the same results.

SLIDE 9

"Our methodology for the bay was to take chlorophyll concentration maps and match that with a Landsat image within a two day error shown here.

SLIDE 10

"Once we obtained the Landsat image we made an NDVI, which is shown here, and could act as a rough chlorophyll concentration map showing the highest levels of concentration of chlorophyll being the red shown here."

SLIDE 11

"Furthermore, we utilized surface profiler ERDAS, using band 4, which is sensitive to chlorophyll. We were able to see the profile of the bloom. The white box is our area of interest, and it should show a collapsed profile of the water in zero crystal values, but the suspected chlorophyll brings back positive values, showing us the contours in the blue."

SLIDE 12

"We also looked at Florida ecosystems. Algae grows on the surface of the water, blocks sunlight from reaching coral, which loosens a symbiotic relationship with zooxanthellae. If the zooxanthellae does not return, the coral becomes bleached and eventually dies."

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"Since OFS is out of commission, and Florida EO was unable to be used, it was more difficult to detect HABs in our project after previous studies. However, what we can do is use MODIS false color composites and chlorophyll concentration maps to reference past HAB-OFS blooms. As seen in the first two images, the red areas indicate the higher concentration of chlorophyll and the bloom itself, and the third image shows the physical appearance of the bloom. For possible future blooms we can use MODIS false color composites and chlorophyll concentration maps."

"The Harmful Algal Bloom and Hypoxia Research Control Act was created in 1998 and amended in 2004. Its focus is on research conducted by the states which does not include regulation on prevention and control.

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"It took until 2010 to change this, but the bill never made it to a vote. A major cause of HABs is runoff, and the EPA attempted to create a policy in Florida in regards to this, but are being sued for setting the nitrogen and phosphorus limits below what naturally occurs."

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"For future work, we would suggest comparing the nutrient load data with HAB events, as well as design more effective monitoring techniques and legislation that could be useful in not only predicting blooms but preventing them as well. Furthermore, we would suggest trying to revive the SeaWiFS project as it has proved very beneficial in past studies. We would like to thank you for your time, and please introduce the CALIPSO team."

[APPLAUSE]