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Issue 5 August 2013



NOAA HAB-OFS Newsletter

Welcome to the NOAA HAB-OFS Quarterly Newsletter. We are always happy to hear from you so please send your topic suggestions, questions, comments and feedback to hab@noaa.gov.

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Coming Soon: Technical Report Assessing the Florida HAB-OFS from 2004-2008

To aid early bloom identification and response efforts, since October 1, 2004, the Harmful Algal Bloom Operational Forecast System (HAB-OFS) has provided the eastern Gulf of Mexico with operational forecasts for *Karenia brevis*, the species commonly known in the region as red tide. The HAB-OFS bulletin products provide advance warning of *K. brevis* blooms based on ocean color satellite imagery and include forecasts of potential bloom formation, movement, intensification, changes in the spatial extent of blooms, and the level of associated respiratory irritation. In order to continually improve the HAB-OFS, bulletin utilization and forecast quality (i.e. forecast accuracy, reliability and skill) are evaluated regularly. The HAB team is pleased to announce that a technical report will soon be published detailing the results of an evaluation of HAB-OFS bulletins issued for Florida from May 1, 2005 to April 30, 2008, with a re-analysis of previously published data for October 1, 2004 to April 30, 2005 to allow comparison across all years (Fisher, et al., 2006). The finalized report will be e-mailed to all bulletin subscribers in September. The report was several years in the making and required extensive research, rigorous data review and statistical analyses. Although the procedures discussed in the report pertain to the years from 2005 to 2008, there have been minimal modifications to the HAB-OFS forecast models since 2008 so the conclusions of the assessment report remain relevant. The team is currently working on evaluating the bulletins issued from May 1, 2008 to April 30, 2012. Those results will be detailed in a future report.

Key Results from the Assessment of Bulletins from October 1, 2004 to April 30, 2008:

- A total of 398 bulletins and 30 supplemental bulletins and/or conditions updates were issued, which included 435 forecasts, requiring approximately 5220 forecast hours.
- **Utilization:** Greater than 83% of the time at least one bulletin was confirmed utilized per week. An average of 86% of all high priority bulletins were confirmed utilized.
- **Early Warning:** Nine out of thirteen *K. brevis* events were first identified in satellite imagery by the HAB-OFS, and then confirmed by water samples collected in the field.
- **Respiratory Irritation Forecasts:** All respiratory irritation forecasts were highly accurate and performed consistently much better than chance, with Heidke skill scores (a measure of accuracy relative to chance) indicating at least a 46% improvement over chance. The forecasts with the greatest potential to protect public health, "moderate" and "high" level respiratory irritation forecasts, had the highest accuracy, reliability and skill of all forecast components issued by the HAB-OFS.
- **Intensification Forecasts:** Intensification forecasts, or predicted changes in bloom concentration, were highly accurate and consistently performed with at least a 39% improvement over chance.
- **Transport and Extent Forecasts:** Transport forecasts were highly accurate and consistently performed much better than chance, with Heidke skill scores indicating at least a 35% improvement over chance. Extent forecasts were issued infrequently with variable accuracy and skill, and a slight bias towards over-forecasting, indicating that the model needs to be improved to enable high-quality forecasts of transport distance and bloom expansion.

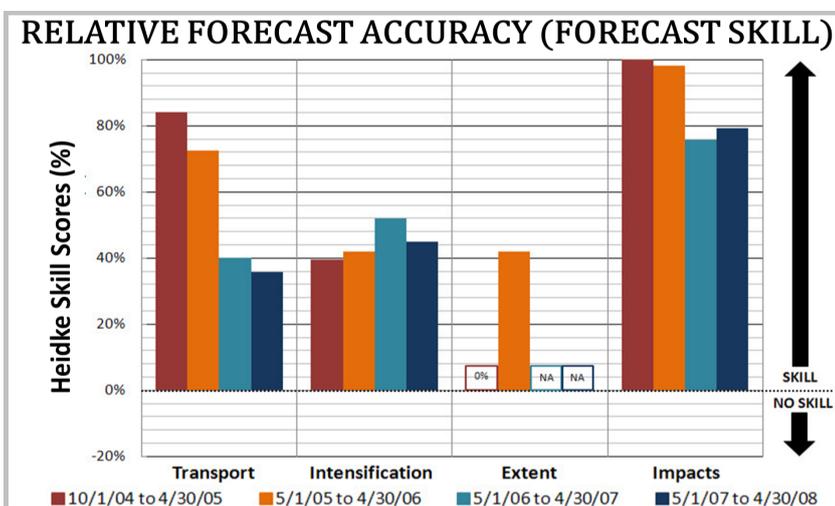


Figure 1. Forecast skill of transport, intensification, extent and respiratory impact forecasts during the 2004 to 2008 bloom years in Florida. The Heidke skill score is a skill corrected verification measure of categorical forecast performance that references the proportion of correct forecasts relative to the number of correct forecasts that could be made by random chance. Note: Values of N/A indicate that the denominator of the calculation was zero because observations of extent were unconfirmed.

(continued from page 1) The HAB-OFS continues to rely on the expertise of a full team of 7 analysts, specially trained to utilize established standard operating procedures and analytical methods. The results of this assessment will be used to guide enhancements to the operational forecast system with the goals of improving forecast quality through increased scientific understanding and the refinement of current forecast models.

References:

Fisher, K., Allen, A., Keller, H., Bronder, Z., Fenstermacher, L., & Vincent, M. (2006). *Annual report of the Gulf of Mexico Harmful Algal Bloom Operational Forecast System (GOM HAB-OFS)*. NOAA Technical Report. NOS CO-OPS 047.

NOAA Harmful Algal Blooms Observing System (HABSOS) Tool

NOAA's HAB-OFS integrates a variety of observed, modeled, and forecasted data in order to produce the analyses and forecasts that are summarized in the bulletin products. Want to dive deeper into the data to zoom into the ocean color satellite imagery, visualize forecasted winds or find ocean eddies? An excellent resource for viewing the data referenced by the HAB-OFS bulletins and beyond is NOAA's Harmful Algal Blooms Observing System (HABSOS) Tool, which serves as a data collection and distribution system for HAB information in the Gulf of Mexico. This interactive GIS tool allows the user to select and view layers of data that they are interested in with all the functionality of standard GIS tools, including the zoom, pan, measure tool, opacity setting and layer toggle functions.

Key data layers include:

- *K. brevis* cell counts
- Chlorophyll satellite imagery from NOAA and the University of South Florida (USF)
- Observed and forecasted ocean currents
- Observed and forecasted winds

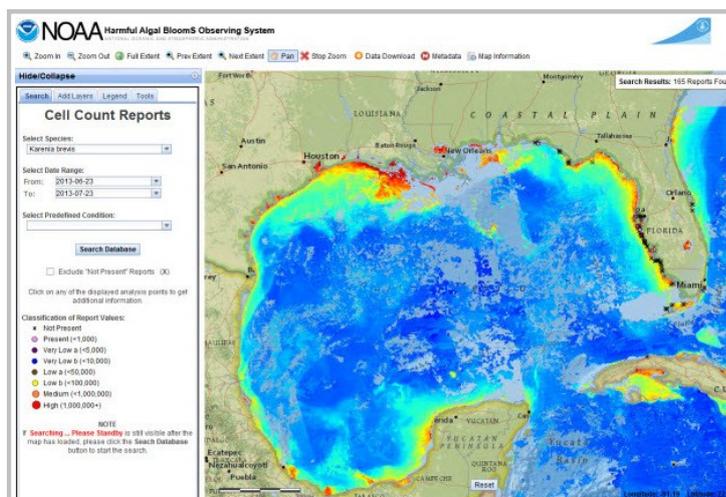


Figure 2. HABSOS interactive map tool.

Data ingested in the HABSOS tool comes from several NOAA offices as well as the Environmental Protection Agency Gulf of Mexico program, Florida Fish and Wildlife Research Institute, Florida Institute of Oceanography, Integrated Ocean Observing System, Texas Parks and Wildlife Department, United States Geological Survey, and the University of South Florida. Currently, the HAB-OFS and HABSOS teams are in collaboration to find ways to integrate our products in the future.

To learn more about HABSOS and access the interactive map tool, visit <http://habsos.noaa.gov>.

The HAB Team is Getting Ready to Upgrade its Eyes in the Sky

Since 2010, the HAB team has been using the Moderate Resolution Imaging Spectroradiometer-AQUA (MODIS-AQUA) as its primary source of ocean color imagery. However, the satellite was launched in 2002 and only intended to serve a lifespan of 6 years. With MODIS-AQUA working on borrowed time, NOAA is readying the next phase of ocean color imagery for HAB forecasting.

The Suomi National Polar-orbiting Partnership (NPP) satellite is a bridge mission toward the Joint Polar Satellite System (JPSS). Launched in 2011, NPP orbits the earth from pole to pole approximately 14 times a day, at an altitude of 512 miles (824 km). The HAB team is particularly interested in the Visible/Infrared Imager/Radiometer Suite (VIIRS), one of five instruments aboard NPP. This sensor boasts an increased

(continued from page 2) resolution from the 1.1 kilometers per pixel of the MODIS-AQUA sensor to an improved .65 kilometers per pixel. This increase in resolution will help the HAB team to track blooms close to shore where the aerosols from the bloom cause the greatest amount of respiratory impacts. The increase in resolution and image quality will also increase the HAB team's ability to highlight anomalously high levels of suspicious chlorophyll before water sampling can confirm if *K. brevis* is present, allowing for a larger buffer between first detection and the first impacts alongshore Florida and Texas.

For now, NOAA will continue to use the MODIS-AQUA satellite for HAB forecasting. However, ongoing development and testing will help to insure that VIIRS can be incorporated into the bulletin by the end of 2014 without a disruption in service.



Figure 3. The VIIRS is one of five instruments aboard the Suomi National Polar-orbiting Partnership (NPP) satellite. Photo Credit: NOAA NESDIS JPSS

Getting to Know the HAB-OFS Analysts: Meet Cristina Urizar

This edition of the newsletter marks the first in a new series that will introduce the forecasters that make up the NOAA HAB-OFS team. The HAB team is composed of analysts from both biological and physical science backgrounds that are based out of three different NOAA offices.

Cristina Urizar joined NOAA under the Knauss fellowship and has been a HAB analyst for 7 years. Based in St. Petersburg, FL, in NOAA's Southeast Regional Office, Cristina is the analyst closest to the blooms along the coast of southwest Florida. Her proximity to the local stakeholders who both support and rely on the HAB bulletin is reflected in her awareness of the importance of accurate HAB forecasting, saying "There is a delicate balance between informing the public and alarming it. I learned to be cautious about what I say and about how I say it." When even the smallest change of words can have large impacts on local economies,

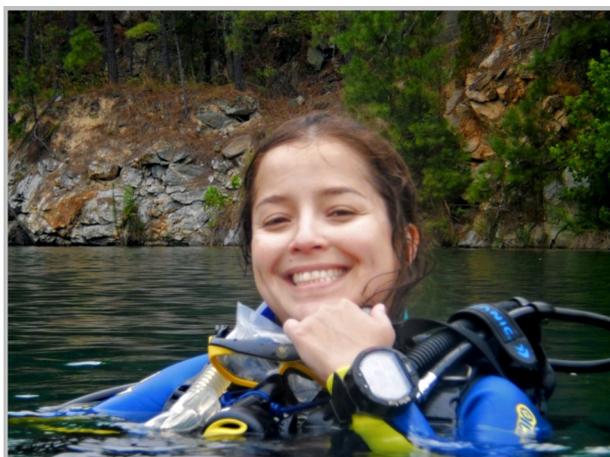


Figure 4. Cristina completed her first dive in Lake Raulings, VA, after getting her Open Water Diver certification.

Cristina's knowledge of southwest Florida has been critical in developing a bulletin that is both accurate and sensitive to local needs. With her educational background in geophysics and oceanography and her past experiences, Cristina was able to make a smooth transition into the HAB team. "I have a lot of experience with numerical models and when I joined NOAA/CO-OPS, it was as part of the modeling team," comments Cristina, "although the modeling team uses numerical models to generate their forecasts and the HAB team does not, I was really interested in learning about the model, protocols, and rules that HAB analysts use to generate their forecasts." Cristina has been a HAB analyst for Florida since 2006 and also began writing bulletins for Texas in 2012. As one of the most experienced HAB analysts, her modeling and forecasting expertise continue to promote the ongoing development of the HAB-OFS products.

Many Thanks to our Partners and Data Providers

<http://tidesandcurrents.noaa.gov/hab/contributors.html>

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