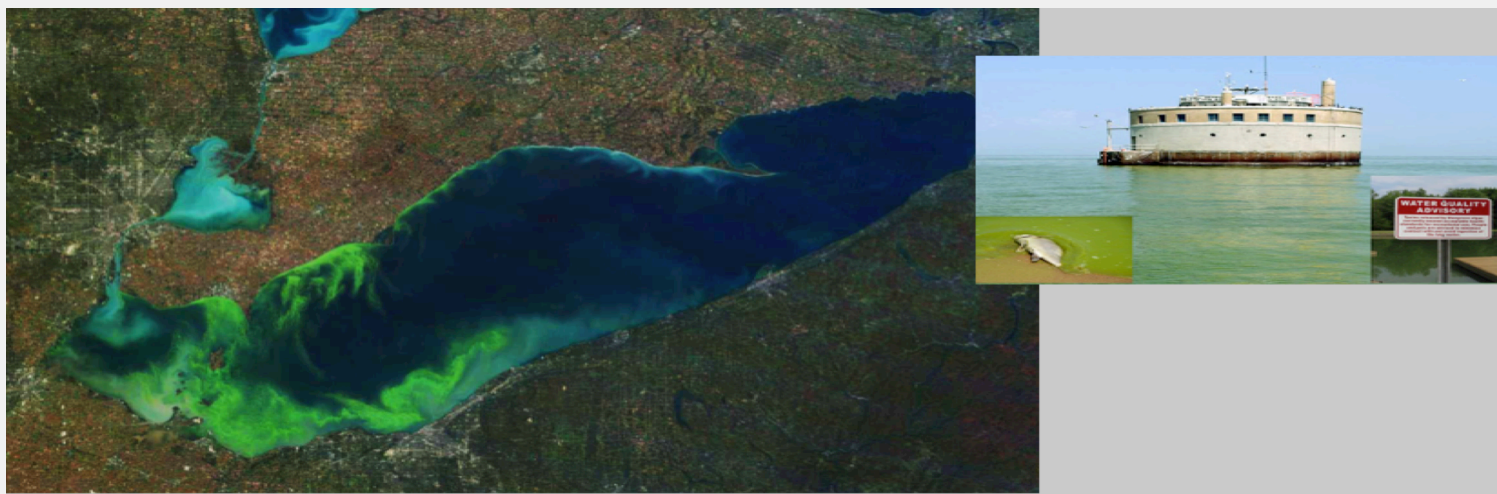


HyspIRI MISSION APPLICATIONS – Public Health: Harmful Algal Blooms



Main Panel: The HAB that shutdown Toledo, OH's water supply August 2014. MODIS satellite imagery shows the extent of the HAB (NOAA GLERL). Toledo's water intake was in the greatest HAB concentration and the resulting levels of the toxin from microcystins in Toledo's drinking water that were above the 1 part per billion safe levels for drinking (The Columbus Dispatch).

Application Question/Issue: *Can NOAA's National Centers for Coastal Ocean Science improve monitoring and forecasting harmful blooms that occur in the Great Lakes to reduce risks to human health associated with recreational exposure and human consumption of Great Lakes water?*

Who Cares and Why?

Harmful algal blooms (HABs) pose a significant health risk to both human and animal populations. HAB occurrence is affected by a complex set of physical, chemical, biological, hydrological, and meteorological conditions making it difficult to isolate specific causative environmental factors. HAB's cause significant reduction in water quality through algal production of toxins potent enough to poison both aquatic and terrestrial organisms. The Great Lakes are the nation's single most important aquatic resource. They are the largest freshwater source in the world and contain 90% of U.S. surface water supply and provide drinking water to 40 million U.S. and Canadian citizens.

Large human populations can be severely impacted by HABs with little or no warning. During the summer of 2014, Toledo, Ohio's 500,000 metro residents were without water for several days.

Needed Measurements

NOAA's National Centers for Coastal Ocean Science fund several research groups working to identify factors that influence HABs and to develop methods to forecast toxic cyanobacteria blooms. Research is focused on improving their ability to predict when algal blooms will occur, whether or not they are toxic, and their impact on human health.

An experimental HABs bulletin has been developed to provide a weekly forecast for HABs (*Microcystis*) in western Lake Erie. When a harmful bloom is detected by the experimental system, scientists will issue the forecast bulletin. The bulletin depicts the HABs' current location and future movement, as well as categorizes its intensity on a weekly basis.

The NASA Response

The HyspIRI mission will provide hyperspectral visible to shortwave infrared and multispectral thermal data products to NOAA that would significantly enhance their ability to predict when algal blooms will occur, whether or not they are toxic, and their impact on human health.

The 60 m resolution hyperspectral data and its 19 day repeat provided from HyspIRI will allow spectroscopy at a spectral accuracy of < 0.5nm and an absolute radiometric accuracy of > 95% from water surfaces. These data would significantly enhance the ability to identify the toxic cyanobacteria species and sub-species along with their distribution within the water column and the spatial variability in the surface waters throughout the Great Lakes.

HyspIRI's thermal infrared multispectral data will also have 60-meter spatial resolution but a 5-day repeat pattern that greatly enhances the ability to obtain timely and adequate thermal data. HyspIRI's NEdT (Noise Equivalent delta Temperature) precision of < 0.2 Kelvin will produce day-night pairs of calibrated surface temperatures for use in determining surface water temperature. The combination of both the visible-shortwave infrared and thermal wavelengths will significantly enhance the ability identify the toxic cyanobacteria species and provide water temperature to help understand the HAB population dynamics.

Comments? Thoughts?

The HyspIRI website is designed to engage the community of practice, accept and process feedback and queries, support interactive workshops and disseminate user tutorials and other pertinent information. Comments and feedback can be posted at hyspiri@jpl.nasa.gov.