USE OF SATELLITE TO IDENTIFY OR QUANTIFY BLUE-GREENS AND "RED TIDE"

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Satellite data has been shown to be effective for monitoring of two major types of harmful algal blooms that impact Florida, cyanobacteria in freshwater and *Karenia brevis* in marine water. The new Sentinel-3 satellites provide remarkable improvement in detection, monitoring, and assessment of these blooms as compared to previous satellites. The Sentinels (3a and 3b) were developed as part of the European Union's Copernicus program and launched in 2016 and 2018. They provide nearly daily coverage with 300-meter pixel resolution. The Ocean Land Colour Imager (OLCI) on these satellites has bands that allow identification and quantification of cyanobacterial blooms, and can also indicate the extent of blooms of *K. brevis*, provided these blooms have been confirmed through other means. Cell counts are a standard confirmation, however, *K. brevis* is the most common bloom-former on the west Florida shelf in the late summer and autumn, so ecological information can be used for confirmation.

OLCI can be used to assess over one-hundred large lakes in Florida for cyanobacterial blooms and determine the presence and quantity of cyanobacteria. As an example, Lake Okeechobee has been monitored with Sentinel-3 since the data become available in 2017. We have also combined the OLCI data with historical MERIS data (2002-2012), in order to provide a time series of bloom severity in the lake.

Karenia brevis "red tides" typically dominate the biomass of the Florida shelf when they occur. These can be detected by chlorophyll fluorescence once they increase above background concentrations, typically at about 1 µg/L of chlorophyll. Sentinel-3 showed the development of the 2018 bloom along the west coast of Florida from June through September and provides detail to within 300-500 m of the shore. We are currently evaluating the consistency of the fluorescence method for quantifying the biomass of these blooms.

PRESENTER BIO: Dr. Richard Stumpf is an Oceanographer at NOAA with over 30 years of experience in detection and forecasting of red tide and other harmful algal blooms. He leads NOAA's efforts to transition research models to operations to forecast these blooms.