

Remote Sensing Methods for Determining Temporal and Spatial Distributions of Microcystis blooms in Saginaw Bay and Lake Erie

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This project completed in 1999

Overview

During a Microcystis bloom, a change in surface reflectance (increase of 3-5%) caused by volumetric and surface scattering can be detected in NOAA/AVHRR (Advanced Very High Resolution Radiometer) satellite imagery. Although the AVHRR may not be the optimum sensor to use owing to its broad visible (channel 1, 580 -680 nm) and infrared (channel 2, 720 -1000 nm) bandpasses and its relatively coarse spatial resolution (~1.3 km), it has a high temporal resolution (daily coverage) and is available from the Great Lakes CoastWatch Program, thus making it well suited for monitoring. As an ocean color sensor, SeaWiFS (Sea Viewing Wide Field of View Sensor) spatial and temporal resolutions are similar to those of the AVHRR, but the SeaWiFS bandpasses are better positioned for algal bloom detection. SeaWiFS should better be able to "identify" biologically caused from non-biological (eg. sediment) reflectance patterns. In addition, through coincident satellite and surface measurements, some measurement of surface intensity or density can be assigned to the reflectance values.

FY 1999 Plans

Plans for future work include the development of an algorithm for bloom detection and monitoring using NOAA/AVHRR and/or SeaWiFS satellite sensors. Re-calibration of existing Satlantic profiling and surface reference radiometers will be performed. During a documented Microcystis bloom on Saginaw Bay or Lake Erie, optical measurements using the Satlantic instruments will be made and water samples taken coincident with satellite overpass. The optical data will be processed to derive water leaving radiance and remote sensing reflectance and the water samples for Microcystis abundance. AVHRR and SeaWiFS satellite imagery during the period of measurements will be obtained. The SeaWiFS imagery will be used with SeaDAS software obtained from NASA for image processing. The "ground truth" data will be used in conjunction with the digital satellite imagery to develop and validate algorithms for bloom detection and monitoring.

1999 Accomplishments

Water samples were collected on Saginaw Bay during Microcystis bloom for ground truth in the development of a satellite derived Microcystis map product. Satellite imagery is just becoming available to researchers for download. Although the "ground truth" data was collected on a cloudy day, the following day was clear. The satellite imagery for this day will be used with the in situ data (currently being processed for presence of Microcystis) to derive a relationship between reflectance and Microcystis concentration.