

Modeling and Monitoring of Agricultural Influences on Harmful Algal Blooms in Western Lake Erie

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Abstract : Harmful Algal Blooms are a recurrent disturbing occurrence in Lake Erie that has caused significant negative impacts on water quality and aquatic ecosystem around Great Lakes areas in the United States. Targeting the recent HAB events in western Lake Erie, this paper utilizes satellite imagery and hydrological modeling to monitor HAB cyanobacteria blooms and analyze the impacts of agricultural activities from Maumee watershed, the biggest watershed of Lake Erie and agriculture dominant. SWAT (Soil & Water Assessment Tool) Model for Maumee watershed was established with DEM, land use data, crop data layer, soil data, and weather data, and calibrated with Maumee River gauge stations data for streamflow and nutrients. Fast Line-of-sight Atmospheric Analysis of Hypercubes (FLAASH) was applied to remove atmospheric attenuation and cyanobacteria Indices were calculated from Landsat OLI imagery to study the intensity of HAB events in the years 2015, 2017, and 2019. The agricultural practice and nutrients management within the Maumee watershed was studied and correlated with HAB cyanobacteria indices to study the relationship between HAB intensity and nutrient loadings. This study demonstrates that hydrological models and satellite imagery are effective tools in HAB monitoring and modeling in rivers and lakes.

Keywords : harmful algal bloom, landsat OLI imagery, SWAT, HAB cyanobacteria

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