THE OHIO STATE UNIVERSITY

Environmental Science Graduate Program Student Seminar Series

Hydrological Modeling of Lake Erie Coastal Wetland for Enabling Nutrients Runoff Predictions

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Abstract

Coastal wetlands provide critical ecosystem services, such as wildlife habitat, fisheries support, carbon sequestration, flood protection, and water quality improvement. Specifically, around the US Great lakes, as the Harmful Algal Blooms (HABs) are becoming a severe issue, coastal wetlands are becoming increasingly important for mitigating nutrient runoff from agriculturally dominated watersheds to the lakes. The H2Ohio initiative was announced in 2019 to protect Lake Erie from excessive phosphorus runoff and includes creation of coastal wetlands.

Natural wetlands intrinsically heterogeneous and are typically composed of a mosaic of ecosystem patches with different plant types. The adaptation of these plant communities to water-dominated environment is the basis for their use in improving the water quality in constructed wetlands. The understanding of wetland vegetation effects on the environment is the key to determine which plant to grow in a constructed wetland in term of nutrients removal. Accurately identifying the vegetation patches is important to understanding their hydrological effects and further effects on nutrients removal. Compared to labor consuming field survey, remote sensing is an efficient way to monitor plant communities in wetlands.

The objective of our study is to develop a modeling approach that is able to provide patch-level hydrological parameters to large-scale models' wetland modules for predicting the total amount of soluble nutrients that may be transported to the lake as a function of the ecological state and hydrology at coastal wetlands. The main product of our study will be an approach to classify vegetation patch types in wetlands by observing their temporal dynamics from remote sensing. We will further utilize these remote-sensed patch locations and vegetation types as input to a calibrate a high-resolution hydrological model to provide the corresponding hydrological parameters, such as Manning coefficient, flow velocities and residence time of different vegetation patches within coastal wetlands.