

Speaker: Emily Rading

**title: Spatio-temporal characterization of a complete algal bloom event using fluorescence spectroscopy in tandem with conventional physio-chemical methods**

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Abstract:

An increase in the frequency and geographic distribution of algal and cyanobacterial blooms has been observed over the last two decades, threatening marine and freshwater ecosystems. In situ fluorometers have been proposed for their potential to provide early warning of bloom development through the analysis of fluorescence signatures of the water. Despite the potential of the technology, there has been no in-depth analysis studying the fluorescence and 3-D excitation emission matrixes (EEMs) of an algal bloom in a waterbody experiencing an algal bloom with intensive monitoring. Furthermore, the correlations between the EEMs and other physical and chemical parameters of blooms have not been elucidated till date.

The Milford Gathering Pond in Geary County, KS experiences annual algal blooms that cause public access closures and affects the KDWP fish hatchery. An algal bloom at the pond was intensively monitored from April 2021 to November 2021. Various water quality parameters such as pH, turbidity, orthophosphate, total nitrogen, and total carbon were tracked and the 3D fluorescence EEM spectroscopy was analyzed. EEM intensity changes were traced through both visual peak identification and with PARAFAC. Two peaks were identified visually: Peak C and Peak T. PARAFAC identified three fluorescence components with compound peaks. Component 1 had Peak A and Peak C1, component 2 had Peak A and Peak C2, and Component 3 had Peak T1 and Peak T2.

Visual peak identification of Peak T was shown to be the best predictor of the algal bloom. The T peak increased before the jump in turbidity indicating the start of the bloom and continued to change with the progression and increase in severity of the bloom. The findings show promise for a proactive and realistic algal monitoring tool which can be used by regulators and scientists alike for greater societal and environmental well-being.