**Title: Evolution of optical signatures in western Lake Erie as related to HAB formation and senescence**

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Abstract: In 2014, a harmful algal bloom (HAB) began in western Lake Erie in late July and continued into October. Over this time period, a variety of instrumentation utilized on cruises captured the optical temporal and spatial variability of the bloom. Hyperspectral radiometry was measured from late June through early November at NOAA sites, and in mid-August a multi-day field survey yielded detailed measurements of the horizontal and vertical optical structure of the water in the western basin. These measurements included hyperspectral radiometry, microscopic holographic imagery, absorption and scattering characteristics of the water column. We observed water types from HAB-free waters of the Detroit River plume, to floating *Microcystis* mats near Maumee Bay. We also observed a transition from *Microcystis*- to *Planktothrix*-dominated waters transiting east into the central basin. Based on these data sets, an optical picture of the evolution of the water over the span of the bloom has emerged, which contain many interesting aspects of the environmental variability of the basin over space and time. These results have important implications for remote sensing algorithms and applications.