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Using a Modified Gaussian Model to Predict Concentrations of Blue-Green Algal Pigments in Eutrophic Indiana Reservoirs

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The purpose of this study is to examine the performance of an empirical method for quantifying blue green algal pigments (i.e., chlorophyll *a* and phycocyanin) from hyperspectral reflectance. Central Indiana reservoirs are typical of eutrophic inland waters where the mean summer chlorophyll *a* is greater than 40 $\mu\text{g l}^{-1}$, a concentration indicative of high algal abundance, and the mean summer phycocyanin concentration is greater than 50 $\mu\text{g l}^{-1}$, indicating a high concentration of blue-green algal species. *In situ* reflectance spectra of these drinking reservoirs were collected during 2005-2007 using an ASD and/or Ocean Optics spectrometer, and water samples were collected and analyzed for both chlorophyll *a* and phycocyanin concentrations. This study used a curve fitting model, Modified Gaussian Model (MGM) to derive the abundance of chlorophyll *a* and phycocyanin from model parameters, which are determined by devolving reflectance values into Gaussian curves representing individual absorptions. The MGM has the ability of adjusting spectral band shifts that are unaccounted for in spectral band ratio algorithms. Once the curve is fitted by MGM, a peak absorbance, maximum strength of absorbance, and logarithmic area under each fitted absorption can be determined for each algal pigment of interest. Preliminary results from a 2005 Morse Reservoir dataset indicate high correlation between chlorophyll *a* concentration and the estimated absorption strength at 672 nm ($R^2=0.84$), and between phycocyanin concentration and the estimated absorption area at 620 nm ($R^2=0.91$). The results demonstrate that the MGM can be applied to quantify chlorophyll *a* and phycocyanin abundance from hyperspectral reflectance.