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Advanced Remote Sensing Methods for Automated Lake Water Quality Mapping

Abstract: Using satellite imagery, we have been assessing lake water quality in Minnesota, USA for over 20 years. These assessments at around five year intervals were used for spatial and temporal trends and causative factors. Recent advances in satellite technology (improved spectral, spatial, radiometric and temporal resolution) and atmospheric correction, along with cloud and supercomputing capabilities have enabled the use of satellite data for automated regional scale measurements of water resource characteristics. These new capabilities provide opportunities to improve lake and fisheries management by measuring more variables (chlorophyll, colored dissolved organic matter (CDOM) and total suspended matter, the main determinants of water clarity) more often.

To utilize these capabilities we have develop field-validated methods and implemented them in an automated water quality monitoring system on University of Minnesota supercomputers. This system enables near real-time monitoring of water quality variables at regional scales, which will enhance our understanding of spatial and temporal variability and responses of surface waters to environmental change. Examples from Minnesota's 10,000+ lakes will be presented.

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