Early detection of toxic algal blooms using unmanned aerial vehicles

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Cyanobacterial harmful algal blooms (CHABs) are dense aggregations of potentially toxin producing cyanobacteria that can degrade water quality and severely harm aquatic ecosystems. Current CHAB monitoring and forecasting are expensive, require specialized equipment, and do not have the spatial or temporal resolution to monitor early blooms, particularly on smaller lakes. Low-cost, off-the-shelf unmanned aerial vehicles (UAV) have emerged as potential techniques for low cost, rapid-response, high resolution, community science friendly environmental monitoring. We applied a novel signal enhancing algorithm to UAV aerial surveys to examine the impact of emergent macrophyte coverage and abiotic predictors on CHAB coverage in Dog Lake, South Frontenac. Our multiple regression model had an R2 value of 0.652, with the distance from the inflow source, mean hourly solar radiation and mean previous day temperature as the strongest predictors. We concluded that timing and duration strongly affects the impact of environmental predictors of CHABs, and that low-cost UAV have great potential for ecological monitoring.