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Title: Quantifying Moss Response to Contaminant Exposure Using Laser Induced Fluorescence

Abstract

The project goal was to develop a detection method of biological response to metal contamination in mosses using a non-destructive laser induced fluorescence (LIF) technique. Moss was selected due to its long history of use in tracing atmospheric deposition of heavy metals and nuclear fallout. Increasing treatments of copper chloride ($CuCl_2$) ranging from .035 to .100 mg/cm2 were administered to three moss samples every 48 hours until reaching a total of 5 doses (10 days). Moss fluorescence was used as a measure of biological response to Cu and was measured using LIF from 532 nm green and 355 nm UV lasers. Images of LIF response were captured using a CMOS camera and red-green-blue (RGB) decimal code values were extracted for each pixel in the images. Pixel densities of color channels from treated and untreated moss samples were compared revealing a shift to lower decimal codes in red and green densities with increase in Cu. The data also suggests that Cu applied as a single dose or in multiple smaller increments over time induce the same response. Multiple quantitative analyses of color distributions were used to demonstrate that LIF is a viable method to identify biological response to Cu in moss at mg/cm2 Cu levels. As such, LIF shows great promise for environmental remote sensing applications.