Airborne LiDAR fluorescence analysis for the quantification of water-quality characteristics

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The purpose of this research is to evaluate the use of a remote sensing technique from an aircraft to detect dissolved organic matter (DOM) in fresh water and estuarine environments. DOM is one of the main components associated with eutrophication in the coastal zone and can be detrimental to

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aquatic ecosystems. It is important to monitor and measure DOM levels to determine areas which may be susceptible to eutrophication and other water quality issues. In August 2008, Laser Induced Fluorescence Light Detection and Ranging (LIF LiDAR) was used to assess the water quality of various areas in the Maritime Provinces. The method works by exciting particulate matter in the water using a laser wavelength of 308nm. Only a consumer grade global positioning system (GPS) used during these flights and lacked an Inertial Measurement Unit (IMU) which caused the calculated position of the fluorescent point measurements to be erroneous by hundreds of meters. Geometric corrections were performed on the LIF LiDAR dataset to facilitate comparisons with in-situ grab samples that were taken at the time of the flights. These grab samples were analyzed in the lab for dissolved organic carbon (DOC), using a total organic carbon (TOC) analyzer, and DOM, using Spectral Fluorescence Signature (SFS) analysis, similar to the method used by the LIF LiDAR. Preliminary correlation analysis tests show discrepancies between the three datasets. Broad patterns of DOM variability are clearly evident in the LIF LiDAR data which show a dilution process from the Annapolis River into the Basin and distinct differences between a highly coloured lake and a clear water spring-fed lake on South Mountain. Investigation into the strengths of these correlations in all areas is still being conducted.