Friday, October 12
Oral Session 10
09:00–10:00

09:20–09:40

MEASUREMENTS OF THE POLARIZED BRDF OF ARCTIC MACROALGAE WITH APPLICATIONS TO MODELLING UNDERWATER LIDAR

The Arctic has been warming steadily for the past few decades causing a reduction in ocean ice-coverage. Consequently, the increased exposure to light has already begun to affect coastal Arctic marine primary productivity, and a regime shift has been observed in some Arctic macroalgal communities where species normally found in cold-temperate waters are seen to occur and survive in Arctic marine ecosystems. There is an urgent need to establish baselines and monitor change in the abundance and diversity of the Arctic marine phytobenthos. Using the absorption, inelastic scattering (fluorescence), and elastic scattering properties of macroalgae excited by lasers, we are developing a LiDAR to carry out surveys of coastal Arctic benthic environments from an autonomous underwater vehicle (AUV). The LiDAR will map the morphology (3-D surface) of the substrate and macroalgal canopy, as well as detect and characterize the macroalgal biomass. Important parameters in designing such a LiDAR are the elastic and fluorescent reflectance properties of Arctic macroalgal targets. Here we present the results of laboratory measurements of the polarized bidirectional reflectance distribution function (BRDF) measurements for both elastic and inelastic scattering (fluorescence), with a particular emphasis on the near-exact backscattering configuration of our LiDAR. Models and in-situ measurements demonstrate two competing approaches for laser detection of macroalgae at a distance: the fluorescent return from laser excitation at 532 nm versus differential absorption from two elastic laser returns (e.g., 473 nm and 532 nm). Spectrofluorescence properties of Arctic macroalgae and the value of using polarization optics are also evaluated.

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