

## Improving our Understanding of ICESat-2 Ice Thickness Estimates in the Canadian Arctic Archipelago using *in situ* and Drone Measurements

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### ABSTRACT

The Canadian Arctic Archipelago (CAA) is a unique sea ice region located across northern Canada, adjacent to the Arctic Ocean. To date, monitoring of sea ice within the CAA has lacked volumetric / ice thickness information. NASA's Ice, Cloud, and land Elevation Satellite-2 (ICESat-2) was launched in 2018 and included a key objective to estimate sea ice thickness. The Advanced Topographic Laser Altimeter System (ATLAS) aboard ICESat-2 measures surface elevation at high resolution with a footprint diameter of approximately 11 m. ATLAS was designed to obtain accurate and routine estimates of sea ice surface height and freeboard (ice plus snow thickness) relative to the height of the adjacent ocean. However, open water within the CAA is scarce due to high concentrations of *in situ* formed landfast ice with few open water leads, and snow thickness is generally unknown. To better understand these uncertainties, researchers from Environment and Climate Change Canada conducted surveys on the sea ice between April 10th to 28th, 2022, documenting sea ice surface heights, snow depth, freeboard and ice thickness using a combination of manual, global navigation satellite system (GNSS) surveys, and drone measurements. Surveys were conducted along 5 ICESat-2 satellite overpasses, at 57 sites, and along 86 km of continuous transects with coincident snow depth and EM-31 electromagnetic induction-sensed sea ice thickness observations. Comparisons of our *in situ* measurements with the ICESat-2 satellite products for sea ice elevation (ATL07), and sea ice freeboard (ATL10) will be presented.

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