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ICESat-2, its retrievals of ice sheet elevation change and sea ice freeboard, and potential synergies with CryoSat-2

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Understanding the causes and magnitudes of changes in the cryosphere remains a priority for Earth science research. Over the past decade, NASA's and ESA's Earth-observing satellites have documented a decrease in both the areal extent and thickness of Arctic sea ice, and an ongoing loss of grounded ice from the Greenland and Antarctic ice sheets. Understanding the pace and mechanisms of these changes requires long-term observations of ice-sheet mass, sea-ice thickness, and sea-ice extent.

NASA's ICESat-2 mission is the next-generation space-borne laser altimeter mission and will use three pairs of beams, each pair separated by about 3 km across-track with a pair spacing of 90 m. The spot size is 17 m with an along-track sampling interval of 0.7 m. This measurement concept is a result of the lessons learned from the original ICESat mission. The multi-beam approach is critical for removing the effects of ice sheet surface slope from the elevation change measurements of most interest. For sea ice, the dense spatial sampling (eliminating along-track gaps) and the small footprint size are especially useful for sea surface height measurements in the, often narrow, leads needed for sea ice freeboard and ice thickness retrievals.

Currently, algorithms are being developed to calculate ice sheet elevation change and sea ice freeboard from ICESat-2 data. The orbits of ICESat-2 and Cryosat-2 both converge at 88 degrees of latitude, though the orbit altitude differences result in different ground track patterns between the two missions. This presentation will present an overview of algorithm approaches and how ICESat-2 and Cryosat-2 data may augment each other.