ICESat-2 Photon Counting Laser Altimetry: Performance, Data Products, Operations, and Mission Outlook

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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 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 Ice, Cloud, and land Elevation Satellite - 2 (ICESat-2) mission launched in September 2018, and has been collecting laser altimetry data since October 2018. ICESat-2 has 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 estimating cross-track slope around the margins of Greenland and Antarctica enabling the calculation of elevation change on a seasonal basis. For sea ice, the dense spatial sampling (eliminating along-track gaps) and the small footprint size are especially useful for sea surface height measurements from, often narrow, leads which are needed for sea ice freeboard and ice thickness measurements.

This presentation will include details of the on-orbit performance of ICESat-2's laser altimeter; the data collection strategy for ICESat-2; details on the main data products of interest to the cryospheric science community including surface-specific products for sea ice and grounded ice; and details on how to access and use the ICESat-2 data products.