

Impact assessment of multiscale surface roughness on ICESat-2 and CryoSat-2 measurements - a case study

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Dataset and Study Area

Study area is on the Queen Maud Land, with the base camp in the Finnish research station Aboa, located roughly 130 kilometers from the coast.

This work is part of the Low orbit altimetry, albedo, and Antarctic Snow and Sea-ice Surface Roughness (LAS3R) project (Figure 1).

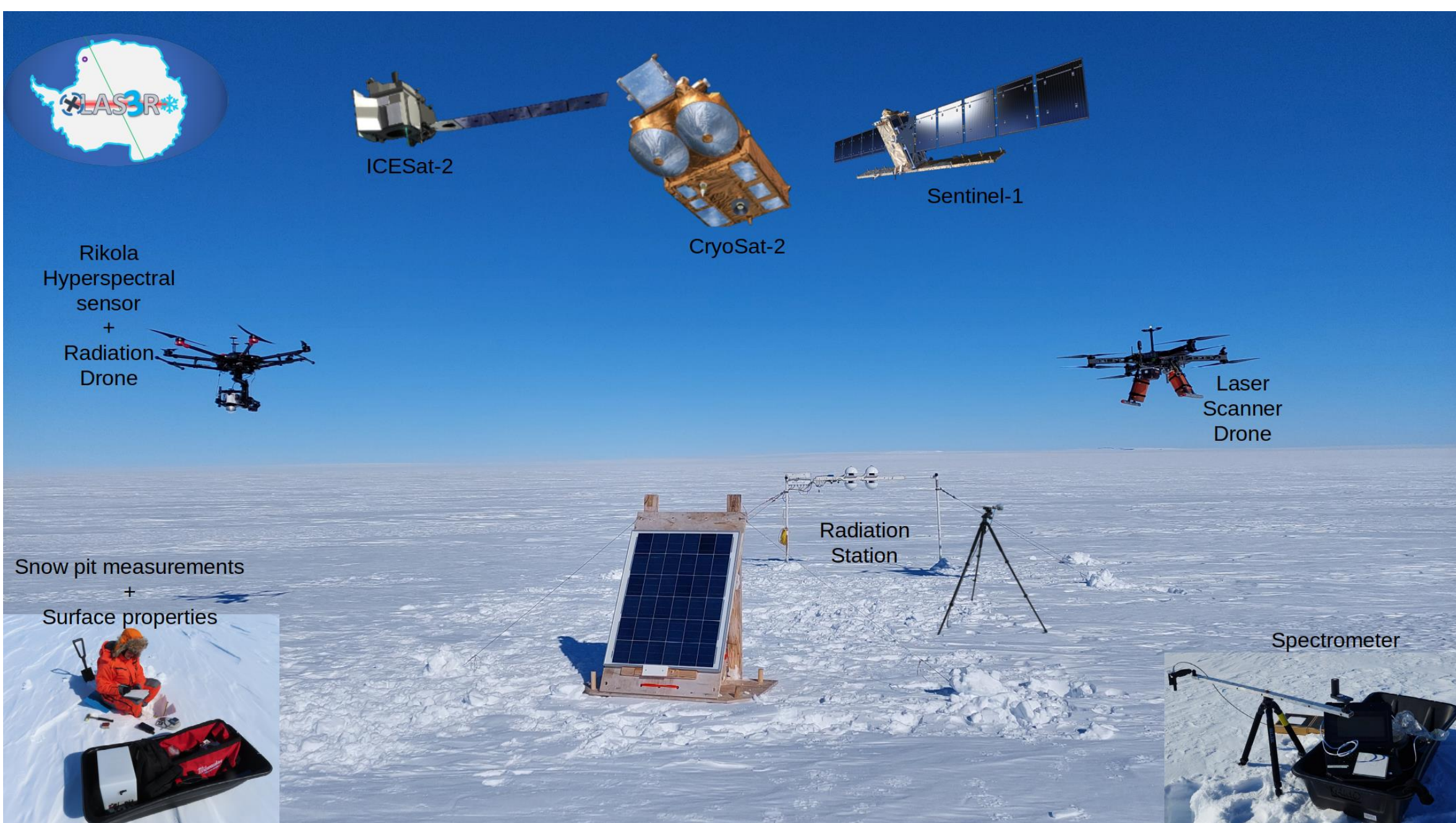
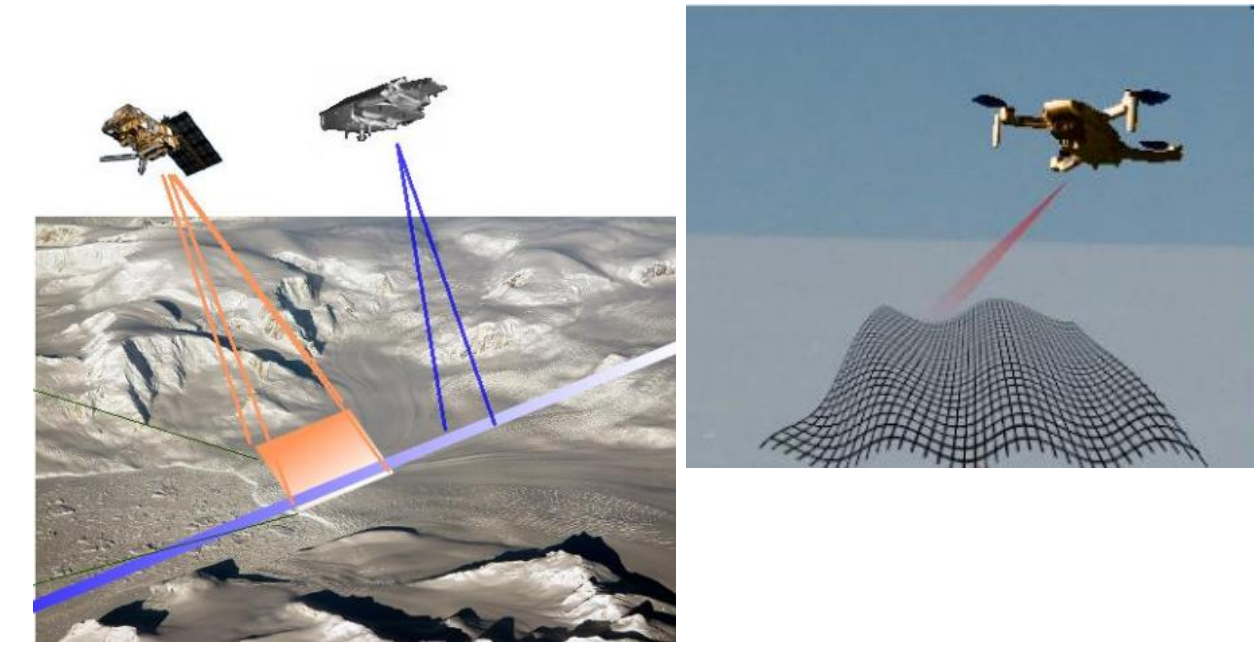


Figure 1: Dataset collected during the LAS3R campaign in 2022-2023 austral summer.

All the in-situ measurements were collected during the 2022-2023 austral summer campaign. In addition, matching satellite measurements.

Dataset used here:

- CryoSat-2 SAR Interferometric mode level-2
- ICESat-2 ATL03 and ATL06 products
- 1550nm pulsed LiDAR Riegl VUX-1DL

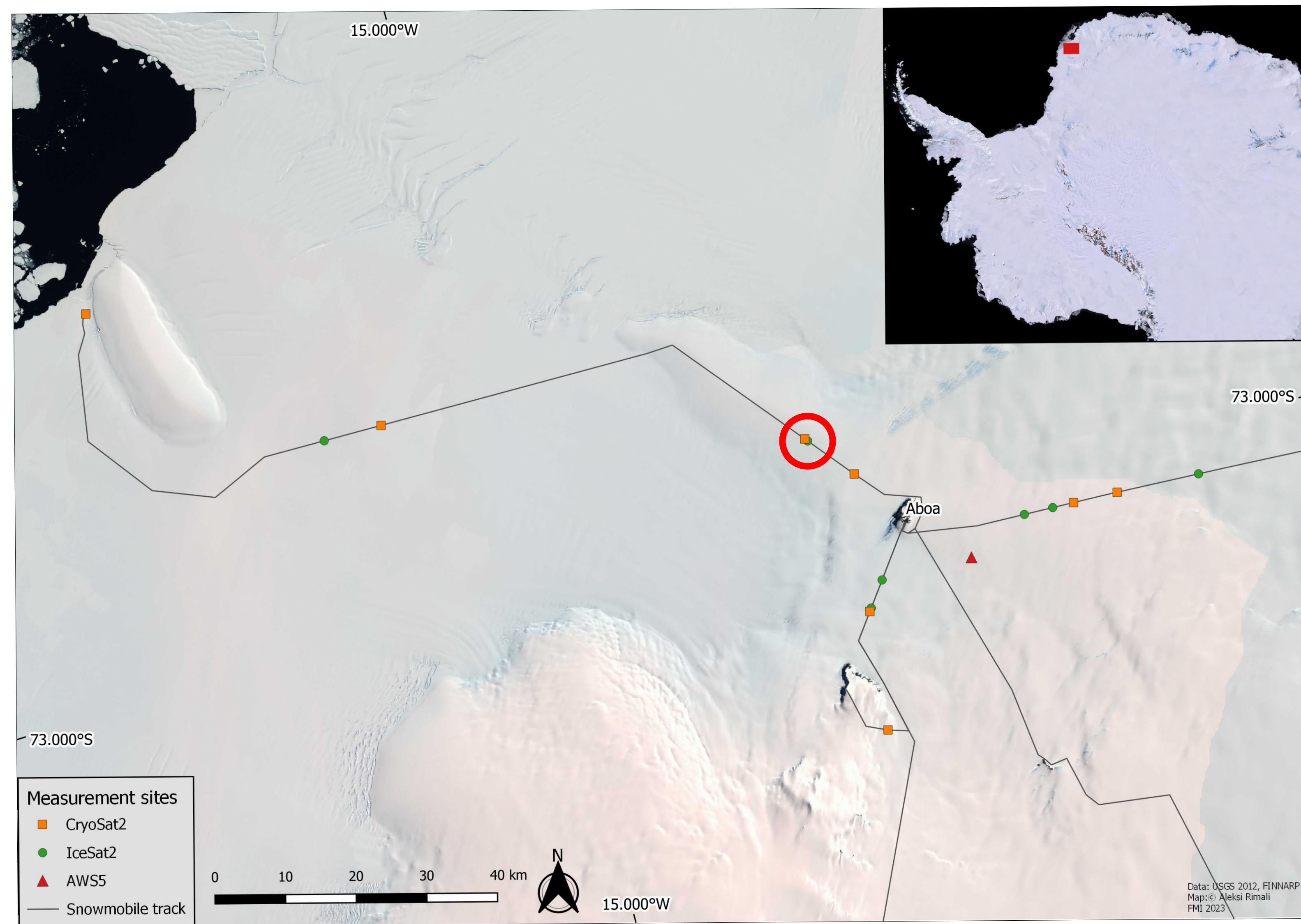


Figure 2: The in-situ data collected along the snow mobile tracks shown in Figure 1.

Ongoing Results

The ongoing work links the in-situ surface roughness with the differences in CS2 and IS2 elevation estimates. In addition, we will observe how well the in-situ surface roughness compares with the satellite derived surface roughness estimates.

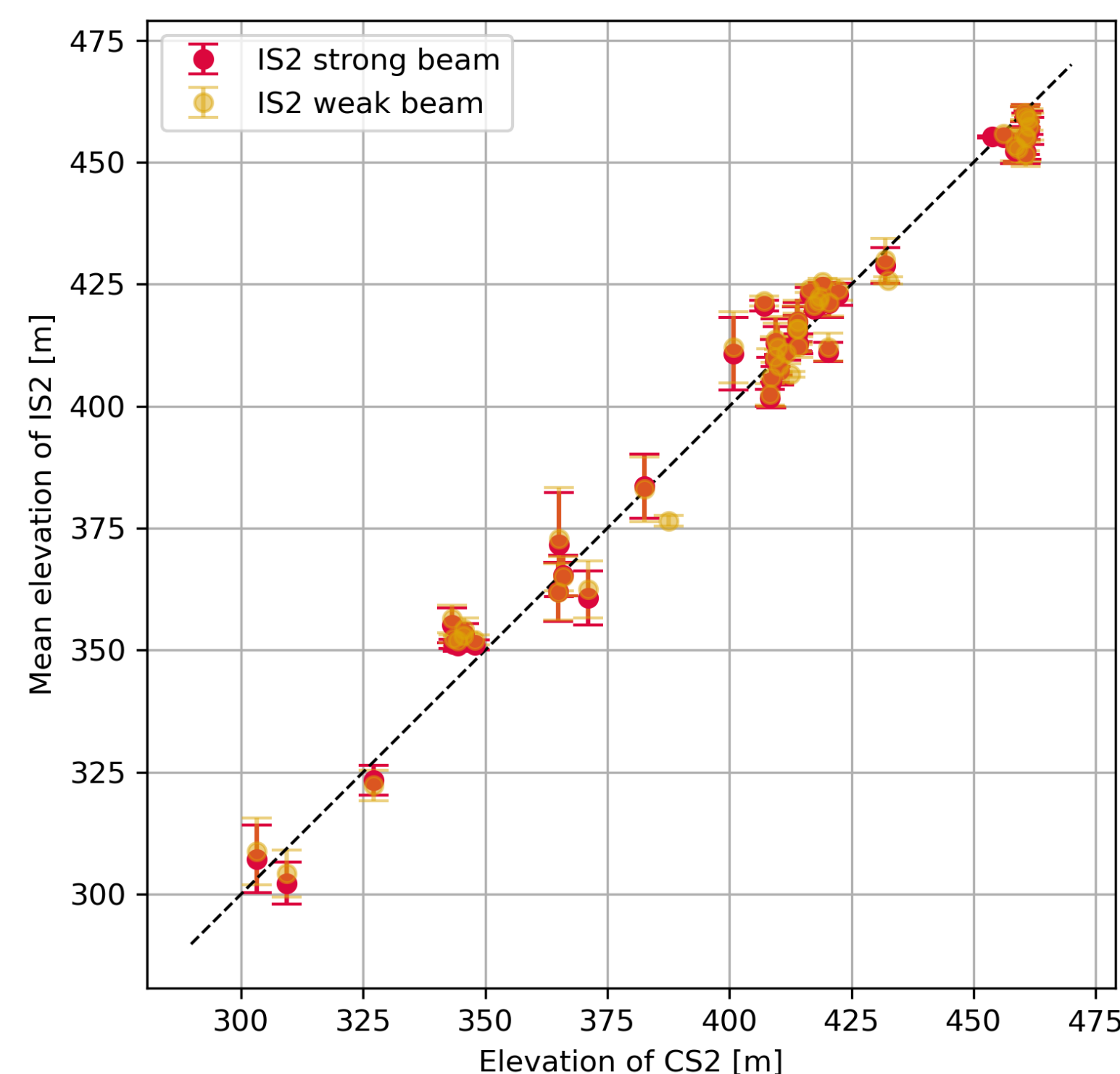


Figure 3: Elevations of CS2 vs IS2 in crossover point.

Crossover point of CryoSat-2 and ICESat-2 overpasses with a 3 days difference in December 2022 located in the red circle in Figure 2.

Elevations of CryoSat-2 and ICESat-2 in a crossover location for both strong (red) and weak (orange) beams of ICESat-2.

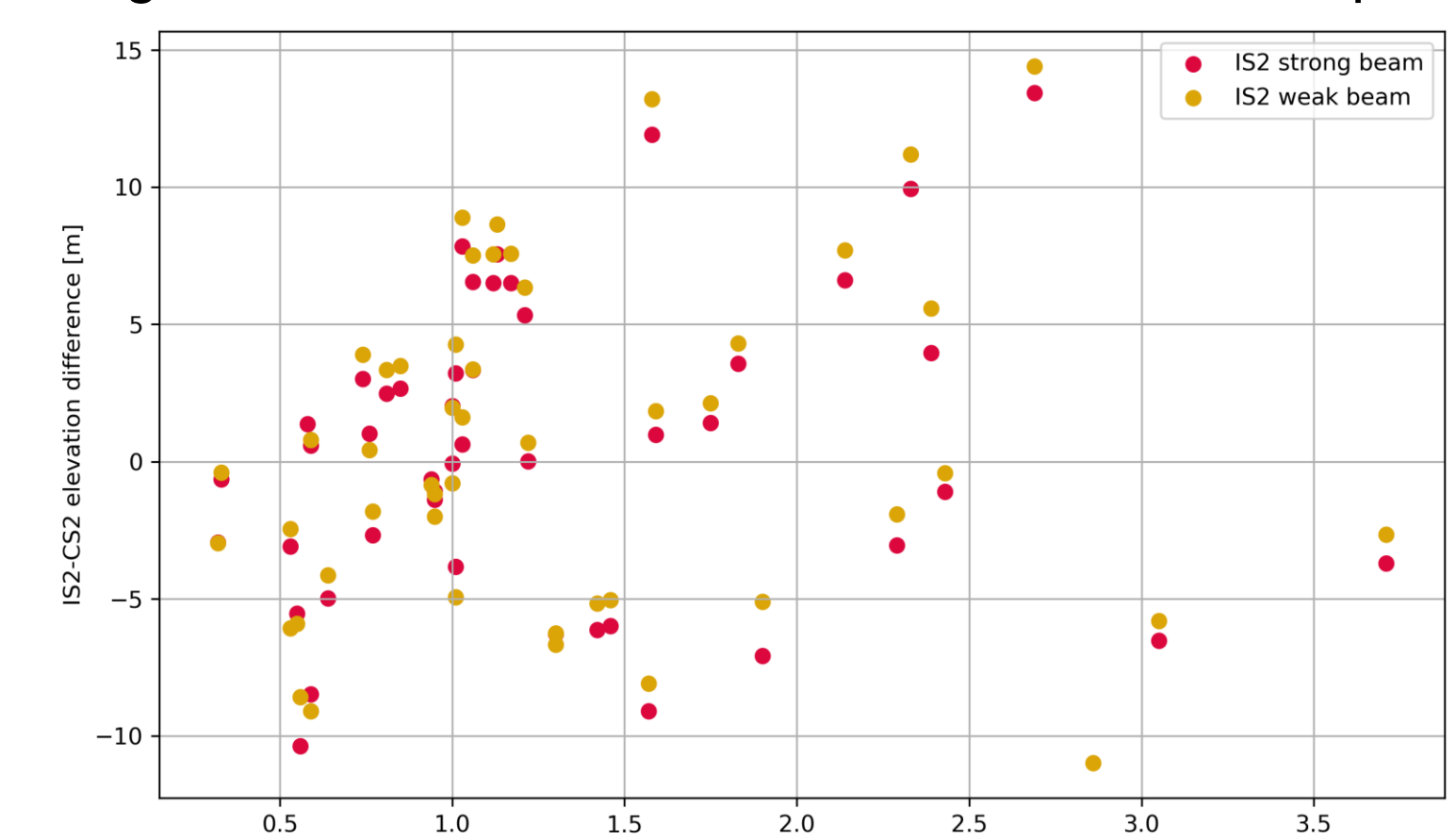


Figure 4: IS2 and CS2 differences compared to Copernicus DEM.

Difference in ICESat-2 and CryoSat-2 elevation estimates and the coincident roughness derived from the DEM for the strong (red) and weak (orange) beams of ICESat-2.

Icesat-2 ATL06 Land Ice height compared to surface height from Icesat-2 ATL03 product and Riegl VUX-1DL laser scanner drone.

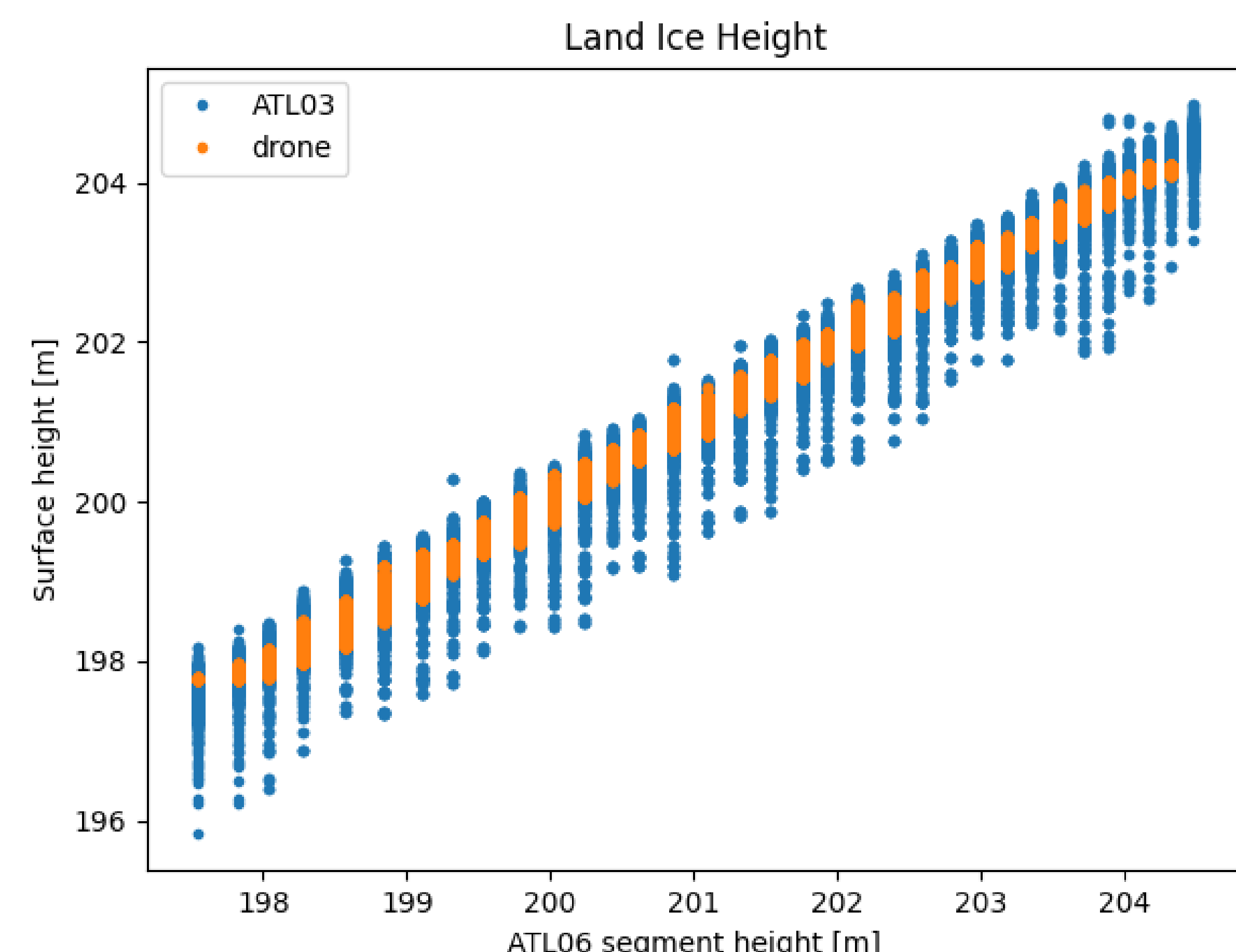


Figure 5: ATL06 vs ATL03 and Laser scanner drone comparison.

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