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Validating Cryosat-2 elevation estimates with airborne laser scanner data for the Greenland ice sheet, Austfonna and Devon ice caps

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The ESA CryoSat-2 satellite, launched in late 2010, carries a new type of radar altimeter especially designed for monitoring changes of sea and land ice.
The radar signal might penetrate into the snow pack and the depth of the radar reflecting surface depends on the ratio between the surface and the volume backscatter, which is a function of several different properties such as snow density, crystal structure and surface roughness.
In case of large volume scatter, the radar waveforms become broad and the determination of the range (surface elevation) becomes more difficult. Different algorithms (retrackers) are used for the range determination, and estimated surface penetration is highly dependent on the applied retracker.
As part of the ESA-CryoVEx/CryoVal-Land Ice projects, DTU Space has gathered accurate airborne laser scanner elevation measurements. Sites on the Greenland ice sheet, Austfonna and Devon ice caps, has been surveyed repeatedly, aligned with Cryosat-2 ground tracks and surface experiments.
Here, we utilize elevation estimates from available Cryosat-2 retrackers (ESA level-2 retracker, DTU retracker, etc.) and validate the elevation measurements against ESA-CryoVEx campaigns. A difference between laser and radar elevations is expected due to radar penetration issues, however an inter-comparison between retrackers will shed light on individual performances and biases. Additionally, the geo-location of the radar return will also be a determining factor for the precision. Ultimately, the use of multiple retrackers can provide information about subsurface conditions and utilize more of the waveform information than presently used in radar altimetry.