The Impact of DEM Resolution on Relocating Radar Altimetry Data Over Ice Sheets - DTU Orbit (24/07/2019)

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Beam-limited footprints from conventional satellite radar altimeters have diameters of up to tens of kilometers. Topography within the footprint results in a displacement of the reflecting point from Nadir to the point of closest approach relative to the satellite. Several methods exist for correcting for such mispointing errors. Here, two techniques are applied to observations near Jakobshavn Isbrae, acquired with Envisat's Radar Altimeter (RA-2). The a priori knowledge on the surface topography is obtained from a digital elevation model. The methods relocate the measurement location horizontally to agree with the measured range. One method assumes a constant surface slope within the footprint and uses this and the surface aspect to estimate the displacement parameter; the other locates the optimal relocation point using local topography. The results of the two methods are evaluated against airborne laser-scanner data from the airborne topographic mapper. We find that the accuracy of the relocation depends on both the technique and the spatial resolution of the digital elevation model, and that this dependency varies with surface roughness. Thus, the relocation may be associated with significant errors, which will lower the accuracy of cryospheric studies based on radar altimetry data. We find that the most accurate results are obtained when assessing the full local topography. Furthermore, errors in data over the steep margin are minimized the most when using a spatial resolution of 2 km; the effect of the resolution over regions with a smoother topography is minor.

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