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Studies of Austfonna ice cap (Svalbard) using satellite altimetry, SAR interferometry and SPOT photogrammetry

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We study largest ice cap in the Eurasian Arctic - the Austfonna on the Svalbard using combination of various satellite techniques - satellite radar altimetry (ERS-2 and ENVISAT), SAR interferometry (ERS-1 and -2) and SPOT photogrammetry. We first analyse ERS-2 and ENVISAT altimetry data over the Austfonna since 1995. We present changes of absolute height and height anomalies, as well as backscatter values (depending on the surface roughness, melting and refreezing processes) and the leading edge width (affected by the presence of snow dunes, small-scale ondulations, effects of radar penetration in the snow).

We also present results of the combined use of various Digital Elevation Models (DEM) of the Austfonna with ENVISAT and ERS-2 altimetry data. We use historical DEM from the Norwegian Polar Institute, as well as several DEMs from ERS-1 and -2 SAR interferometry (INSAR) and SPOT photogrammetry. DEMs from INSAR and SPOT stereo pairs are able to resolve topography with high resolution but they lack absolute reference and are prone to long-wavelength errors. Radar altimetry produce absolute measure of height with low spatial resolution (several km) with very high precision reference but they are perturbed by small-scale topographic changes. By combining DEMs with altimetric measures we could improve DEMs precision.

We have also performed correclation of multitemporal SPOT imagery and INSAR data. While interferometry provide only one component of the speed vector but with high accuracy, while correlation of SPOT imagery (with little time lag and with incidence angles less than 15 degrees) provide estimates of the two component, though

with lower precision. These two techniqes are highly complementary and both are necessary to establish the best possible assessment of ice movements.