



Recent glacier volume changes in Eastern Svalbard using ASTER optical stereo

A. Kääb (1)

(1) Department of Geosciences, University of Oslo (kaeaeb@geo.uio.no)

The current melt of glaciers on the Svalbard archipelago is believed to be one of the strongest glacial contributions to current sea level rise among all glacier systems on Earth. However, little is known about recent glacier volume change in particular in Eastern Svalbard. Though optical stereo sensors of higher spatial resolution (SPOT5, ALOS PRISM) are meanwhile available, the advantage of ASTER (Advanced Spaceborne Thermal Emission and Reflection Radiometer) is the large global data set acquired since 2000. This significantly increases the probability to find suitable data in the archives and even to investigate short time series. Here, we investigate glacier volume changes on Olav V Land, Barentsøya, and Edgeøya (Eastern Svalbard). Digital Terrain Models (DTMs) derived from ASTER stereo data are compared to elevation information from 1:100'000 scale topographic maps by the Norwegian Polar Institute, based on airphotos from the 1970s.

The steps of DTM generation from ASTER stereo data over our study area include: (1) image orientation using Ground Control Points (GCPs) from the 1:100'000 map series by the Norwegian Polar Institute, (2) photogrammetric measurement of DTMs from ASTER bands 3N and 3B, and (3) filtering the derived DTMs using the correlation values from parallax matching and DTMs from different image pyramid levels. Finally, (4), orthoimages are computed both from the 3N and the 3B data using the final DTM from (3). The latter procedure allows for rigorously visualizing and marking of vertical DTM errors. Steps (3) and (4) result, thus, in a final DTM including a data layer that indicates the reliability of individual elevation values.

The ASTER-derived orthoimages and DTMs over Eastern Svalbard glaciers are then compared to planimetric and height data from 1:100'000 scale maps from the early 1970s. In their lower parts, the glaciers investigated have lost up to between 25m to

50m of ice thickness over the about 30 years considered. The ice thickness in the upper glacier parts has not changed significantly. There are even indications for a slight increase in ice thickness. These results for a so far little investigated area on Svalbard are consistent with recent findings for Western Svalbard.