Abstract Master Thesis

Calculation and Evaluation of Mass Balance Parameters from airborne LiDAR Data for the Hintereisferner, Ötztaler Alpen, Austria.

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The main goal of the master thesis is to calculate and evaluate mass balance parameters from airborne LiDAR data for the Hintereisferner.

Airborne LiDAR scanning campaigns of the Hintereisferner region are carried out since 2001 (OMEGA and ALS-X project) at the end of the ablation season and at further glaciologic interesting dates. This results in a world wide unique data set, highly valuable for glacier monitoring aspects.

In a first step of the master thesis, glacier volume changes on a yearly time scale are calculated by applying the geodetic method on raster-grids with 1m spatial resolution. The raster-grids are calculated from last pulse point data for each year (2001-2008) by using a linear interpolation algorithm.

In a second step, glacier volume changes are converted into mass change. This is done by multiplying the volume change with density values. Airborne LiDAR does not give any direct information about snow, firn or ice densities. To overcome this problem, density values have to be estimated. Intensity values of the back scattered laser beam energy, which were recorded for all flight campaigns carried out at the end of each ablation season, can be used for surface classification. The surface classification (Diploma thesis Patrick Fritzmann, work in progress) results in a distinction of snow, firn and ice surfaces. This information on different surface classes, combined with information from long-term density analyis for the Hintereisferner carried out by Matzi (2004) allow a three dimensional density estimation.

The resulting mass balance parameters will be compared to results from the stratigraphic method. Mass balance parameters calculated using the stratigraphic method are calculated regularly by the Institute of Meteorology, Innsbruck.

In theory, mass balance parameters (e.g. mean specific mass balance per altitude band) calculated by the geodetic method should underestimate the ablation in the ablation area and accumulation in the accumulation area compared to the values from the stratigraphic method. This is because of ice dynamic effects which can not be accounted for with the geodetic method.

Beside that, the comparability of both methods depends on the accuracy of each method. Therefore, an extensive data quality check of the airborne LiDAR data combined with a mulit-temporal error assessment is carried out.