Geophysical Research Abstracts
Vol. 12, EGU2010-4434, 2010
EGU General Assembly 2010

Snowmelt monitoring with Terrestrial Laser Scanner Measurements

Kati Anttila (1,2), Sanna Kaasalainen (1), Harri Kaartinen (1), Anssi Krooks (1), Terhikki Manninen (2), Panu Lahtinen (2), Aku Riihelä (2), Niilo Siljamo (2), Laura Thölix (2), and Tuure Karjalainen (2)

(1) Finnish Geodetic Institute, Geodeetinrinne 2, P.O.Box 15, FI-02431 Masala, FINLAND, (2) Finnish Meteorological Institute, P.O.Box 503, FIN-00101 Helsinki, FINLAND

The increasing use of satellite data has caused an increasing need for validation data. Terrestrial laser scanning (TLS) and Mobile Mapping Systems (MMS) are potential methods of gaining information on vast areas at remote locations. We have investigated the snowmelt 2009 using stationary and mobile TLS during the SNORTEX –campaign (Snow Reflectance Transition Experiment) in several locations in Finnish Lapland during 2008-2009.

The SNORTEX is a 3-years investigation (started in 2008) piloted by Météo-France and FMI (Finnish Meteorological Institute). The key objectives of SNORTEX are to improve the characterization of snow-melting patterns in boreal regions using a multiscale approach supported by multi-angular and multi-spectral remote sensing information, and to build an integrated database for snow variables (albedo, fraction, water equivalent) in a forested environment for the validation of the SAF (Satellite Application Facilities) snow-related products. Validation data for EUMETSAT Land, Climate and Hydrological SAFs will be gathered in the campaign. The focus of the 2009 campaign was on the melting season. The field work was scheduled to include different snow/weather conditions and to include a time period with fractional snow cover. There will be one more field measurement period in spring 2010.

The field survey took place at Sodankylä in Finnish Lapland. The existing facilities of FMI-ARC (The Arctic Research Center of the Finnish Meteorological Institutes) (67.4 °N 26.6 °E) were used. The studied area was chosen for this campaign because it is located far from the coasts, which makes the climate continental. The winters are long and cold during which the snow usually does not completely melt and several layers form in the snow pack. The area is partially forested which makes it possible to observe how the forests affect snow, snow cover and albedo. In addition to this the topography of the area is relatively plain which makes the area ideal for gathering validation data for satellite products. The results of the ground measurements of the SNORTEX campaign will be used to SAF product validations and to support the aerial data collected during the campaign.

The TLS measurements during the campaign were made in several different locations at different stages of snowmelt. These measurements were georeferenced and normalized so that they could be compared. The results were compared to different ground measurements, e.g. snow depth, water equivalent etc., made by the Finnish Meteorological Institute. The results were used to estimate the usability of the point cloud and intensity data of the scanner in measuring different snow properties. The results show that TLS data is applicable in profiling seasonal snow conditions and the intensity data helps the classifying of the snow cover. The laser backscatter from snow surface is not directly related to any of the snow cover properties measured during the campaign but the snow structure has a clear effect on the TLS intensity. A MMS method for snow profiling was also developed during the campaign and the results show potential for MMS-based surface roughness profiling and change detection.