First snow cover extent time series based on 15 years of observations with ERS-2 ATSR-2 and Envisat AATSR

Rune Solberg[1], Bjørn Wangensteen[1], Sari Metsämäki[2], Thomas Nagler[3], Helmut Rott[3], Andreas Wiesmann[4], Kari Luojus[5] and Jouni Pulliainen[5]

1) Norwegian Computing Center; 2) Finnish Environment Institute; 3) ENVEO, Austria; 4) Gamma Remote Sensing, Switzerland; 5) Finnish Meteorological Institute

One of the goals of the ESA GlobSnow project is to develop a Snow Extent (SE) product based on optical data and produce a time series of products for the whole seasonally snow covered Earth from 1995 until present. The project has carried out two phases of development, testing and validation and is now releasing the first official product set (version 1.0) for the Northern Hemisphere. The products are based on snow coverage retrieved from ERS-2 ATSR-2 and Envisat AATSR data. There are four product types: 1) Daily Fractional Snow Cover (DFSC), snow fraction (%) per grid cell for all satellite overpasses of a given day; 2) Daily 4-classes Snow Cover (D4SC), snow cover classified into four categories per grid cell for all satellite overpasses of a given day; 3) Weekly Aggregated Fractional Snow Cover (WFSC) for all satellite overpasses within a seven day period based on aggregation of daily products (available for each day based on a 7-day sliding time window giving most recent observations highest priority); and 4) Monthly Aggregated Fractional Snow Cover (MFSC) for all satellite passes within a calendar month period providing the average, standard deviation, minimum and maximum Fractional Snow Cover (FSC) for the period. The data set is freely available and can be downloaded via a web or FTP interface.

The SE products are available in a geographical (latitude/longitude) coordinate system based on the reference ellipsoid WGS 84 and with a grid resolution of 0.01×0.01 degrees. The geographical area covered is the Northern Hemisphere 25°N-84°N (the seasonally snow covered part of the hemisphere). The processing system applies optical measurements in the visual-to-thermal part of the electromagnetic spectrum acquired by the ERS-2 sensor ATSR-2 and the Envisat sensor AATSR. Clouds are detected by a cloud-cover retrieval algorithm (SCDA) and masked out. Large water bodies (oceans, lakes and rivers) and glaciers are also masked out. The snow cover information is retrieved by two algorithms, one for high-mountain areas of steep topography above the tree line (NLR) and another for forested and open areas (SCAmod). The domains of the algorithms are determined by the thematic masks, and the retrieval results are merged. The resulting snow cover map is the basis of the generation of the four product types.

Thematic quality evaluation of retrieved FSC has focussed on 1) a set of dedicated experiments to investigate algorithm performance etc., 2) a pan-European experiment in order to obtain experience with SE mapping on a larger scale (as a stepwise approach to global SE mapping), and 3) evaluation of the performance for the full Northern Hemisphere at a selection of sites spanning climate, terrain and land-cover variability.

Oral presentation in GlobSnow session