

Snow remote sensing in Finland: a review on research and operational activities in the Finnish Environment Institute and the Finnish Meteorological Institute

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The Finnish Environment Institute (SYKE) and the Finnish Meteorological Institute (FMI) provide operational services and service infrastructure for the national and international cryospheric applications, and carry out research and development of Earth Observation (EO) techniques related to these. Here we list the main research/service development projects and on-going services:

ESA Data User Element project GlobSnow: multi-national project coordinated by FMI provides two new global (northern hemisphere) records of snow parameters intended for climate research. The datasets contains EO-information on snow extent (SE) and snow water equivalent (SWE) extending 15 and 30 years respectively. The SWE product is derived using an algorithm developed at FMI while the SE product is a combination of SYKE developed algorithm (non-mountainous areas) and Norwegian Computing Centre (mountains).

EUMETSAT Satellite Application Facility project H-SAF: The overall aim of the Met-Italy-led H-SAF project is to develop satellite services for hydrological applications in Europe. FMI is coordinating the activities related to snow cover, operates the near-real-time data processing and also provides the SWE mapping methodology. SYKE has provided the algorithm for Snow extent (Fraction of Snow Covered Area).

ESA GMES Polarview project: The multi-national project is led by C-CORE (Canada). SYKE provides operational snow mapping service (Fraction of Snow Covered Area) for Baltic Sea drainage area, based on daily MODIS imagery and SCAMod-method.

EC FP-7 GMES Downstream Service Cryoland: The project coordinated by ENVEO (Austria) is aiming to the development of snow and terrestrial ice cover information retrieval and delivery systems for European end-use. The project aims to dedicated services according to varying user needs with integrated easy-access service interface.

FloodFore: The national project (SYKE, FMI and VTT) develops techniques for improving flood forecasting by applying (a) satellite observations, (b) weather radars, and (c) in situ measurements from automatic monitoring stations. The project demonstrates the feasibility of multi-source information in a pilot experiment for Finnish Lapland using the hydrological forecasting system of SYKE as an example of a typical operational distributed model.

Sodankylä-Pallas CAL-VAL site for the development of cryospheric EO-applications

provides a significant contribution to international EO methodology development. The monitoring time-series include observations on relevant cryospheric characteristics such as soil moisture, soil temperature, soil respiration, soil frost depth, snow pack characteristics, vegetation properties including CO₂ and CH₄ fluxes as well as atmospheric profile characteristics. These data are accompanied with observations by satellite system reference instruments, such as Elbara-II radiometer (reference to ESA SMOS), SnowScat scatterometer (reference to planned ESA CoReH₂O), SodRad 1 and 2 (reference to SSM/I, AMSR-E and AMSU-A) and SodSpec (reference to MODIS, Envisat MERIS and coming Sentinel 2 and 3 instruments).

