SNORTEX (SNOW REFLECTANCE TRANSITION EXPERIMENT): REMOTE SENSING MEASUREMENT OF THE DYNAMIC PROPERTIES OF THE BOREAL SNOW-FOREST IN SUPPORT TO CLIMATE AND WEATHER FORECAST: REPORT OF IOP-2008

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Large discrepancies are observed between snow albedo in Numerical Weather Prediction (NWP) models and from satellite observations in the case of high vegetation. In fact, snow-forest albedo is under-estimated in climate modelling because of a disregard to the vegetation heterogeneity. These latter yields a significant quantity of light travelling through canopy gaps within and between crown and reaching the soil background. The large amount of ground sun-flecks enhances the magnitude of the surface albedo and somewhat as a paradox contributes to snowmelt. Knowledge of the Bidirectional Reflectance Distribution Function (BRDF) of snow-forest system is required to solve the problem. The BRDF of the boreal environment is complex due to the strong radiometric contrast that exists between snow and vegetation attributes. This becomes a dynamic issue in springtime as the sun elevation rapidly evolves. But the sampling of the snow BRDF in boreal regions from space is jeopardized by the high frequency of clouds, which places a severe limit to characterize the snow metamorphism. In this regard, a thorough verification is needed.

The implementation of SNORTEX (Snow Reflectance Transition Experiment) from 2008 aims at acquiring in situ measurements of snow and forest properties in support to the development of modelling tools and to validate coarse resolution satellite products. The SNORTEX studied area is located in Finnish Lapland beyond the Arctic Circle (at 67.4°N) and benefits from existing facilities provided by the FMI-ARC based in Sodankylä. The speciality of the project is to integrate the project results into operational chains devoted to map snow properties from Metop satellite within the framework of the SAF (Satellite Application Facilities) Land, Climate and Hydrology activities supported by EUMETSAT and the National Meteorological Services. It will be presented the results obtained during the Intensive Observing Period (IOP) of 2008, which can be decomposed into airborne and ground operations.

OSIRIS (airPOLDER) flew onboard a helicopter at different times during the spring in order to acquire multi-temporal BRDF at a few meters resolution. The same helicopter embarked a pair of pyranometers, UV sensors and also a wide-optics camera to estimate the leaf area index. The ground component included various snow parameters (snow depth, density and the snow water equivalence) with no less than 100 samples collected. In addition crystal size photos and photos of the top surface impurities were taken at almost every point. The snow temperature, humidity and density profiles were obtained at 76 points. The broadband albedo of the snow surface was recorded in 44 measurement points including one time series within one day of melting snow at the extensive test site at the NorSEN mast. Spectrometer measurements were carried out at the flight dates at some test sites. Hemispherical photos were taken in about 10 albedo measurement locations. Ground based snow BRDF measurements were carried out at the NorSEN mast using the FigiFiGo spectrogoniometer. Terrestrial aser scanning profiles were recorded at some test sites.

All these data sets will supply the development and the validation of radiation transfer models in optical, microwave and radar. An overview of the SNORTEX objectives, structure and first results will be shown. Particularly, we will compare OSIRIS BRDF with POLDER/PARASOL at 6 km for several shortwave bands, and also LAI maps from different sources with emphasis on the upscale strategy.