EVALUATION OF SATELLITE-BASED SWE RETRIEVAL APPROACHES FOR NORTHERN HEMISPHERE

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ABSTRACT

Reliable information on snow cover across the Northern Hemisphere and Arctic and sub-Arctic regions is needed for climate monitoring, for understanding the Arctic climate system, and for the evaluation of the role of snow cover and its feedback in climate models. In addition to being of significant interest for climatological investigations, reliable information on snow cover is of high value for the purpose of hydrological forecasting and numerical weather prediction. Terrestrial snow covers up to 50 million km2 of the Northern Hemisphere in winter and is characterized by high spatial and temporal variability. Therefore satellite observations provide the only means for timely and complete observations of the global snow cover.

While multiple independent passive microwave derived SWE products are available, their full potential has not been realized because of poorly constrained error budgets due to the challenges related to the physical processes underpinning the SWE retrievals, and the extensive snow covered regions of the world without adequate surface observations for algorithm validation. The purpose of the ESA funded SnowPEx project is to obtain a quantitative understanding of the uncertainty in remotely sensed SWE products through an internationally coordinated and consistent evaluation exercise.

The currently available Northern Hemisphere wide satellite-based SWE datasets have been acquired and the preliminary intercomparison of the different products have been performed. The inter-comparison has been carried out for the 1) GlobSnow SWE [1], 2) the NASA Standard SWE [2], 3) NASA prototype and 4) NSIDC-SSM/I [3] SWE products. The intercomparison has been carried out by using ground-based snow course observations as the reference. The evaluations have been carried out using Finnish Snow Course data, available for 1979-2014, covering Finland and distributed snow transect data collected from the former Soviet Union and Russia covering the period 1979–2012. The reference dataset contains snow path measurements carried out within 517 different snow path locations, ranging from 35° to 85° northern latitude and 14° to 179° of eastern longitude. The results indicate large differences in the retrieval performances between different approaches. The GlobSnow approach, which combines ground-based observations with satellite data, is in all aspects more reliable and accurate that those relying on satellite data alone.

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