



Circumpolar to global remote sensing of permafrost – contributions of ESA DUE GlobPermafrost to a permafrost information system

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Coarse resolution soil moisture datasets are available globally. Their utilization in permafrost areas is however limited due to heterogeneity within the footprint. Validation across the Arctic does also not exist due to only very few monitoring sites which measure soil moisture. There is in addition the discrepancy between typical measurement depth and satellite data representativeness.

C-band scatterometer information is of specific interest in heterogeneous environments due to the availability of higher spatial resolution Synthetic Aperture Radar (SAR) data at this wavelength. The C-band scatterometer ASCAT (on board of several Metop platforms) provides operational data in near real time since 2007. The microwave backscatter variations are expected to correspond to soil moisture variations. Surface roughness and volume scattering, which also contribute to the backscatter signal, are parameterized or assumed to be constant under certain conditions. This provides the basis for a global near surface soil moisture product available through EUMETSAT.

We designed a monitoring set-up for measuring moisture very close to the surface in the Lena River

Delta, Siberia to specifically investigate Metop ASCAT derived surface soil moisture. Four sites have been covered representing two different ASCAT footprints and settings. Samoylov Island is dominated by a polygonal wet tundra landscape. The Yedoma landscape unit Kurungnakh is located only a few kilometres south from Samoylov Island. The measurement stations were installed in August 2013 on Kurungnakh and Samoylov and data were collected in August 2014. Three stations were placed on Kurungnakh and one on Samoylov. The Volumetric Water Content (VWC) and temperature sensors have been in the moss organic layer in order to account for the limited penetration depth of the signal. VWC measured at the different sites within the Lena Delta correlate well with each other. This indicates representativeness of single station records for ASCAT validation regarding temporal patterns. ASCAT backscatter variations are in general very small, in line with low variability of in situ VWC. Short term changes after complete thaw of the upper organic layer seem to be however mostly influenced by temperature.