Geophysical Research Abstracts
Vol. 13, EGU2011-8146, 2011
EGU General Assembly 2011

Toward an operational production of ASCAT Soil Water Index (SWI) for the GMES Land Monitoring Service

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Soil moisture has been identified as one of the essential variables in atmosphere-land processes. Real time information on soil moisture is extremely valuable for many climate and hydrological applications. In frame of the FP7/geoland2 project of the European GMES initiative, , an operational processing algorithm has been developed to provide Soil Water Index (SWI) product representing profile soil water content using the surface soil moisture information measured by the Advanced SCATterometer (ASCAT) onboard Metop satellite based on the Vienna University of Technology soil moisture retrieval method.
The SWI retrieval algorithm uses an infiltration model describing the relation between surface soil moisture and profile soil moisture as a function of time. The algorithm is based on a two-layer water balance model to estimate profile soil moisture from remotely sensed topsoil moisture. In this model, the water content of the reservoir, whose depth is related to a characteristic time length (T), is described in terms of an index, which is controlled only by the past soil moisture conditions in the surface layer. A computational adaptation of the original SWI algorithm has been made based on a recursive formulation to make the operational calculations possible. The SWI processing chain is enhanced with information on soil surface state which is also extracted from scatterometer measurements. An empirical threshold-analysis method is developed to derive a set of parameters which are used to evaluate the normalized backscatter measurements through decision trees for determination of freeze/thaw conditions. The model parameters are extracted from multiyear ASCAT backscatter measurements by comparing with ECMWF ReAnalysis (ERA-Interim) soil temperature. By using these parameters within the SWI processing chain, a so-called Surface State Flag (SSF) is generated as indicator of frozen/unfrozen surface, thaw condition/snow melt or permanent ice/frozen water body.
The SWI processing algorithm uses ASCAT-25km surface soil moisture product available in near-real-time through EUMETCAST as input to generate daily global SWI images, calculated for eight different T values together with the respective quality flags. The retrieval algorithm is designed and developed by Vienna University of Technology and the processing line is developed by CNES. The processing line is foreseen to be implemented in near future at the Institute of Meteorology of Portugal providing SWI data in near-real-time.