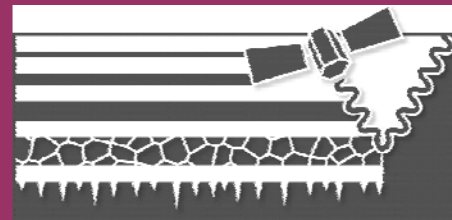


ESA DUE Permafrost



ASCAT Surface Soil Moisture/Freeze-Thaw V1 product guide



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This document is the Product Guide for the version 1 release of the 25km pan-arctic Surface Soil Moisture (incl. Frozen ground status) product. It has been compiled for the DUE Permafrost project (ESRIN Contract No. 22185/09/I-OL), a project of the Data User Element initiative of the European Space Agency.

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1 Product overview

The ASCAT Surface Soil Moisture (SSM) Product is derived from the ASCAT sensor onboard Metop satellite. The soil moisture derivation algorithm is based on a change detection method initially proposed by Wagner et al. (1999). ASCAT SSM product is the result of an improved SSM retrieval algorithm developed at the Institute for Photogrammetry and Remote Sensing (IPF) of the Vienna University of Technology (Naeimi et al., 2009). The SSM Product is delivered with a weekly temporal resolution and 25km spatial resolution. The circum-polar dataset covers the entire year 2007 north of 50°N.

The ASCAT Level 2 product including soil moisture data are produced by EUMETSAT in near-real time following the method developed and prototyped for EUMETSAT by the IPF. ASCAT data are distributed primarily via EUMETCast system and are available within about 2 hours after acquisition. Data are also accessible through EUMETSAT Data Centre.

For integration into the Permafrost Information System ASCAT data are resampled to a Discrete Global Grid (DGG). The DGG is an adapted sinusoidal grid using an ellipsoid based on the GEM6 model (Kidd 2005).

The soil moisture product also includes a quality flag which contains the number used measurements. Data are masked for frozen ground conditions also based on MetOp ASCAT.

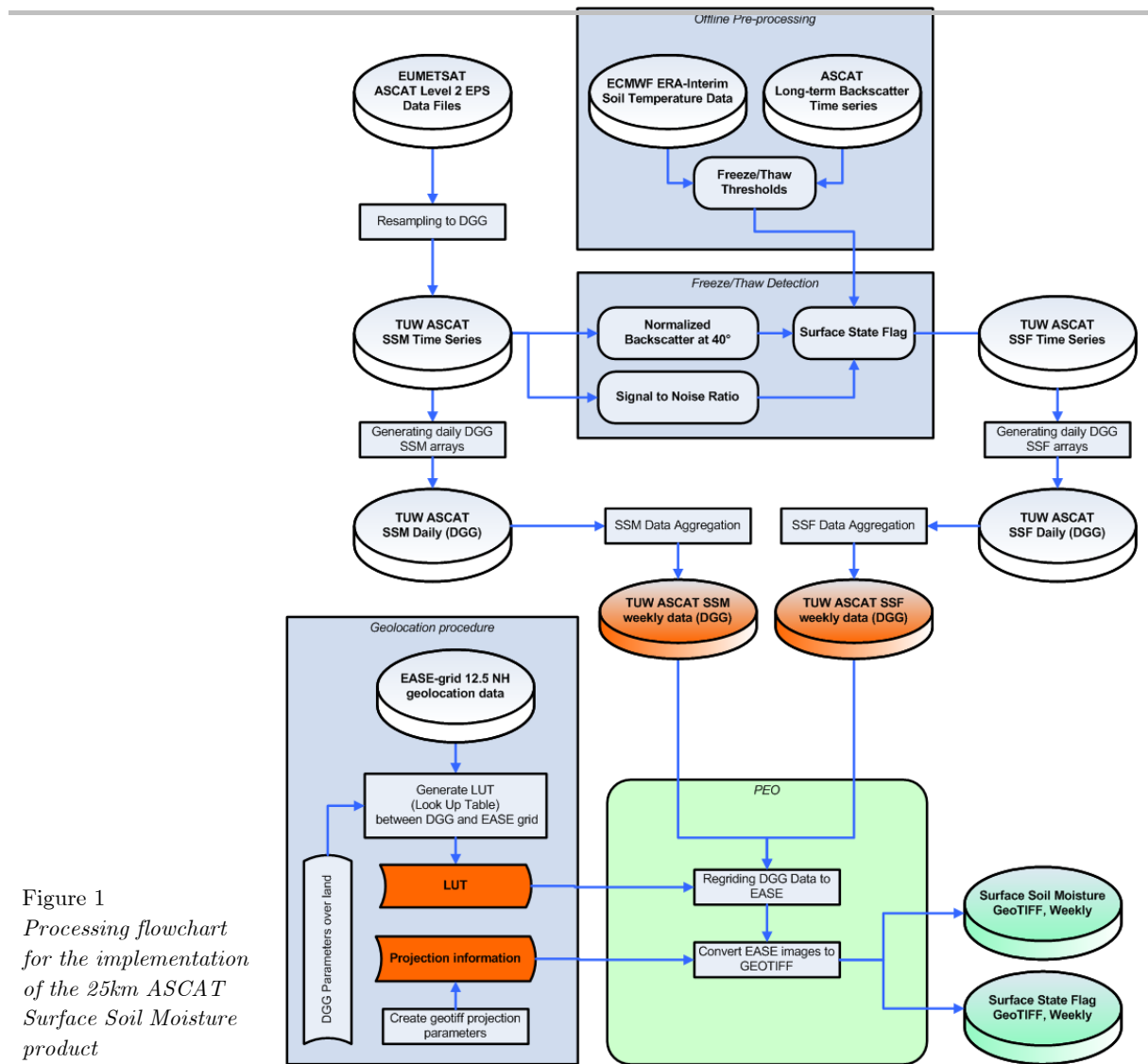


Figure 1
 Processing flowchart
 for the implementation
 of the 25km ASCAT
 Surface Soil Moisture
 product

2 Product specification

The Surface Soil Moisture parameter represents a relative measure of the soil moisture in the top layer of the soil, scaled between wilting level (0%) and field capacity (100%) (Wagner et al. 1999).

The v1 product is provided as weekly averaged images north of 50°N in GeoTIFF/NetCDF format and EASE Grid projection. The week is defined by the day of interest and its proceeding 6 days. The data are described in Table 2-1.

Table 2-1
*Description of the ASCAT
 surface soil moisture test
 dataset*

| Subject | Specification |
|--------------------------------------|---|
| Variable | Relative surface soil moisture |
| Units | in % * 2 [0 - 200] |
| Coverage | Globally above 50° latitude |
| Time period | 2007 - Sept. 2010 |
| Temporal frequency of the input data | Irregular, 80% global daily coverage |
| Temporal aggregation | Weekly (daily files) |
| Coordinate system | Polar Stereographic (EASE grid) |
| Spatial resolution | 25 km x 25 km |
| Geometric accuracy | 4 km (original ASCAT orbit data localisation accuracy) |
| Thematic accuracy | 0.04-0.08 m ³ water per m ³ soil, depending on land cover and soil type |
| Data format | GeoTIFF (separate quality flag file) NetCDF (includes quality flag) |
| Other data codes | -254 for no data or masked (quality flag applied) |

Table 2-2
*Description of the ASCAT
 quality flag (QF) dataset*

| Subject | Specification |
|----------------------|--|
| Variable | Proportion of measurements used, with respect to the maximal possible acquisitions |
| Units | in % * 2 [0 - 200] |
| Coverage | Globally above 50° latitude |
| Time period | 2007 - Sept. 2010 |
| Temporal aggregation | Weekly (daily files) |
| Coordinate system | Polar Stereographic (EASE grid) |
| Spatial resolution | 25 km x 25 km |
| Data format | GeoTIFF NetCDF (included in SSM file) |
| Other data codes | 0 for no data or masked |

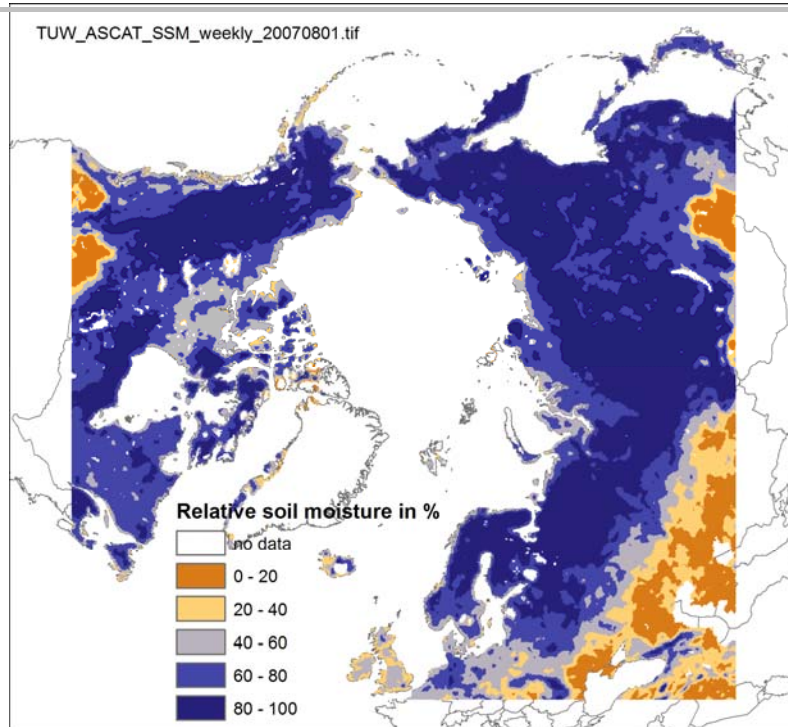


Figure 2
 Examples of 25 km
 SAR Surface Soil
 Moisture mosaic test
 product > 50°N

3 Known issues

Only frozen ground masking has been applied for the test product version. There are uncertainties during the transition time periods. Very low soil moisture values can occur in cases where the masking has failed.

Masking is also required in case of inundation.

Both issues will be investigated in further detail for version 2.

4 Data access and contact information

The ASCAT SSM test product is stored on the Institute of Photogrammetry and Remote Sensing (TU Wien) FTP server. Login information is available to all with the project associated users.

For login access to the FTP server, contact Annett.Bartsch@tuwien.ac.at.

For questions about the product, contact Vahid.Naeimi@tuwien.ac.at or Annett.Bartsch@tuwien.ac.at

For ESA's technical officer, contact Frank.Martin.Seifert@esa.int.

Additional information on the ESA DUE Permafrost project can be found at the web-site: <http://www.ipf.tuwien.ac.at/permafrost>

5 References

Kidd, R. (2005), Discrete Global Grid Systems. ASCAT Soil Moisture Report Series, No. 4, 4, Institute of Photogrammetry and Remote Sensing, Vienna University of Technology, Vienna.

Naeimi, V., K. Scipal, Z. Bartalis, S. Hasenauer and W. Wagner (2009), An improved soil moisture retrieval algorithm for ERS and METOP scatterometer observations, IEEE Transactions on Geoscience and Remote Sensing, Vol. 47, pp. 555-563.

Wagner, W., G. Lemoine, and H. Rott (1999). "A Method for Estimating Soil Moisture from ERS Scatterometer and Soil Data." Remote Sensing of Environment 70(2): 191-207.