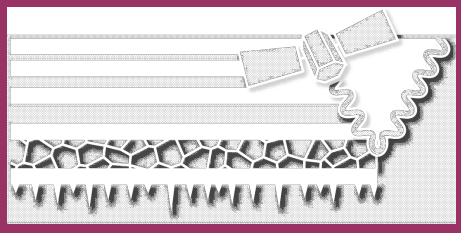
ESA DUE Permafrost



Subsidence V1 product guide

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Issue 1.1	30/11/11	V1 product guide	TS

Contents

1 Product overview

The development of SAR interferometry to detect long-term surface subsidence due to permafrost-related phenomena appears to be an excellent research opportunity. However, the use of this data for permafrost applications is still being developed.

Multiple interferograms from different sensors (ERS-1/2, ENVISAT, ALOS, TerraSAR-X) were used within this project. In consideration of data availability, land and snow cover and topography a short-baseline interferometric approach was employed (Berardino et al., 2002). Interferometric SAR processing was performed with the GAMMA software (Werner et al., 2000).

The main result of the SAR interferometric analysis is a temporal series of displacement maps on coherent targets in the satellite line-of-sight direction. The overall characteristics are specified in Table 2-1.

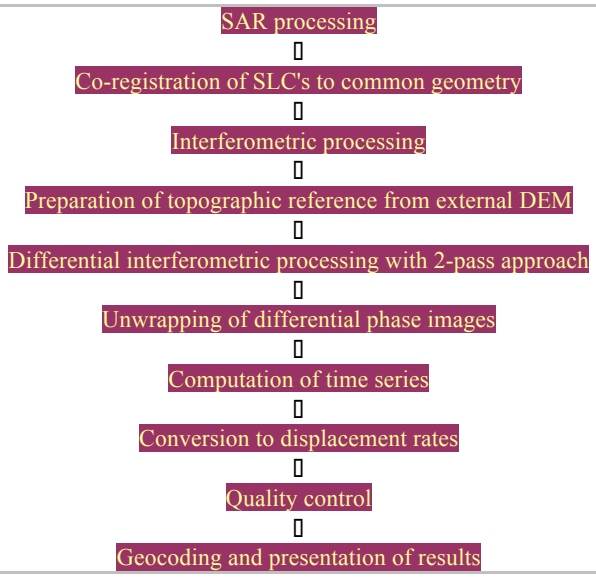

Figure 1
Processing flowchart for the implementation of subsidence product.

2 Product specification

The subsidence parameter represents the surface displacement along the satellite line-of-sight relative to a reference position and reference time. The data are described in Table 2–1.

The quality flag represents the average coherence of the interferograms considered in the data stack. The quality flag is described in Table 2-1.

Table 2–1
Description of the subsidence test dataset

Subject	Specification
Variable	Surface elevation change
Units	m
Coverage	Local up to 50km x 50km
Time period	2007 - 2011
Temporal frequency	once
Coordinate system	UMT, WGS84
Spatial resolution	~20m
Geometric accuracy	Horizontal position ~ ±20 m
Thematic accuracy	Vertical ~ ±1 cm
Data format	GeoTIFF
Other data codes	0.0 for no data or masked

Table 2–2
Description of the subsidence quality flag (QF) dataset

Subject	Specification
Variable	Averaged coherece
Units	Unity
Coverage	Local up to 50km x 50km
Time period	2007 - 2011
Coordinate system	UMT, WGS84
Spatial resolution	~20m
Data format	GeoTIFF
Other data codes	0.0 for no data or masked

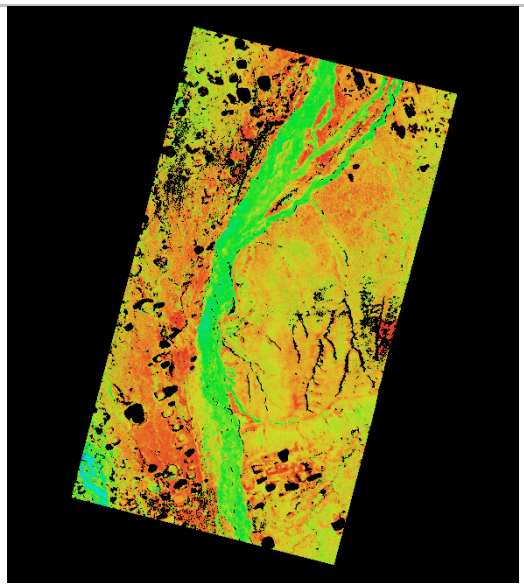

Figure 2
Example of subsidence product

-3 cm +3

3 Known issues

The most important sources of inaccuracy are related to atmospheric artifacts and phase unwrapping errors. In particular, uncorrect phase ambiguities translates into the following displacement errors for the different wavelengths of the satellite SAR sensors :

Band	Frequency	Wavelenght	Ambiguity	Satellites
L	1.3 GHz	23.6 cm	11.8 cm	ALOS PALSAR
C	5.3 GHz	5.7 cm	2.8 cm	ERS-1/2 ENVISAT ASAR RADARSAT-1/2
X	9.6 GHz	3.1 cm	1.6 cm	TerraSAR-X Cosmo-SkyMed

4 Data access and contact information

The subsidence v1 local products can be accessed via PANGAEA (http://doi.pangaea.de/10.1594/PANGAEA.783307) and should be cited as:

Strozzi, Tazio (2012): InSAR Digital Elevation Models for subsidence with links to geotiff files. GAMMA Remote Sensing doi:10.1594/PANGAEA.783307

In: ESA Data User Element (DUE) Permafrost: Circumpolar Remote Sensing Service for Permafrost - Local Services-I: terrain elevation and terrain subsidence - with links to datasets. doi:10.1594/PANGAEA.783634

The product is alternatively stored at GAMMA Remote Sensing and the Institute of Photogrammetry and Remote Sensing (TU Wien) FTP server which can be accessed via the DUE Permafrost data portal (www.ipf.tuwien.ac.at/permafrost). The dataportal includes a WebGIS for visualization. Login information is available on request.

For login access to the dataportal, contact Annett.Bartsch@tuwien.ac.at.
For questions about the product, contact strozzi@gamma-rs.ch
or mail to: 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

Werner, C., U. Wegmüller, T. Strozzi and A. Wiesmann (2000), Gamma SAR and Interferometric Processing Software, Proceedings of ERS-ENVISAT Symposium, Gothenburg, Sweden.

Berardino, P., G. Fornaro, R. Lanari, E. Sansosti (2002), A new Algorithm for Surface Deformation Monitoring
based on Small Baseline Differential SAR Interferograms, IEEE Transactions on Geoscience and Remote
Sensing, Vol. 40, No. 11, pp. 2375-2383.