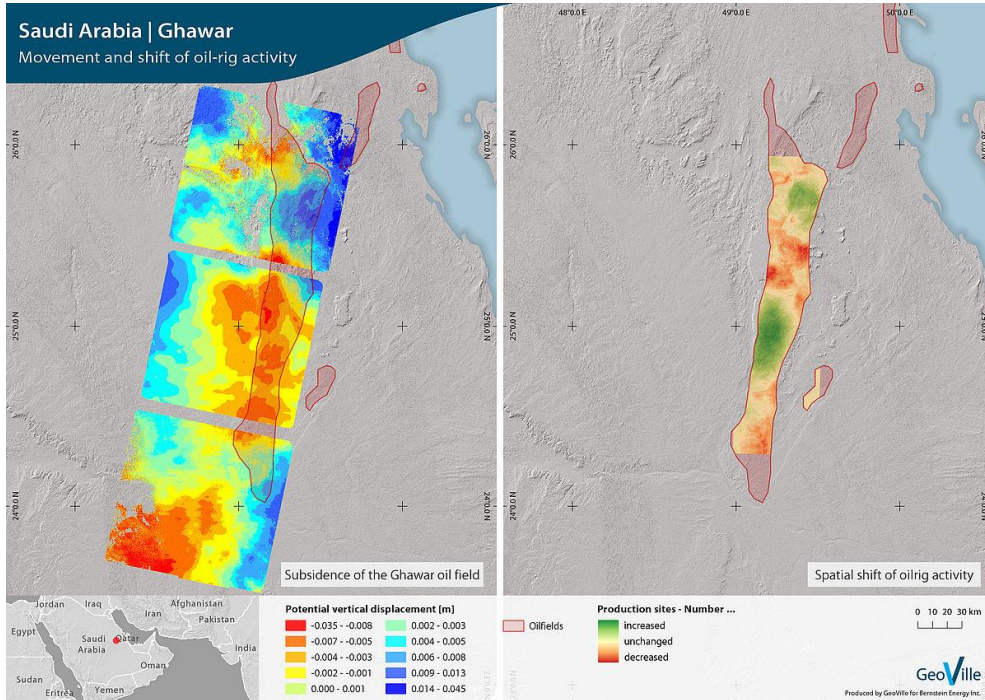


GEOPHYSICAL ASSESSMENT



Movement and shift of oil-rig activity (Source: GeoVille)

PRODUCT DESCRIPTION

Category

- | | |
|--|---|
| <input checked="" type="checkbox"/> Topographic information | <input checked="" type="checkbox"/> Surface deformation |
| <input type="checkbox"/> Impact assessment | <input type="checkbox"/> Precision ortho-images |
| <input checked="" type="checkbox"/> Change detection / continuous monitoring | <input checked="" type="checkbox"/> Terrain information |
| <input type="checkbox"/> Land cover / use | <input type="checkbox"/> Water quantity & quality |
| <input type="checkbox"/> Near surface geology | |

Uses

Subsidence monitoring – Land motion relating to fault lines or other causes

Subsidence monitoring – Infrastructure monitoring

Logistics planning and operations – Facility siting, infrastructure development

Challenges addressed

Exploration – Geological Mapping

Development and Operations – Ground Stability/Geotechnical

Geo-information needs

E-1: Geological mapping of surface expressions

DO-6: Geotechnical assessment – karst mapping

DO-19: Underground operations – surface subsidence

Description

An area, where mining takes place, must be structurally competent and must not be susceptible to subsidence or collapse. Therefore, an assessment is needed before any construction takes place. Also, further monitoring during mining activities is of high need, especially to monitor structural stability of buildings.

This product addresses these issues by monitoring the mining area and detecting any changes within the relief. Change detection is usually performed by using radar satellite imagery (Synthetic Aperture Radar, SAR) for analysis. To monitor any changes, images from different points in time are compared to analyse and highlight severe deformations. The detected variations in reflectivity indicate morphological changes, soil moisture variations, vegetation growth and anthropogenic causes.

To assess surface movements, processing radar imagery with interferometric techniques can furthermore be utilized in this matter. With this information it is also possible to conclude on possible damages in infrastructure.

Information on movements, variations and changes can be delivered in various formats, such as vector and raster formats, as well as reports. Maps can show the status quo and highlight problematic changes.

Known restrictions / limitations

Accuracy and timeliness are dependent on the resolution and repeat time of the satellite. Concerning change products consistent data from the same sources and the same period for the entire region is needed.

Lifecycle stage and demand

Exploration	Environmental Assessment & Permitting	Design, Construction & Operations	Mine Closure & Aftercare
■■■■■		■■■■■	■■

Exploration:

- Baseline mapping of natural ground movement in the pre-production phase
- Ground movement information for the identification of a structurally sound ground

Design, Construction & Operations:

- Regular monitoring of structural stability
- Ground movement information over infrastructure can be monitored in order to identify potential stability issues

Mine Closure & Aftercare:

- Regular monitoring of structural stability
- Ground movement information over infrastructure

Geographic coverage

Globally available.

EARSC Thematic Domain

DOMAIN	LAND
Sub-domain	Geology
Product description	Map geological features

PRODUCT SPECIFICATIONS

Input data sources

Sampling of available products:

<i>Satellite</i>	<i>Sentinel 1</i>	<i>TerraSAR-X</i>	<i>COSMO-SkyMed</i>
Status	In operation	In operation	In operation
Operator	ESA	DLR/Astrium	e-Geos
Data availability	Public	Commercial, on demand	Commercial, on demand
Resolution (m)	5 – 100	1 – 16	1 – 3
Coverage	Global	Global	Global
Frequency (days)	< 3	< 5	4-16

Launch year	2014	2007	2007
Website	link	link	link

Minimum Mapping Unit (MMU)

Variable, depending on source data resolution. A MMU as small as 1 m is possible.

Accuracy / constraints

Thematic accuracy:

Analysis shows movements, variations and changes of the surface.

Spatial accuracy:

Dependent on input pixel resolution.

Accuracy assessment approach & quality control measures

N/A

Frequency / timeliness

Observation frequency:

Every one or more days, depending on satellite.

Timeliness of delivery:

Within five (working) days of sensing.

Availability

Data from all Sentinel satellites are freely available through the open data policy of the operator ESA (Sentinel-1A since 2014, Sentinel-1B since 2016).

TerraSAR-X satellite imagery is commercially available through EADS Astrium GmbH, COSMO-SkyMed must be purchased from e-Geos.

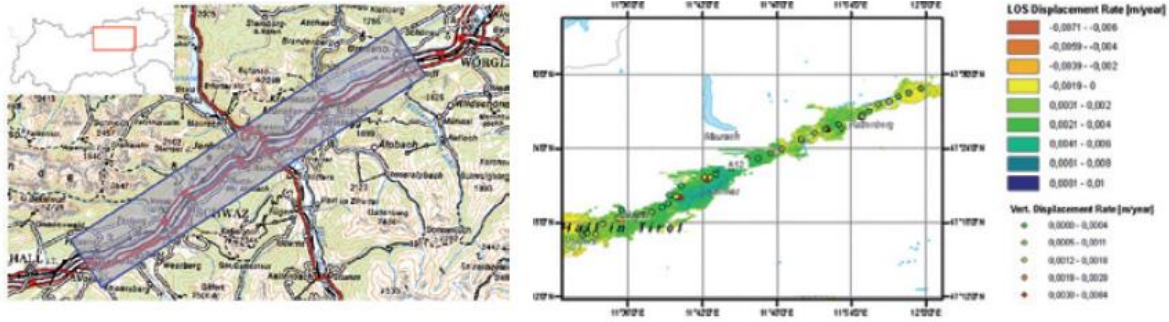
Delivery / output format

Data type: Raster formats

File format: GeoTIFF

Other delivery format: Report

USE CASE



(Copyright: Österreichische Bundesbahnen, ESA, GeoVille)

This example shows spatial monitoring of surface movements along a transport axes in Tyrol. SAR data was used here. Displacements in the centimeter range could be detected. Comparing imagery before and after mining commences makes it possible to detect changes very small changes and at an early stage. Combined with other products such as the settlement map, affected areas and buildings might be detected easily.