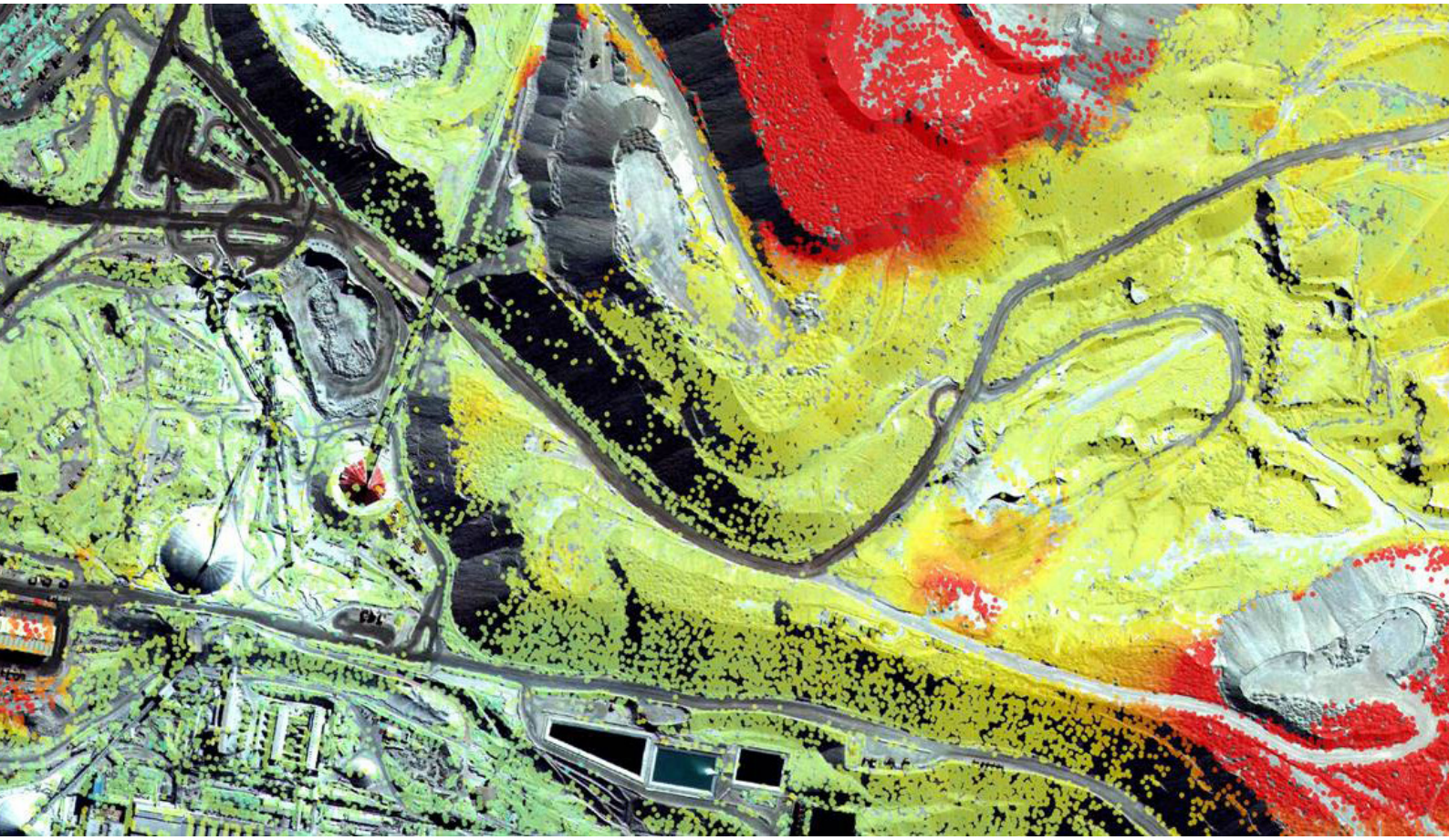
IDS GeoRadar

InSAR Service

Mining operations





InSAR Service - Ground motion monitoring for mining operations

PART OF HEXAGON

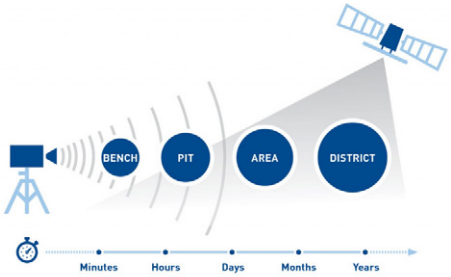
IDS GeoRadar: Innovative Interferometric Radar for Mining, Environmental and Civil Engineering Applications

www.idsgeoradar.com

InSAR Service

InSAR SERVICE

IDS GeoRadar, in partnership with TRE ALTAMIRA, offer a comprehensive solution – InSAR Service – to fulfill all **mine stability needs**, ranging from monitoring large-scale mining operations over hundreds of square kilometers, to specific movements at the pit scale.



With the large spatial coverage of satellite data, mining engineers can **identify unstable areas** over wide areas, also with the ability to extend the analysis of deformation back in time, thanks to the availability of historical archives of satellite images. All mining assets can be monitored regularly and precisely for deformation.

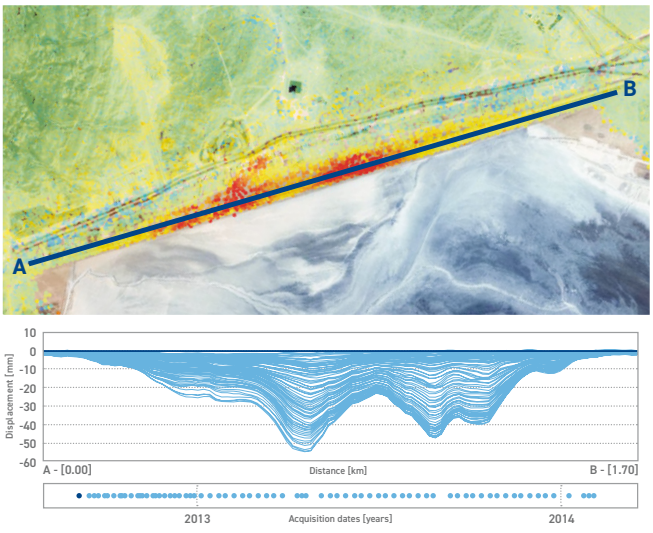
Through the analysis of satellite data, mine operators can complement ground-based radar measurements to identify anomalous instability over large areas, to **address and properly plan the best monitoring array.** The two technologies are complementary, with satellite radars mostly sensitive to the vertical settlement of ground and IBIS to rock face movements of steep walls.

LONG-TERM ANALYSIS

Mine wide deformation mapping with satellite radar data

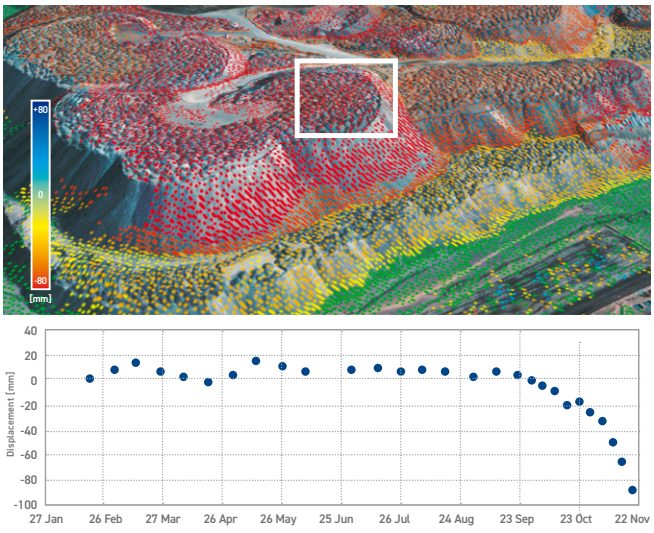
The history of surface deformation over the entire mine site can be extracted with our advanced multi-temporal satellite radar data analyses. All mining assets can be monitored regularly for deformation every month, quarter, semi-annually or annually. Satellite radar data is an excellent monitoring tool over slopes and surfaces where Health & Safety concerns limit access for conventional surveying techniques.

Tailings Dams



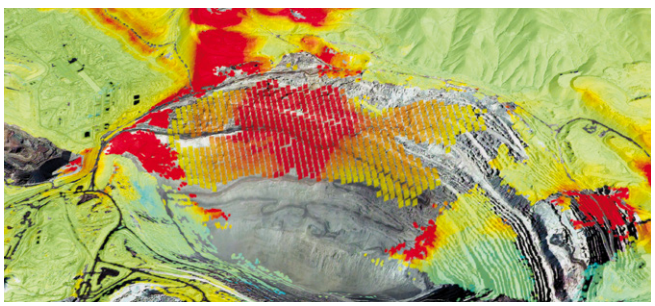
Dam compaction is shown in the cross-section profile. Profile A-B shows non standard settlement of the tailings dam with a maximum rate of 32 mm/year.

Waste Piles



Sample point densities of greater than 10,000 /km2 provide more complete coverage than any other monitoring technique.

Slope Management



SqueeSAR™ coupled with a Rapid Motion Tracking analysis provides identification of slow and fast motions for improved hazard prevention and management.

InSAR Service

MONITORING BULLETTIN

The Monitoring Bullettin service is available over any mine site worldwide

This service provides actionable reports on trends and changes to the ground surface within 12 hours of receiving the most recent satellite image.



LEGEND

LOS Displacement [mm]

- <-200
- [-200, -100]
- [-200, -50]
- [-50, -30]
- [-30, -15]
- [-15, 15]
- [15, 30]

Visibility

- Amplitude change detection
- Decorrelation noise
- No Visibility

Additional information

- Fast movement (RMT)
- Possible motion

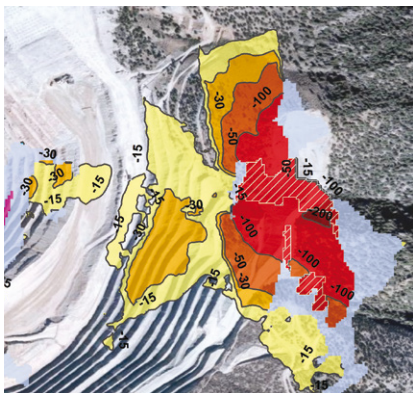
Deformation over the entire mine site is detected without the need for ground instrumentation. A synoptic view from satellite offers a quick visualization of deformation trends over all mine assets.

Intuitive colour-coded deformation maps highlight areas where changes in trend are occuring with respect to previous situations, providing magnitude and area of deformation at a glance.

Weekly updates of deformation within a few hours of the latest satellite acquisition, thanks to a new generation of satellites acquiring every 6/10 days.

Compatibility with the main mine softwares. Maps are delivered in all standard formats, to seamlessly import into your visualization software.

Client support, with a global presence and offices in five continents, IDS GeoRadar and TRE ALTAMIRA provides support for geotechnicians and decision makers.



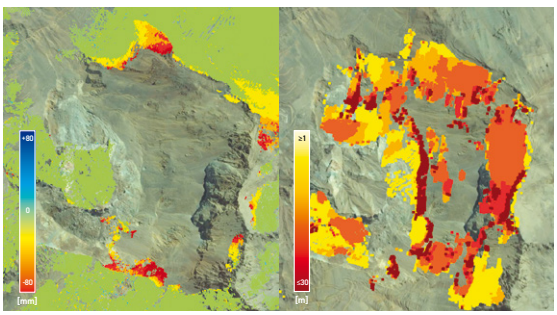
UNDERGROUND MINING

Complex subsidence patterns associated with underground activities are suitably monitored from satellite

Underground activities often lead to surface deformation patterns with strong temporal and spatial variation since face work progress determines the affected area. TRE ALTAMIRA has developed algorithms to analyse the complex subsidence patterns associated with these operations and conducts studies for all ranges of underground mining activities, including unsupported underground mining sites (like block caving and longwall).

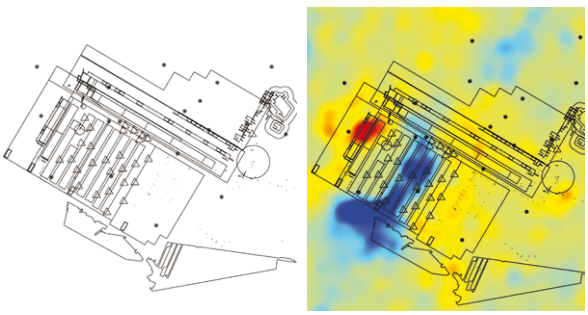
This technology has also proven to be an efficient tool for providing long-term monitoring of residual subsidence over inactive and abandoned mines.

Block Caving



Monitoring over a block caving mine: the subsidence crater is delimited and different types of motion magnitudes measured, millimetric-centrimetic motion on the left, metric motion on the right.

Longwall



Monitoring over a longwall mined coal seam: an advanced SqueeSAR™ analysis (right image) identifies areas of increasing rates of subsidence (red), as the longwall operations approach, and residual subsidence rates (blue), after the initial longwall operations have passed.

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