SAR based studies as a solution for monitoring construction operations in mining and tunnelling

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Summary

Synthetic Aperture Radar (SAR) satellites acquire images of the Earth’s surface by emitting radar signal that are captured again by the satellite. By processing these signals, the evolution of the surface deformation caused by underground construction operations (e.g. tunneling and other mining operations) can be monitored worldwide. This technology allows for the monitoring of all ranges of motion (millimetric, centimetric and metric magnitudes) over extremely large areas (e.g. 50 km x 50 km) with a high density of measurement points.

The main benefits of this monitoring technology are: (1) it provides millimetric precision in the measurements, (2) it is very suitable for restricted sites since in situ measurement are not necessary, (3) all key elements of the mine site can be monitored at the same time: open pit slopes, mine heaps, access roads, etc. and (4) it feeds geomechanical models improving their forecasting capabilities.

Furthermore, historical analyses (using satellite data archived since 1992) provide a unique opportunity for studying the surface ground motion occurred in the past. This information is highly interesting in the planning phase of any construction operation and for providing (through the analysis of time series) changes in the deformation rates of the area of interest. In order to illustrate the applicability of this technology, different case studies related with tunnelling (applied to linear infrastructures) and mining activities are presented.
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