



Integration of SAR and passive seismic data for monitoring mining activities (Minas Riotinto, SW Iberia)

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The extraction of raw materials is constrained by hazards linked to mining activities. Earthworks and pumping change soil mechanical properties and can cause landslides, subsidence or runoff drifting with potential serious economic, environmental and human-life consequences. The present research aims to reduce mining hazards by developing a “real time” system for monitoring ground instabilities. Our approach combines SAR Copernicus data (Sentinel-1) for surface deformation modeling and passive seismic data for subsurface imaging. Both data sources require low maintenance, can be automatized, record non-stop and fully cover the target zone; all suitable characteristics for an Early Warning System tool. This pilot study is being performed in the world-class Riotinto mine, SW Spain, with mining activity going back for more than 4000 years. A-DInSar techniques (CPT) have been used for processing Sentinel-1 images to establish the baseline surface deformation field. Our algorithm will automatically update the image catalogue and the surface deformation model. Environmental and anthropogenic “seismic noise” will be used for the subsurface imaging. The mining activities generate a broad variety of acoustical signal. Currently, the main seismic sources are being characterized. Autocorrelation and noise interferometry techniques will be used for underground dynamic imaging. Both datasets will be integrated into a new protocol for monitoring the mechanical integrity of the shallow subsurface, applicable to a wide range of environments.

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