Geophysical Research Abstracts
Vol. 21, EGU2019-15568, 2019
EGU General Assembly 2019

SIT4ME: seismic imaging for mining exploration in Sotiel-Elvira (Spain)

Juan Alcalde (1), Yesenia Martínez (1,2), David Martí (1), Puy Ayarza (2), Mario Ruiz (1), Ignacio Marzán (1), Fernando Tornos (3), Alireza Malehmir (4), Alba Gil (4), Stefan Buske (5), Dirk Orlowsky (6), and Ramon Carbonell (1)

(1) Department of Structure and Dynamics of the Earth, Institute of Earth Sciences Jaume Almera, ICTJA-CSIC, Spain (juan.alcalde@abdn.ac.uk), (2) Department of Geology, University of Salamanca, Spain, (3) Institute of Geosciences, CSIC-UCM, Spain, (4) Department of Earth Sciences, Uppsala University, Sweden, (5) Technische Universität Bergakademie Freiberg, Germany, (6) DMT GmbH & Co, Germany

Fair and sustainable production of raw materials is one of the main challenges faced by our society. Through its RawMaterials Programme, the European Institute of Technology (EIT) encourages research and innovation solutions for mineral exploration to make them safer, sustainable and cost-effective. The SIT4ME project, funded by EIT, addresses these objectives by undertaking seismic mineral exploration methods in crystalline tectonic settings, at a reduced cost.

Active seismic imaging is a powerful method for deep imaging but considered an expensive prospecting tool, making it conventionally restricted to the hydrocarbon industry. Contrarily, innovative passive seismic imaging methods use ambient noise as source, showing promising results at a much lower cost, but with lower resolution. In this work, we will analyse the efficiency of passive seismic methods (i.e. ambient noise interferometry) for subsurface imaging, by comparing active- and passive-source datasets in mining areas.

A multi-method seismic dataset was acquired in the Sotiel-Coronada mine in the Iberian Pyrite Belt (SW Spain) to image a pyrite-rich massive sulphide orebody interbedded with felsic volcanic rocks and shales at a depth of 300-500 m. The acquired data comprises 2D/3D and 3C components and will be processed by active (e.g. reflection imaging techniques) and passive (e.g. ambient noise interferometry) seismic methods. This special combination of acquisition and processing approaches allows us to address the imaging problem from different innovative perspectives.

The acquisition employed 647 seismic receivers, distributed in a 3D mesh around the target and along six 2D crooked lines sampling the study area. The source employed was a 32 t vibroseis truck, operating at c. 900 points in the pathways along the 2D profiles. Each vibration point was used three times, with frequency sweeps of 10-100 Hz. Here we describe the preliminary processing applied to the 3D seismic data and present the initial imaging results. This complex dataset will be integrated with information from borehole data in order to obtain a robust model of the subsurface.