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SIT4ME: seismic imaging of mineral-hosting structures in Sotiel-Coronada (Spain)

Yesenia Martínez^{1,2}, Juan Alcalde¹, David Martí³, Puy Ayarza², Mario Ruiz¹, Ignacio Marzán¹, Fernando Tornos⁴, Alireza Malehmir⁵, Alba Gil⁵, Stefan Buske⁶, Dirk Orlowsky⁷, Imma Palomeras², Juan Manuel Pons⁸, Juan Carlos Videira⁸, Irene De Felipe¹, and Ramon Carbonell¹

¹Salamanca University, Geology, Salamanca, Spain (yesimartinez@usal.es)

²Department of Geology, University of Salamanca, Spain

³Lithica SCCL, Spain

⁴Institute of Geosciences, CSIC-UCM, Spain

⁵Department of Earth Sciences, Uppsala University, Sweden

⁶Technische Universität Bergakademie Freiberg, Germany

⁷DMT GmbH & Co, Germany

⁸MATSA, Almonaster la Real (Huelva, Spain)

In order to tackle the ever-increasing demand of raw materials, the European Institute of Technology (EIT) promotes research and innovation solutions for safe and sustainable mineral exploration through its Raw Materials Programme. The SIT4ME project ("Seismic Imaging Techniques for Mineral Exploration") has been funded as part of this program to develop efficient techniques in seismic acquisition and imaging methods for mineral exploration in crystalline environments. Within SIT4ME, a multidisciplinary data acquisition experiment (i.e. 3D-3C active and passive source seismic datasets) took place in November 2009 in Sotiel-Coronada (Iberian Pyrite Belt, SW Spain). The aim of this experiment was to image a 300-500 m depth pyrite-rich massive sulfide orebody interbedded with felsic volcanic rocks and shales. The seismic dataset involves the recording of 875 vibration points in 653 seismic receivers, distributed in a 3D mesh around the target and six 2D crooked lines. Conventional processing workflow (such as static corrections, surface-consistent deconvolution, amplitude equalization, frequency filtering, and velocity analysis) was combined with more advance methods (e.g. ground roll attenuation or post-stack coherency filtering) to obtain robust images of the subsurface of the target area. The processing workflow has been applied to four 2D seismic sections, one in the North-South and three in the East-West directions, distributed across the study area. The preliminary imaging results show coherent reflective packages down to two seconds two-way traveltime (TWT). The North-South line contains a north-dipping ~400 m long highly reflective zone in the center at 130 ms TWT. The east-west profiles show a slightly folded structure (antiform and synform) which is evident down to 0.25 s TWT. Towards the north, the seismic lines become parallel to subsurface structures and therefore the track of these structures is lost. Current work involves the incorporation of well-log data to improve the quality and resolution of the interpretations. The next processing steps will involve pre-stack depth migration, P-wave travel-time tomography and a

combined analysis of controlled source imaging and ambient noise interferometry data.

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