

## **PALYNOSTRATIGRAPHIC STUDY OF THE CAVEIRA MINE (NW SECTOR OF THE IBERIAN PYRITE BELT, PORTUGAL)**

Z. Pereira<sup>1</sup>, J. X. Matos<sup>2</sup>, P. Fernandes<sup>3</sup>, J. T. Oliveira<sup>4</sup>

<sup>1</sup>LNEG, LGM, Unidade de Geologia e Cartografia Geológica, S. Mamede Infesta, Portugal,  
zelia.pereira@ineti.pt

<sup>2</sup>LNEG, LGM, Unidade de Recursos Minerais e Geofísica, Beja, Portugal,  
joao.matos@ineti.pt

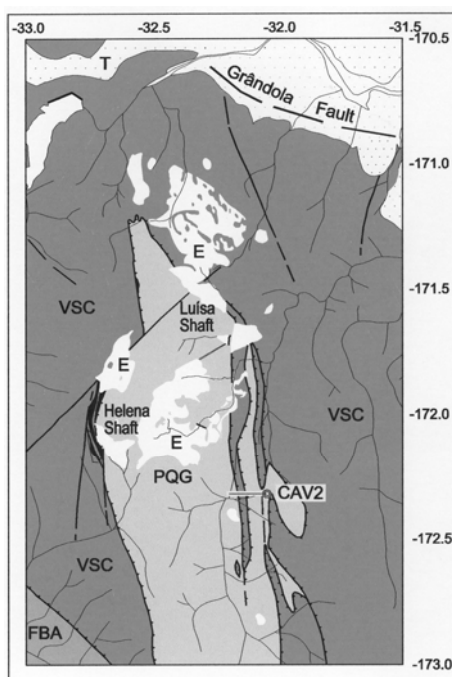
<sup>3</sup>UALG, CIMA Centro de Investigação Marinha e Ambiental, Faro, Portugal,  
pfernandes@ualg.pt

<sup>4</sup>LNEG, LGM, Unidade de Recursos Minerais e Geofísica, Alfragide, Portugal,  
tomas.oliveira@ineti.pt

In the NW sector of Iberian Pyrite Belt, the geology is dominated by complex antiformal structures, as we can observe in the Lousal and Caveira old massive sulphide mines, both located at the Azinheira de Barros region. The age of the lithostratigraphic units of these structures is still poorly constrained and subsequently palynostratigraphy revisions are being undertaken. The Caveira mine is located in a complex N-S trending antiformal structure, with a core composed of shales and quartzites belonging to the Phyllite-Quartzite Group (PQG), surrounded by felsic volcanics and volcanoclastics of the Volcano-Sedimentary Complex (VSC) (Oliveira et al. 2006, Matos, 2006, Figure 1). Several massive sulphides, <10m thick lenses, occur near the PQG/VSC boundary, forming two main ore horizons: the Helena Shaft and the Luísa Shaft. The structure is affected by N-S and NE-SW late Variscan reverse faults. The Grândola Fault limits the Palaeozoic basement in the northern sector of the Caveira mine. The borehole CAV 02 (SMRA 2001 exploration project, 301 m length, 60°, Az 270°, M= -32042, P= -172321) was selected to illustrate the lithological succession and support the palynostratigraphic study.

The following units were identified in the CAV 02 hole from the top to the base: dark shales with thin-bedded siltstones and quartzites (Xn1); felsic porphyritic volcanics (Va); black shales (Xn2) with massive sulphide intercalations (Luisa Shaft orebodies); dark shales with siltstones and quartzitic beds (PQG). The Unit Xn1, interpreted as a PQG equivalent, is thrust over the felsic volcanics Va and the contact between unit

Xn2 and the PQG lithologies is faulted (probable shear zone). The black shales of unit Xn1 and also those intercalated in the massive sulphides (Xn2), both gave rich miospore associations of the LN Biozone, of upper Strunnian age, characterized by abundant specimens of *Auroraspora macra*, *Cristatisporites triangulatus*, *Densosporites spitsbergensis*, *Dictyotriletes fimbriatus*, *Discernisporites* sp., *Geminospora spongiata*, *Grandispora cornuta*, *G. echinata*, *Knoxisporites literatus*, *Punctatisporites irrasus*, *Retispora lepidophyta*, *Retusotriletes incohatus*, *Rugospora flexuosa*, *Vallatisporites pusillites* and *Vallatisporites verrucosus* together with the index species *Verrucosisporites niditus*. *Maranhites* spp. are also present.



**Figure 1** Simplified Caveira mine geology (adapt. Matos, 2006): FBA - Mértola Fm. Flysch; VSC - Volcano-Sedimentary Complex; PQG - Phyllite-Quartzite Group; T - Tertiary sediments; E - Mine waste tailings. Hayford-Gauss coordinates in km

The black shales interbedded in the PQG quartzites revealed the presence of moderately preserved miospores indicating the AD miospore Biozone, subzone Lem, of Lower Givetian age. This biozone shows moderately preserved species of *Cristatisporites* sp., *Geminospora lemurata*, *Cymbosporites magnificus*, *Aneurospora greggsii*, *Emphanisporites annulatus*, *Grandispora* sp., *Retusotriletes rugulatus*, *Verrucosisporites premnus* and *V. scurrus*. Reworked older miospores of Lower Devonian make part of the assemblage (e.g. *Camarozonotrilestes sextantii* and *Diatomozonotriletes* sp.).

The time gap between unit Xn2 and the PQG covering the Famennian, the Frasnian and part of the Givetian is probably due to the effect of the extensional fault between

the two units. Recent U-Pb geochronology data in zircons recovered from felsic volcanics ca. 300m SSE of Luisa Shaft indicates an age of  $361\pm 4$ Ma (Rosa et al., 2008), e.g. upper Famennian. Available palynological data suggest that the age of the Caveira massive sulphides is upper Strunian. This new age achieved, together with the same age determined for the PQG lithologies in the near São Francisco Anticline, located 14 km westward (Pereira et al., 2009; 2010) indicates that these are the oldest sediments of the PQG, ever found at the South Portuguese Zone, were the Iberian Pyrite Belt is included. Other sedimentary units can be older but no fossil record was found until now.

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