



Geophysical characterization of the Cercal Paleozoic structure, Iberian Pyrite Belt, from a mineral exploration perspective

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ABSTRACT

The Cercal Volcano-Sedimentary Complex (Cercal VSC) structure is the westernmost sector of the Iberian Pyrite Belt (IPB) giant metallogenic province and was explored since Roman times for volcanogenic massive sulphides (VMS) and Fe–Mn (Ba) deposits. However, presently only a single deposit is known, the Salgadinho Cu–Ag–Au stockwork/disseminated deposit. Nevertheless, according to several mining companies that operated in the area during the last two decades, the Cercal area keeps a high potential for the discovery of new massive and stockwork mineralization deposits hosted in VSC felsic volcanic rocks. The lack of seismic data and deep drill-holes (> 800 m), has been limiting the discovery of possible deep seated massive/stockwork deposits. The goal of this work is to provide new insights into the Cercal deep and near surface structure through the integrated interpretation of geophysical and geological data and contribute to the discovery of new stockwork or massive sulphide deposits. For this purpose, we reprocessed ground gravity, airborne magnetic/radiometric and electrical resistivity/induced polarization data which was interpreted and integrated with geological data. Data interpretation included 2.5D forward gravimetric modeling constrained by i) a new rock density database (from outcrops and drill-holes) built under the scope of this work, ii) the scarce available drill-holes and iii) geological information. A small magnetic susceptibility/conductivity database based on drill-hole core samples was also built to assist the magnetic and electrical/chargeability data interpretation. The integrated interpretation agrees with some of the expected geological scenarios predicted by surface mapping and exploration drill-hole logs in the IPB and provides further details on the deep structure of the Cercal Anticline, a NNW-SSE oriented VSC unrooted structure, controlled by variscan SW verging thrust faults and discordant strike-slip Late-Variscan faults. This geological scenario favors the possibility of new findings at relatively shallow depths (200–900 m), and a few sites for further exploration are indicated based on the integrated interpretation. Therefore, this work contributes to the understanding of the Cercal deep structure from a mineral exploration perspective and confirms the proposed structural models for the IPB's westernmost region.

1. Introduction

The Iberian Pyrite Belt (IPB) is one of the world's largest provinces of volcanogenic massive sulphide (VMS) deposits with an estimated 2000 million tons of ore exploited (e.g., Barriga et al., 1997; Tornos, 2006; Inverno et al., 2015). It extends from Marateca (Portugal) to Seville (Spain) and covers an area of approximately 10,000 km² (Fig. 1).

Mineralization is hosted in volcanic and sedimentary rocks forming a Volcano-Sedimentary Complex (VSC) with ages comprised between the Upper Devonian and Lower Carboniferous (Oliveira et al., 2005, 2019; Pereira et al., 2008a, 2008b; Rosa et al., 2008). The Cercal-Odemira volcanic rocks have been considered as part of the IPB VSC (Carvalho, 1976; Pereira et al., 2008a, 2008b; Oliveira et al., 2005, Oliveira et al., 2013, 2019).

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