



Time-space evolution of Iberian Pyrite Belt igneous activity: Volcanic and plutonic lineaments, geochronology, ore horizons and stratigraphic constraints

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ABSTRACT

The volcanism in the Iberian Pyrite Belt migrated from the present day west/southwest to the east/northeast during Devonian/Carboniferous times. Evidence is here discussed based in U-Pb zircon ages of felsic volcanic and plutonic rocks, bounded by enclosed sediments and their biostratigraphic ages, together with hosted massive sulphides deposits and associated plutonic counterparts.

Volcano-Sedimentary Complex rocks define several volcanic axes, or lineaments, with the general NW-SE to WNW-ESE belt trending orientation. The usage of all the available data from high-resolution stratigraphy, geology and geophysics lead to establishment of eleven main volcanic axes, nine with zircon U-Pb radiometric ages (166 samples).

In this research, we reinforce a previous inter-axes volcanic evolutionary trend, but we also suggest an intra-axis evolutionary trend of the IPB igneous activity with time. This means the basin igneous activity also evolved along most of the volcanic and plutonic lineaments, from west/northwest to east/southeast.

Successive weighted average ages for each axis (SW to NE) and opposite end-point sample ages for each axis (NW/W to SE/E) are presented. Similar trends are found with felsic volcanic rocks, subvolcanic and plutonic rocks and even massive sulphide ages correspond to the regional trend corroborating the proposed geological framework.

Siliciclastic sediments and lower VSC sequences (sediments, felsic volcanic rocks and massive sulphides) show a comparable age trending evolution although upper VSC sediments seem to be contemporaneous across the province. Older ages, from zircon U-Pb and from associated reworked palynomorph in the sediments, show a long-lasting age distribution along most Devonian times, suggesting the IPB evolved since Lochkovian times (Lower Devonian). Therefore, we propose the IPB inter-axes evolution could be related with a NE-direction plate motion (present-day location) over a heat source, while intra-axes are probably due to the collisional/compressive tectonic interaction of South Portuguese – Ossa-Morena zones tectonic setting.

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1. Introduction

The Iberian Pyrite Belt (IPB) is a NW-SE to W-E trending metallogenic province, located in southwestern Iberia (Fig. 1), comprising several world-class volcanic hosted massive sulphide (VHMS)

deposits mostly accommodated in a Volcano-Sedimentary Complex (VSC) rock suite (Schermerhörn, 1971; Carvalho et al., 1971, 1999; Sáez et al., 1996; Barriga et al., 1997; Leistel et al., 1998; Oliveira et al., 2005, 2019; Tornos, 2006; Inverno et al., 2015; Almodóvar et al., 2019). Despite the almost 90 deposits known to date (e.g. Barriga et al., 1997; Leistel et al., 1998; Sáez et al., 1999; Tornos, 2006), there is still high potential for new discoveries particularly in Cenozoic cover unexposed areas

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