



Research Article

Tracking the Late Devonian high-P metamorphic belt in the Variscan Orogen: New constraints on the PT evolution of eclogites from the Cubito-Moura Unit (SW Iberian Massif)

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ABSTRACT

The Cubito-Moura Unit is a high-P metamorphic succession that occurs in the southern part of the Ossa-Morena Complex (SW Iberian Massif). It includes a series of metasedimentary, metafelsic and metamafic rocks affected by a high-P, low to intermediate-T metamorphic event during Late Devonian times. Geochemistry of the metabasic rocks reveals that the generation of the protoliths occurred in a supra-subduction zone setting during Late Ediacaran to Early Ordovician times, either in a back-arc or fore-arc context. The eclogites contain atoll-like garnets, omphacite, amphibole, phengite (up to $Si = 3.38$ apfu), paragonite, rutile and quartz. Thermodynamic modelling in the MnNCKFMASH system indicates a high-P metamorphic event at ~24 kbar and ~585 °C followed by a thermal peak at ~19 kbar and ~630 °C, and a subsequent exhumation to ~15 kbar. This P-T path indicates deep subduction at c. 370 Ma of this arc-related section. The lithostratigraphy and tectonothermal evolution of the Cubito-Moura Unit are equivalent to that of a number of units along the Iberian, Armorican and Bohemian massifs that can be correlated as a part of the same Basal Allochthonous Terrane. These units define a single Late Devonian high-P, low- to intermediate-T metamorphic belt developed during the first stages of the Variscan Orogeny.

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1. Introduction

Deep subduction of continental margins occurs in the initial stages of continental collision. This process leads to the formation of distinctive high/ultrahigh-P metamorphic belts, which are distributed along the suture zones of orogens and contain key information on the nature of the paleo-subduction zones. Therefore, the identification of high-P metamorphic belts is essential to understand the tectonic evolution of orogens and plate margins (Dewey 1975; Miyashiro 1973). Along Western and Central Europe, large outcrops of the Variscan Orogen define the French Massif Central and Armorican, Bohemian and Iberian massifs

(Fig. 1a). This orogenic belt formed during the Devonian and Carboniferous as a consequence of the diachronic collision between Gondwana and Laurussia which led to the assembly of Pangea (Arenas et al. 2014; Díez Fernández et al. 2016; Franke 1989, 2000; Kroner and Romer 2013; Martínez Catalán et al. 1997; Matte 1991, 2001; Ribeiro et al. 2007; Simancas et al. 2005). In the Iberian Massif, there is a complete transverse cross-section of the Variscan Orogen, from the Gondwanan to the Laurussian forelands (Fig. 1b). It includes an Internal Variscan Zone comprising ophiolites and high-P units, which are preserved as tectonic klippen defining six allochthonous complexes (i.e. Cabo Ortegal, Órdenes, Malpica-Tui, Bragança, Morais and Ossa-Morena) featured by several suture zones exposures (Fig. 1b; Arenas et al. 2016a; Díez Fernández et al. 2016; Martínez Catalán et al. 2009).

In NW Iberian Massif, the allochthonous complexes comprise a thick stack of terranes (Fig. 1b). At the top of the nappe pile, a peri-Gondwanan continental-affinity terrane, so-called Upper Units, traces an Early Devonian high-P, high-T metamorphic belt (Ábalos et al. 2003; Fernández-Suárez et al. 2007; Fuenlabrada et al. 2010; Gil Ibarguchi et al. 1990; Mendía et al. 2001; Ordóñez Casado et al., 2001).

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