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Research paper

The inception of a Paleotethyan magmatic arc in Iberia

M.F. Pereira [a,*], A. Castro [b], C. Fernández [c]

[a] IDL, Departamento de Geociências, ECT, Universidade de Évora, Apartado 94, 7001-554 Évora, Portugal
[b] Departamento de Geología, Universidad de Huelva, Spain
[c] Departamento de Geodinámica y Paleontología, Universidad de Huelva, Spain

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ABSTRACT

This paper presents a compilation of recent U-Pb (zircon) ages of late Carboniferous–early Permian (LC–EP) calc-alkaline batholiths from Iberia, together with a petrogenetic interpretation of magma generation based on comparisons with Mesozoic and Tertiary Cordilleran batholiths and experimental melts. Zircon U-Pb ages distributed over the range ca. 315–280 Ma, indicate a linkage between calc-alkaline magmatism, Iberian orocline generation and Paleotethys subduction. It is also shown that Iberian LC–EP calc-alkaline batholiths present unequivocal subduction-related features comparable with typical Cordilleran batholiths of the Pacific Americas active margin, although geochemical features were partially obscured by local modifications of magmas at the level of emplacement by country rock assimilation. When and how LC–EP calc-alkaline batholiths formed in Iberia is then discussed, and a new and somewhat controversial interpretation for their sources and tectonic setting (plume-assisted relamination) is suggested. The batholiths are proposed to have formed during the subduction of the Paleotethys oceanic plate (Pangaea self-subduction) and, consequently, they are unrelated to Variscan collision. The origin of the Iberian batholiths is related to the Eurasian active margin and probably represents the inception of a Paleotethyan arc in the core of Pangaea.

1. Introduction

There is currently general consensus regarding global palaeogeographic views of Pangaea during late Carboniferous–early Permian times (LC–EP; ca. 315–280 Ma), which place Iberia at the core of this supercontinent, near the Eurasian active margin located to the east (Cocks and Torsvik, 2006; Stampfli and Kozur, 2006, and references therein). Surprisingly, in spite of this widely-accepted palaeogeographic proximity, the likely relationship between the source of Iberian LC–EP calc-alkaline magmas and the subduction of the Paleotethys oceanic plate has never been explored.

This point of view was first discussed in a general way for the Alpine arc (Finger and Steyrer, 1990) with regard to the Variscan granitoids of the Tauern area. But the existence of a wide magmatic province in the Alpine domain (Catalonia, Pyrenees, Calabria, Sardinia, Corsica, Provence, Tuscan nappes, Briançonnais domain, the southern and eastern Alps), characterized by the transition from LC–EP calc-alkaline plutonism to early to mid-Permian post-collisional or extension related magmatism was documented by Stampli (1996) and references therein. The inception of the subduction of Paleotethys in the Permian and a representation of subduction-related magmatic belts were later presented by Stampfli (2001).

Until now, LC–EP calc-alkaline magmas in Iberia have been linked by a number of researchers with a range of sources and tectonic settings associated with Variscan collision. Among these, are: (1) the reworking of different crustal protoliths, including metaigneous and metasedimentary rocks (Bea et al., 2003); (2) the reworking of oceanic metabasic rocks accreted to mid-to-lower crustal levels (Villaseca et al., 2009); (3) the involvement of mantle-derived melts or meta-igneous lower crust (Fernández Suárez et al., 2011); and (4) a primarily igneous rock source stemming from depleted mantle or meta-igneous lower crust and derived by partial melting of heterogeneous metasedimentary detrital rocks in the mid-crust (Neiva et al., 2009). Recently, a new tectonic model was presented for the origin of LC–EP calc-alkaline

* Corresponding author. Tel.: +351 266 745301; fax: +351 266 745397.
E-mail address: mpereira@uevora.pt (M.F. Pereira).

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