

# Variscan intra-orogenic extensional tectonics in the Ossa–Morena Zone (Évora–Aracena–Lora del Río metamorphic belt, SW Iberian Massif): SHRIMP zircon U–Th–Pb geochronology

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**Abstract:** Following a Middle–Late Devonian (c. 390–360 Ma) phase of crustal shortening and mountain building, continental extension and onset of high-medium-grade metamorphic terrains occurred in the SW Iberian Massif during the Visean (c. 345–326 Ma). The Évora–Aracena–Lora del Río metamorphic belt extends along the Ossa–Morena Zone southern margin from south Portugal through the south of Spain, a distance of 250 km. This major structural domain is characterized by local development of high-temperature–low-pressure metamorphism (c. 345–335 Ma) that reached high amphibolite to granulite facies. These high-medium-grade metamorphic terrains consist of strongly sheared Ediacaran and Cambrian–early Ordovician (c. 600–480 Ma) protoliths. The dominant structure is a widespread steeply-dipping foliation with a gently-plunging stretching lineation generally oriented parallel to the fold axes. Despite of the wrench nature of this collisional orogen, kinematic indicators of left-lateral shearing are locally compatible with an oblique component of extension. These extensional transcurrent movements associated with pervasive mylonitic foliation (c. 345–335 Ma) explain the exhumation of scarce occurrences of eclogites (c. 370 Ma). Mafic-intermediate plutonic and hypabyssal rocks (c. 355–320 Ma), mainly I-type high-K calc-alkaline diorites, tonalites, granodiorites, gabbros and peraluminous biotite granites, are associated with these metamorphic terrains. Volcanic rocks of the same chemical composition and age are preserved in Tournaisian–Visean (c. 350–335 Ma) marine basins dominated by detrital sequences with local development of syn-sedimentary gravitational collapse structures. This study, supported by new U–Pb zircon dating, demonstrates the importance of intra-orogenic transtension in the Gondwana margin during the Early Carboniferous when the Rheic ocean between Laurussia and Gondwana closed, forming the Appalachian and Variscan mountains.

## Introduction

Recent studies of ancient and modern examples of orogenic belts have demonstrated the importance

of intra-continental extensional tectonics during the terminal stages of, and immediately after, continental accretion (late- to post-orogenic processes). The main effects of such crustal thinning processes