Visean high-K mafic–intermediate plutonic rocks of the Ossa–Morena Zone (SW Iberia): implications for regional extensional tectonics

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Abstract: Field relationships and new U–Pb geochronology data indicate a temporal link between the diverse high-K mafic–intermediate magmas of the Ossa–Morena Zone (OMZ). Ages of *c.* 338–335 Ma for the Vale de Maceiras gabbro and the Campo Maior microdiorite and quartz-diorite indicate that plutonism took place during a Variscan extensional D_2 deformation event in the OMZ. The syntectonic nature of the Vale de Maceiras pluton is attested to by the orientation of intrusive contacts, magmatic foliation and the growth of contact metamorphic minerals in relation to the Variscan extensional D_2 foliation. The Campo Maior microdiorite, quartz-diorite and orthomigmatites are temporally linked to high-temperature mylonitic gneisses formed simultaneously with the Variscan extensional D_2 deformation event. The geochemical features of the Vale de Maceiras and Campo Maior mafic–intermediate rocks show an affinity with the sanukitoid series. This finding suggests that the observed geochemical variability, from tholeiitic to calc-alkaline and sanukitoid, in the Visean OMZ plutonic rocks (*c.* 349–335 Ma) may have been inherited from partially melted mantle domains that were previously contaminated by crustal melts during subduction.

Supplementary material: Microprobe analyses of mineral phases, whole-rock geochemistry for major and trace elements, and U–Pb geochronology data are available at https://doi.org/10.6084/m9.figshare.c.6243822

Recent petrological and geochronological studies of plutonic rocks have resulted in a better understanding of the evolution of Late Paleozoic synorogenic magmatism in SW Iberia (Castro 2019 and references therein). Topics that have received specific attention include subduction polarity, and the closure of oceanic basins during the collision between Gondwana and Laurussia (Martínez Catalán *et al.* 2007; Ribeiro *et al.* 2007; Simancas *et al.* 2009; Pereira *et al.* 2017 and references therein). Progress in the knowledge of magma sources has contributed to the plate-tectonic models for SW Iberia being gradually updated (Castro *et al.* 1996; Simancas *et al.* 2009; Lima *et al.* 2012; Cambeses *et al.* 2015; Jesus *et al.* 2016). In this regard, the origin and tectonic significance of Early Carboniferous magmatic activity provide clues to refine these plate-tectonic models (Rodríguez *et al.* 2022).

In palaeogeographical reconstructions of the Late Paleozoic, Iberia is placed at the centre of the Pangaea supercontinent as part of the west European Variscan belt, and hosts the suture zone that resulted from the closure of the Rheic Ocean as Laurussia and Gondwana collided (Matte 1991; Quesada *et al.* 1994; Ribeiro *et al.* 2007; Simancas *et al.* 2009; Martínez Catalán *et al.* 2021) (Fig. 1a). In SW Iberia, the Late Paleozoic suture zone is defined along the boundary between the South Portuguese and Pulo do Lobo zones (SPZ and PLZ, respectively; Laurussia) and the Ossa–Morena Zone (OMZ; Gondwana) (Pereira *et al.* 2017 and references therein) (Fig. 1b). The Beja-Acebuches ophiolitic unit, which is located along the southern boundary of the OMZ, has been considered to trace the Rheic suture zone in this part of the Variscan belt (Quesada *et al.* 1994). However, the tectonic significance of the Beja-Acebuches

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