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Carboniferous magmatism in the Evora Massif (southwest Portugal, Ossa-Morena Zone): from typical arc calc-alkaline to adakitic-like magmatism

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The Evora Massif is one of the subdivisions of western Ossa-Morena Zone. It is a dome-like structure mainly composed of Ediacaran, Cambrian and Ordovician country rocks, affected by medium- and high-grade metamorphism coeval with the emplacement of several mafic to felsic intrusive bodies. The last magmatic event recorded in this area (Carboniferous) consists of calc-alkaline volcanism and voluminous plutonism (mainly composed by tonalites, gabbros, diorites and late-orogenic granodiorites and granites) [1]. Detailed chemical and isotopic studies from Evora Massif plutons were performed in the last few years. Whole-rock chemical and isotopic data suggest that the Hospitais tonalite (HT), Alto de Sao Bento area (ASB) and Reguengos de Monsaraz pluton (RM) resulted from fractional crystallization of mantle-derived magmas followed by mixing with variable proportions of crustal melts [2-4]. U-Pb ID-TIMS data indicate an age of 337-335 for the RM [4].
The Pavia pluton is a multiphase granitic body constructed incrementally by the episodic emplacement of several batches of magma (at 328 Ma, ca. 324 Ma and 319-317 Ma) [5]. The main granitic phases range from tonalite to two-mica granite that contain rare surmicaceous and fine-grained enclaves, and granitic and amphibolitic xenoliths. On the other hand, they are cut by abundant rhyodacite porphyries, microgranites (s.l.) and pegmatite dikes, predominantly oriented NE-SW and NW-SE. Although each phase seems to represent a distinct batch of magma, whole-rock Sr-Nd isotopic data suggest a similar and fairly homogenous source for all the constituent phases. Initial $^{87}Sr/^{86}Sr$ varies between 0.70428 and 0.7058 and ϵ Ndt ranges from -3.4 to +0.4, pointing towards a mantle or juvenile crust origin. A higher variation is observed in whole-rock $\delta^{18}O$ (5.6-9.6 ‰), consistent with assimilation of crust. The PP was interpreted as the result of assimilation-fractional crystallization of a basaltic magma.
Substantial differences between the PP and the neighboring plutons are observed. First, the PP has the most primitive Sr-Nd isotopic signature; second, several chemical features (like high Na_2O [3.86-5.87 %], Sr [278-939 ppm] and Sr/Y [12.4-192.5], low Y [2.4-19.5 ppm] and K_2O/Na_2O [0.19-0.75], strongly fractionated REE patterns [LaCN/YbCN = 18-43] and lack of pronounced Eu anomaly) suggest that the PP is chemically distinct from typical calc-alkaline arc rocks and is more similar to Archean TTGs and modern adakites. Using the compositional criteria of [6], an evolution towards "slab-melts" compositions is observed within the PP, whereas the other Evora Massif plutons clearly represent "non-slab melts". Given their close spatial and temporal relation, we believe that the link between these granitic bodies deserves further investigation.

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