Ordovician metabasites from central Spain: geochronology, source nature and geodynamic setting

DAVID OREJANA[1], CARLOS VILLASECA[1,2] AND ENRIQUE MERINO-MARTÍNEZ[1]

[1]Dpto. Petrología y Geoquímica, Facultad de Ciencias Geológicas, Universidad Complutense de Madrid, 28040 Madrid.
dorejana@ucm.es; granito@ucm.es; enriqmer@geo.ucm.es
[2] Instituto de Geociencias IGEO (UCM, CSIC), 28040 Madrid.

The geochemical features and emplacement ages of magmatic rocks in basement terranes are essential data when interpreting their nature and the geodynamic context in which they were generated.

The metabasites from the Central Iberian Zone (Iberian Massif) are intrusive into pre-Arenig metasedimentary and metaigneous rocks of the Spanish Central System. They are mainly meta-gabbros and meta-diorites, with accompaning fractionated felsic terms. They exhibit a tholeiitic affinity and relatively high incompatible element contents, contrary to N–MORB magmas. Their heterogeneous trace element composition and Sr–Nd radiogenic ratios point to the involvement of two distinct mantle sources, both akin to an E-MORB component. The variable degree of isotopic depletion and the high trace element ratios (e.g., Th/Yb, Th/Ta and Ba/Nb), plotting towards compositional fields of the Continental Crust, are in agreement with recycling of crustal material in the mantle source.

The age of these basic intrusions, which has been estimated in the range 473–453 Ma (SHRIMP, U–Pb zircon ages), implies that this pre-Variscan basic magmatism is not coetaneous with the abundant Cambrian–Ordovician felsic peraluminous orthogneisses of the Central Iberian Zone (477–500 Ma) and that it is associated to a rifting context previous to the Rheic ocean opening.

The comparison of precise geochronology data of basic and felsic rocks from west European terranes, together with their geochemical affinity, evidence a heterogeneous evolution from late Ediacaran to middle Paleozoic in the northern margin of Gondwana. It can be highlighted that terranes located to the west (e.g., Armorican Massif, Saxo-Thuringian Zone) followed a more simple post-Cadomian tectonic evolution, reflected in the scarcity of magmatic manifestations from late Ordovician to the inception of the Variscan orogeny. On the contrary, those microterranes positioned more to the east (e.g. Central Iberian Zone, Alps) reflect a more complex evolution, with the succession of several extensional and compressive diachronous events along the NE Gondwana margin.