



Geochemical and isotopic (Sm–Nd) provenance of Ediacaran-Cambrian metasedimentary series from the Iberian Massif. Paleoreconstruction of the North Gondwana margin



José Manuel Fuenlabrada^{a,*}, Ricardo Arenas^b, Sonia Sánchez Martínez^b, Rubén Díez Fernández^c, Agustín P. Pieren^c, M. Francisco Pereira^d, Martim Chichorro^e, José B. Silva^f

^a Unidad de Geocronología (CAI de Ciencias de la Tierra y Arqueometría), Universidad Complutense de Madrid, 28040 Madrid, Spain

^b Departamento de Mineralogía y Petrología, Facultad de Geología, Universidad Complutense de Madrid, 28040 Madrid, Spain

^c Departamento de Geodinámica, Estratigrafía y Paleontología, Facultad de Geología, Universidad Complutense de Madrid, 28040 Madrid, Spain

^d ICT, Departamento de Geociências, Universidade de Évora, 7001-554 Évora, Portugal

^e GeoBioTec/Departamento de Ciências da Terra, Universidade Nova de Lisboa, Lisbon, Portugal

^f IDL/Departamento de Geologia, Faculdade de Ciências, Universidade de Lisboa, Lisbon, Portugal

ARTICLE INFO

Keywords:

Iberian Massif
Sm–Nd isotope geochemistry
Ediacaran–Cambrian metasedimentary series
Autochthonous domain and allochthonous units
Avalonian–Cadomian active margin
Gondwana paleogeography

ABSTRACT

The geochemical and isotopic (Sm–Nd) features of the Ediacaran–Cambrian siliciclastic series from the Central Iberian Zone and the Iberian Allochthonous Domains indicate a significant paleogeographic change at the northern margin of Gondwana, associated with the development of the Avalonian–Cadomian arc. During the Neoproterozoic, the opening of a peri-Gondwanan back-arc basin and its subsequent widening during the Cambrian led to a progressive separation of the sedimentary basins from the main focus of the probably waning Cadomian magmatic arc activity. This work presents a paleogeographic reconstruction of the distribution of the Iberian terranes along the North Gondwanan margin during Ediacaran and Cambrian times, based on the geochemical and Nd-isotope data from the Iberian Allochthonous and Autochthonous Domains. These results suggest a location close to the West Africa Craton for both the allochthonous and autochthonous terranes, but they would be distributed laterally along the northern margin of Gondwana, occupying arc- or continental-ward positions within a wide back-arc basin. In this context, the peri-Gondwanan volcanic arc acted as the main supplier of the abundant juvenile material, as reflected in positive values of ϵ_{Nd} and young TDM model ages (720–1215 Ma) of the Middle Cambrian siliciclastic series from NW Iberia Upper Allochthonous Units. On the other hand, the rather equivalent geochemical and isotopic features of the sedimentary series of the NW and SW Iberia Basal Allochthonous Units suggest a common paleolocation for those series, yet within the back-arc basin but closer to the mainland and older isotope sources. The sedimentary series of these terranes present the oldest TDM ages (1499–2156 Ma), clearly greater than the TDM ages that characterize coeval sedimentary series of the Iberian Autochthonous Domain (1256–1334 Ma). This finding allows us to place Iberian Basal Allochthonous Units very close to the West Africa Craton, from where they received a dominant contribution of old crustal materials, whereas the Iberian Autochthonous Domain occupied a more eastern paleoposition closer to the Sahara Metacraton.

1. Introduction

Synorogenic sedimentary series contain petrographic, geochemical and isotopic information fundamental to discussing provenance and paleogeography of terranes involved in orogenic events (Dickinson and

Suczek, 1979; Bhatia, 1983; Floyd and Leveridge, 1987; Johnsson, 1993). Particularly, siliciclastic sequences furnish valid information about source areas and their geodynamic setting (Dickinson et al., 1983; Bhatia and Crook, 1986; McLennan et al., 1993; Floyd et al., 1991), being the mirror of the tectonic setting of the sedimentary

* Corresponding author at: Facultad de Geología, Unidad de Geocronología (CAI de Ciencias de la Tierra y Arqueometría), Universidad Complutense de Madrid, Calle José Antonio Novais, 12, 28040 Madrid, Spain.

E-mail addresses: jmfuenla@ucm.es (J.M. Fuenlabrada), rarenas@ucm.es (R. Arenas), s.sanchez@geo.ucm.es (S. Sánchez Martínez), rudiez@ucm.es (R. Díez Fernández), apieren@ucm.es (A.P. Pieren), mpereira@uevora.pt (M.F. Pereira), ma.chichorro@fct.unl.pt (M. Chichorro), jbrandao@fc.ul.pt (J.B. Silva).

<https://doi.org/10.1016/j.earscirev.2019.103079>

Received 25 July 2019; Received in revised form 17 December 2019; Accepted 28 December 2019

Available online 31 December 2019

0012-8252/ © 2019 Elsevier B.V. All rights reserved.