Precambrian Research 397 (2023) 107185

Contents lists available at ScienceDirect

Precambrian Research

journal homepage: www.elsevier.com/locate/precamres

Variability in the sources of North Gondwana Cadomian basins tracked by Nd isotopic systematics (Iberian Massif)

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ARTICLE INFO

Keywords:
Ediacaran-Early Cambrian *peri*-Gondwanan basins
Siliciclastic rocks
Nd isotopic geochemistry
Cadomian orogeny
Variscan terranes
Iberian Massif

ABSTRACT

The Cadomian Orogeny encompassed the opening and closure of oceanic domains and associated sedimentary basins in the northern margin of Gondwana from Ediacaran to Early Cambrian time. In the Iberian Massif, these Cadomian basins are included in autochthonous and allochthonous (far-travelled) terranes of the Variscan Orogen. A compilation of Nd isotope information of Ediacaran-Lower Cambrian siliciclastic series supports previous proposal for variability in the sources along the North Gondwanan margin that continued during the Early Paleozoic. Older T_{DM} model ages ranging from 1361 to 2357 Ma of the Variscan allochthonous Ediacaran-Lower Cambrian siliciclastic series indicate proximity to Archean and Paleoproterozoic old crustal sources of the West African Craton and represent deposition on a western Cadomian basin. In turn, the autochthonous Ediacaran-Lower Cambrian siliciclastic series show relatively younger T_{DM} values ranging from 1179 to 2114 Ma, suggesting derivation from more juvenile magmatic rocks that are well represented further east. The Ediacaran-Lower Cambrian siliciclastic series of the autochthonous terranes formed in an eastern Cadomian basin located near the Sahara Metacraton, the Trans-Saharan Orogen and the Tuareg and Arabian-Nubian shields.

1. Introduction

Widespread consensus exists on the role that geochemical tools play in addressing geological conundrums currently found in day-to-day research (Fernández-Suárez et al., 2021 and references therein). Application of geochemical, isotopic and geochronological data to accomplish paleo-reconstructions has led to a significant progress in understanding the geodynamic evolution of Neoproterozoic to Early Paleozoic sedimentary basins from North Gondwana (e.g. Fernández-Suárez et al., 2000; Bea et al., 2010; Pereira et al., 2012; Meinhold et al., 2013; Hajná et al., 2018; Avigad et al., 2022; Arenas et al., 2016, 2018, In press). Studies on provenance of Neoproterozoic to Early Paleozoic sedimentary series have provided constant advance in paleogeographic reconstruction models for the Cadomian orogeny (e.g. Avigad et al., 2012; Fernández-Suárez et al., 2014; Linnemann et al., 2014; Abbo et al., 2015; Pereira, 2015; Cambeses et al., 2017; Stephan et al., 2019; Fuenlabrada et al., 2020). Isotopic geochemistry and zircon-based dating studies (e.g. Linnemann and Romer, 2002; Fernández-Suárez et al., 2003; Pereira et al., 2006; Díez Fernández et al., 2010; Díez Fernández et al., 2012a; Accotto et al., 2022; Lains Amaral et al., 2022; Padel et al., 2022) have contributed decisively to improving knowledge on the Cadomian orogenic events, developed in Neoproterozoic-Early Cambrian times, recognized in the European section of the North Gondwanan margin. The Neoproterozoic- Early Cambrian rocks were later involved in the processes related to the assembly of Pangea, becoming pieces of the Variscan orogen and conforming to a variety of terranes (e.g. Díez Fernández et al., 2013; Albert et al., 2015; Avigad et al., 2018; Hajná et al., 2018; Linnemann et al., 2008; Linnemann et al., 2014; Fuenlabrada et al., 2020). Understanding the initial location of the Variscan terranes at the North Gondwana margin during Ediacaran and Early Cambrian times, provided crucial information to interpret the architecture of the Variscan orogenic belt (Matte, 1986; Matte, 1991; Kroner and Romer, 2013; Arenas et al., 2014; Díez Fernández et al., 2016; Casas and Murphy, 2018 and references therein). Tectonic,

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https://doi.org/10.1016/j.precamres.2023.107185
Received 6 August 2023; Received in revised form 10 September 2023; Accepted 11 September 2023
Available online 17 September 2023