



North-Gondwana assembly, break-up and paleogeography: U–Pb isotope evidence from detrital and igneous zircons of Ediacaran and Cambrian rocks of SW Iberia

M.F. Pereira ^{a,*}, A.R. Solá ^b, M. Chichorro ^c, L. Lopes ^d, A. Gerdes ^e, J.B. Silva ^f

^a IDL, Departamento de Geociências, Universidade de Évora, Portugal

^b LNEG, Unidade de Geologia e Cartografia Geológica, Portugal

^c CiCEGE, Departamento de Ciências da Terra, Universidade Nova de Lisboa, Portugal

^d CGE, Departamento de Geociências, Universidade de Évora, Portugal

^e Institut für Geowissenschaften Mineralogie, Frankfurt am Main, Germany

^f IDL, Departamento de Geologia, Universidade de Lisboa, Portugal

ARTICLE INFO

Article history:

Received 2 November 2011

Received in revised form 23 January 2012

Accepted 4 February 2012

Available online 24 February 2012

Handling Editor: G. Zhao

Keywords:

Zircon geochronology

LA-ICPMS

Pan-African and Cadomian orogenies

Neoproterozoic back-arc basins

Cambrian ensialic basins

ABSTRACT

The Estremoz Anticline in the Ossa-Morena Zone (SW Iberia) includes upper Ediacaran detrital rocks unconformably overlain by lower Cambrian detrital and carbonate rocks. The spectra of detrital zircon U–Pb ages dominated by Cryogenian and Ediacaran ages (with a typical gap in Mesoproterozoic ages) of the upper Ediacaran greywackes and lower Cambrian arkosic sandstones indicate provenance from sources placed near or at the North-Gondwana margin. These late Ediacaran and early Cambrian basins developed in a paleoposition close to the West African Craton and related to a long-lived Neoproterozoic magmatism (c. 850–700 Ma – Pan-African suture; c. 700–635 Ma – early Cadomian arc; and c. 635–545 Ma – late Cadomian arc).

The rhyolites of the Volcanic–Sedimentary Complex of Estremoz whose stratigraphic position so far has been a controversy, yielded an upper Cambrian age (Furongian) at about 499 Ma indicating that carbonate production was episodic in SW Iberia during the Cambrian. This new evidence should be taken into account in the reshaping of paleogeographic reconstruction models that have erroneously insisted on placing Iberia at southerly cold water higher latitudes (>60°S) during the Furongian.

© 2012 International Association for Gondwana Research. Published by Elsevier B.V. All rights reserved.

1. Introduction

SW Iberia includes the westernmost exposures of Neoproterozoic and Cambrian sedimentary rocks of the European Variscan belt, a major orogenic system formed during the Carboniferous as result of the Pangaea assembly (Franke, 1989; Matte, 2001) (Fig. 1). In SW Iberia, the Neoproterozoic–Cambrian record is exposed in different tectono-stratigraphic zones (Julivert, 1987; Franke, 1989): in SW Central Iberian Zone and in the Ossa-Morena Zone. The Neoproterozoic and Cambrian stratigraphy of the Ossa-Morena Zone (SW Iberia) records the assembly and break-up processes at the North-Gondwana margin (Quesada et al., 1991; Eguíluz et al., 2000; Sánchez-García et al., 2003, 2008, 2010; Pereira et al., 2006, 2011, 2012). The Neoproterozoic rocks of the Ossa-Morena Zone were partly emerged in the early Cambrian after the Cadomian collision and magmatic arc activity (Pereira and Quesada, 2006; Pereira et al., 2006). The subsequent break-up of the North-Gondwana margin was initiated by the onset of a Cambrian ensialic rifting. Cambrian rifting led to the opening of the Rheic Ocean during the Ordovician (Sánchez-García et al., 2003;

Murphy et al., 2006; Linnemann et al., 2008; Nance et al., 2010). The Cambrian basins include fluvial, deltaic and shallow-marine platform detrital and carbonate sequences with peri-Gondwana trilobites (Liñán et al., 1993; Álvaro and Clausen, 2005), interbedded with felsic and basic volcanic rocks (Sánchez-García et al., 2003, 2008, 2010). Cambrian rifting was responsible for block faulting and tilting of the Cadomian basement, which was extensively eroded and contributed to feeding the Cambrian basins (Linnemann et al., 2008; Pereira et al., 2011).

Recent studies based on U–Pb geochronology of detrital/inherited and igneous zircons from sedimentary and igneous rocks of the Ossa-Morena Zone have reinforced that SW Iberia reflects the geodynamic evolution of the North-Gondwana margin during the late Ediacaran to early Cambrian times (Chichorro et al., 2008; Linnemann et al., 2008; Pereira et al., 2008, 2011; Sánchez-García et al., 2008; Solá et al., 2008). In this work we present new U–Pb dating of zircons of the stratigraphic sequences of the Estremoz Anticline that is a major Variscan structure of the Ossa-Morena Zone (Portugal) (Fig. 1). The stratigraphic position of sedimentary and volcanic rocks exposed in the Estremoz Anticline has been a matter of debate, either due to the scarcity of fossils or due to the complexity of the regional tectonics (e.g., Piçarra and Le Menn, 1994; Araújo et al., 2006). The data obtained allow us to discuss: 1) the different ages assigned to

* Corresponding author.

E-mail address: mpereira@uevora.pt (M.F. Pereira).