Geological Magazine

www.cambridge.org/geo

Original Article

Cite this article: Gama C, Pereira MF, Crowley QG, Dias da Silva Í, and Silva JB. Detrital zircon provenance of Triassic sandstone of the Algarve Basin (SW Iberia): evidence of Gondwanan- and Laurussian-type sources of sediment. *Geological Magazine* https://doi.org/10.1017/S0016756820000370

Received: 2 October 2019
Revised: 6 February 2020
Accepted: 8 April 2020

Keywords:
U–Pb geochronology; detrital zircon; Triassic sandstone; Algarve Basin; Palaeozoic terrane; sediment source; Pangaea palaeogeographic reconstruction

Author for correspondence:
M Francisco Pereira,
Email: mpereira@uevora.pt

CAMBRIDGE UNIVERSITY PRESS

Detrital zircon provenance of Triassic sandstone of the Algarve Basin (SW Iberia): evidence of Gondwanan- and Laurussian-type sources of sediment

Cristina Gama[1], M Francisco Pereira[1], Quentin G Crowley[2], Ícaro Dias da Silva[3] and J Brandão Silva[4]

[1]Instituto de Ciências da Terra, Departamento de Geociências, Escola de Ciências e Tecnologia, Universidade de Évora, Portugal; [2]Department of Geology, School of Natural Sciences, Trinity College, Dublin 2, Ireland; [3]Instituto D. Luiz, Departamento de Geologia, Faculdade de Ciências da Universidade de Lisboa, Portugal and [4]Instituto D. Luiz, Departamento de Geologia, Faculdade de Ciências da Universidade de Lisboa, Portugal

Abstract

Detrital zircon populations from six samples of upper Triassic sandstone (Algarve Basin) were analysed, yielding mostly Precambrian ages. zircon age populations of the Triassic sandstone sampled from the western and central sectors of the basin are distinct, suggesting local recycling and/or lateral changes in their sources. Our findings and the available detrital zircon ages from the Palaeozoic terranes of SW Iberia, Nova Scotia and NW Morocco were jointly examined using the Kolmogorov–Smirnov test and multidimensional scaling diagrams. The obtained results enable direct discrimination of competing Laurussian-type and Gondwanan-type sediment sources, involving recycling and mixing relationships. The detrital zircon populations of the Algarve Triassic sandstone are very different from those of the lower–upper Carboniferous Mértola and Mira formations (South Portuguese Zone), upper Devonian – lower Carboniferous Horta da Torre, Represa and Santa Iria formations (Pulo do Lobo Zone), and the late Carboniferous Santa Susana and early Permian Viar basins, which are ruled out as potential sources. The detrital zircon populations of Triassic sandstone from the central sector and those from the Ossa–Morena Zone Ediacaran–Cambrian siliciclastic rocks, upper Devonian – Carboniferous Ronquillo, Tercenas, Phyllite-Quartzite and Brejeira formations (South Portuguese Zone), and Frasnian siliciclastic rocks of the Pulo do Lobo Zone are not statistically distinguishable. Thus, sedimentation in the central sector was influenced by Gondwanan- and Laurussian-type putative sources exposed in SW Iberia, in contrast to the western sector, where Meguma Terrane and Sehoul Block Cambrian siliciclastic rocks allegedly constituted the main (Laurussian-type) sources. These findings provide insights into the denudation of distinctive source terranes distributed along the late Palaeozoic suture zone that juxtaposed the Laurussian and Gondwanan margins.

1. Introduction

The petrography and geochemistry of siliciclastic rocks has widely been used to identify different sources, providing reliable information about provenance. In regions where information on the source of sediments and the occurrence of sediment recycling is difficult to evaluate using petrography and geochemistry, detrital zircon U–Pb geochronology may provide a useful means for testing potential sources (Andersen, 2005; Gehrels *et al.* 2011). Zircon grains found in siliciclastic rocks may derive directly from primary sources and/or represent recycled material from intermediate sediment repositories (Pereira *et al.* 2016*a*,*b*) associated with multiple sedimentary cycles (Morton *et al.* 2008; Thomas, 2011). Detrital zircon U–Pb ages are hence critically important to the process of creating a geological historical profile of sedimentary basins and their surrounding (local) and remote (external) source regions (Fedo *et al.* 2003). Often such a relationship is not readily recognizable because sources may have been displaced or separated, with a distance of hundreds of kilometres between them, as a result of the movement of the lithospheric plates.

Following the complex process of the formation of Pangaea as a result of the collision between Laurussia and Gondwana that led to the juxtaposition of distinct Palaeozoic terranes, both basements experienced uplift and erosion. As debris derives from different sources it is very likely that contrasting zircon age populations are recognizable in the Triassic basins formed during the first stages of the fragmentation of this supercontinent, where they were deposited. Mixed provenance may also be a significant phenomenon depending on the complexity of the dispersal paths connecting sources to the basins. According to palaeogeographic maps showing