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Tracing the geodynamic evolution of the North Gondwana margin using detrital-zircon geochronology of Pliocene–Pleistocene sand from SW Iberia

L. Albardeiro¹, M.F. Pereira¹, C. Gama²,
M. Chichorro³, M. Hofmann⁴ and U. Linnemann⁴

¹*Instituto D. Luiz, Departamento de Geociências ECT, Universidade de Évora, Portugal*

²*Centro de Geofísica de Évora, Departamento de Geociências ECT, Universidade de Évora, Portugal*

³*Centro de Investigação em Ciência e Engenharia Geológica, Universidade Nova de Lisboa, Portugal*

⁴*Senckenberg Naturhistorische Sammlungen Dresden, Museum für Mineralogie und Geologie, Germany*

Pliocene–Pleistocene sand of the Alvalade basin was sampled from the sea-cliffs of SW Iberia close to Cape Sines for a provenance study using LA-ICPMS U–Pb dating of detrital zircons. The results are used to compare age distributions and to trace potential source areas based on existing knowledge of zircon-forming events in the pre-Cenozoic basement of SW Iberia. The 492 U–Pb ages obtained span a wide interval ranging from Cretaceous to Archean, with predominance of Paleozoic (31–71%; mainly Carboniferous), Neoproterozoic (19–20%; mainly Cryogenian–Ediacaran) and Cretaceous (21–39%). Two important features were noted: i) Carboniferous ages younger than ~ 315 Ma infrequent or absent in SW Iberia, and ii) Cretaceous ages are interpreted to indicate a Sines massif provenance. The data obtained confirm previous studies that indicate a sediment source in the Paleozoic basement of SW Iberia (Ossa-Morena and South Portuguese zones) but also suggest a more complex history of drainage than previously documented, involving other sources located to the north. The detrital zircons age populations also enable recognition of previously undocumented sources of Pliocene–Pleistocene sands and decipher their paleotectonic meaning: i) Neoproterozoic to Early Paleozoic meta-sedimentary and meta-igneous rocks of the Ossa-Morena and Central-Iberian zones formed in North Gondwana during the Cadomian orogeny and opening of the Rheic Ocean, and ii) Devonian to Carboniferous sedimentary and igneous rocks of the Ossa-Morena, Central Iberian, and South Portuguese zones formed when Gondwana and Laurussia collided (Variscan orogeny).