Zircon U–Pb geochronology of paragneisses and biotite granites from the SW Iberian Massif (Portugal): evidence for a palaeogeographical link between the Ossa–Morena Ediacaran basins and the West African craton

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Abstract: Sensitive high-resolution ion microprobe U–Th–Pb age determinations on detrital and inherited zircon from the Évora Massif (SW Iberian Massif, Portugal) provide direct evidence for the provenance of the Ossa–Morena Ediacaran basins (Série Negra) and a palaeogeographical link with the West African craton. Three samples of the Série Negra paragneisses contain large components of Cryogenian and Ediacaran (*c*. 700–540 Ma) detrital zircon, but have a marked lack of zircon of Mesoproterozoic (*c*. 1.8–0.9 Ga) age. Older inherited zircons are of Palaeoproterozoic (*c*. 2.4–1.8 Ga) and Archaean (*c*. 3.5–2.5 Ga) age. The same age pattern is also found in the Arraiolos biotite granite, which was formed by partial melting of the Série Negra and overlying Cambrian rocks. These results are consistent with substantial denudation of a continental region that supplied sediments to the Ediacaran Ossa–Morena basins during the final stages of the Cadomian–Avalonian orogeny (peri-Gondwanan margin with principal zircon-forming events at *c*. 575 Ma and *c*. 615 Ma). Combined with the detrital zircon ages reported for rocks of the same age from Portugal, Spain, Germany and Algeria, our data suggest that the sediment supply to the Ediacaran–Early Palaeozoic siliciclastic sequences preserved in all these peri-Gondwanan regions was similar. The lack of Grenvillian-aged (*c*. 1.1–0.9 Ga) zircon in the Ossa–Morena and Saxo-Thuringia Ediacaran sediments suggests that the sediment in these peri-Gondwanan basins was derived from the West African craton.

The sensitive high-resolution ion microprobe (SHRIMP) U–Th–Pb geochronology of detrital and inherited zircon grains in sedimentary and metasedimentary rocks is a technique that has proved very useful in constraining palaeogeographical reconstruction models for Neoproterozoic and Early Palaeozoic sedimentary basins of North Africa and Arabia (Williams *et al.* 2002; Avigad *et al.* 2003; Kolodner *et al.* 2006). The spectrum of ages and compositions of detrital and inherited zircons is not only an excellent indicator of sediment provenance, but also helps to identify the protoliths of high-grade rocks. These data provide direct information about igneous and metamorphic events in the continental crust of the source area, especially if the zircon grains are zoned as a result of multiple episodes of growth. A recent example of such a study in Europe is the work of Linnemann *et al.* (2004), who used SHRIMP data to deduce the provenance of Late Neoproterozoic and Early Palaeozoic sediments of the Saxo-Thuringia Zone (Germany). Those workers demonstrated how the integrated analysis of SHRIMP zircon U–Pb geochronology, cathodoluminescence (CL) imaging of zircon growth textures, and statistical assessment of SHRIMP data was invaluable in defining the provenance of such peri-Gondwanan sediments. They also found that the principal cratonic source of the sediments (the West African craton where Grenvillian (*c*. 1.1–0.9 Ga) zircon-forming events are rare or absent) did not change from the Late Neoproterozoic to the Palaeozoic, and therefore that the Saxo-Thuringia Zone must have remained with North Africa for a long period of geological time.

Recent studies in the SW Iberian Massif (Julivert *et al.* 1972) have produced new results from whole-rock geochemistry, Nd–Sr–Pb isotopic chemistry and radiometric dating of detrital zircons that help characterize the nature and provenance of the Neoproterozoic to Early Cambrian clastic sediments of the Ossa–Morena Zone (e.g. Nägler 1990; Beetsma 1995; Ordoñez-Casado 1998; Fernández-Suárez *et al.* 2002; Gutiérrez-Alonso *et al.* 2003; Pereira *et al.* 2006*a*). These

From: ENNIH, N. & LIÉGEOIS, J.-P. (eds) *The Boundaries of the West African Craton.* Geological Society, London, Special Publications, **297**, 385–408.
DOI: 10.1144/SP297.18 0305-8719/08/$15.00