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Ion Probe U-Pb dating of the Central Sakarya basement: a peri-Gondwana terrane cut by late Lower Carboniferous subduction/collision related granitic magmatism

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Our aim here is to better understand the age and tectonic history of crystalline basement units in the Sakarya Zone of N Turkey, north of the Neotethyan İzmir-Ankara-Erzincan Suture Zone, utilising field, petrographic and ion probe dating, the latter carried out at the University of Edinburgh. One of the largest basement units, Central Sakarya, is dominated by paragneisses and schists that are best exposed between Bilecik and Sarıcakaya, forming a belt ∼15 km wide x 100 km long. Smaller outcrops of this basement are exposed further north, for instance in the Geyve area. High-grade metamorphic basement is unconformably overlain by Lower Jurassic-Upper Cretaceous cover sediments of the Sakarya Zone and is in tectonic contact with the Late Palaeozoic-Early Mesozoic Karakaya Complex to the south. Ion-probe U-Pb dating of 89 detrital zircons, separated from one garnet micaschist sample, range from 551 Ma (Ediacaran) to 2738 Ma (Neoarchean). 85% of the ages are > 90 % concordant. Zircon populations cluster at ∼550-750 Ma (28 grains), ∼950-1050 Ma (27 grains) and ∼2000 Ma (5 grains), with smaller groupings at ∼800 Ma and ∼1850 Ma. The first, prominent population (Neoproterozoic) reflects derivation from a source area related to a Cadomian-Avalonian magmatic arc, likely to be associated with a Cadomian/NE African terrane rather than Baltica (Baltica is known to be magmatically inactive during this period), or Avalonia/Amazonia (in view of the absence of Mesoproterozoic ages in Avalonian-Amazonian terranes). The early Neoproterozoic ages (0.9-1 Ga) deviate significantly from the known age spectra of Cadomian terranes (i.e. Armorican Terrane Assemblage) and instead suggest derivation from an original part of NE Africa. The detrital zircon age spectrum of Cambrian-Ordovician sandstones deposited at the northern periphery of the Arabian-Nubian Shield (i.e. the Elat sandstone) is notably similar to that of the Sakarya basement. The Central Sakarya terrane may have rifted in the Early Palaeozoic, relatively early compared to other E Mediterranean inferred Minoan terranes (e.g. Menderes, Crete, Bitlis), and then accreted to the Eurasian margin, possibly in during Late Palaeozoic time. The Central Sakarya metamorphic basement is cut by a number of granitic intrusions (collectively termed the Söğüt Granite or Sarıcakaya Granite), three of which were dated in this study. Pink, alkali feldspar-rich granite (Küplü granite) yielded an age of 324.3 ±1.5 Ma. Grey, blastomylonitic biotite granite (Çaltı granite) is dated at 327.2 ± 1.9 Ma. Another granitic body with biotite and amphibole (Borçak granite) yielded a significantly younger age of 319.5 ± 1.1 Ma. Thus, late Early Carboniferous granitic magmatism in the Central Sakarya terrane could have persisted for ≥ 8 Ma, possibly related to subduction or collision of a Central Sakarya terrane with the Eurasian margin.

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