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Precise zircon dating identifies the threefold evolution of the Sinclair Supergroup of Namibia

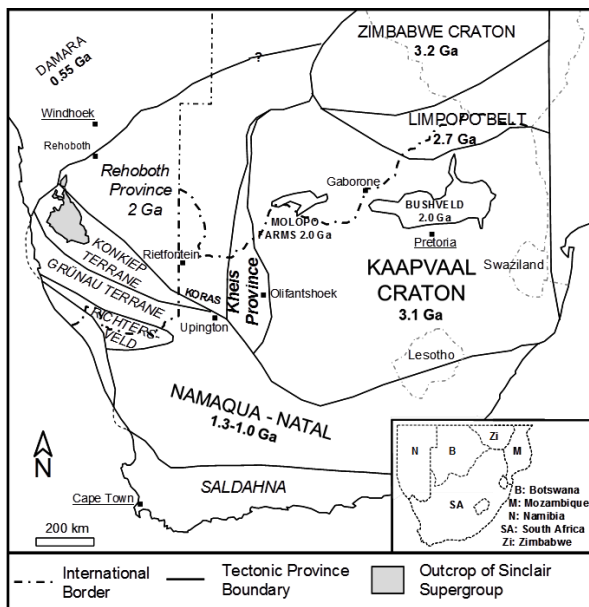
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The Sinclair Supergroup (Fig. 1) was mapped in detail by Watters [1] who defined several, largely undeformed formations and postulated the existence of a long-lived Mesoproterozoic Rehoboth Magmatic Arc. Our group, supported by a Swedish Research Links grant has sampled all the units (Fig. 2) and dated them using microbeam zircon U/Pb and Lu/Hf methods. Three well-defined magmatic episodes are now defined.



The 1369±10 Ma (2σ) Kumbis and 1363 ±11 Ma Nagatis felsic volcanics are the oldest units, but not comagmatic according to Hf isotope evidence. Together with the 1372±12 Ma Helmeringhausen gabbro, these may reflect an early Namaqua rift and drift event. The volcanic pile became thick enough to host the 1353±8 Ma Haremub Granite, the 1340±7 Ma Rooiberg Granite (previously placed at the top of stratigraphy) and 1334±4 Ma Nubib Granite. At least 50 Ma of exhumation and erosion took place before the Kunjas sandstone formed after 1304 Ma.

Fig. 1. Crustal framework of southern Africa showing the location of the Sinclair Supergroup.

A second phase of bimodal volcanism gave rise to the 1214 ±5 Ma Barby Formation, intruded by the 1217 ±3 Spes Bona Syenite (U-Pb on baddeleyite).

This suite reflects subduction of the adjacent Namaqua Ocean before terrane assembly by collision at about 1210 Ma, and represents a slimmed-down Rehoboth Magmatic Arc.

A third magmatic event some 100 Ma later is represented by the 1107 ±10 Ma Tumuab Granite Gneiss and a 1103 ±10 Ma bimodal dyke swarm, which reflects the post-tectonic Umkondo Plume event known from the Kaapvaal Craton [2]. The sedimentary Auborus formation was laid down after 1105 Ma.

Fig. 2. Sampling the Kunjas sandstone, overlain by Barby basal tuff on farm Vergenoeg, Namib desert.



The detrital zircon age spectra and zircon Lu-Hf data shows that the Konkiep Terrane, in which the Sinclair Supergroup developed originated as part of the Palaeoproterozoic Rehoboth Province. The provenance of sedimentary material was also largely the Rehoboth Province to the east, rather than the western ≈ 1200 Ma Namaqua collisional mountain belt.

References:

[1] Watters, B 1974. Prec. Res. Unit Univ. Cape Town. Bull. 16, 235pp.

[2] Hanson, R.E. et al., 2004. Science 304, 1126–1129.

[3] van Schijndel, V. et al., 2014. Precambrian Research 240, 22-36.

