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## Using Isotopic Techniques to Constrain the Tectonic Evolution the Basement of Oman



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The Arabian-Nubian Shield (ANS) preserves the Neoproterozoic coalescence of Gondwana on closure of the Mozambique Ocean which separated Neoproterozoic India from the continents that now form the core of Africa. Oman lies to the east of the ANS and despite being separated by ca. 1000 km of non-exposure across the Rub Al-Khali Basin, the isolated basement outcrop inliers appear similar to those found in west Arabia. Are the basement exposures in Oman an extension of the ANS or do they represent a completely different tectonic regime? The timing and nature of the accretion of Oman into the Arabian – Nubian Shield has continued to be problematic and the significance of the Neoproterozoic basement provides important information to unravel the Neoproterozoic tectonic geography of the region. Here we use U-Pb, Hf and other isotopic techniques to characterise these basement rocks and to further constrain 1) the timing and location of oceanic-crust subduction, and 2) whether or not the subduction zones consumed old continental crust or were the locus for formation of new continental crust.

Jebel Akhdar basement diamictites yield detrital zircon U-Pb ages between 794 - 767 Ma and are juvenile with time-corrected epsilon hafnium values ranging between +2.12 and +9.01. This suggests that these rocks are mantle-derived with little crustal input. Further south, granitoid basement windows in central Oman (Al Joba) yield U-Pb ages between 855 – 839 Ma. Metasedimentary sequences from Jebel Ja'alan have detrital zircon U/Pb ages ranging between ca. 2109 - 875 Ma and evidence for metamorphism at  $838 \pm 12$  Ma. These have a wide  $\epsilon\text{Hf}(t)$  range from +14.0 to -9.0, suggesting that these metasedimentary sequences are derived from juvenile mantle-derived rocks and pre-existing continental crust. A dominant Tonian-aged population exists in all samples, ranging from ca. 876 Ma to 928 Ma and the youngest zircon population at  $876 \pm 12$  Ma is used to provide a maximum depositional age. The Mirbat region in the south of Oman forms the largest basement outcrop in east Arabia. Plutonic rocks from this region yield U-Pb igneous crystallisation ages between 764 – 810 Ma, suggesting that this area formed after the northern Oman regions and may reflect progressive northward accretion of terranes to a north/east continent.

Collectively, from these data, we suggest that Oman experienced crustal growth from ca. 880 – 750 Ma via juvenile arc accretion, but with more northerly terranes positionally linked to a continent. The relatively early cessation of accretion here compared to the most eastern outcrops in the Arabian Nubian shield suggests that that this active Tonian margin of Neoproterozoic India transformed to a passive margin by Cryogenian times with consumption of the Mozambique Ocean switching to the

African margin. We address the timing of these various terranes and compare them to the magmatic record in the Seychelles, Rajasthan and from Pakistan.

