

Age and tectonic significance of Cryogenian magmatism on Socotra

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The Socotra archipelago (Yemen) sits in the Arabian Sea south of the Yemen/Oman border and east of northernmost Somalia. Prior to Miocene rifting, Socotra occupied a position adjacent to the Precambrian rocks of Oman, east of Marbat (Fournier *et al* 2007) - an area now devoid of basement exposure. Consequently Socotra potentially fills an important geological 'gap' for southern Oman. The age and geochemical signature(s) of Socotra's igneous rocks are important for defining their tectonic setting and establishing geological correlations.

Older calc-alkaline granitoids and granitic gneisses from Socotra are c. 860-800 Ma. The Hadibo granite, the youngest plutonism on the island, represents a gap in magmatic activity until c. 720 Ma. Inferred extrusive equivalents of this granite include effusive and pyroclastic volcanic rocks, as well as hypabyssal dikes and these were sampled for geochronological and geochemical analysis in order to constrain their tectonic setting and to assess tectonic reconstructions.

The extrusive sequence is dominated by high-silica rhyolites with low REE and HFSE concentrations. A flow-banded rhyolite within the sequence yields an age of c. 720 Ma, within error of the Hadibo granite age and likely correlative. Abundant disequilibrium textures in thin-section suggest mixing of discrete magma batches. Younger cross-cutting dikes are bimodal though their age is unconstrained.

An excellent agreement between our results and those from the Marbat region (Rantakokko *et al.*, 2014) indicate a strong correlation between the two areas. Furthermore, the basement of the Marbat region and Socotra have more in common with the older juvenile western arc terranes of the Arabian shield in Saudi Arabia than with the younger and more evolved eastern arc terranes of Saudi Arabia, or with the continental terranes exposed at the eastern margin of the ANS (Khida, Saudi Arabia and Yemen terranes). This suggests that this arc magmatism i) occurred along the opposing margin of the Mozambique Ocean, i.e.- along the East Gondwana margin, and ii) lasted for c. 50 Ma before transitioning into a post-tectonic/extensional regime, albeit poorly constrained to ≤ 720 Ma.