Misleading geochemical signature of rift-related magmas – a cautionary tale from the Neoproterozoic margin of the Congo–Kalahari Craton

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The *c.* 820–785 Ma syn-sedimentary igneous activity in the Coastal Terrane of the Kaoko Belt (NW Namibia), produced a bimodal volcanic suite, metamorphosed during the *c.* 650–630 Ma collision. The whole-rock geochemistry, including Sr–Nd isotopes, of the amphibolites reflects an origin from variously depleted sub-continental lithospheric mantle, overprinted by subduction fluids. However, the apparently arc-like enrichments in LILE (Cs, Rb, Ba, K), Th and U, over the HFSE (Nb, Ta ± Ti) do not reflect the real geotectonic setting of the magmatism. Its bimodal character and predominance of clastic sedimentation sourced in the Congo Craton is taken as an evidence that the Coastal Terrane formed shallow part of a developing back-arc or rift. The basaltic magmas interacted with crustal melts of immature, young arc-related metapsammites or orthogneisses (T^{Nd}_{DM} ~1.1–1.2 Ga) resembling those of the southerly Namaqua Belt (western edge of the Kalahari Craton); matching acid melts also formed the felsic end-member of the Bimodal suite.

The ongoing crustal stretching and sedimentation on top of the Congo Craton (Kaoko Belt) and the Namaqua Complex basement (Gariep Belt) was accompanied by *c.* **7**40–710 Ma tholeiitic/mildly alkaline syn-sedimentary volcanism, with no HFSE depletion. The geochemical variation allows for negligible, if any, crustal contamination or subduction fluids imprint. Both the within-plate geochemistry and geodynamic context of this igneous suite are thus in line with back-arc setting, remote from volcanic front, or a truly rift-related environment.

Taken together, the apparently arc-related LILE over HFSE enrichments analogous to those seen in the Bimodal suite of the Kaoko Belt can be inherited from crustal sources, and/or lithospheric mantle domains, that have retained subduction signature acquired in a previous tectonic environment. In particular, the subduction-like chemistry of felsic igneous rocks may reflect the composition of the pre-existing, arc-related crustal sources, recycled, perhaps repeatedly, over the history of the given geological unit.

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