Evolution of Late Archean HFSE-enriched igneous rocks of the Gindalbie Domain, Eastern Yilgarn Craton, Western Australia

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High-field-strength-element (HFSE) enriched igneous rocks overlie Late Archean (~2.69-2.68) tholeiite-komatiite and calc-alkaline successions in the Gindalbie Domain and are interpreted as rifting of the Kurnalpi Terrane (or similar) arc [1].

Geochemical studies of the dolerites, gabbros, basalts and felsic volcanic rocks identified two distinct geochemical groups; a group with LREE enrichment (the HFSE-enriched suite) and a group characterised by flat REE patterns (the tholeiitic suite).

Sm-Nd isotope analysis of the HFSE-enriched suite yields εNd-values of –0.59 to +1.55, indicating a less depleted source. This compares favourably to εNd of HFSE-enriched comagmatic suites in the Kurnalpi Terrane. The tholeiitic suite yielded εNd-values of +1.09 to +3.27, indicating a more depleted source, which also compares well to other isotopic studies in the eastern Yilgarn Craton. This switch from a depleted to a less depleted suite indicates enrichment of the source material for this region.

Geochemical and isotopic analysis suggest that the HFSE-enriched suite represents magmatism druing a period of renewed extension to produce bimodal basalts and rhyolites, as well as emplacement of dolerite and gabbro sills. The HFSE-enriched volcanic rocks are probably the result of melting of upwelling mantle, which has been enriched by a previous episode of subduction. The older tholeiitic rocks, on the otherhand, have come from a depleted mantle source.

The combination of different mafic-ultramafic and felsic sequences in the Kurnalpi Terrane was probably the result of mantle upwelling and extensional tectonics in an Archaean convergent margin environment, rather than a mantle plume event that would induce uplift.

References

[1] Cassidy, K.F., Champion, D.C., Krapez, B., Barley, M.E., Brown, S.J.A., Blewett, R.S., Groenewald, P.B., and Tyler, I.M. (2006) *GSWA Record* **2006/8,** 8p.