

# **Felsic volcanism in the eastern Yilgarn Craton: Evolution of a Late Archean convergent margin**

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Felsic volcanic and volcanogenic sedimentary rocks form significant components of Late Archean greenstone belts and comprise ~20% of outcropping greenstones in the eastern Yilgarn Craton. On the basis of trace element geochemistry, volcano-sedimentary facies, post 2.72 Ga felsic volcanic rocks in the Eastern Yilgarn have been divided into three associations.

1) Calc-alkaline andesite dominated complexes and associated sedimentary rocks characterise the Kurnalpi Terrane, and range in age between 2704 and 2716 Ma. Volcanic facies, and the geochemistry of intermediate lavas are similar to those in modern intra-arc settings, and imply a similar tectonic environment. The relatively large range in  $\epsilon\text{Nd}_T$  values for Kurnalpi Terrane andesites indicates contributions from either subduction-modified mantle and/or older arc basement. High MgO, Ni and Cr contents of basaltic andesites and andesites are consistent with derivation of parent magmas from a mantle source.

2) Bimodal and intermediate to felsic sub-alkaline volcanic successions, including the high field strength element (HFSE) enriched Melita complex, define a younger age range (2692–2676 Ma), within the Gindalbie domain. This association is interpreted to represent a late rifting phase of the Kurnalpi Terrane arc. Both mafic and felsic lavas have relatively high  $\epsilon\text{Nd}_T$  values, and rhyolites high zircon saturation temperatures ( $>800^\circ$ ), with no evidence of zircon inheritance, indicating that parent magmas were derived from subduction-modified mantle with minimal involvement of older crust, with rhyolites produced by ACF processes or melting of older arc crust.

3) A high-Na dacite dominated (TTD) association is characteristic of the Kalgoorlie Terrane. This association represents episodic volcanism between ~2710 and 2660 Ma. Andesites and dacites have a wide range of  $\epsilon\text{Nd}_T$  values, dacites have low zircon saturation temperatures (750 to  $800^\circ$ ), and both andesites and dacites contain inherited zircons. TTD suite volcanic rocks in the Kalgoorlie Terrane are most likely derived by hydrous melting of mafic-intermediate rocks (in the garnet stability field).

The composition, distribution, and age ranges defined by the post-2720 Ma associations are consistent with the evolution and accretion of several arc-related terranes within a convergent continental margin environment over a ~50 Myr period. Formation of continental crust in the Eastern Yilgarn during the Late Archaean involved both recycling of older crustal material as well as addition of new mantle-derived magmas.