# Origin of Archean late potassic granites: evidence from the Yilgarn and Pilbara Cratons

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Late potassic granites are a characteristic feature of many Archean cratons, including the Yilgarn and Pilbara Cratons in Western Australia. In the Yilgarn Craton, these 'low Ca' granites comprise over 20 percent by area of the exposed craton, are distributed throughout the entire craton and intruded at c. 2655–2620 Ma, with no evidence for significant diachroneity at the craton scale. In the Pilbara Craton, similar granites are concentrated in the East Pilbara Terrane, have ages of c. 2890–2850 Ma and truncate domain boundaries.

Late potassic granites are dominantly biotite granites but include two mica granites. They are 'crustally derived' with high $K_2O/Na_2O$, high LILE, LREE, U, Th, variable Y and low CaO, Sr contents. They likely represent dehydration melting of older LILE-rich tonalitic rocks at low to moderate pressures. High HFSE contents suggest high temperature melting, consistent with a water-poor source.

Models for their genesis must take into account that: 1. the timing of late potassic granites shows no relationship with earlier transitional-TTG plutonism; 2. there is no relationship to crustal age, with emplacement ranging from c. 100 m.y. (eastern Yilgarn) to c. 800 m.y. (eastern Pilbara) after initial crust formation; 3. the emplacement of late granites reflects a change in tectonic environment, from melting of thickened crust and/or slab for earlier TTG magmatism to melting at higher crustal levels; 4. at least in the Yilgarn, the late potassic granites were contemporaneous with mid-crustal high-grade metamorphism.

Two models have been invoked for late potassic granites: melting driven by thermal influx following lithospheric delamination; and decompression melting resulting from orogenic collapse. There is no geophysical evidence for underplated or intraplated mafic magmas, typically invoked to provide extra-crustal heat, in either the Pilbara or Yilgarn. There is clearly older lithospheric mantle below the eastern Pilbara and central Yilgarn, making it difficult to invoke delamination prior to later crustal melting. Orogenic collapse following crustal thickening may be more appropriate. The late granites are post major compression in both cratons, coincident with extensional deformation and contemporaneous with syenitic granites (eastern Yilgarn). A similar time interval between compression and generation of crustal granites is present for all the Yilgarn regardless of crustal history. Independent of either model was the transfer of heat-producing elements from the lower crust into the upper crust, effectively cratonizing each province.