Dating the stabilization of Archaean and Palaeoproterozoic cratons: Clues from the Kaapvaal (South African) and Southern São Francisco (Brazil) Cratons

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ABSTRACT: Establishing the timing and causes of great cratonization events as well as the subsequent evolution of such continents lead us to important answers about our past. It involves however the search for certain key features of the Earth´s plate tectonic regime in the best exposed and best preserved remnants of Archaean and Palaeoproterozoic crust. The South American and African continents are riddled with a number of continental blocks (or cratons) that have been shielded from mantle convection by thick roots of mantle lithosphere. A common feature to all these cratons is that they preserve Archaean crustal segments (or shields) that were formed between 3.5 and 2.5 billion years ago. These ancient shields were assembled into broad, continental-scale cratons via tectonic accretion and subsequent partial melting in the Palaeo- and Mesoproterozoic.

Stabilization of the Kaapvaal and Southern São Francisco cratons involved substantial fractionation of the lithosphere with large scale partial melting of the middle and lower crust. Compilations of U–Pb age and petrology data show that the continental crust of these cratons experienced massive intrusions of potassic (K-rich) granitoids into Archaean TTG and greenstone belt sequences. Such voluminous potassic magmatism marked a major turnover of the geological events that followed; primarily the events in the upper crust that were dominated by the deposition of a series of thick clastic and chemical sedimentary successions. For both cratons, the timing of potassic magmatism coincides of the major events of partial melting in the lower crust suggesting that deep crustal partial melting and subsequent transport and intrusion of these granites in the upper crust is a likely mechanism by which this segment of the crust attained buoyancy to survive recycling.