Crust-Mantle interaction and Archaean Granitoid heterogeneity from SW Bundelkhand Craton, India

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Crustal stabilization of Bundelkhand Craton, Central India began with the evolution of Paleo-Archaean TTG's (3.3 - 2.5 Ga) and got steadily reworked by the Neo-Archaean with the genesis of relatively undeformed & compositionally variable K-rich granites (2.57 - 2.52 Ga). This granitoid variability comprises our core topic.

Late Archaean was the time of extensive crustal growth and formation of varied plutonic rocks ranging from sanukitoids, Closepet type (source: enriched mantle) to intracrustal granites (Rapakivi and Monzogranites) (source: crustal). Chemically these are calc-alkaline, peraluminous, S-type granites (Exception: A-type Rapakivi Granite). Their U-Pb zircon ages show overlapping results and range in between 2.57 – 2.54 Ga and the Sm-Nd data comprises of highly negative ε_{Nd} values suggesting a longer crustal residence time.

We propose presence of melts rich in incompatible elements resulted in the partial melting of a lithologically varied crust and mantle approximately around the same time, causing the granitoids to be varied in nature, suggesting an age prior to c. 2.5 Ga for the explosion of geochemical diversity. The sanukitoid granodiorites probably formed by melting of an enriched mantle. The heat from mantle melting along with the heat of the fluid was competent enough to instigate melting at lower and middle crustal levels promoting genesis of Low-HREE Monzogranites and melting in the upper crust resulted in the genesis of Rapakivi Granites and High HREE Monzogranites. Thus the complex petrogenetic history of the granitoids indicates crust-mantle interaction for the genesis of Closepet granites and pure crustal melting for the genesis of intracrustal granites.