Geochemical and Isotopic constraints on the evolution of Archaean Rapakivi Granites from Bundelkhand Craton, India

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The Bundelkhand Craton began with the evolution of TTG's (3.3 to 2.5 Ga) in Paleo-Archaean which eventually paved the way for the genesis of relatively undeformed, compositionally variable K-rich granites (2.57 to 2.52 Ga) in the Neo-Archaean, among which (Rapakivi Granites) is the topic of our discussion.

Geochemically these granites are meta to peraluminous, exhibiting wide range of SiO_2 composition (60.54-73.43wt %), higher K_2O & HFSE, and lower MgO. They exhibit calc-alkaline affinity along with a within plate setting.Thin sections show plagioclase-mantled K-feldspar ovoids, rounded quartz megacrysts and euhedral plagioclase megacrysts in a more fine-grained granitic matrix (Rapakivi texture). The Chondrite normalized REE plot are highly fractionated, with a sharp negative Eu anomaly (Eu/Eu*=0.27).Whereas the multi-elemental plot suggests interaction between both mantle and crustal components in their genesis with negative anomalies for Nb & Ti suggesting fractionation of Ti-bearing phases. For the U-Pb Zircon age of this granites, 27 spots were analysed including cores and rims, out of which 16 spots give a concordant age of 2554±3 Ma.

Most of the rapakivi granites are associated with Proterozoic terrains with a few Archaean exceptions as we can see in a well preserved formation in Bundelkhand Craton. We propose partial melting of pre-existing continental crust would be capable in bringing the said geochemical composition. However, the origin of these rocks involve a complex set of petrogenetic processes and a theory to relate it to the crustal evolution pattern that happened during the Archaean-Proterozoic transition.