Role of TTGs in deciphering crustal evolution: a case study from the Aravalli – Bundelkhand protocontinent, India.

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Remnants of the earliest crust can be found mostly in the Archean tonalite-trondhjemite-granodiorite (TTG) suites which help in understanding the crustal evolution. We have carried out studies on TTG and K-rich granites of Bundelkhand and Aravalli craton to understand melting of what source, in which tectonic setting and how did melting of mafic source produced Archean TTG and the associated K-rich granites which constitutes a major volume of the Archean crust through detailed petrographic, geochemical, mineral chemical and geochronology.

Based on findings of our study we have concluded that (i) source of TTG melt can be variable but definitely has to be mafic composition (basalt / basaltic amphibolites / mafic eclogite), (ii) compositional variability of the source plus fluid present or absent reactions will control the crystallization of different assemblage of minerals in TTG rocks and hence will control the K-rich granite compositions as they are nothing but reworked TTGs, (iii) Tectonic setting invariably will be a Archean subduction zone, (iv) TTG magmatism need not necessarily be a single episode but more commonly it has to be episodic and will invariably be associated with K- rich granite/granitoids generation and (v) On a regional context (a) We have reported age of TTG rocks from Aravalli craton to be of 2.6 Ga (b) based on reported age, the TTG magmatism of Bundelkhand and Aravalli Craton are of different generations, and (c) also of different mafic source based on their varied mineral chemistry.