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Abstract

The Keonjhar siliciclastics in the Singhbhum craton, eastern India, represents one of the best preserved examples of Mesoarchean sedimentation. This PhD dissertation programme throws light on the depositional system and nature of Mesoarchean upper crust from a collective study of internal stratigraphic development, depositional settings and provenance. The succession is classified here as a formal lithostratigraphic unit of the rank of formation and named as Keonjhar Quartzite. Two members have been proposed, namely, the Asurkhol Member that forms the lower conglomerate-pebbly sandstone-coarser sandstone dominated part and a *lentil* of iron ore clast-bearing conglomerate at the upper part, namely, the Chamakpur Member. Facies analysis reveals that the lower part of the succession is dominated by mass-flow deposits of conglomerates from proximal subaerial fan which grades upwards to cross-stratified and wavy bedded mature arenites of shelf depositional setting. The sequence includes a LST with Incised Valley Fills from FSST followed by a TST and TST-HST.

Petrographic study depicts recycled orogen to craton interior provenance. SEM-CL fabric analysis of the quartz framework grains reveals predominance of plutonic quartz over metamorphic type and suggests that high-grade components from collisional geodynamics were not significant in the Paleo-Mesoarchean upper continental crust in the Singhbhum craton.

The superchondritic Hf isotopic compositions expressed as ϵ_{Hf} values against their stratigraphic ages from the detrital zircon LA-ICPMS U-Pb-Lu-Hf compositions suggest depleted mantle source and juvenile crustal components and possible onset of accretionary plate tectonics.

Uranium mineralization in the basal QPCs reveals U-concentration in the U-Ti oxides and indicates supergene mobilization of U. Geochemical proxies suggest a passive margin setting with cratonic as well as active margin components. The REE pattern with negative Eu-anomaly indicates the presence of differentiated upper crust suitable for the source of U-Th minerals for the U-QPCs.

The iron ore conglomerate yielded detrital zircon U-Pb ages of around 3.0 Ga. The hard ore clasts in the conglomerate suggest that the ore formation in the source terrain predated the deposition of the conglomerate and hence the primary iron ore genesis at the source from where the ore clasts were derived should be at least >3.0 Ga event.