

**Title: Provenance and palaeoclimate study of Palaeoproterozoic basal Gulcheru Formation of Cuddapah Basin, Andhra Pradesh, India**

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**Abstract:** The basal Paleoproterozoic Gulcheru Formation (30-200m thick) of Papaghni Group of rocks, Cuddapah Basin, India is composed of thin conglomerate and multi-storey thick quartzite with grey shales as interbeds from base to top. The entire succession sits on the Archaean gneiss with profound unconformity in the Eastern Dharwar Craton (EDC). The present work focuses on sedimentological and geochemical studies on the Palaeoproterozoic Gulcheru Formation, Papaghni Group belonging to Cuddapah Supergroup of the Papaghni Sub-basin of Proterozoic Cuddapah Basin, in an around Kanampalli (78°05'25.18" E, 14°25'13.60"N), Pendillimari (78°36'43" E, 14°24'55.2"N) and Gandhi (14°18'25.34" N, 78°28' 36.52" E) areas, Andhra Pradesh, India. Three stratigraphic sections, each from each aforesaid area are measured for sedimentological and geochemical studies. Eleven facies are identified from the studied sections as under: Facies A: Clast supported poorly sorted breccia; Facies B: Clast supported conglomerate; Facies C: Stacked couplets of clast supported conglomerate and sandstone; Facies D: Medium to coarse grained trough cross stratified sandstone; Facies E: Medium to coarse grained tabular cross-bedded sandstone; Facies F: Fine to medium grained ripple laminated sandstone; Facies G: Fine to medium grained tabular cross-bedded sandstone; Facies H: Fine to medium grained massive sandstone with coarse basal lag; Facies I: Fine grained planar laminated sandstone; Facies J: Fine to Medium grained trough cross-stratified sandstone; Facies K: Rhythmite. Facies associations along with associated sedimentary structures like ripple marks, cross-bedding, pin-stripe lamination, herringbone cross-strata, tidal bundles and double mud drape demonstrate that the Gulcheru Formation lithology is deposited in alluvial-fan, ephemeral braided stream, aeolian and low gradient tidal flat environment under extensional setting in semi-arid climatic set-up. Major oxides, trace and rare earth element (REE) elemental abundance gives significant information about (a) source rock including paleo-environment condition, (b) tectonic setting during deposition of sediments and (c) condition of deposition of the sediments. The high Chemical Index of Weathering (CIW) [average 97], Plagioclase Index of Alteration (PIA) [average 95] values of the Gulcheru shales suggest strong chemical weathering processes of the source rock. The  $Al_2O_3/TiO_2$ ,  $TiO_2/Ni$  ratio, LREE/HREE ratios with negative Eu anomaly and Cu/Zn, Ni/Co, U/Th and V/Cr ratio indicate a mixed felsic igneous provenance which seems to be derived from Dharwarian Granite Gneiss. The geochemical components of V, Cr, Ni, Co, U and Th strongly suggest that these clastic rocks are deposited in an oxic condition. The discrimination plot La-Th-Sc and Th-Sc-Zr/10 suggest that the Gulcheru clastic sediments are deposited in continental island arc setting during the process of amalgamation of supercontinent Columbia. Combined, it is concluded that Paleoproterozoic Gulcheru Formation, Cuddapah Basin reveals the saga of deposition of sediments in the Papaghni sub-basin taking place in fluvio-aeolian environmental condition with alluvial fan in the lower part and tidal-flat in the upper region. The clastic sediments having been eroded from mixed source rocks of granite, granodiorite and tonalite felsic igneous rocks of Eastern Dharwar Craton (EDC) of southern India during late Paleoproterozoic time are deposited in the Papaghni sub-basin when the process of amalgamation of supercontinent Columbia is taking place.

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