Vempalle Flows of the Cuddapah basin, Eastern Dharwar Craton, India: insights on Proterozoic magmatism

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Proterozoic magmatism of the Vempalle and Tadpatri Formations of Cuddapah basin is in the form of mafic flows and sills which are aligned in arcuate patterns parallel to the western margin of the basin. Six flows were identified based on primary volcanic structures. The flows are characterized by vesicular and amygdaloidal structures, columnar joints with minor epidotisation indicating subaerial nature of eruption. Flow morphology suggests that these are simple pahoehoe flows which are laterally extensive and traceable over long distances. Texturally, lath shaped plagioclase and prismatic clinopyroxene dominates in the phenocrystal phases and minor volcanic clast, glass and opaques occupy accessory phases exhibiting porphyritic, intersertal and intergranular texture. Geochemical characteristics suggest that these are tholeiitic with moderate Mg# (41-60), MgO (3.87-10.86 wt%), Zr (74-229 ppm) and Nb/Th (1.9-4.2) contents exhibiting moderately evolved nature which is attributed to fractional crystallisation and crustal contamination. They display pronounced LREE/HREE fractionation $(La/Yb)_N$ = 2.31-5.34) with negative Eu anomalies (Eu/Eu*= 0.27-0.96) reflecting the role of plagioclase fractionation. Negative K, Sr and Ti anomalies corroborate an intracontinental, rift-controlled tectonic regime for the genesis of the Vempalle flows. Lower Dy/Yb (1.36-1.82) and variable La/Yb ratios (3.21-7.44) suggests lower degrees of partial melting at spinel peridotite melting regime in an intracratonic rift setting.

Keywords: Vempalle flows, Cuddapah basin, sub-aerial eruption, intracontinental rift setting.