

Paleoproterozoic Variegated Tuffs of the Gwalior Basin, Central India: Insight into petrological, geochemical, depositional and zircon U-Pb isotope signatures

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The Paleoproterozoic Gwalior basin in the Bundelkhand Craton, Central India, exhibits a range of sedimentary units, such as quartzite, shales, and carbonates. Additionally, it preserves well-developed banded iron formations (BIFs) interbedded with tuffaceous shale units. Three different varieties of tuffaceous shales are found, viz., ash beds interbedded with BIF beds/laminae in the lower Sitla and Sithauli formations; lapilli tuffs interbedded with shales, and carbonates containing lapilli; and black tuffs interbedded with green fragile shale, from the Nayagaon Formation. The thin section study shows the presence of pumice fragments, glass shards, angular grains, and fiamme texture that are typical for tuffs. The major-oxide data shows that the average SiO₂, K₂O, and Na₂O contents of ash tuffs are 62.13, 2.31, and 0.11 wt %; for lapilli tuff, 64.27, 4.24, and 0.57 wt. %, and for black siliceous tuffs, 82.70, 1.97, and 0.72 wt. %, respectively. These tuffs are comparable to those described from other Proterozoic basins, such as the Cuddapah, Vindhyan, and Chhattisgarh basins of India and the Rooiberg Group of South Africa. A distinctly negative Nb anomaly is present in all three types of tuffaceous rocks, suggesting crustal contamination. The REE distribution patterns of tuffaceous rocks show LREE enrichment and a flat HREE. Available geochronological data suggest Pb-Pb ages of 1914±120 and 1866 ±250 Ma for limestones and BIFs, respectively (Absar et al., 2010). The zircon geochronology of the tuffaceous horizons can give precise depositional age constraints for these important Paleoproterozoic successions. The possibility that these BIFs of the Gwalior Basin may be coeval with the 1.88 Ga global reappearance of BIFs will be discussed.