

PROVENANCE OF BARA FORMATION, SOUTHERN INDUS BASIN, PAKISTAN

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Abstract

The Bara Formation at Bhit Nala Section (BHNS) deposited during Middle Paleocene in southern Indus basin is evaluated for its provenance based on petrography, major element geochemistry and heavy mineral analysis. Lithologically, the Bara Formation is mainly composed of sandstone which is interbedded with conglomeratic sandstone, siltstone, carbonaceous shale, and mudstone. The petrographic study reveals the fine to very coarse quartz grains along with subangular to subrounded grain shape and poor sorting. The feldspar and lithic fragments are in traces with abundant ferruginous cement and matrix. Based on modal analysis of Bara Formation sandstone it is dominantly Ferruginous Quartz Arenite and Ferruginous Quartz Wacke. Its sediments were originated mainly from craton interior along with the influence from recycled orogen setting. The Bara Formation sandstone is rich in silica, iron, calcium and aluminum while the other major elements are in low concentration. The plotting of major element geochemical data of CHNS (Carbon, Hydrogen, Nitrogen and Sulfur) on discriminatory diagrams show that the studied sediments were produced dominantly from passive margin (PM) along with few samples plot in Active continental margins (ACM) and in granitic/felsic provenance field. The intense chemical weathering is established by the high CIA (Chemical Index for Alteration) values. The heavy minerals of Bara Formation are in low concentration ranging from 0.1% to 1.4% with an average of 0.4%. The low ZTR (Zircon, Tourmaline and Rutile) index values of Bara Formation sediments exhibit cratonic provenance while the high concentration of ultra-stable heavy minerals shows intense chemical weathering. The Bara Formation sediments were dominantly produced at passive continental margin (PM) from cratonic rocks along with some influence from active continental margin. Its depositional site was situated close to the equatorial region, where chemical weathering was moderate to intense. Therefore, the sediments of Bara Formation were derived from Indian craton exposed in the south east of study area while the source of southern Indus basin sediments was located close to the equatorial region.