Influence of braided river bed morphology over concentration of geochemical constituents in river sediments: a case study of Ganga and Yamuna Rivers in and around Kait-Haridwar, Uttarakhand, India

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The clastic sediments and its aspect of provenance, weathering and erosion, tectonic setting, fluvial processes, paleoclimate and some other geological processes are better studied with the help of geochemical analysis. The changing geochemistry of sediment present in Himalayan river has been a great point of interest in sedimentary geochemistry because of its impact over Indian ocean chemistry and climate. In all Himalayan rivers, the Ganga and Yamuna Rivers are most important in global scenario due to their perennial nature, and peculiar flow and depositional characteristics. These two rivers had played important role in formation of Indo-Gangetic Plain during Quaternary period. Both the Ganga and Yamuna Rivers emerge from great Himalaya and carried the sediments from there to Bay of Bengal, India.

This causes sequential change in geochemistry of deposited sediments. The studied region is near by Mohand ridge and extend up to Balawali in Ganga River side and up to Kait in Yamuna River side. In this region rivers have high gradient channels and high flow speed condition. The channels are braided and have gravelly bed load. The converging channel system effects the geochemical constituent of river sediments.

The geochemical analysis of river bed sediments of both rivers by using XRF data analysis were carried out to find out the variation and effect of river bed morphology over geochemical constituents concentration. The prepared tectonic setting discriminant diagrams through plots log(K_2O/Na_2O) versus SiO_2 and [SiO_2/Al_2O_3] versus log(K_2O/Na_2O) indicate transitional tectonic setting from an active continental margin to a passive margin. The discriminant function plot indicates quartzose sedimentary provenance, and to some extent, the felsic igneous provenance, derived from weathered granite, gneissic terrain and/or from pre-existing sedimentary terrain. Further, by plotting SiO_2 versus other major elements plot reveals the changing concentration of major elements with respect to changing river bed morphology with 50-60 km length of both the rivers. In braided zone of river, there is sudden increase in SiO_2 concentration of river sediments. The gravels present in channel bed provide more resistance and tight pore spaces for flow of water which causes increase in abrasion phenomena. These vital change in geochemistry (which is from 65% to 81% for SiO_2 concentration) of sediments indicates about the major role play of...
braided zone gravel deposit. The changing bed morphology of river channel has vital effect on geochemical composition of deposited sediments.