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Chemical weathering in Himalaya: Insights from trace element geochemistry of the Ganges-Brahmaputra River sediments
Chemical weathering in Himalaya: Insights from trace element geochemistry of the Ganges-Brahmaputra River sediments

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The Ganges-Brahmaputra River drains a greater part of the Himalaya, including the western and eastern Himalayan syntaxis, a tectonically active region in the world. Rivers play a vital role in earth surface processes and are regarded as the key carrier of terrestrial materials into the ocean. Major and trace element analyses of the river sediments have been used to investigate their provenance, physical and chemical processes of silicate weathering.

The chemical index of alteration (CIA), chemical index of weathering (CIW), and elemental ratios (Ca/Ti, Na/Ti, Al/Ti, Al/Na, and Al/K) are sensitive to terrestrial chemical weathering intensities in sediment source area. SiO_2 in both rivers show a linear trends and marked negative correlation with grain size, suggesting quartz dilution, mineral sorting as well as compositional maturity during transportation of sediments in fluvial system. The distribution of Fe, Ti, Zr and Th is controlled by their association with heavy or coarse minerals, but Al is independent of hydrodynamic processes. Low CIA (˜62) and CIW (˜64) values in the river bed sediments are due to fresh detritus within the active channel or most likely favored physical over chemical weathering. High CIA, CIW with high Al/Ti and Al/Na ratio values in the river suspended sediments, suggesting a significant chemical weathering in its source rocks. Discriminant diagrams and trace element ratio plots show the influx of sediments were derived from felsic continental crust sources. Geochemical similarity between the Ganges-Brahmaputra River sediments and various lithologies of the High Himalayan Crystalline Series, Lesser Himalaya, Tibetan Himalayan batholiths and Siwalik sedimentary rocks in Nepal indicates homogenization of material derived from the Himalayan source region.
Keywords: Geochemistry, fluvial sediments, chemical weathering, Ganges-Brahmaputra River, Bangladesh