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Impact of chemical weathering and fluvial processes on the geochemical composition of sediments: insights from the Nethravati river, southwest coast of India

GUNDIGA PUTTOJIRAO GURUMURTHY[1] AND TRIPTI MUGULI[2]

[1]Birbal Sahni Institute of Palaeosciences
[2]Hydrological Investigations Division, National Institute of Hydrology, Roorkee 247667, India

Major, trace, and rare earth element (REE) geochemistry of sediments from a small tropical mountain river is investigated to understand the behaviour of chemical elements during weathering and transportation in a Peninsular Gneissic terrain. The geochemistry of major, minor and trace element composition of suspended particulate matter (SPM) and mud sediments (<63 µm) of Nethravati River indicate that sediments are derived from a relatively homogenous felsic to intermediate source rock, of tonalitic composition. The sediments experience intense chemical weathering in the source region. The elemental composition and their inter-element relationships suggest differential chemical weathering of mineral phases, and sorting of mafic (biotite mica) source and their secondary mineral products in SPM, and felsic source (K-feldspars and muscovite mica) and their secondary mineral products in mud sediments. Intense chemical weathering and hydraulic sorting (mineralogical and textural) induce significant geochemical split among the granulometric grades. Mafic to intermediate compositional bias in SPM, and intermediate to felsic compositional bias in mud sediments is observed. The transport of mafic-biased SPM from Peninsular India to Oceans, and the geochemical similarity among the Peninsular Gneiss and Deccan Basalt-derived sediments makes it challenging to track the Peninsular Gneiss-derived sediment provenance in the Indian Ocean using conventional elemental geochemistry. The inferences from this study have important implications for determining the sediment provenance along the continental margin of India. Therefore, careful geochemical and isotopic constraints are needed to decipher the sediment provenance in the Indian Ocean.