

Dissolved Nd in the Ganga river system and its flux to the Bay of Bengal

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Dissolved Nd concentration and isotopic composition has been measured in the Ganga river system, to examine the possibility of using Nd to trace silicate chemical erosion. ϵ_{Nd} of the Ganga is -11.5, -12.0 and -14.2 at Varanasi, Patna and Manihari (outflow) respectively in 2008. But in 2010, ϵ_{Nd} of the Ganga at the same places are found to be less radiogenic, -13.1, -13.9 and -15.3 respectively. The radiogenic ϵ_{Nd} in the Ganga in 2008 compared to 2010 could be due to its higher contribution from the peninsular rivers particularly the tributaries draining Deccan basalts through the Yamuna (-12). The data indicates the dominance of Higher Himalayan (~16) contribution to the dissolved Nd budget compared to the Lesser Himalaya (~25). Further, the importance of Deccan tributaries in contributing to the dissolved Nd budget has been observed, though its contribution indicates significant temporal variability.

Higher ϵ_{Nd} in dissolved phase compared to their respective particulates and higher dissolved Sm/Nd compared to known endmembers indicate fractionation of ϵ_{Nd} during weathering. Possibility of preferential dissolution of minerals with different Sm/Nd ratio has been examined. For this purpose, Nd isotope composition of dissolved phase has been compared to respective bedload/suspended sediments. The comparison shows that dissolved Nd is more radiogenic compared to the sediment. This difference could be due to preferential dissolution of apatite and higher contribution of dissolved Nd from the Deccan tributaries of the Yamuna in the Ganga mainstream downstream Allahabad. As these tributaries do not contribute significantly to the sediment, their higher dissolved Nd contribution could give rise to this difference. Fractionation of ϵ_{Nd} between dissolved and particulate phases restricts the application of dissolved Nd isotope composition in tracking the sources of silicate erosion. Nd flux of the Ganga to the Bay of Bengal has been estimated to be around 17000 to 34000 moles of Nd annually with ϵ_{Nd} value -14.5 ± 0.5 .

The dissolved Nd isotopic composition in the surface coastal BoB is 2 to 3 epsilon unit more radiogenic compared to the Ganga outflow. Possible reason could be contribution of more radiogenic Nd from the Brahmaputra other than estuarine processes. The deeper samples indicate desorption of Nd from the shelf sediments of the Ganga origin.