Controls on temporal variations in the dissolved $^{87}Sr/^{86}Sr$ of large rivers: Evidence from the Ganga and Brahmaputra

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The $^{87}Sr/^{86}Sr$ composition of dissolved Sr delivered by rivers to the ocean is the most important control of the mass balance of strontium in the ocean [1]. Despite the impressive reconstruction of the marine $^{87}Sr/^{86}Sr$ record spanning the last 850 Myrs, our understanding of high frequency variability of dissolved $^{87}Sr/^{86}Sr$ in large rivers is limited. To improve our understanding, water and sediment samples were collected weekly during monsoon and monthly during non-monsoon months of 2010-2011 from the Ganga and Brahmaputra rivers in Bangladesh. Water samples were collected midstream and filtered through 0.22 μm PES membranes. Discrete depth samples of suspended sediments were collected from surface, three and six meters water depth. These samples allow us characterize temporal vartiations in $^{87}Sr/^{86}Sr$ and investigate covariations in $^{87}Sr/^{86}Sr$ between the dissolved and suspended loads.

We observe that the dissolved $^{87}Sr/^{86}Sr$ for both rivers is much more variable during the monsoon than the non-monsoon period. For example, the dissolved $^{87}Sr/^{86}Sr$ of the Ganga River shifted from 0.73436 to 0.72089 within a week. Moreover, the $^{87}Sr/^{86}Sr$ of the dissolved and particulate loads are well correlated, with the particulate load being systematically more radiogenic. This observation is consistent with either 1) temporal variations in contributions from large tributaries characterized by contrasted $^{87}Sr/^{86}Sr$ and/or, 2) chemical weathering of suspended particulate matter (specifically carbonate minerals) during transport, that affects the dissolved $^{87}Sr/^{86}Sr$. In rivers draining a wide range of bedrocks and characterized by large isotope contrasts between the suspended and dissolved loads, such processes need to be considered to fully understand how the dissolved signature evolves from source to sink.

[1] Peucker-Ehrenbrink & Fiske (2019) *Chem. Geol.***510,** 140-165.