$^{87}Sr/^{86}Sr$ in the Ganga (Hooghly) River estuary, India: radiogenic vs. unradiogenic source of Sr

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The Ganga River system assumes global importance due to its high water and sediment discharge to the oceans. A comprehensive study was carried out by investigating the concentrations of major elements and Sr, and $^{87}Sr/^{86}Sr$ in the waters, coexisting suspended particulate matter (SPM) and the exchangeable phase of the SPM in the Ganga (Hooghly) River estuary, India. Our results are suggestive of estuarine sources of Sr that are characterized by contrasting $^{87}Sr/^{86}Sr$.

Data on the paired bulk-exchangeable phases of the SPM indicate the release of Sr to the estuary waters via ion-exchange such that the magnitude of loss of radiogenic Sr from the SPM is more at higher salinity. Available data also suggest the groundwater to be a source of radiogenic source of Sr to the estuary. However, the complementary increase in the dissolved $^{87}Sr/^{86}Sr$ that is expected due to Sr supply via ion-exchange and groundwater contribution is not evident. Such a discrepancy is inferred to be caused by the dissolution of the particulate carbonate phases, as evident from covariation trends of excess Sr with excess Ca and DIC. The process of dissolution of particulate carbonates had been documented earlier as an ongoing process in the estuary[1]. Thus, our results and observations point to the estuarine sources of Sr such that the release of unradiogenic Sr via dissolution of particulate carbonate phases counteracts the change in $^{87}Sr/^{86}Sr$ of estuary water that is driven by the contributions of Sr via ion-exchange and groundwater discharge.

Such results and inferences highlight the need for detailed studies to determine the impact of estuarine modulation on the marine mass balance of Sr and $^{87}Sr/^{86}Sr$.

References

1. Samanta et al. (2015): GCA 165, 226-248.