Nonconservative behaviour of dissolved Mo in tropical estuaries, westcoast of India

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The study presents the seasonal and inter-annual monitoring of molybdenum (Mo) distribution and variability in humid tropical riverine and estuarine systems (Nethravati, Gurupur and Mandovi estuary), west coast of India. The study was intended to understand the geochemical behaviour of Mo in the riverine and estuarine environment, and their ultimate discharge fluxes. The riverine flux of dissolved Mo (DMo) to the Nethravati and Gurupur estuary is 1.8x 10^3 mols yr^{-1} (4.88 mols day^{-1}) and 195 mols yr^{-1} (0.53 mols day-1) respectively, and the particulate Mo (PMo) flux to Nethravati estuary is 10.8 x 10^3 mol yr^{-1}. DMo in the riverine environment is being lost to particulates by reversible scavenging under oxidized acidic water. Assuming the linear relationship between silicate weathering flux and DMo, the adsorptive loss of DMo is estimated at 30-40% of total DMo. This has implications in marine DMo budgeting as the reversible scavenged oxidised particles (produced in the river) may release Mo on its entry to the sea.

In the lower salinity reaches of the studied estuaries, DMo is found to be sequestered during premonsoonal season. The DMo sequestration in the estuary is estimated at ~2mols day^{-1} in the Nethravati estuary and is about 1.9 mol day^{-1} in the Mandovi estuary. The DMo sequestration in the estuary is higher than the riverine supply, indicating the sequestration of both marine and river borne DMo. However, the mechanisms involved in the removal process are distinct in these estuaries viz oxidative adsorption process in the Nethravati-Gurupur estuary and biological utilization in the Mandovi estuary. At higher salinity (>20psu) region, there is a systematic gain in the DMo (~1 to 37nM L^{-1}). Mo release from river borne particulate Mo could contribute up to 3nM L^{-1} to 4nM L^{-1}, which is not sufficient to balance the observed Mo excess. On the other hand, the reductive Mo remobilization from bottom sediments (Mo=4 mg kg^{-1}) during sediment diagenesis and subsequent tidal activity could release up to 14 to 28 nM L^{-1} of DMo to the estuarine water. Mo release to water column is supported by the gradual enrichment of DMo with depth in the estuary. Therefore, diagenetic release of DMo could be the potential source of DMo excess in the estuary.