Chemical and Isotope Composition of Saline/alkaline Soils in the Ganga Plain and Impact of Their Dissolution on River Chemistry

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The objectives of this study are to characterise chemically and isotopically the saline/alkaline soils present in the Plain and Peninsular drainage of the Ganga and to assess their contribution to the riverine chemistry. Towards this, soil and water samples were collected from the Ganga plain during peak (August, 2008) and lean (February, 2009) flow. Major ions along with Si and $^{87}Sr/^{86}Sr$ are measured in the water soluble fractions of the soils and river water samples. Sodium carbonate/bicarbonate seems to be the dominant mineral in these soils with water soluble Na and HCO_3 ranging from 0.1 to 17% and 0.1 to 31%. The Sr isotopic ratios in water soluble fractions of the soils and waters flowing through them lie in same range (0.7208-0.7229). Figure 1 shows a mixing plot of $^{87}Sr/^{86}Sr$ vs Mg/Na of the river water measured in this study along with the known end members such as Himalayan silicates, carbonates and the Deccan Basalts contributing to the river chemistry in the plain. This figure shows that the Ganga headwater chemistry is mainly controlled by the dominating lithologies present in the basin, viz. silicates and carbonates. However, to explain the Sr isotopic composition and major ion data of the Ganga and its tributaries in the plain, a third end member is needed. From the data obtained so far, saline/alkaline soil can act as that additional end member. As the contribution of the saline/alkaline soils to the dissolved budget seems to be considerable, these Na-dominating soils can supply large amount of Na to the rivers and hence the earlier estimates of silicate erosion rate and associated CO_2 consumption rate based on dissolved Na [1] could be higher.

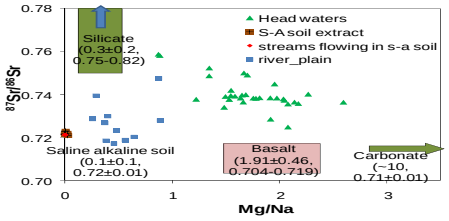

Figure 1. Mixing plot of $^{87}Sr/^{86}Sr$ vs Mg/Na

Keywords: Saline alkaline soil; Ganga Plain; silicate erosion; $^{87}Sr/^{86}Sr$

References

[1] A. Galy and C. France-Lanord, *Chem. Geo.***159**, 31-60 (1999).