Goldschmidt 2024 Abstract
https://doi.org/10.46247/gold2024.21906

Elemental flux of Hot springs to the river systems in the rain-fed and rain-shadow regions of the Western Himalayas

MS. KRIBINA PATHAK[1] AND SAMBUDDHA MISRA[2]

[1]Indian Institute of Science, Bangalore
[2]Indian Institute of Science
Presenting Author: kribinap@iisc.ac.in

Terrestrial hot springs are a recognized source of CO_2 in the atmosphere. Thus, quantifying the flux of hot-spring-derived inputs to the Himalayan River is crucial for the precise determination of regional silicate weathering rates. We will present the concentrations of alkali, alkaline earth, and transition metals from Himalayan hot spring samples for both fluid and sediment phases. We have quantified the impact of hot springs on rivers through the concentration and isotope ratio of metals.

River and hot-spring samples were collected from the Ganges and Indus River basins, in the Pre-monsoon season of 2023 and 2024. The chemistry of 55 river water samples and 16 Hot springs samples, along with the sediment chemistry of 40 samples will be presented. We observe a two-fold increase in Li and B concentration in the fluvial chemistry after the hot springs discharge into the river. Furthermore, the hot springs and their impact on the chemistry shall also be constrained in Li and Mg isotopes space.

Unlike their river counterparts, hot springs starkly differ in chemistry. Hot springs are characterized by 10-100-fold higher alkali metal concentrations compared to proximal rivers. Besides the elevated level of alkali metals, they are reported to have higher B, Si, Rb, Mn, and Sr. River water samples immediately downstream of hot springs are characterized by extremely high concentrations of major elements (alkali and alkaline earth). The influence of hot spring water in the Indus basin is observed to a greater degree, i.e., the main Indus River has an elevated alkali metal concentration. Na concentration in subsequent river-sampling points after the hot springs- has ascended to 1mg/L- in each segment. In Shyok, after the confluence of Nubra, Ca increased to 5 mg/L; meanwhile, Na rose to 10 mg/L. Before joining Nubra, Shyok has no reported hot springs. Hotsprings' influence on the rainfed Himalayan region is observed to have lesser influence than on the rain-shadow region.

Based on our quantifications of river we demonstrate that constraining silicate weathering without considering hot springs input will lead to an overestimation of silicate weathering.