

Hydrogeochemistry of Mahi River, India

SHAILJA SINGH¹, ANIRBAN DAS¹

¹Pandit Deendayal Petroleum University, Gujarat, India

shailja.jphd16@sot.pdpu.ac.in

anirban.das@spt.pdpu.ac.in

Geochemical studies on rivers provide important qualitative and quantitative insights/estimates into the chemical weathering and erosion processes occurring within a river basin. This study focusses on hydrogeochemistry of Mahi River, the third-major west flowing interstate-river of India and, which has potential to influence the chemistry of the Gulf of Khambhat. Water samples were collected in March-2018 and were analysed for basic physicochemical parameters and major ions. Water pH (8.6-9.5) was alkaline in nature, while EC ranged from 273-610 μScm^{-1} . On average, Na^+ constitutes (~37%; range: 23-55%) while (Ca^{+2} and Mg^{+2}) contribute (~62%; range: 44-76%) of the total cation charge (TZ^+ ; 2338-6058 μE). Amongst anions, on average basis, HCO_3 , Cl and SO_4 contribute to 70%, 20% and 9% of the total anion charge (TZ^- ; range: 2570-6368 μE). TZ^+ is reasonably well balanced ($\text{TZ}^- = 0.96 \times \text{TZ}^+ + 435$; $r^2 = 0.98$) with an indication of cation deficit/anion excess. Majority of water samples fall under Ca-Mg- HCO_3 type / and a few of Na- HCO_3 -Cl type. Gibbs diagrams exhibit strong rock weathering dominance in the region. Na/Cl (mol/mol) ranges from 1.3-2.2 indicative of Na derived from silicates. This is supported by the facts that (i) average Na^*/TZ^+ (μE ratio) ($\text{Na}^* = \text{Na} - \text{Cl}_e$) is 0.2 and, (ii) average $\text{HCO}_3/(\text{Ca} + \text{Mg})$ (μE ratio) is 1.25, signifying ~25% excess of HCO_3 over (Ca+Mg) has to be balanced (mostly) by Na, while K is low in water. $\delta^{13}\text{C}_{\text{DIC}}$ values (-3.8‰ to -8.6‰) suggest significant carbonate contribution to Ca & Mg while role of (bi-) carbonates to Na has to be scrutinized. Studies are underway to apportion sources (atmospheric, weathering and anthropogenic components) to arrive at quantitative estimates of their rates of weathering of the Mahi River Basin and associated CO_2 drawdown.

Keywords: Mahi River, Major Ions, Chemical Weathering, Gulf of Khambhat.