

Investigation on the hydrodynamics of Ganga Alluvial Plain using environmental isotopes: a case study of the Gomati River Basin, northern India

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ABSTRACT

An investigation using environmental isotopes ($\delta^{18}\text{O}$ and δD) was conducted to gain insight into the hydrological processes of the Ganga Alluvial Plain, northern India. River-water, shallow-groundwater and lake-water samples from the Gomati River Basin were analyzed. During the winter season, the $\delta^{18}\text{O}$ and δD compositions of the Gomati River water ranged from -1.67 to -7.62 ‰ and -25.08 to -61.50 ‰, respectively. Deuterium excess values in the river water ($+0.3$ to -13 ‰) and the lake water (-20 ‰) indicate the significance of evaporation processes. Monthly variation of $\delta^{18}\text{O}$ and δD values of the Gomati River water and the shallow groundwater follows a similar trend, with isotope-depleted peaks for $\delta^{18}\text{O}$ and δD synchronized during the monsoon season. The isotopically depleted peak values of the river water ($\delta^{18}\text{O} = -8.30$ ‰ and $\delta\text{D} = -57.10$ ‰) can be used as a proxy record for the isotopic signature of the monsoon precipitation in the Ganga Alluvial Plain.