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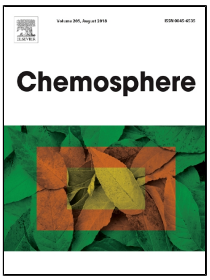

Chemometric Tool to Study the Mechanism of Arsenic Contamination in Groundwater of Puducherry Region, South East Coast of India

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Chemometric Tool to Study the Mechanism of Arsenic Contamination in Groundwater of Puducherry Region, South East Coast of India

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Abstract To understand occurrence, distribution and source of arsenic, 175 groundwater samples from coastal aquifers of the Puducherry region were collected and analyzed for major ions and trace metals. The concentration of As in groundwater of study area ranges from not detectable — 28.88 µg/L during the post-monsoon and not detectable — 36.88 µg/L in the pre-monsoon. The desirable limit for As in groundwater is 10µg/L as per World Health Organization and Bureau of Indian standard. About 13.64 and 11.50% of groundwater samples shows arsenic concentration higher than recommended limit. Hydrochemical facies which dominate during pre and post monsoon are Na-K-Cl-SO_4, Ca-Cl and Ca-Mg-Cl-SO_4type and Na-K-Cl-SO_4, mixedCa-Na-HCO_3, Ca-HCO_3 and mixed Ca-Mg-Cl type respectively. The Gibbs diagram suggested that rock-water interaction is major process controlling hydrochemistry of groundwater. From the Pourbaix diagram, it is inferred that H3AsO3 is the principal As species in groundwater. The PHREEQC modelling indicates supersaturation of ferric oxides and hydroxide mineral phases in aquifer system which on reductive dissolution releases arsenic into groundwater. Statistical analysis (Spearman Correlation and Principal Component Analysis) showed that reductive dissolution of As-bearing minerals and Fe-oxyhydroxides in the presence of organic matter is the major process contributing arsenic into groundwater. The relationship between As, K^+ and HCO^-_3 indicates agricultural and competitive exchange process which is an additional contributor of arsenic in groundwater. The sources which act as a sink and responsible for the release of As into the groundwater are marine sediments enriched in As and Fe-bearing minerals and organic matter.

Key Words: *Groundwater, Arsenic, Hydrochemical, Puducherry, India, PHREEQC, Reductive Dissolution*