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# Is arsenic contamination of groundwater in Bangladesh the result of groundwater pumping? Environmental tracers provide an answer.

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Noble gases and tritium are widely used as environmental tracers in aquatic systems. They provide important information about groundwater dynamics, which are of crucial importance for both groundwater hydraulics and hydrogeochemistry. Here we present a case study using environmental tracers to investigate groundwater dynamics in Bangladesh, where naturally occurring high concentrations of arsenic in groundwater cause major health problems.

Various hypotheses have been proposed to explain the mobilization of arsenic in groundwater. Most of these are based on geochemical studies. However, the possibility that arsenic mobilization may depend on groundwater dynamics has not yet been sufficiently explored. An important issue that is currently the subject of debate is the role played by groundwater extraction for irrigation, and by re-infiltration of this irrigation water, within the arsenic mobilization mechanism.

We used noble gases and tritium, together with conceptual groundwater modeling, to assess the possible effects of groundwater extraction on arsenic contamination. $^{3}H/^{3}He$ ages of the contaminated groundwater exceed 30 years, indicating that the water infiltrated before groundwater irrigation became established in Bangladesh. As a result, we can exclude re-infiltrated irrigation water as a direct cause of arsenic mobilization, at least at our field site.

Furthermore, the tracer data indicate that two different groundwater bodies come into

contact and mix at the same depth at which arsenic concentrations are highest, and from which water for irrigation is extracted. The mobilization of arsenic might therefore be related to hydraulic changes due to groundwater pumping.