Geophysical Research Abstracts
Vol. 17, EGU2015-6807-1, 2015
EGU General Assembly 2015

Managed aquifer recharge in weathered crystalline basement aquifers in India: Monitoring of the effect of tank infiltration on water quality over several monsoon events

Marina Alazard (1,2), Alexandre Boisson (1,2), Jean-Christophe Maréchal (1), Benoît Dewandel (1), Jérôme Perrin (1), Marie Pettenati (1), Géraldine Picot-Colbeaux (1), Shakeel Ahmed (3,2), Dominique Thiéry (1), and Wolfram Kloppmann (1)

(1) BRGM, France, (2) Indo-French Center for Groundwater Research, Hyderabad, India , (3) CSIR-National Geophysical Research Institute, Hyderabad, India

Managed aquifer recharge (MAR) structures like percolation tanks are considered by the Indian national and regional governments as major option for tackling declining groundwater levels due to overexploitation for irrigation purposes (Boisson *et al.*, 2014). Their main purpose is to restore groundwater availability under strong climatic and anthropogenic pressure. Furthermore, MAR-induced dilution with fresh surface water is generally expected to improve groundwater quality with respect to both anthropogenic and geogenic contaminants (total mineralisation, nitrates, chlorides, sulphates and fluoride contents). The impact of a percolation tank on groundwater quality was investigated in a context that is typical for hydro-climatic and geological settings in southern and eastern India: fractured crystalline basement aquifers overlain by a weathering zone under semi-arid climate. Water level data and geochemical indicators (stable isotopes and major ions) were monitored for both groundwater and surface water, over several successive monsoon events. In case of high to very high water levels, the groundwater quality is globally improved. However, in a few cases, the quality of the groundwater can be negatively impacted due to leaching of salts under the tank, particularly during the first rain events of the monsoon. Geogenic fluoride contents in groundwater, induced by water-rock interaction and enhanced by recycling of agricultural return flow under paddy fields, is found to be relatively stable over the year. This finding points out that the underlying processes, mainly dissolution of F-bearing phases like fluorapatites combined with Ca/Na cation exchange and calcite precipitation, both limiting the possibility of F-removal via fluorite precipitation (Pettenati *et al.*, 2013, 2014), are not impacted by the hydrological conditions. This work highlights the complexity of the recharge processes in crystalline aquifers, enhanced by the variability of hydrological conditions. It also provides insights into the possible risk for groundwater quality deterioration in cases of light and short monsoons periods.

This research was conducted within the framework of the Saph Pani project and co-financed by the European Commission within the Seventh Framework Programme, grant agreement No. 282911 and the Research Division of BRGM.

Boisson A., Villesseche D., Baisset M., Perrin J., Viossanges M., Kloppmann W., Chandra S., Dewandel B., Picot-Colbeaux G., Rangarajan R., Maréchal J. C., and Ahmed S. (2014) Questioning the impact and sustainability of percolation tanks as aquifer recharge structures in semi-arid crystalline context. *Environ Earth Sci.*, DOI 10.1007/s12665-014-3229-2.

Pettenati M., Perrin J., Pauwels H., and Ahmed S. (2013) Simulating fluoride evolution in groundwater using a reactive multicomponent transient transport model: Application to a crystalline aquifer of Southern India. *Appl. Geochem.* **29**, 102-116.

Pettenati M., Picot-Colbeaux G., Thiéry D., Boisson A., Alazard M., Perrin J., Dewandel B., Maréchal J.-C., Ahmed S., and Kloppmann W. (2014) Water Quality Evolution During Managed Aquifer Recharge (MAR) in Indian Crystalline Basement Aquifers: Reactive Transport Modeling in the Critical Zone. *Procedia Earth and Planetary Science* **10**, 82-87.