Geophysical Research Abstracts, Vol. 8, 10264, 2006
SRef-ID: 1607-7962/gra/EGU06-A-10264
© European Geosciences Union 2006

The use of multiple isotope tracers to evaluate the impact of urban recharge in an alluvial aquifer located underneath the city of Santiago, Chile

S. Iriarte (1), R. Aravena (2), D. Rudolph (2)

(1) Water Management Consultants, Santiago, Chile, (2) Department of Earth Sciences, University of Waterloo, Waterloo, Ontario, Canada

Urban recharge associated to leakages of the water and sewage distribution system can have a significant impact in groundwater quality and water balance in aquifers located in urban environments. Environmental isotopes are one of the tools that can be use to complement the conventional hydrogeological and geochemical approach to evaluate the impact of urban recharge in groundwater. These tracers can be use to track down the fate of the urban water and the fate of contaminants, such as nitrate, in the aquifer. This paper will discuss the use of environmental isotopes as tools to evaluate the impact of urban recharge in an alluvial aquifer, which is part of the Mapocho River basin, and located underneath the city of Santiago. High level of nitrate and sulfate has been previously documented in the aquifer, however no clear evidences of the origin of the contamination have been presented. A detailed evaluation of the hydrogeology and groundwater geochemistry was carried out in the study.

The chemical data showed a pattern of increasing nitrate concentration from around 1 mg-N/L in the up gradient areas to values as high as 20 mg-N/L in the down gradient areas. A similar pattern is observed in the sulfate concentration that increases from $\sim$ 80 mg/L to 400 mg/L along the groundwater flow system. Chemical data from depth-profiles showed the high concentration of nitrate and sulfate is found in the shallow part of the aquifer in the middle part of the basin under the old part of the city. These data suggested that the source of contamination has to be related to leakages of the sewage and water distribution system. The water for the city is imported from the Maipo River that has its headwater at higher altitude than the Mapocho River. A distinct isotope composition is observed in the main sources of recharge to the

aquifer. Stable isotope and tritium data in groundwater clearly showed the input of the Maipo river water to the aquifer. Nitrogen-15 data confirm the high level of nitrate is associated to sewage that reaches the aquifer by leakage of the sewage distribution system. Sulfate-34 data also confirm the sulfate comes from marine evaporative that are found in the high part of the Maipo River basin. The sulfate reaches the aquifer by leakage of the potable water and sewage distribution systems. This study is an excellent example of the use of multidisciplinary tools to evaluate the impact of urban activities in groundwater.