Geophysical Research Abstracts
Vol. 12, EGU2010-7907, 2010
EGU General Assembly 2010

Assessing the vulnerability of a karst groundwater system to contamination by pharmaceuticals

Florian Einsiedl (1) and Michael Radke (2)

(1) Department of Environmental Engineering, Technical University of Denmark, 2800 Kgs. Lyngby, Denmark , (2) University of Bayreuth, Department of Hydrology, Bayreuth, Germany (michael.radke@uni-bayreuth.de, +49 921 55842297)

Contamination of drinking water supplies is a serious problem and a potential threat to public health. Organic micropollutants such as pharmaceuticals and personal care products are identified as an environmental risk and concern has been raised about their environmental presence and fate. These compounds are present in effluents of wastewater treatment plants (WWTPs) in concentrations of up to several μg/L, and they have frequently been detected in surface waters and groundwater systems.
A popular method for wastewater disposal in karst areas is the injection of wastewater into open sinkholes. Subsequently, the wastewater infiltrates rapidly along conduits and through the fractured karst aquifer. This is a major contributing factor to the contamination of karst aquifers. To address the vulnerability of such systems against relatively mobile organic micropollutants, we investigated the occurrence of two pharmaceuticals (diclofenac, ibuprofen) in combination with the groundwater heterogeneity and flow pathways in the aquifer.
Groundwater samples and effluents of three WWTPs were repeatedly collected during a field campaign in the Franconian Alb karst system which is located in southern Germany. These results were coupled with hydrogeological investigations such as tracer tests, application of environmental isotopes (3H), and modeling. The results of this study demonstrated that (i) both pharmaceuticals are mobile in the karst aquifer and thus represent a risk for contamination of karst water, (ii) the transport of pharmaceuticals in the fractured system with mean transit times of some years affects the karst groundwater contamination, and (iii) long-term wastewater injection containing organic micropollutants into karst ecosystems may contribute to water quality deterioration over years.