Geophysical Research Abstracts
Vol. 12, EGU2010-11375, 2010
EGU General Assembly 2010


# Influence of karst evolution on solute transport evaluated by process-based numerical modelling

Bernhard Hubinger and Steffen Birk

Karl-Franzens-Universität Graz, Institut für Erdwissenschaften, Graz, Austria (steffen.birk@uni-graz.at, +43 316 3809870)

Karst waters are of major interest in water resources management. Because of their inherent properties karst systems show great vulnerability with regard to contaminants. Karst systems include highly permeable solution conduit networks formed by chemical aggressive water embedded in a fissured matrix. Small initial voids are widened and thus act as preferential passages, where flow is rapid and often turbulent. Water discharging at karst spring originates from different pathways with different residence times. Contaminant transport through conduit pathways is very rapid, whereas flow through the fissured porous matrix is much slower. Thus, on the one hand, pollutants may be rapidly transported and reach high concentrations at the karst spring shortly after their release; on the other hand, the existence of slow flow components may cause the pollution to last for long times.

In this work, solute transport properties of karst aquifers are investigated using generic conduit networks of hydraulically connected proto-conduits with initially log-normally distributed apertures in the millimetre range and below. Conduit evolution is modelled by coupling flow, transport, and dissolution processes, whereby single conduits are widened up to the metre range. Thus, different stages of karst evolution can be distinguished. The resulting flow systems provide the basis for modelling advective-dispersive transport of non-reactive solutes through the network of more or less widened (proto-)conduits. The general transport characteristics in karst systems as well as the influence of heterogeneities and structures on solute transport are illustrated for cases of direct injection into the conduit systems at different evolutionary stages. The resulting breakthrough curves typically show several distinct, chronologically shifted peaks with long tailings, which appears to be similar to data from field tracer experiments.