Abstract

The transport experiments demonstrate how the combined efforts of laboratory-, field investigations and modeling can improve the understanding of tracer transport and flow conditions in fissured rocks.

The development of perylene and pyrene dyes for groundwater tracing was supported by the Institute of Organic Chemistry, University of Munich. The recently developed watersoluble fluorescent dyes and microsphers were used in laboratory and field experiments combined with the radioactive tracer Tritium and Uranine. The perylene dyes could improve their transport behaviour by changing the position of the sulphonic acid functional groups. The current understanding suggests that the high detection limit of perylene dyes (AUBERT et al. 1985) provides a possibility for tracer **[1b]** for groundwater tracing in carstified aquifers. In comparison to Pyranine the pyrene tracer **[2]** demonstrated a conservative transport behaviour.

The field experiments were carried out in a shear zone whithin a granitic rock massiv. Concerning the field investigations the samples have been analysed at the underground rock laboratory of the University of Karlsruhe ("Testfield Lindau") and the Nagra´s underground rock laboratory.

At the "Testfield Lindau" the process of matrix diffusion is manifested through a mobile and nearly stagnant (immobile) zone. A multitracer experiment with a polydisperse colloid suspension demonstrated that larger colloids are transported faster, further along a fracture and least retarded than smaller particles.

The dipol experiments of the Grimsel Test Site, performed over a distance of 0.77 m and 1.0 m and the tracer experiment between test section BL 10 to BL 11 at the "Testfield Lindau" resulted in a new concept for the interpretation of tracer experiments. For this reason the observed monomodal tracer breakthrough curves were interpretated as bimodal tracer breakthrough curves.
The modeling results for the Grimsel tracer migration field experiment performed with the mathematical modeling of THERRIEN & SUDICKY (1995) showed that the model is able to adequately describe the mean transport processes. The modeling results can reasonably well extrapolated to laboratory results of BOSSART & MARTUREK (1990).