

A tracer test to determine subsurface outflow of a karst catchment along the Lauchert-Graben, Swabian Alb

Paul Knöll and Traugott Scheytt

Institute of Applied Geosciences, Technische Universität Berlin, EB-10, Straße des 17. Juni 135, 10623 Berlin, Germany
(paul.knoell@tu-berlin.de)

During a severe flood event in 2013 it was hypothesised that a significant amount of flood water from the lower course of the Lauchert infiltrated into the karst system, flowing towards the Danube catchment. The Lauchert, a tributary of the river Danube is a perennial stream in the Swabian Alb, southern Germany. Its catchment is entirely comprised of Upper Jurassic karstified carbonate rocks, slightly dipping south-east. The river mainly flows in the so called Lauchert-Graben except for the lower course.

An artificial dye tracer experiment was conducted in August 2016 to examine a connection of the Lauchert and Danube catchment. 4 kg of Uranine were injected into the unsaturated zone of the Lauchert surface catchment, approximately 200 m west of the eastern main fault of the Lauchert-Graben. Close to the injection point the Lauchert is crossing this fault.

A total of 7 observation points were monitored, among those the river Lauchert and 6 springs in the Danube valley. 3 of the springs were monitored with field fluorimeters while the other observation points were monitored by regular sampling for 5 days. A tracer breakthrough was detected at 3 springs in the Danube valley, showing a southward flow direction with a maximum transport velocity of 81 m/h. Tracer breakthrough curves were analysed using the CXTFIT code implemented in Stanmod.

This experiment proved a preferential hydraulic connection from the Lauchert valley to springs in the Danube valley in the vicinity of the Lauchert-Graben and revealed a flow towards the Danube catchment. The monitored springs in the Danube valley are at least partly fed by groundwater originating in the Lauchert catchment. Augmented flow of flood water through the karst system becomes very likely if an inundation reaches outcropping karst structures flanking the Lauchert flood plain.