XXXVIII IAH Congress

Groundwater Quality Sustainability
Krakow, 12–17 September 2010

Extended Abstracts

Editors:
Andrzej Zuber
Jarosław Kania
Ewa Kmiecik

University of Silesia Press 2010

abstract id: **364**

topic: **3**
Aquifer management

3.4
Environmental and artificial tracers in hydrogeology

title: **Groundwater exchange between porous and karstic aquifer in deep mountain valley – Southern Karavanke, Slovenia**

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keywords: karstic aquifer, porous aquifer, mine hydrology, tracer experiment, Karavanke

INTRODUCTION

In higher mountainous regions of Central Europe very often groundwater appearance is related to the extensive aquifers developed in karstic rocks. Due to high relief and intensive glacial processes in the geological past slopes and valleys are covered and filed with porous aquifers. The media in these aquifers is represented by heterogeneous slope and glacial sediments of different hydraulic conductivities. It can happened that in deeper valleys groundwater flow is directed from the karstic rock to the porous aquifer and then back to the karstic aquifer where can latter appear as a karstic spring.

In the study we have illustrated the appearance of extensive Košuta karstic aquifer in the transboundary water body Karavanke (between Austria and Slovenia) in the region Lajb north of city Tržič — Slovenia. In the area extensive discharge (between 500 and 1500 l/s) from the karstic Košuta aquifer along strong normal fault is present in the group of springs on the both sides of the deep valley filed with fluvioglacial sediments. Springs are forming river. After several meters of flow part of the river water sinks in the bottom of the valley and appears again on the surface as a karstic spring Črni gozd that is captured for water supply. It is also detected that groundwater from the porous aquifer in the valley flows back into the karstic aquifer in down gradient direction. The situation is additionally complicated with the existence of old abandoned mercury mine Sveta Ana where some tunnels are crossing valley perpendicular to the river flow.

METHODS

Detailed geological mapping and analyses of Sveta Ana mine archive were done. Results represented as geological map and profiles were formed basis for the construction of observation boreholes and planning of the tracing experiment in the area of spring appearance along the fault. Tracing experiment was performed with the uranine tracer. Concentrations of the tracer were measured by sampling at Črni gozd springs and with the passive sampling with the charcoal bags exposed to some points in the mine and in the boreholes. The distance between injection point and sampling point in spring was 1100 m. Breakthrough curves of the tracing experiment were modeled with the multi dispersion model calculated by our own macro procedures written in Excel 2003 – Microsoft.

RESULTS AND DISCUSSION

First arrival time of the tracer to the spring is t_{max}=10,25 hours that is equal to maximum velocity of v_{max}=0.030 m/s, efective time is t_{eff}= 15.2 hours with the effective velocity of v_a=0.020 m/s and the average time of the whole breaktrough curve is t_{mean}=17.9 hours with the velocity v_{mean} =0.017 m/s. Basic parameters are shown in the Figure 1a.

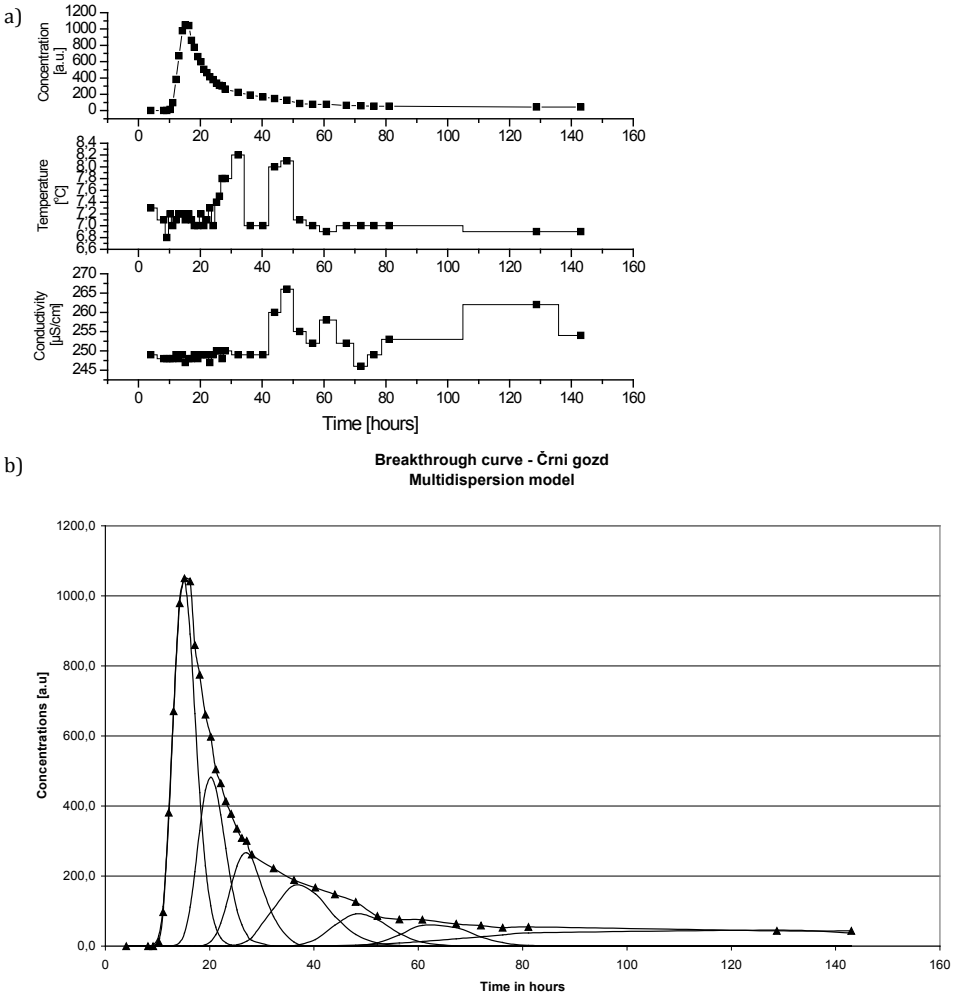

Figure 1. Results of tracing experiment in the Košuta aquifer in the region of Lajb Črni gozd — Slovenia.

During the tracing experiment rainfall was present reflecting in rise of the temperature and electrical conductivity. We have modeled breakthrough curve with the dispersion model of seven components (Fig. 1b) with mean velocities from 0.02 to 0.003 m/s.

The most important result of the experiment is conclusion and approval that in the area groundwater in the relatively short distance is flowing from the karstic aquifer into fluvioglacial and slope sediments and back into the karstic aquifer.

International Association of Hydrogeologists

AGH University of Science and Technology

2-vol. set + CD
ISSN 0208-6336
ISBN 978-83-226-1979-0