

Ber. Inst. Erdwiss. K.-F.-Univ. Graz	ISSN 1608-8166	Band 20/1	Graz 2014
PANGEO AUSTRIA 2014		Graz, 14. September 2014 – 19. September 2014	

How does non-linear flow behaviour affect spring discharge response and tracer travel times?

Case study of the Lurbach karst system (Austria)

MAYAUD, C.¹, WAGNER, T.¹, BENISCHKE, R.², BIRK, S.¹

¹ University of Graz, Institute of Earth Sciences, NAWI Graz, Heinrichstraße 26, A-8010 Graz, Austria
email: cyril.mayaud@uni-graz.at

² Institute for Water, Energy and Sustainability, Joanneum Research Forschungsgesellschaft mbH., Elisabethstraße 18/II, 8010 Graz, Austria

Karst waters represent about 25% of the world groundwater reserves and can even reach 50% of the water supply in countries like Austria or Slovenia (COST Action 65, 1995). Because karst aquifers are highly heterogeneous (the conduit network allows a rapid transfer of the water through the aquifer) they can be very vulnerable to natural and anthropogenic contaminations, which lead then to an improper water quality. To prevent and forecast the occurrence and consequences of such events, an improvement of the general understanding of these complex systems is needed. To this end, the use of the so-called discretized groundwater models (where heterogeneities can be defined spatially) proved to yield good results.

The aim of this work is to characterize the hydrodynamic behaviour of a small binary karst aquifer located 20 km north from Graz (Austria) with the distributive groundwater model MODFLOW and a recently developed numerical package allowing the computation of non-linear flow using the Forchheimer equation (Mayaud et al. under review). To do this, a comparison between standard laminar flow and non-linear flow will be done, in order to check how the latter affects spring discharge response and tracer travel times. The model is intended to reproduce the processes observed in the real field site for different hydrogeological situations and has no purpose for calibration.

References

COST Action 65., 1995. Hydrogeological aspects of groundwater protection in karst areas. Final report EUR 16547 EN, Office for Official publications of the European Communities, Luxembourg, 446 pp.
Mayaud, C., Walker, P., Hergarten, S., and Birk, S., (under review). Non-Linear Flow Process : a new package to compute non-linear flow in MODFLOW. Submitted as Methods Note to Groundwater.