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: **116**

topic: **6**
General hydrogeological problems

6.2
Hydrogeology of karst

title: Evaluating the effect of lineaments on groundwater flow system in karstic aquifers

author(s): **Yaser Nikpeyman**
Tooss Ab Consulting Engineers Co., Iran, yaser.nikpeyman@gmail.com

Gholam Hossein Karami
Faculty of Earth Sciences, Shahrood University of Technology, Iran, karamigh@yahoo.com

Parviz Omody
Faculty of Earth Sciences, Shahrood University of Technology, Iran, pomidy@yahoo.com

keywords: karst, flow system, lineament

One of the most important problems in karstic aquifers studies is to determine groundwater flow regime in such hard rock aquifers. Methods to determine whether flow system in an aquifer is diffuse, conduit or something in between, are in most cases expensive and time consuming. The major aim of this study is to reduce and optimize costs and time of flow system determination in karstic aquifers. To reach this goal two basins were selected and were chosen because of status of their karstic development. Cheshme Gilas basin is located NE of Iran and Dasht-e Bou basin is located N of Iran.

There is only one spring in each basin which is the only discharge point of them (Gilas spring in the Cheshme Gilas and Gholghol spring in the Dasht-e Bou basin). They have been used to determine the hydrogeological characteristics of study areas. Also, structural properties and lineaments geometrical characteristics of the two basins are measured concurrently.

Studies show that flow system in Dasht-e Bou aquifer is fully diffuse (Fig. 1a), while in Cheshme Gilas is mixed (Fig. 1b).

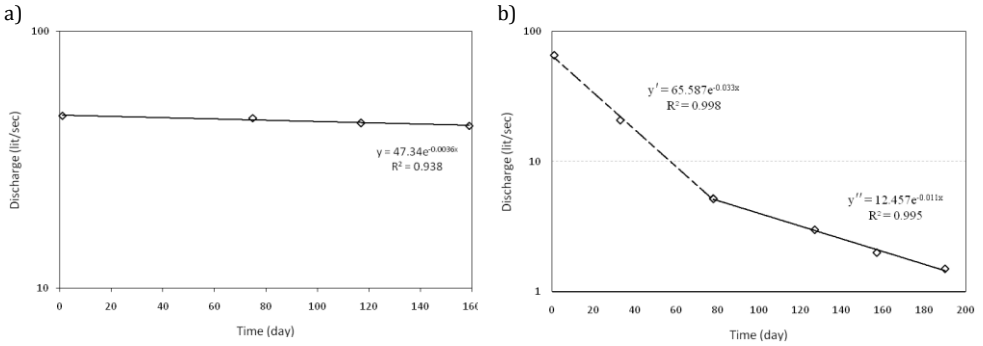

Figure 1. Recession curves in study areas: a) Gholghol spring recession curve (Dasht-Bou); b) Gilas spring recession curve (Cheshme Gilas).

Average fractures dip in Cheshme Gilas basin is less than that of in Dasht-e Bou (Tab. 1).

Table 1. Fracture geometry statistics (related rose diagrams will be inserted in the extended paper).

Basin	Fracture Type	Filling (%)	Ave. Dip	Dip SD.	Strike SD.
Cheshme Gilas	Relaxation	55	47	20	9.5
	Tensional	73	73	17	70
	Shear	44	77	15	78
Dasht-e Bou	Relaxation	74	73	11.5	48.5
	Tensional	52	74.4	5.6	96.9
	Shear	35	74.6	9.5	133.6

These show that in Cheshme Gilas less fractures filling, more relaxation fractures intensity (maps will be inserted in the extended paper) and less fractures dip in comparison with that of Dasht-e Bou are major reasons for more developed karstic features. Furthermore, fractures strike standard deviations (SD) in Cheshme Gilas basin are less than that of Dasht-e Bou. Moreover, in Cheshme Gilas fractures are concentrated in distinctive areas (Maps are available). So, these cause less fluid energy downfall and more concentrated karstification in Cheshme Gilas aquifer. Besides, fractures aperture size distributions in Dasht-e Bou are more homogenous than Cheshme Gilas which cause heterogeneity in karstification in Cheshme Gilas (Fig. 2).

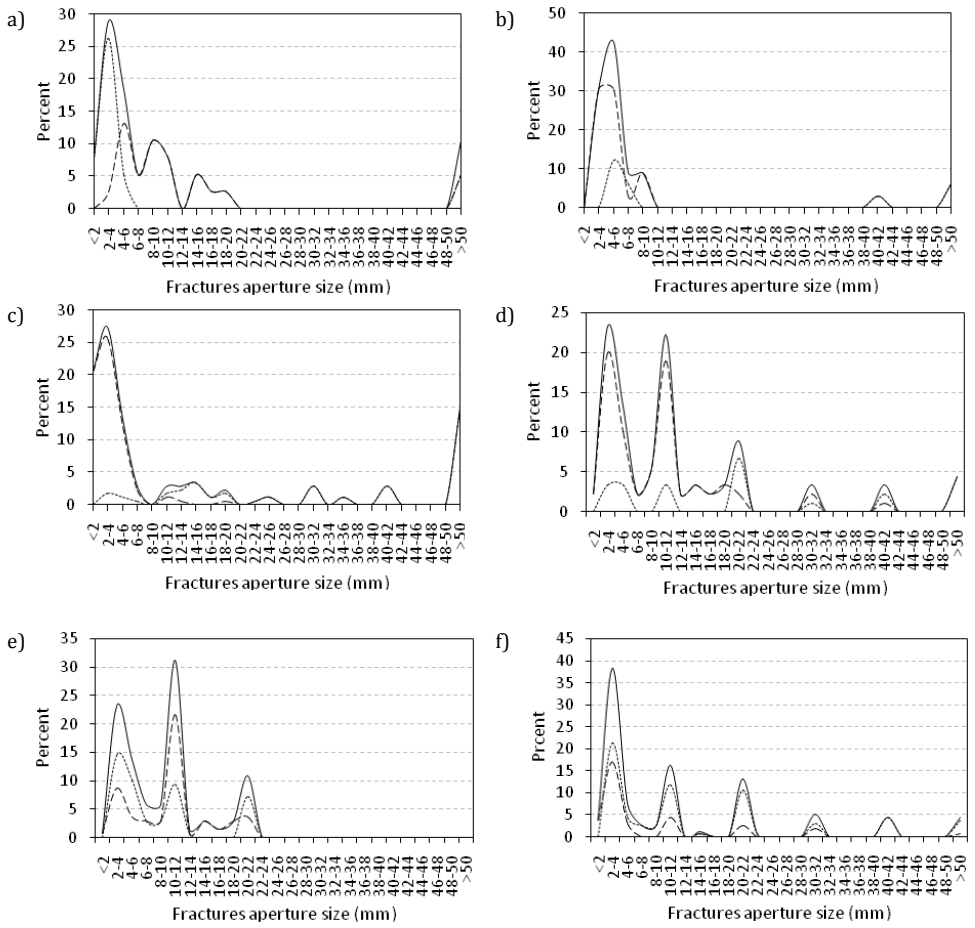

Figure 2. Fractures aperture size distributions for various types of joints in the both study areas. Dotted lines illustrate non-filled fractures; while, dashed ones are demonstrate those which are filled. Continues lines reveal overall percent of fractures: a) Cheshme Gilas relaxation fractures; b) Cheshme Gilas tensional fractures; c) Cheshme Gilas shear fractures; d) Dasht-Bou relaxation fractures; e) Dasht-Bou tensional fractures; f) Dasht-Bou shear fractures.

REFERENCES

Bahat D., 1999: *Single-layer burial joints vs. single-layer uplift joints in Eocene chalk from the Beer Sheva syncline in Israel*. Jou. Struct. Geol. Vol. 21, p. 293–303.

Berberian M., King G.C.P., 1980: *Towards a paleogeography and tectonic evolution of Iran*. Geology Survey of Iran, Vol. 52, pp. 502–557.

Cacas M.C., Ledoux E., DeMarsily G., Tillie B., et al., 1990: *Modeling fracture flow with a stochastic discrete fracture network: calibration and validation*. Water Resources, Vol.26, p. 479–489.

Evans J.P., Forster C.B., Goddard J.V., 1997: *Permeability of faultrelated rocks and implications for hydraulic structure of fault zones*. Jou. Struct. Geol. Vol. 19, p. 1393–1404.

Henriksen H., Braathen A., 2006: *Effects of fracture lineaments and in-situ rock stresses on groundwater flow in hard rocks: a case study from Sunnfjord, western Norway*. Hydrogeology Journal, p 444–461.

Jackson J., Priestly K., Allen M., Berberian M., 2002: *Active tectonics of the South Caspian Basin*. Geophys Jou. Int., p. 214–245.

Karami Gh., 2002: *Assessing the heterogeneity and flow system types in karstic aquifers using pumping test data*. Ph.D. Thesis, University of Newcastle, Newcastle Upon Tyne, 180 pp.

McClay K.R., 1989: *The mapping of geological structures*. 2nd edition, Open University Press, London.

Menachem W., Rubin Y., Adar E., Nativ R., 2006: *Fracture and bedding plane control on groundwater flow in a chalk aquitard*. Hydrogeology Journal, Vol. 14, p. 1081–1093.

Odling N.E., 1997: *Scaling and connectivity of joint systems in sandstones from western Norway*. Jou. Struct. Geol. Vol. 19, p. 1257–1271.

Odling N.E., Gillespie P., Bourgine B., Castaing C., Chiles J.P., Christensen N.P., Fillion E., Genter A., Olsen C., Thrane L., Trice R., Aarseth E., Walsh J.J., Watterson J., 1999: *Variations in fracture system geometry and their implications for fluid flow in fractured hydrocarbon reservoirs*. Petrol. Geosci, 5:12 pp.

Parizek R.R., 1971: *Hydrogeology of folded and faulted rocks of the central Appalachian type and related land-use problems, Pennsylvania State University*. Earth and Mineral Sciences Experiment Station Circular 82, 181 pp.

Parizek R.R., 1976: *On the nature and significance of fracture traces and lineaments in carbonate and other terranes*. Karst Hydrology and Water Resources. Vol. 1, Water Resources Publications, Fort Collins, CO, 31–62 pp.

Singhal B.B.S, Gupta R.P., 1999: *Applied hydrogeology of fractured rocks*. Kluwer Academic, Dordrecht.

International Association of Hydrogeologists

AGH University of Science and Technology

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