

// : - - - // :



\*

( )

( )

) )

( (

:

(Dreybrodt 1988; Zuber and Motyka 1996)

مقدمه

(Ford and Williams 1989)

)

(

( )

(Jenning 1985; White 1988)

( )

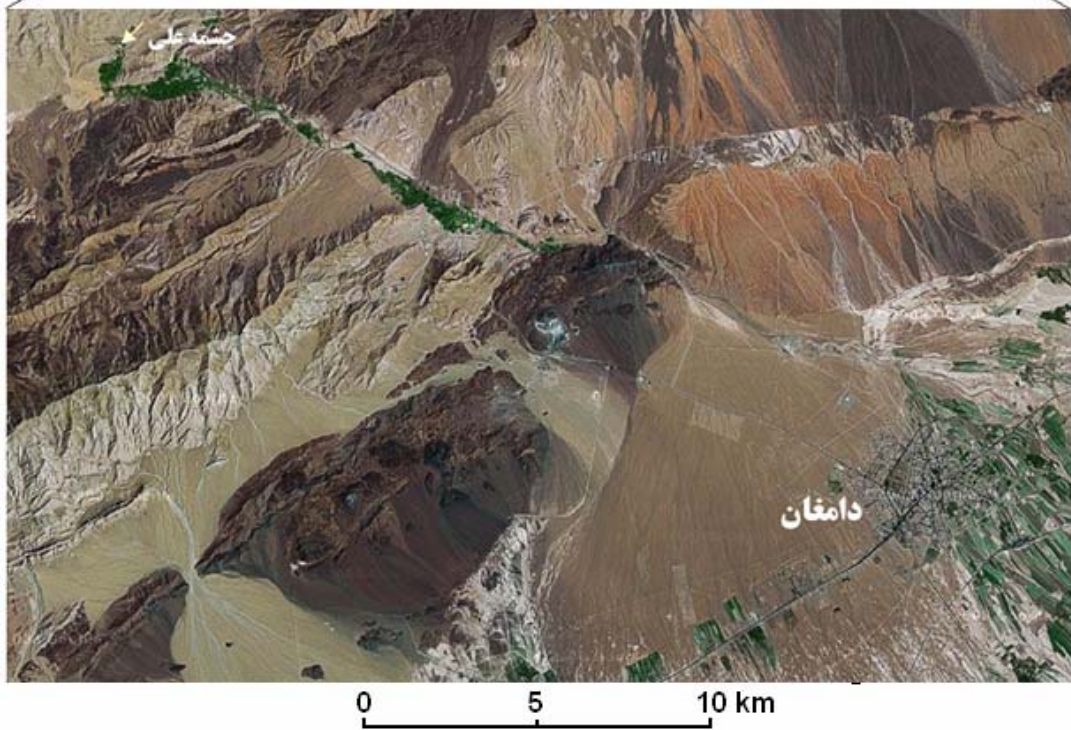
(Ford and Williams 1989)

( )

(Ahmadipour 1999)

(White 1988, Eisenlohr et al. 1999, Veni 2008)

( )



(Google Earth)

:

:

:

( )

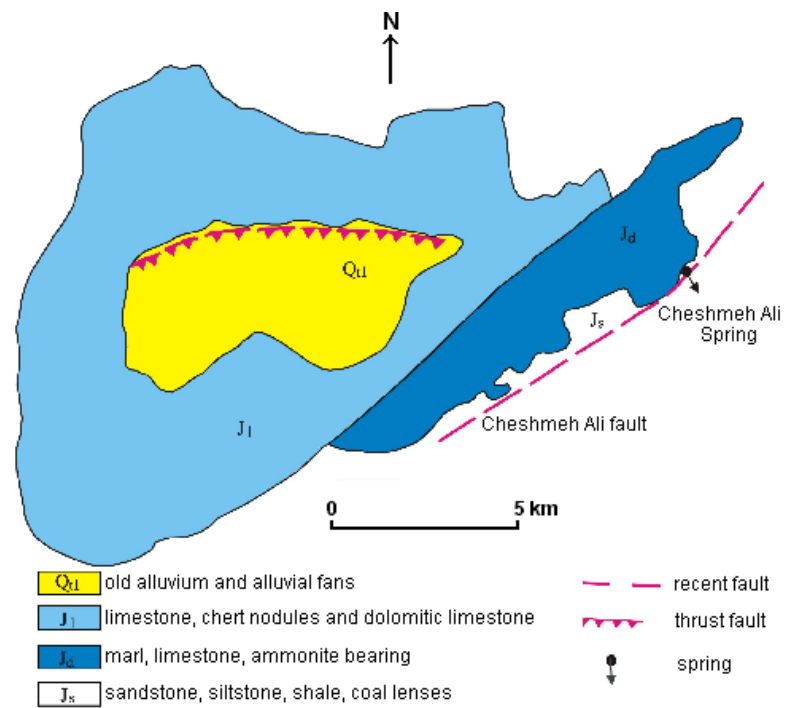
/

/

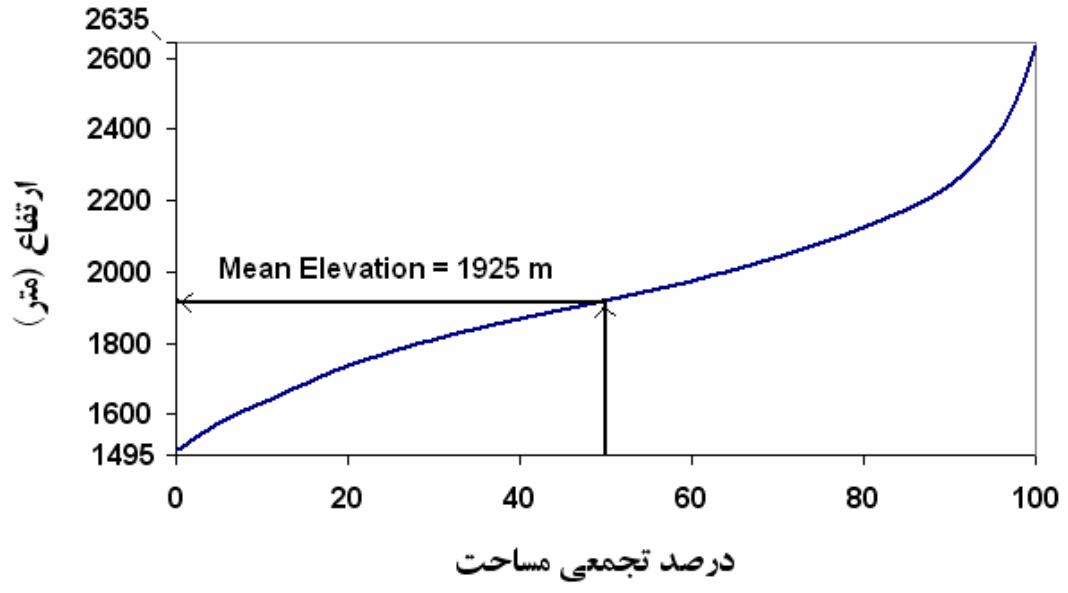
/

- ( )

( )



( )



( )

( )

( )

( )

)

(



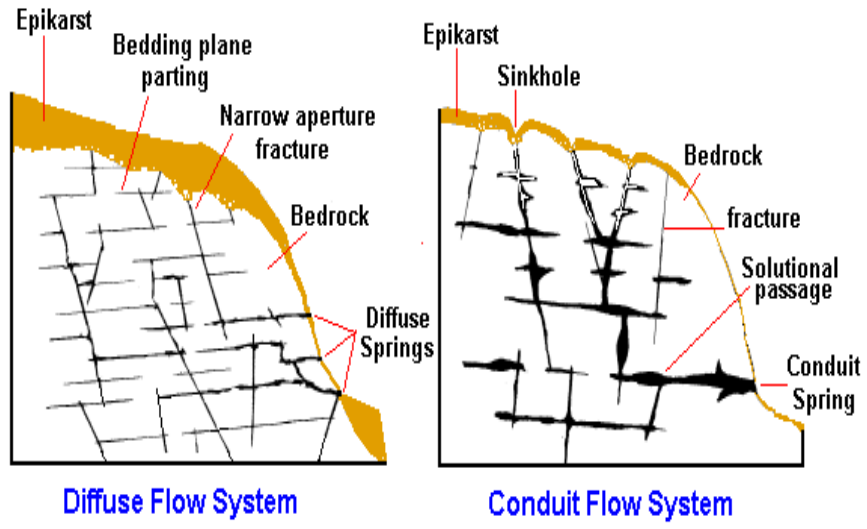
(Shuster and White 1971; 1972)

Atkinson 1977; Quinlan et al. 1991; Drew et al. )

(1996

- 
- 1- Conduit flow
  - 2- Diffuse flow

(Jacobson and Langmuir 1974)



(Karami 2002 )





:(Milanovic 1981)

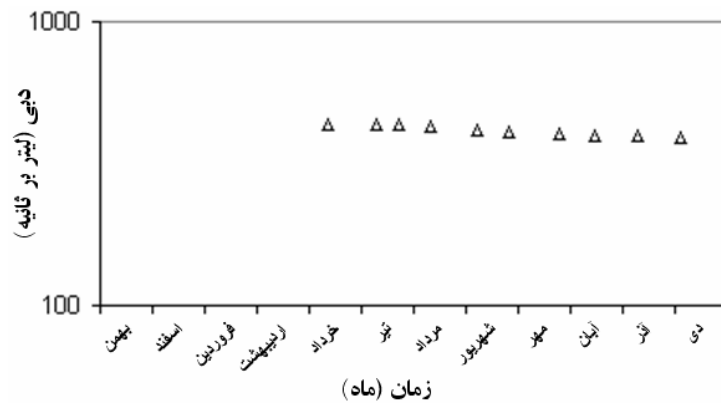
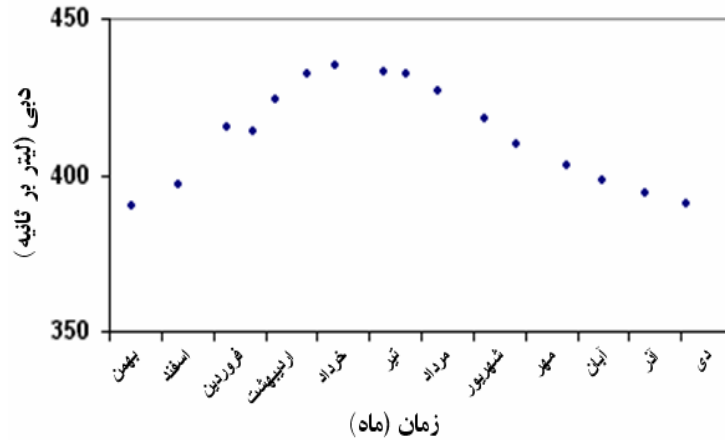
$$\alpha = \frac{\log Q_0 - \log Q_t}{0.4343(t - t_0)} \quad ( )$$

$Q_t$     $Q_0$     $\alpha$

$t_1$     $t_0$

.(   )

(   )



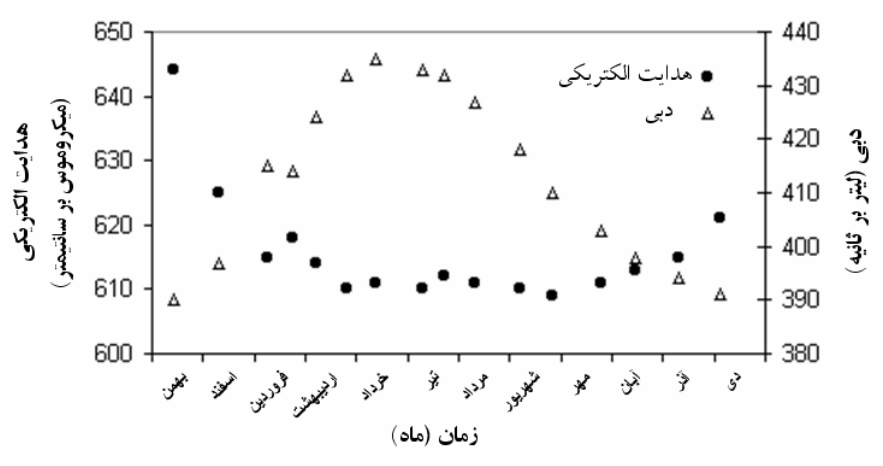
( )

)

$$5.2 \times 10^{-4}$$

(

( )



)

(

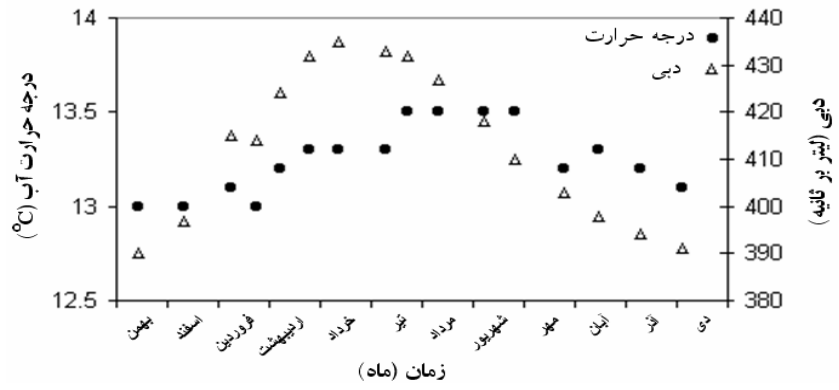
( )

( )

( )

)

(



)  
(  
)  
(  
on hydrogeology, ecology, monitoring, and management of ground water in karst terrains. National Ground Water Association, Dublin, Ohio, p. 573-635.

- Ford, D. C., and Williams, P. W., 1989, Karst geomorphology and hydrology: Chapman and Hall, London. 895 p.

- Jacobson, R. L. and Langmuir, D., 1974, Controls on the quality variations of some carbonate spring waters: *J. Hydrol.*, v 23, p. 247–265.

- Jennings, J. N., 1985, Karst geomorphology: 2 edition, Basil Blackwell, Oxford, 293 p.

- Karami G.H., 2002, Assessment of heterogeneity and flow systems in karstic aquifers using pumping test data: Ph.D. Thesis, Univ. of Newcastle upon Tyne, Newcastle upon Tyne, 180 p.

- Milanovic P.T., 1981, Karst hydrogeology: Water Resources Publications, 434 p.

- Shuster, E. T. and White, W. B., 1971, Seasonal fluctuations in the chemistry of limestone springs: A possible means for characterising carbonate aquifers. *J. Hydrol.*, v. 14, p. 93–128.

15- Shuster, E.T. and White, W.B., 1972, Source areas and climatic effects in carbonate groundwaters determined by saturation indices and carbon dioxide pressures. *Water Resour. Res.* v. 8, no. 4, p. 1067 – 1073.

- Veni, G., 2008, Lithology as a Predictive Tool of Conduit Morphology and Hydrology in Environmental Impact Assessments, ASCE Publications, v. 177, no. 6, p. 46-56.

- White, W. B., 1988, Geomorphology and hydrology of karst terrains: Oxford University Press, 464 p.

- Zuber, A. and Motyka J., 1996, Hydraulic conductivity and solute transport parameters of karstic-fractured-porous aquifers. In: proceedings of international conference on karst-fractured aquifers – vulnerability and sustainability, Katowice-Ustron, Poland, June 10-13, 1996, p. 282-289.

- Ahmadipour, M.R., 1999, Karst terrains in Iran– Example from Lorestan: *Acta Carsologica* v. 28, p. 213-224.

- Atkinson, T.C., 1977, Diffuse flow and conduit flow in limestone terrain in the Mendip Hills, Somerset (Great Britain): *J. Hydrol.* v. 35, p 93-110.

- Drew, D.P., Burke, A.M., and Daly, D., 1996, Assessing the extent and degree of karstification in Ireland: In proceedings of international conference on karst-fractured aquifers–vulnerability and sustainability, Katowice-Ustron, Poland, p. 37-47.

- Dreybrodt, W., 1988, Processes in karst systems physics, chemistry, and geology. Springer: Berlin, New York, Heidelberg, 288 p.

- Eisenlohr, L., Meteva, K., Gabrovsek, F. and Dreybrodt, W., 1999, The inhibiting action of intrinsic impurities in natural calcium carbonate minerals to their dissolution kinetics in aqueous H<sub>2</sub>O-CO<sub>2</sub> solutions. *Geochim. cosmochim. Acta*, v. 63, no. 7/8, p. 989-1002.

- Quinlan, J.F., Smart, P.L., Schindel, G.M., Alexander, E.C., Edwards, A.J., and Smith, A.R., 1991, Recommended administrative/regulatory definition of karst aquifer, principles for classification of carbonate aquifers, practical evaluation of vulnerability of karst aquifers, and determination of optimum sampling frequency at springs. In third conference