Geophysical Research Abstracts
Vol. 14, EGU2012-8086, 2012
EGU General Assembly 2012

Development of a 3D groundwater flow model with scarce data in semi-arid to arid region: the western drainage basin of the Dead Sea (Israel and West Bank)

A. Gräbe (1,3), K. Rink (2), T. Fischer (2), F. Sun (2), T. Rödiger (1), and O. Kolditz (3)

(1) Helmholtz Centre for Environmental Research - UFZ, Department Catchment Hydrology, 06120 Halle/Saale, Germany(agnes.graebe@ufz.de), (2) Helmholtz Centre for Environmental Research – UFZ, Department of Environmental Informatics, 04318 Leipzig, Germany, (3) TU Dresden, Applied Environmental System Analysis, 01062 Dresden, Germany

Water is scarce in the semi-arid to arid region around the Dead Sea where water supply mostly relies on restricted groundwater resources. Because of population increase the regional groundwater body is exposed to additional stress, which also results in a continuous decrease of the Dead Sea level. As the interdependency between water demand from population increase and the decrease in groundwater availability will proceed over the next years, the stressed water supply situation appears to proceed also and possibly worsens unless sustainable changes are introduced. These changes however, can only be suggested if the hydrogeological situation in the tectonically complex region is fully understood.
A number of simplified models of the Judea Group aquifer have been formulated and employed using a two-dimensional (one horizontal layered) numerical simulation of groundwater flow (Baida et al. 1978; Goldschtoff & Shachnai, 1980; Guttman, 2000; Laronne Ben-Itzhak & Gvirtzmann, 2005). However, all previous approaches focused only on a limited area of the Judea Group aquifer. We developed a high resolution regional groundwater flow model for the entire western basin of the Dead Sea. Whereas the structural model could be defined using a large geological dataset, the challenge was to generate the groundwater flow model with only limited well data. With the help of the scientific software OpenGeoSys (OGS) the challenge was reliably solved resulting in a simulation of the hydraulic characteristics (hydraulic conductivity and hydraulic head) of the cretaceous aquifer system, which was calibrated using PEST.
References:
Baida, U., Y. Goldschtoff and I. Qidron (1978): Numerical model of the Cenomanian aquifer in the southern Yarkon-Taninim basin (Beer Sheva area), . Tahal, Water Planning for Israel, Rep. 01/78/78, (1978), p. 45

Goldschtoff, Y. and E. Schachnai (1980): The Yarkon-Taninim aquifer in the Beer Sheva area: outline and calibration of the flow model, . Tahal, Water Planning for Israel, Rep. 01/80/58, (1980), p. 20

Gräbe A, Sun F, et al (2011) A regional flow- and runoff model along the western Dead Sea Escarpment Proc. Of MODELCARE 2011

Guttman, Y. (1987): salinization along the western border of the Jordan Valley and Dead Sea. In Terra Nostra, The 13th Meeting on the Dead Sea Rift as a unique global site. Dead Sea, Israel: The German Israeli Foundation for Scientific Research and Development.

Guttman, Y. (1988): A two layers model of flow regime and salinity in the Yarkon-Taninim aquifer, . Tahal, Water Planning for Israel, Rep. 01/88/23, (1988), p. 17.

Guttman, J., 2000. Multi-Lateral Project B: Hydrogeology of the Eastern Aquifer in the Judea Hills and Jordan Valley. Mekorot Water Company, Report 468, p. 36.

Guttman, Y. and Zuckerman, H. (1995): Flow Model in the Eastern Basin of the Judea and samaria Hills. TAHAL Consulting Engineers Ltd. 01/95/66.

Laronne Ben-Itzhak, L., and H. Gvirtzman (2005), Groundwater flow along and across structural folding: An example from the Judean Desert, Israel, J. Hydrol., 312, 51– 69.

OGS (2011): OpenGeoSys Project, www.opengeosys.net

Rink K, Fischer T, Gräbe A, Kolditz O (2011a) Visual Preparation of Hydrological Models. Proc of MODELCARE 2011