

## **Groundwater models can provide totally different results than integrated hydrological models**

Lubczynski M.W. - University of Twente, Faculty of Geo-Information Science and Earth Observation (ITC)  
Hengelosestraat 99, P.O.Box 6; 7500 AA Enschede; The Netherlands

Sardon catchment (~80 km<sup>2</sup>) in Spain was modelled by standard, standalone groundwater MODFLOW model (Lubczynski and Gurwin, 2005) and by integrated hydrologic GSFLOW model coupling PRMS and MODFLOW-NWT codes (Tanvir-Hassan et al. 2014). Despite the same modelled domain, the two solutions provided totally different groundwater balance results. In the standalone groundwater model, the lateral groundwater flow represented 64% of recharge and groundwater evapotranspiration 36%. In the GSFLOW solution, the groundwater evapotranspiration represented 30% of recharge, lateral groundwater outflow only 5% while groundwater exfiltration to unsaturated zone, 69% of recharge. There are two main reasons of such differences: 1) in a standalone groundwater model, the recharge is defined arbitrary while in the integrated models is calculated internally based on climatic driving forces; 2) in a standalone groundwater model, groundwater can be discharged only by lateral flow or by groundwater evapotranspiration while in integrated models can also be exfiltrated to unsaturated zone from where it can be discharged to sinks, for example by interflow, so outside groundwater flow domain. The practical implications of discovered differences in the two model solutions will be discussed and critical conclusions for modeling practices formulated.

Lubczynski, M.W. and Gurwin, J. (2005) Integration of various data sources for transient groundwater modeling with spatio - temporally variable fluxes : Sardon study case, Spain. *Journal of Hydrology*, 306: 1-4 p. 71-96.

Tanvir-Hassan S.M., Lubczynski M.W., Niswonger R.G., Su Z., 2014. Surface-groundwater interactions in hard-rocks in Sardon Catchment of Western Spain: an integrated modeling approach. *Journal of Hydrology*, in press.