Geophysical Research Abstracts
Vol. 17, EGU2015-9813, 2015
EGU General Assembly 2015

Quantifying streamflow observation types importance to calibrating coupled groundwater/surface water models using frugal sensitivity analysis methods

Laura Foglia (1), Jakob Neumann (1), Mary Hill (2), and Thomas Harter (3)

(1) Technische Universität Darmstadt, Institute of Applied Geosciences, Darmstadt, Germany (foglia@geo.tu-darmstadt.de), (2) University of Kansas, Department of geology, (3) University of California, Davis, Land, Air, and Water Resources department

The importance of using different types of observations, such as heads, concentrations, groundwater age, with computationally frugal sensitivity analysis methods, has been widely demonstrated for models of groundwater flow and transport. In this work we present two examples of complex coupled surface water/ groundwater models in which head data and different types of streamflow data are used for sensitivity analysis and calibration. We demonstrate that the selection of streamflow data to be used in the process can be critical for a successful model calibration. The first example is the coupled groundwater/hydrological model developed for the Maggia Valley, Southern Switzerland. Here two different sensitivity analyses have been carried out: the first one with a limited amount of streamflow observations mainly concentrated in the peak of the hydrograph suggested the need to include more low and medium flows, and the second one including a better representation of all the parts of the hydrograph. The second example is the integrated surface water/groundwater model developed for the Scott Valley in Northern California. Using the knowledge provided from the Maggia example, in this specific case streamflow observations have been immediately identified as low, medium and high flows and different rules have been tested to select then the observations to include in each group. Examples of the effects of the various tests are presented. We can conclude that in this case there is the need to be careful with the amount of observations included in the analysis: we discovered that with too many observations and mainly with too many observations with potentially high measurement error it is difficult to properly calibrate the model.

In both cases it is shown the importance to carefully represent all parts of the hydrographs in order to properly simulate the surface water system and, based on the Scott Valley example, potentially redundant observations or too many observations with a very high measurement error should be removed in the analysis. Furthermore, regarding important observations, linear computationally frugal methods were not always able to distinguish between moderately and unimportant observations. However, they consistently identified the most important observations which are critical to characterize relationships between parameters and to assess the worth of potential new data collection efforts. Importance both to estimate parameters and predictions of interest was readily identified.