XVIII International Conference on Water Resources
CMWR 2010
J. Carrera (Ed)
CIMNE, Barcelona 2010

REDUCING MODELING UNCERTAINTY IN NATURAL AQUIFERS: THE EXPERIMENTAL SITE OF SETTOLO (ITALY)

Matteo Camporese[*], Luigi Da Deppo[*], Paolo Salandin[*], and Paolo Pizzaia[†]

[*] Università degli Studi di Padova
Via Loredan 20, 35131 Padova (PD), Italy
e-mail: camporese@idra.unipd.it, dadeppo@idra.unipd.it, sala@idra.unipd.it

[†] Alto Trevigiano Servizi S.r.l.
Via Schiavonesca Priula 86, 31044 Montebelluna (TV), Italy
e-mail: ppizzaia@altotrevigianoservizi.it

Summary. The uncertainties characterizing the description of hydraulic properties of aquifers and modeling of flow and transport processes, together with measurement errors, can be successfully dealt with by stochastic approaches, which allow the interpretation and the prediction of these processes in natural heterogeneous formations. However, the practical application of these approaches still encounters many difficulties, mainly due to the need for a detailed hydrogeological characterization of the site and to the unsuitability of the models, sometimes related to simplistic schematizations when describing in random terms the aquifer properties. Such circumstances emerge clearly in the real case of Settolo, an alluvial phreatic aquifer in a piedmont area of Northeastern Italy, where the uncertainties related to the variability of the geological structures crossed by paleo-riverbeds, to the interactions between watercourses and the aquifer, and to the recharge linked to precipitation and evapotranspiration must be challenged for an effective protection and/or a sustainable exploitation of the water resource. In order to face these challenges, a careful site characterization is in progress, with a number of different measurements and scales involved. The experimental site has an area of about 6 km^2, with an average aquifer thickness of about 40 m. We present here the data recorded at Settolo in the first months of monitoring activities and some results of a modeling approach consisting of a coupled surface-subsurface hydrological model integrated with an ensemble Kalman filter assimilation algorithm. The objective of this preliminary study is to show how the assimilation of variables that are relatively easy to collect in the field (e.g., only water table depth), in conjunction with other measurements (e.g., geophysical characterization of the subsurface formations), can help to quantify and reduce the uncertainty inherently affecting real applications of hydrological models.