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

DEVELOPMENT OF GROUNDWATER MODEL FOR THE ARID AND SEMIARID AREA：THE WADI KAFREIN CATCHMENT/JORDAN

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Summary. The purpose of this study is to develop a three-dimensional groundwater flow model integrating all important geological features of the hydrogeological system, in order to investigate the groundwater flow system in the Wadi Kafrein area. The study area is located in the lower Jordan Valley/Jordan and is intensively used by irrigated agriculture. However the scarcity of water due to semi-arid and arid climate is the key challenge for the growing population. Therefore, a proper assessment of the groundwater resources as well as their quality is a prerequisite. The numerical model is implemented in the framework of scientific software OpenGeoSys and then updated in order to meet the challenges of complex geological features of the study area. The challenge in this work is to apply a numerical flow model to the complex geological layers. To deal with the discontinuity of layers, a new methodology is developed by removing and adjusting elements. Using the newly developed mapping approach, the translation of the highly detailed and complex geological formations to the structural model can be achieved with high accuracy. The steady-state groundwater model is then created through appropriate boundary conditions, infiltration and hydrogeological parameters and calibrated using the observed well data. Based on the above results, a three-dimensional numerical transient model integrating all important geological features of the hydrogeological system is developed using the time and space dependent source terms for a long period. The comparisons between the simulation results and the observation data show that the flow model is capable of reproducing historical groundwater level changes to a satisfactory degree. Since the Wadi Kafrein area is one of the arid and semiarid regions in the Lower Jordan Valley, the models developed in this study can be a useful tool for analyzing the hydrological processes and improving groundwater management practices elsewhere affected by similar geologic and hydrologic conditions.