

Groundwater management of Skhira aquifer (center east of Tunisia): flow modeling and planning under climate and anthropogenic constraints

Fadoua Hamzaoui-Azaza^{a,*}, Rihem Trabelsi^b, Rachida Bouhlila^b

^aUniversity of Tunis El Manar, Faculty of Sciences of Tunis, Laboratory of Sedimentary environments, Oil systems and Reservoir characterization, 2092, Tunis, Tunisia, email: fadoua_fst@yahoo.fr

^bUniversity of Tunis El Manar, National Engineers School of Tunis Modeling in Hydraulic and Environment Laboratory, BP 37, 1002, Le Belvédère, 1002, Tunis, Tunisia, emails: rihemtrabelsi2012@gmail.com (R. Trabelsi), rjbouhlila@yahoo.fr (R. Bouhlila)

Received 1 May 2019; Accepted 26 June 2019

ABSTRACT

High pumping rates from Skhira aquifer during the previous years led to a significant decline of water levels and degradation of the groundwater quality by seawater intrusion. In order to avoid these major problems affecting groundwater quality and quantity of this aquifer, sustainable water resource management is necessary and a priority to select an appropriate exploitation scheme. For this purpose, geographic information systems and Modflow have been applied to estimate current and future water budgets; hydrodynamic modeling of Skhira groundwater was investigated by using Modflow code to understand the hydrodynamics and the geometry of the aquifer system. The calibration of the mathematical model in steady state (1973) helped to refine the spatial distribution of transmissivity, to restore the groundwater level at each point, and to establish the stock of the groundwater. The assessment of the reliability of the model was conducted by comparing the simulated and observed values of the hydraulic head for the observed wells. It is noticed that there is a satisfactory concordance between these levels, especially in areas, where there is sufficient information about the hydrodynamic properties (transmissivity and piezometry). The results from the steady state were used to calibrate the transient model, to refine the spatial distribution of recharge and storage coefficient, and to determine the drawdowns at all points capturing Skhira aquifer during the period (1973–2014). Using the calibrated model, different scenarios were considered in order to predict the aquifer response under different exploitation conditions and stresses.

Keywords: Water management; Modflow; Modeling; Calibration; Simulations; Skhira aquifer; Tunisia

* Corresponding author.