

Evaluation of Surface and Groundwater Flows to the Tuzla (Palas) Lake Using Simulation Models

F. Dadaser-Celik^{*1}, S. T. Azgin³, A. M. Amiri, and M. Celik²

^{1,3} Environmental Engineering Department, Erciyes University, TURKEY.
(E-mail: fdadaser@erciyes.edu.tr, stazgin@erciyes.edu.tr)

² Computer Engineering Department, Erciyes University, TURKEY.
(E-mail: mcelik@erciyes.edu.tr)

ABSTRACT

Tuzla (Palas) Lake, which is the second largest salt lake in Turkey, is part of the Palas Basin in Kayseri. Tuzla Lake is one of the important wetland ecosystems in the Central Anatolia region and has significant potential for ecotourism. Tuzla Lake is fed by precipitation and surface and groundwater flows generated in the Palas Basin and therefore is very susceptible to the changes climatic conditions and in water use practices. In recent years, water levels and surface areas at the Tuzla Lake showed significant fluctuations. Satellite remote sensing methods and accompanied statistical analysis of hydrologic and climatic data showed that these fluctuations were partly related to climatic changes. However, the relationships between lake hydrology and surface and groundwater use practices are still unknown. In this study, we examined how the hydrology of the Tuzla Lake is related to surface and groundwater flows in the Palas Basin using simulation models. Surface water flows to the Palas Basin were simulated with SWAT (Soil and Water Assessment Tool), which is a semi-distributed process-based hydrologic model that simulates hydrological processes at subbasin level. The groundwater flows were simulated with the model developed using the FREEWAT (FREE and open source software tools for WATER resource management) platform. FREEWAT platform is based on the groundwater models (i.e., MODFLOW) and has been integrated as plugin into the open-source GIS program of QGIS. The analyses reveal the causes of hydrologic changes at the Tuzla Lake.

Keywords: saline lakes, hydrology, watershed modeling, groundwater modeling SWAT, FREEWAT, Tuzla (Palas) Lake.

Acknowledgment: This paper is presented within the framework of the project FREEWAT, which has received funding from the European Union's HORIZON 2020 research and innovation programme under Grant Agreement n. 642224. This study was also supported by Erciyes University Research Fund through projects FBA-12-3953 and FBD-12-4131.