Environmental Engineering and Management Journal xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
http://www.eemj.icpm.tuiasi.ro/; http://www.eemj.eu

"Gheorghe Asachi" Technical University of Iasi, Romania

ESTIMATING OF THE POTENTIAL EVAPOTRANSPIRATION (PET) USING SATELLITE IMAGERY IN ARID LANDS

Azam Sadat Hosseini, Mohammad Zare*, Mohammad Hossein Mokhtari

Faculty of Natural Resources and Eremology, Yazd University, Iran

Abstract

Evapotranspiration is one of the main sources of water loss in arid regions. Although FAO Penman-Monteith (FAO-PM) method is one of the accurate method to estimate potential evapotranspiration (PET). Nevertheless, it is a point-based method and requires several weather data such as radiation, wind speed, air humidity and temperature, which is not available in all regions. Therefore, this study is aimed to estimate PET equivalent to FAO-PM model using satellite data and Priestly-Taylor (PT) model in Yazd province, located in Central Iran. Daily net radiation and soil heat flux, which are used in PT method, were calculated using Landsat 5 data. Then, the net radiation data were integrated with ground data to estimate PET through PT equation. Although similarity between ground-based Priestly-Taylor (PT land) and satellite-based Priestly-Taylor (PT image) was observed, FAO-PM had higher PET values (RMSE=4.74 mmd^{-1}) compared to other methods in all climatic zones of the study area. Therefore, results of PT image method can be replaced with PT land results to estimate potential evapotranspiration, in regions with limitation or lack of weather data. Finally, linear regression model were used for presenting relationship between ground-based FAO-PM and PT land. For this purpose, 70% and 30% of ground data were used for modeling and testing, respectively at different Selianinov climatic zones of the study area. Maximu RMSE for modeled and test data were 4.6 and 2.93, respectively. The model output was applied on PT image to get the FAO-PM image with maximum RMSE of 3.67. It can be concluded that the defined regression equations for each climate zones in this study, can be used to convert values of satellite- based Priestly Taylor method (PT image) as independent variable (X) to equivalent of FAO-PM PET.

Key words: arid lands, FAO Penman- Monteith, potential evapotranspiration, Priestly- Taylor, remote sensing

Received: April, 2017; Revised final: September, 2018; Accepted: October, 2018

* Author to whom all correspondence should be addressed: e-mail: mzernani@yazd.ac.ir; Phone: +98 3531232819; Fax: +98 3538210312