Estimation of Actual Evapotranspiration Using Satellite Imageries and Single-Source and Two-Source Surface Energy Balance Algorithms in Qazvin Plain

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Abstract

Reference Evapotranspiration is a complex and multivariate phenomenon that depends on several factors and the most accurate way to estimate is lysimeter, though it is costly and time-consuming. Therefore, the main objective of this study was to estimate actual evapotranspiration based on single-source energy balance, i.e. SEBAL and SSEB, and two-source energy balance algorithm, i.e. TSEB, in three sensors MODIS, ETM+ and OLI & TIRS in three steps. In evapotranspiration estimating by SEBAL, Soil Adjusted Vegetation Index and the correction factor for soil effects (L) are particularly important. For this purpose, this index was used as calibration coefficient that is selected based on percentage of vegetation coverage. According to the results, the actual evapotranspiration with L calibrated (L=0/5) had lower error in each of the three sensors (RMSE=1/76, 0/84, and 1/49 mm/day). For verification of calibration results, 30% of the remaining lysimeter data was used. The results of the statistical indices showed significant difference between the predicted data at the 95% level and also in the predictions. Finally, by comparing the three algorithms in the three sensors i.e. MODIS, ETM +, and OLI & TIRS, SSEB algorithm in ETM + sensor was introduced as the best algorithm in Qazvin plain area, at 95% significance level and RMSE of 0/41 mm/day.

Keywords: SEBAL, SSEB, TSEB, SAVI, Soil Adjusted Vegetation Index

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*- Received: December 2017 :and Accepted: May 2018