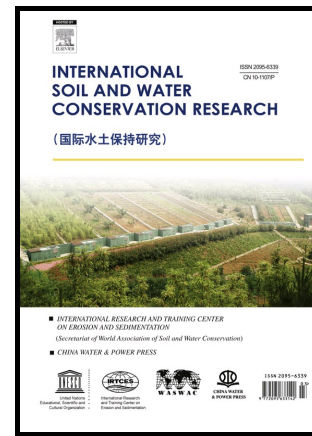


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Validation and Calibration of Various Reference Evapotranspiration Alternative Methods under Bosnia and Herzegovina Climate Conditions

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Abstract

In Bosnia and Herzegovina (BiH), the number of weather stations (WS) that are monitoring all climatic parameters required for FAO-56 Penman-Monteith (FAO-PM) equation is limited. In fact, it is of great need and importance to achieve the possibility of calculating reference evapotranspiration (ET_0) for every WS in BiH (around 150), regardless of the number of climate parameters which they collect. Solving this problem is possible by using alternative equations that require less climatological data for reliable estimation of daily and monthly ET_0 . The main objective of this study was to validate and determine, compared to the FAO-PM method, a suitable and reliable alternative ET_0 equations that are requiring less input data and have a simple calculation procedure, with a special focus on Thornthwaite and Turc as methods previously often used in BiH. To fulfill this objective, 12 alternative ET_0 calculation methods and 21 locally adjusted versions of same equations were validated against FAO-PM ET_0 method. Daily climatic data, recorded at sixteen WS, including mean maximum and minimum air temperature ($^{\circ}\text{C}$), precipitation (mm), minimum and maximum relative humidity (%), wind speed (m s^{-1}) and sunshine hours (h) for the period 1961-2015 (55 years) were collected and averaged over each month. Several types of statistical indicators: the determination coefficient (R^2), mean bias error (MBE), the variance of the distribution of differences (s_d^2), the root mean square difference (RMSD) and the mean absolute error (MAE) were used to assess alternative ET_0 equation performance. The results, confirmed by various statistical indicators, shows that the most suitable and reliable alternative equation for monthly ET_0 calculation in BiH is the locally adjusted Trajkovic method. Adjusted Hargreaves-Samani method was the second best performing method. The two most frequently used ET_0 calculation methods in BiH until now, Thornthwaite and Turc, were ranked low.

Keywords

Reference Evapotranspiration; Limited data; FAO-56 Penman-Monteith; Calibration; Thornthwaite

1. Introduction

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