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Trend Analysis of Evapotranspiration in Northern Cyprus

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Global warming commenced to effect various kind of climates abruptly especially in last two decades. Rainfall and temperature characteristics, and other atmospheric events present “abnormal” trends due to these abrupt changes. Therefore, small-scale climate models are becoming essential at least as much as global models. In this study, Northern Cyprus, a Mediterranean island below the Turkey, is examined by using 37 years’ monthly temperature and rainfall data from 30 different stations to estimate potential evapotranspiration (PET) and actual evapotranspiration (ET). This region has semi-arid climate features where evapotranspiration is the main water loss due to scarce rainfall amount and high temperature tendency. Mainly temperature based Hamon and Thornthwaite equations are selected for the evapotranspiration estimation. In such semi-arid climates, water balance is highly critical in order to maintain the self-sufficient systems. Unexpected value detection, distribution fittings (normality tests), and outlier tests (Grubbs for normally distributed data sets, and interquartile range test (IQR) for not-normal distributed tests) were implemented as quality control stage of the data before any further analysis. Standard Normal Homogeneity Test (SNHT) was required for temperature data ahead of the PET and ET estimation to reveal change-points which might be caused by environment alteration or method change. Seasonal and annual ET and PET maps are created on the Geographic Information Systems (GIS) platform for an explanatory visual representation. Even though aforementioned methods are mostly based on temperature, PET trends are not completely following the temperature trends especially on transition seasons due to other parameters (annual heat index (I) for Thornthwaite, and saturated vapor pressure (e_s) for Hamon). Actual evapotranspiration estimations, however, considers both temperature and rainfall, consequently, ET trends are more likely to prove a realistic evidence for the climate change. Mann-Kendall test was performed on seasonal and annual ET data sets. Due to having relatively less rainfall in most parts of the island, ET correlations were resulted quite high for almost all periods and stations, nonetheless, PET results show interesting correlations. Eventually, depending on the climatic conditions, some regions (environments with high rainfall and temperature such as tropical climates) promising the performance difference on the contrary to the literature suggests.