RESEARCH ARTICLE **(Open Access)**

Duration of the pluviometric deficit in Albania

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Abstract

The pluviometric deficit is the part of water amount evapotranspirated from the field but not getting replaced by the rainfall in a given period of time. That is why the pluviometric deficit could get quantified only when both, the potential evapotranspiration and rainfall are determined quantitatively. However, the pluviometric deficit is made of two dimensions: duration and magnitude. The aim of this paper is to present the results of a study done throughout Albania on the duration of pluviometric deficit. For this, the dependencies of potential evapotranspiration and rainfall, respectively, over time are determined by applying the regression analysis, after the data on sun radiation, temperature, relative humidity, wind speed and precipitation are collected from 56 meteorological stations throughout Albania and over six years. All of these functions are plotted in individual graphs and the duration of pluviometric deficit is determined by equalizing the function of potential evapotranspiration over time with the respective function of rainfall over time. The results are going to be used to classify the Albanian climate on humidity and aridity scales.

Keywords: potential evapotranspiration; rainfall;pluviometric deficit.

1. Introduction

The climate itself is much more than precipitation, sun radiation, temperature, wind speed and relative humidity. The climate parameter we miss is the evapotranspiration. In substance, evapotranspiration is the inverse of rainfall. If the rainfall brings water to the field, evapotranspiration takes the water away from the field to the atmosphere [1]. To determine whether a climate is dry or humid, we must know whether the rainfall is less or greater than the evapotranspiration, or vice versa. The present study is focused on quantifying the evapotranspiration based on the Penman-Monteith formulae [2, 3, 4, 5] and comparing it with the rainfall [6, 7], in various points (56 meteorologic stations) spread throughout Albania.

2. Materials and methods

2.1. Applying Penman-Monteith formula to quantify the potential evapotranspiration

The following one is the formula applied to determine the potential evapotranspiration [5], for each meteorological station under consideration. Temperature, sun radiation, wind speed and relative humidity are measured on daily basis for a period of six years.

$$ET_0 = \frac{0.408\Delta(R_n - G) + \gamma\frac{900}{T+273}u_2(e_s - e_a)}{\Delta + \gamma(1 + 0.34u_2)} \quad (1)$$

To do the calculations, the computer programme released by FAO was used.

2.2 Rainfall

Determination of the rainfall has been done at the same time as the potential evapotranspiration was. The rainfall readings were done in a classic manner.

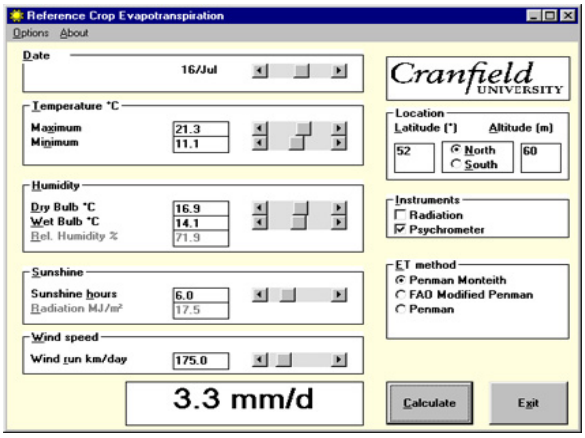

Figure 1: The program (software) used to apply the formulae Penman-Monteith

2.3 Pluviometric deficit determination

Pluviometric deficit determination is calculated and graphed for the 56 locations throughout Albania.

The metereologic locations are spread all over the country and this is shown in the following figure.

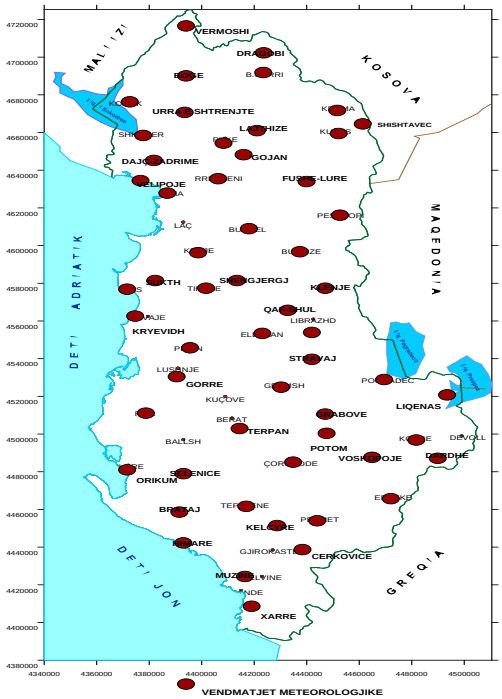

Figure 2:Locations of the meteorological stations

3. Results and Discussions

The curves $Etp=f_1(time)$ and $R=f_2(time)$ are given. Being as there are fifty six locations whose curves should be presented, which is going to occupy a space that goes beyond the standard limits of publication, only the curves of three typical areas (regions, zones) will be shown and discussed in the present article.

As it can be seen, the north-west zone of Albania is characterized merely by the lack of the pluviometric deficit, which means that statistically the two curves, $ET_p=f_1(t)$ and $R=f_2(t)$, do not intersect with each other, consequently, there is not any pluviometric deficit.

As it can be seen, the south-east zone of Albania is characterized by a medium magnitude of the pluviometric deficit, which means that statistically the two curves, $ET_p=f_1(t)$ and $R=f_2(t)$, do intersect with each other, but, the duration of the deficit doesn't last long and its magnitude will be somewhat between 150-300 mm.

As it can be seen, the central zone of Albania is characterized by a duration of the pluviometric deficit lasting long and its magnitude will be between 400-550mm

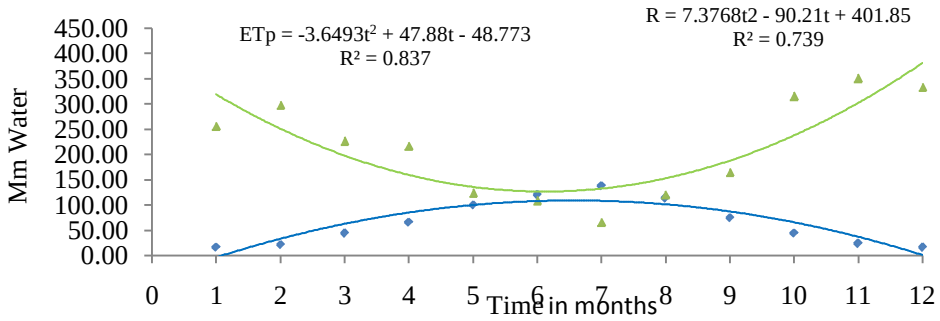

Figure 3: The functions of potential evapotranspiration and rainfall over time. Boga location; north west of Albania

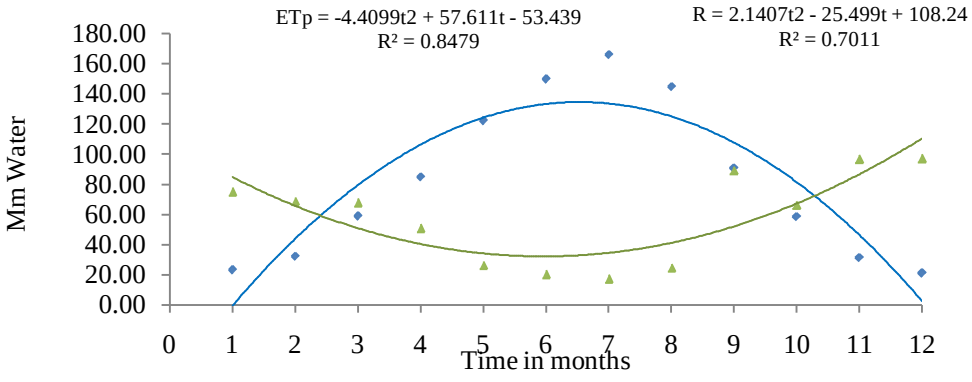

Figure 4: The functions of potentialevapotranspiration and rainfall over time. Çorovode location; south of Albania

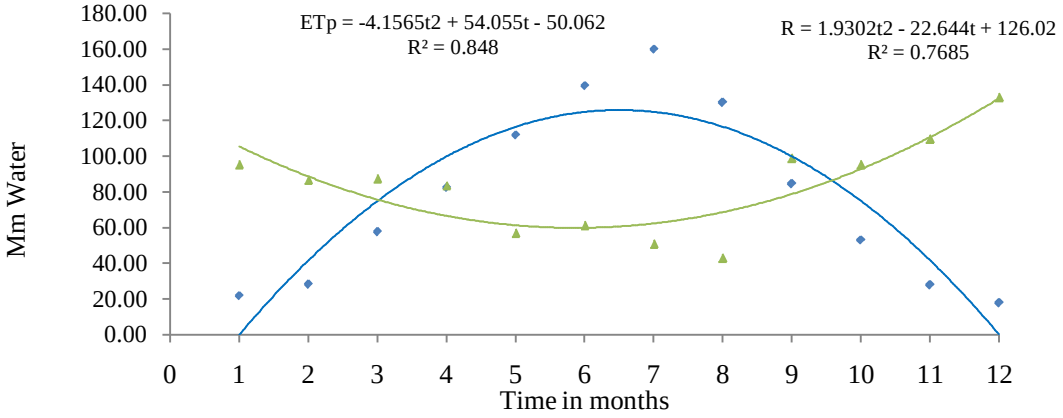

Figure 5: The respective functions of potential evapotranspiration and rainfall over time. Fier location; central part of Albania

4. Conclusions

1. At the north west zone of the country the curves don't intersect or intersect slightly. Therefore, the zone will be characterized by high humidity coefficients.
2. The rest part of the country, so, approximately 3/4 of it, is characterized by the medium to large pluviometric deficits. The functions of evapotranspiration and rainfall over time. Çorovode; south of Albania

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