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CHARACTERISTICS OF THE EVAPORABILITY SPATIAL DISTRIBUTION IN THE REPUBLIC OF MOLDAVIA

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Abstract: *On the basis of measurements from 14 meteorological stations and using different interpolation methods we calculated evaporability. At the same time have been drawn maps showing the spatial variation of evaporability on the territory of the Republic of Moldova.*

Key words: *evaporability, spatial interpolation*

Introduction

It is well known that in southern and south-eastern Europe the rainfall quantities do not compensate the annual evaporability, thus occurring conditions of insufficient humidity, mainly in the warm periods of the year, when takes place the growth and development of crops. By evaporability (E_o) we understand the water quantity that can be evaporated from a certain surface if the water reserve would be unlimited.

For the territory of the Republic of Moldavia, situated in an insufficient humidity region, knowing the evaporability spatial repartition features presents a special interest, especially for the last decades, when was registered an increased frequency of droughts and humidity deficient periods. The limited quantity of atmospheric precipitations and the approximate values of evaporability registered at the meteorological stations from the Republic of Moldavia have determined the opportunity of using diverse calculation methods known in classical climatology for the spatial evaluation of this index.

Materials and methods

The measurements regarding evaporability are quite limited in the republic, being conducted at only 7 of the existent 17 meteorological stations. At the same time, the multiple calculation methods known in climatology might allow interpolations, if the empiric data would be concordant with those registered at the 7 stations. Taking into account the mentioned facts, we applied several calculation methods in the attempt of analyzing the characteristics of the spatial distribution of evaporability in the study area, in the search for an

optimum one. The interpolations of the obtained data were conducted in the Surfer software, by the Radial Basic method.

In the evaporability calculation formula, A. Alpatiev used the air humidity deficit:

$$E_0=0.65\ \Sigma\ d, \qquad (1)$$

0.65 – the biologic coefficient of evaporation used by Alpatiev as constant value;

Σd – the sum of the humidity deficit, мм.

The calculation of evaporability after N. Ivanov has the following expression:

$$E_0=0.0018\ (25\pm t)2(100-a), \qquad (2)$$

t – mean annual temperature;

a – monthly average of relative air humidity.

S. Costin proposes the taking into consideration in the evaporability calculation of the air humidity saturation insufficiency and of air temperature:

$$E_0=dn/4\ (1+0.004t)2, \qquad (3)$$

d – mean insufficiency of air humidity saturation for a certain period;

n – length of period in days;

t – mean air temperature for a certain period.

M. Budîco demonstrated that the sum of active temperatures is in a strong correlation with the radiation budget, and as a consequence with evaporability. This relation may be expressed as:

$$E_0=0.18\sum T, \qquad (4)$$

∑T – the sum of active temperatures.

Later E. Olidecop proposed the taking into account of the evaporability value in relation to the air humidity saturation, according to the expression:

$$E_0=ad, \qquad (5)$$

d – air humidity insufficiency;

a – proportionality coefficient.

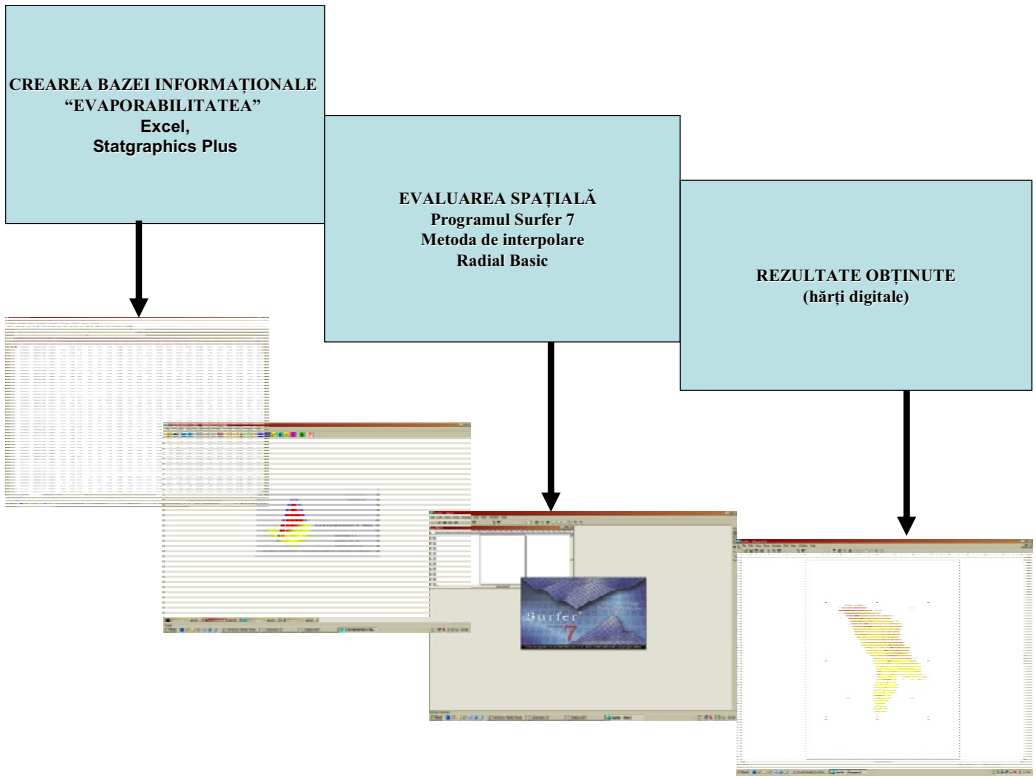

Fig.1. The informational database *Evaporability* included in the Regional Geographic Systems

The informational database created in Excel (fig.1) allowed the import and statistical processing of data in the Statgraphics Plus software. The obtained results have stood at the base of the evaporability interpolation according to the above mentioned methods.

Obtained results

The interpolation of the data obtained through the use of several methods shows visible qualitative differentiations of the potential evaporability at a regional level. The theoretical possibilities of one or other interpolation method have to take into account both the presence of the input data as well as the characteristics of the local landscape features.

According to the previous research conducted on this subject [1], the most effective method for evaporability calculation is considered that of the radiation budget. Still, even in the use of this method occur difficulties that depend on the use of the initial radiation balance data, because on the territory of the Republic of Moldavia such measurements are conducted at only one station - Chişinău. Besides, there were also registered high variations of the E_o index, even for only one chosen method (Budîco).

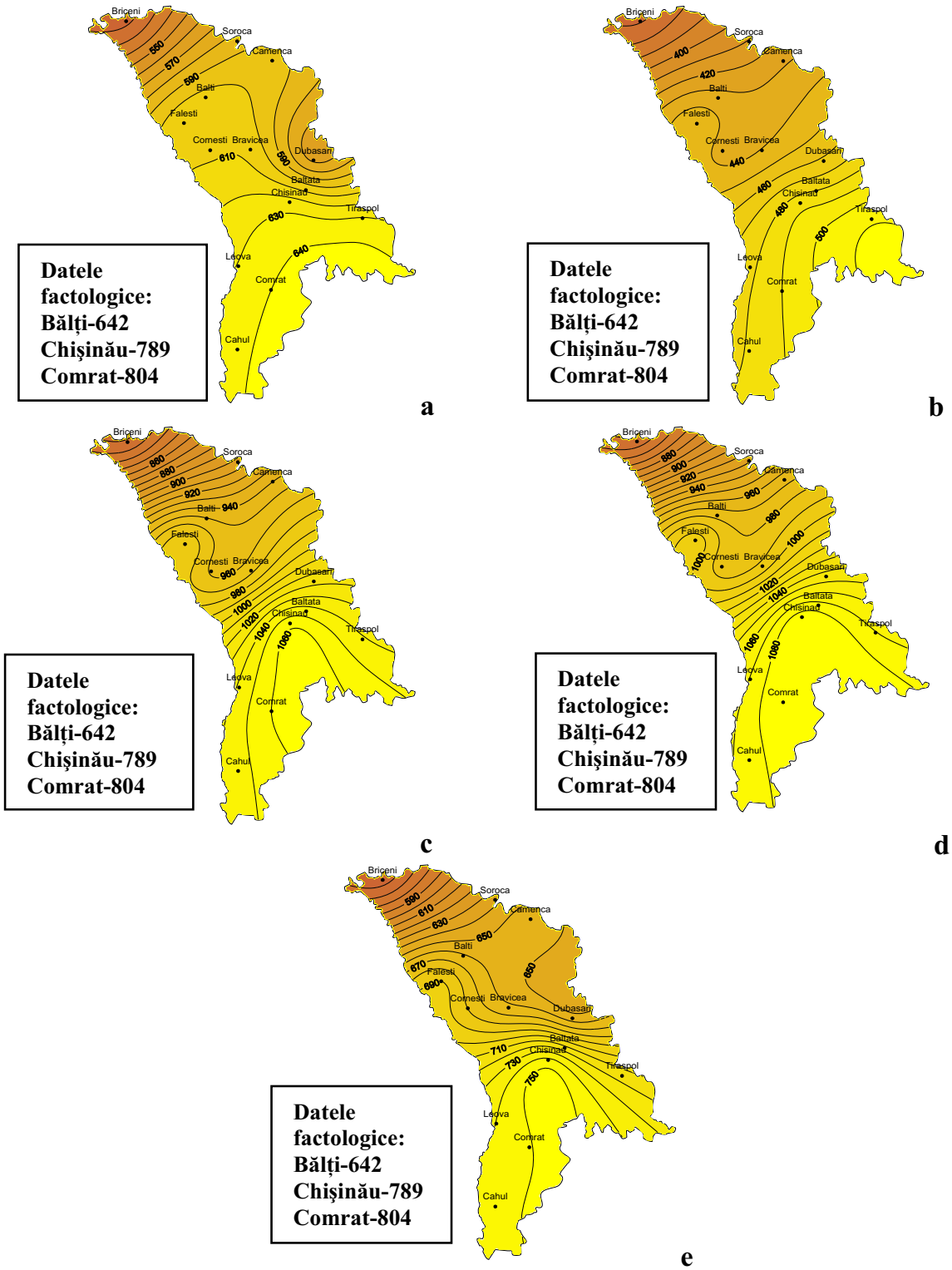

Figure 2. *The spatial repartition of evaporability according to different calculation methods (a-Budîco, b-Costin, c-Olidecop, d-Alpatiev, e-Ivanov)*

In this context, for the evaluation of the characteristics of regional evaporability spatial repartition, as well as for the solving of a series of problems of practical character, have been used the data calculated on the basis of air humidity deficit (A. Alpatiev), according to the mean annual temperature in relation to monthly average of air relative humidity (N. Ivanov), according to air temperature and air humidity saturation insufficiency (S. Costin, E. Olidecop), and on the basis of the sum of active temperatures, strongly related to the radiation balance and thus with evaporability (M. Budîco).

The obtained results allow the conclusion regarding the manifestation of the zoning principle in the evaporability repartition on the territory of the Republic of Moldavia, disregarding the method used. Thus, the regions with the highest values of this index are characteristic to the southern and south-eastern regions, where the atmospheric rainfall quantity is lower. The lowest values are measured in the north-western part of the territory, where the rainfall sum is higher.

The comparison of the regional evaluations of E_0 obtained as result of the use of different calculations methods denote that the values obtained from the method of N.Ivanov are closer to the measured ones. The obtained results will make up the base for a complex estimation of the republic territory from the viewpoint of its water reserves.

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