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THE EVOLUTION OF THE PLUVIOMETRIC CONDITIONS IN CONNECTION WITH THE DEVELOPMENT OF THE DROUGHT PHENOMENON IN THE PLAIN OF BANAT

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Abstract: The highlight of the climate dryness tendency, in a certain zone, can be realized through the ratio between the annual amount of precipitations and the multiannual average and through their deviation. Representing in a diagram the tendency equation it had been highlighted the evolution in long time of the annual precipitations, also with the drought periods and their frequency.

INTRODUCTION

Arid climates exhibit different degrees of temporal and spatial variations of climate (especially precipitation) and vegetation cover characteristics.(Lioubimtseva, 2004) The aridization tendency of the climate in the Plain of Banat, especially in the extreme west is being highlighted by the increasing of the frequency and intensity of the risk phenomena, especially in the warm period of the year, manifested through drought, excess precipitations, showers, storms, hails. The meteorological drought is the situation in which on a large surface there appears the deficit of precipitations, in comparison with the normal value for the region in cause and a certain season.(Mihailovic et al., 2000) The natural climatic damage can contribute to the dry fields' degradation and to the spreading of the desert conditions.(Roberts, 2002) In the same time, the degradation of the soils in the semiarids and dry-subhumid climates, intensifies both the climatic drought and the edafic drought.(Munteanu, 2000)

MATERIAL AND METHOD

The highlight of the evolution tendency in time and in space of the amount of precipitations was made using data from 3 meteorological stations characteristic to the zones the most affected by the drought. For the Sannicolau Mare and Banloc stations were processed data for a period of 48 years (1958-2005) and for the Jimbolia station for a period of 21 years (1985-2005). On the basis of the annual values of the precipitations there were calculated multiannual averages, using the arithmetic average. The evolution tendency was showed through the graphic representation of the 6^{th} grade polynomial equation included in every diagram. The frequency of precipitation deficitary periods was established after the Hellman criterium, through the comparison in a row of data, the number of deviations from the multiannual average considered normal, with the number of negative deviations larger than 5.0%. From the data row there were extracted the extreme values, representing the extremely dry years.

RESULTS AND DISCUSIONS

The characteristics of the general circulation of the atmosphere and the particularities of the structure of the active terrestrial surface are the fundamental causes determining the regime and the territorial spreading of the precipitations. Their very complex genesis in interdependence with the natural varied environment of the Banat zone, determine the large differences of their repartition on the vertical.(Stanciu, 2005) The annual amounts of precipitations register very large fluctuations from year to year, in relation with the circulation conditions. These non-periodic variations can be highlighted through the variation in time of the amount of precipitatios, through the establishment of the largest and smallest annual values and through the deviations of the annual averages from the multiannual one.(Bogdan, 1980)

The Sânnicolau Mare station is located at 85 m altitude in the plain zone, and after the interpretation of the data for a period of 48 years (1958-2005), the multiannual average is 530,7mm. Making a comparison with the multiannual average calculated for the period 1950-1999 (541,4mm) it can be observed a diminution of the average. The non-periodic variation and the deviation from the multiannual represented in the diagram (fig. 1) shows large differences from year to year, being registered the value 699,1mm in 1999 and 267,7 mm in 2000. The maximum amount was registered in 1969 (743,5 mm) and the minimum one in the year 2000. (267,7mm), the maximum negative deviation being of 49,6%.

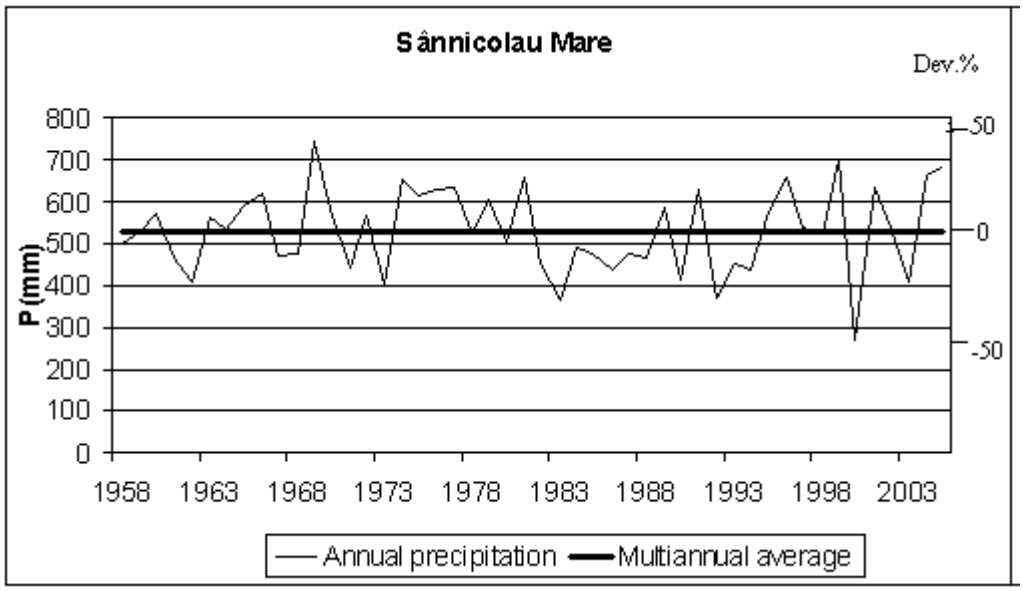

Fig.1 The non-periodic variation and the deviation of the annual amount of precipitations from the multiannual average at Sânnicoalu Mare station

Analyzing the tendency line of the precipitations evolution registered at Sânnicolau Mare, (fig.2) it can be seen the existence of 2 periods of diminution of the amounts, these being situated mostly under the multiannual average. The first period is short (1960-1962) and the second is of 14 years, from 1980 to 1994, followed until present by the increasing tendency of the amounts of precipitations.

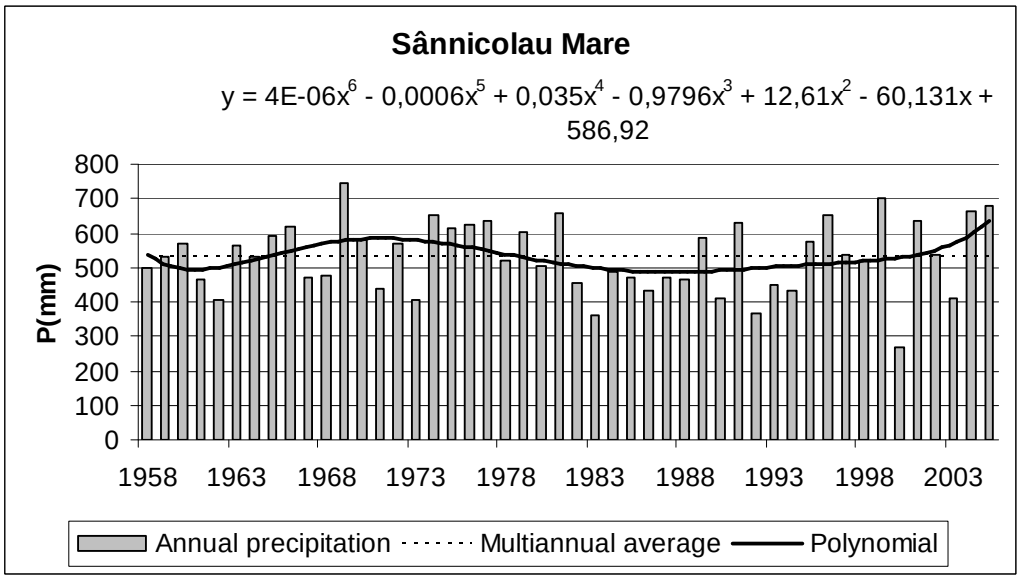

Fig.2 The evolution tendency of the annual amounts of precipitations at Sânnicolau Mare station

A different meteorological station located in the area of the zones affected by the drought is the one from Jimbolia. It is located at South from Sânnicolau Mare station, in the plain zone, at 79 m altitude. The studies were made on a period of 21 years, from 1985 to 2005. In this period the calculated multiannual average of the amounts of precipitations is of 529,9 mm, smaller than the one for the period 1950-1999, which is of 560,1 mm. Through the ratio between the annual precipitations and the multiannual averages, the maximum value was registered in 1999 (801,1 mm) and the minimum value in the year 2000. (218,5 mm).The temporal alignment of the maximum and minimum value in two consecutive years, demonstrates the strongly fluctuant character of the pluviometric regime. The largest negative deviation of the amount of precipitations registered at the Jimbolia station is of 58,7% (fig. 3).

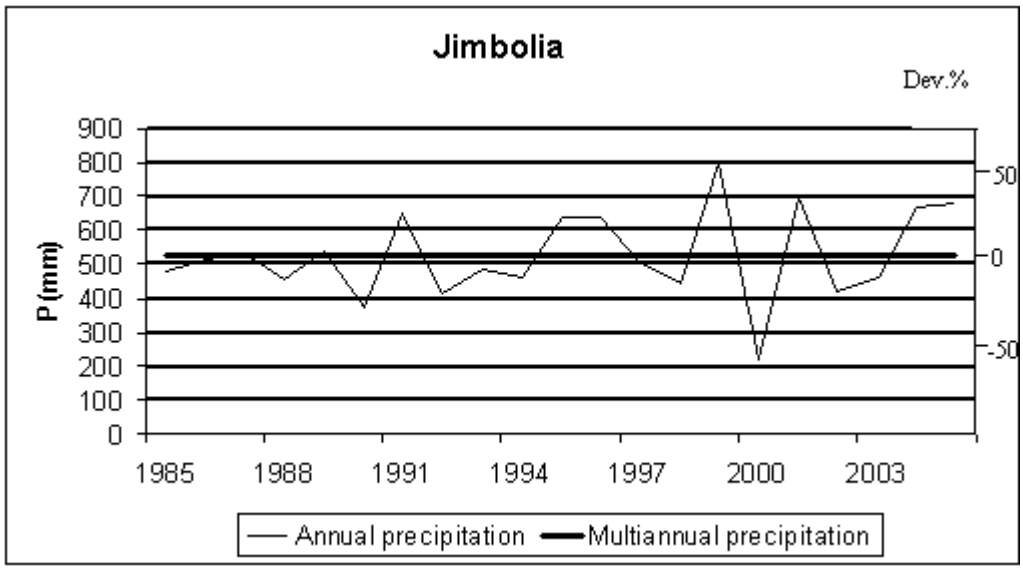

Fig.3 The non-periodic variation and the deviation of the annual amount of precipitations from the multiannual average at Jimbolia station

The diagram representations of the tendency equation shows the presence of two periods dominated by the deficit of precipitations, one from 1988 to 1991 and the other from 1997 to 2003, each of them flanked by excedentary periods. In the second mentioned period it appears maximum value between two years in which the amounts of precipitations are situated under the multiannual average(fig.4).

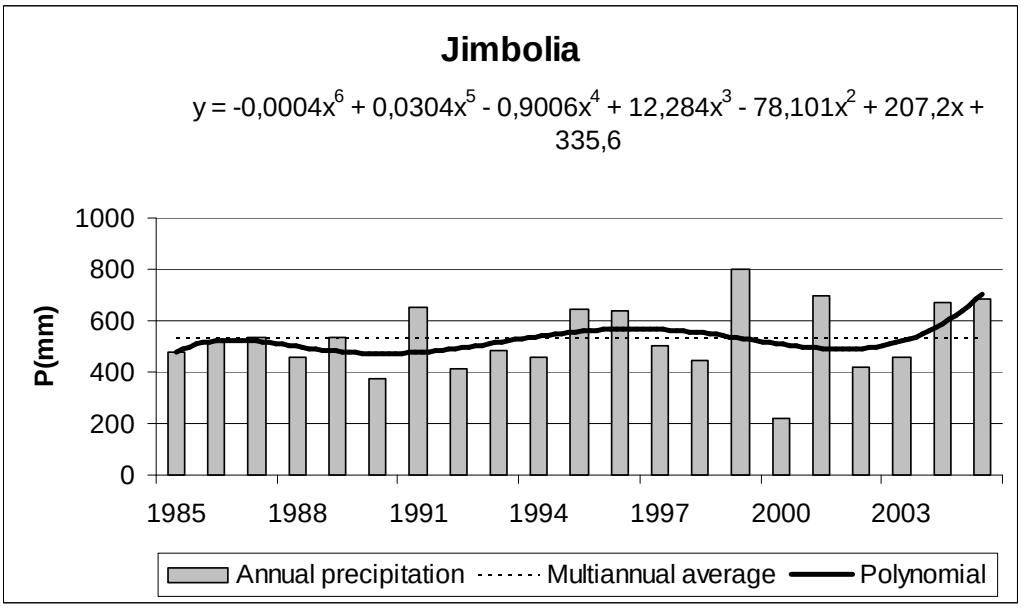

Fig.4 The evolution tendency of the annual amounts of precipitations at Jimbolia station

The Banloc station is located in the plain zone, at 83 m altitude, at South from the Jimbolia station and the period of data registration was of 48 years, from 1958 to 2005. The multiannual average of the amounts of precipitations is of 598,3 mm, in diminution comparing to the multiannual average from the period 1950-1999, which was of 600.6 mm. The maximum negative deviation is of 50,3%, in the year 2000 (297,3 mm). The maximum amount of precipitations in the studied period is of 915,2mm in 2005 (fig.5).

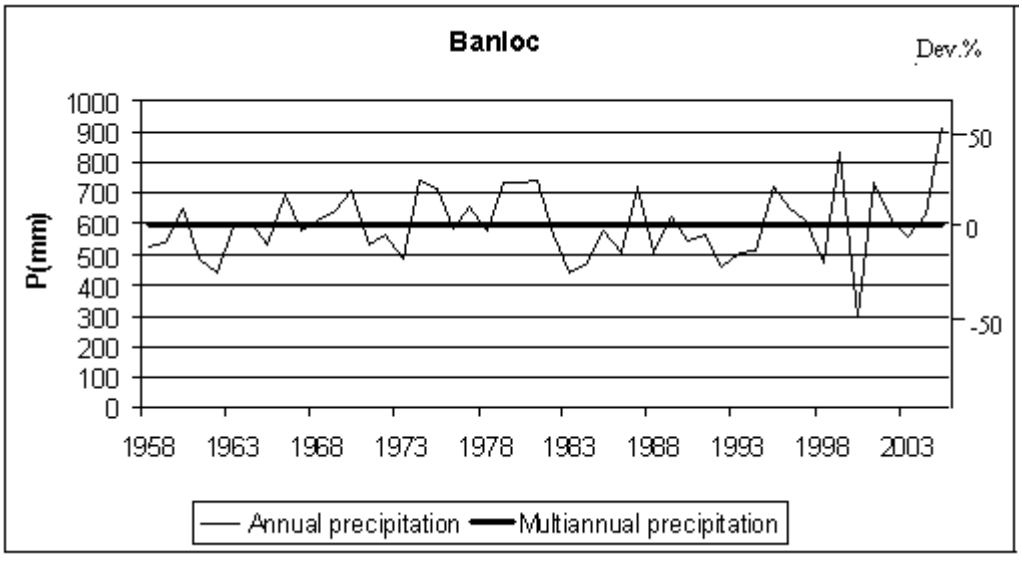

Fig.6 The non-periodic variation and the deviation of the annual amount of precipitations from the multiannual average at Banloc station

Analyzing the tendency evolution of the annual amounts of precipitations at Banloc station there can be observed two diminution periods. The 1st period (1958-1965) is short but with larger differences from the average and the 2nd period is larger (1981-1998) and more liniar, situated between two increasing periods (fig.6).

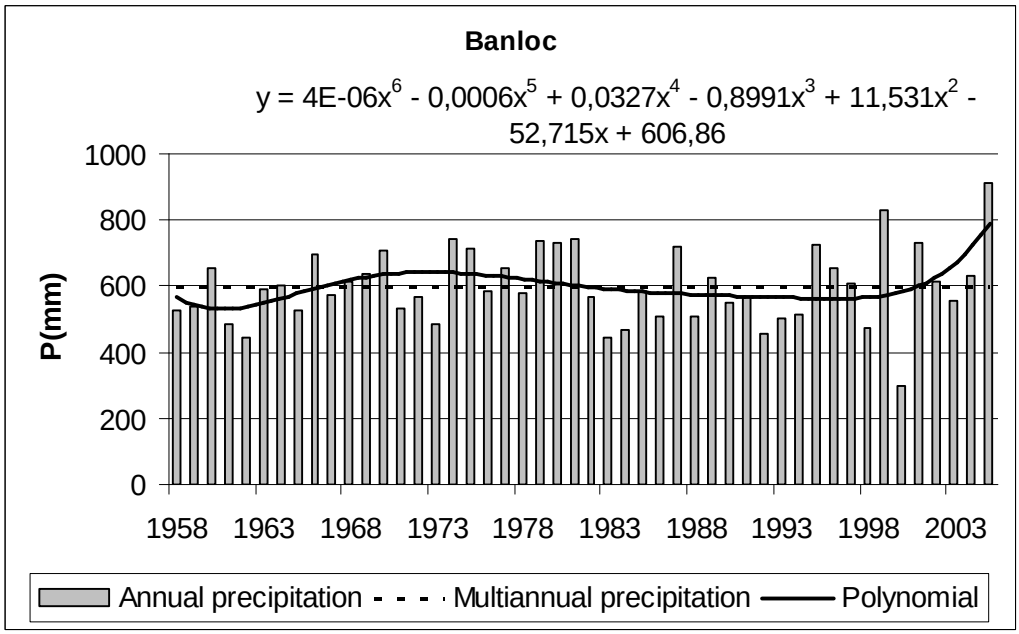

Fig.4 The evolution tendency of the annual amounts of precipitations at Banloc station

In general, there can be observed as extremely dry years the years 1961, 1962, 1983, 1992, 2000 and 2003. Moreover, the minimum value of the annual amounts of precipitations is registered, at all the stations taken into account, in the year 2000, when it diminished with up to 58.7%.

The total frequency of the years pluviometrically deficitary can be calculated after the Hellman criteria, comparing the years considered normal with the ones deviating with more than 5.0%. The resulted situation is present in table 1.

Tabel 1. The total frequency of the years pluviometrically deficitary

No.	Meteorological station	Normal		Deficitary	
		Deviation –5,0…5,0%		Deviation >-5,0%	
		No.of cases	%	No. of cases	%
1.	Sânnnicolau Mare	7	14,6	20	41,7
2.	Jimbolia	2	9,5	11	52,4
3.	Banloc	9	18,7	21	43,7

The total frequency of the years pluviometrically deficitary shows that the deficitary years are in average twice to four times numerous than the normal ones and their percentage is over 40% from the total.

Tabel 2. Situation of extremely dry years, with a deviation of multiannual average larger than 25%

Nr.	Meteorological station	Year	Precipitations (mm)
1.	Sânnicolau Mare	1983 1992 2000	362,5 367,9 267,7
2.	Jimbolia	1990 2000	372,4 218,5
3.	Banloc	1962 1983 2000	441,8 442,2 297,3

From the analysis of the table 2 it can be observed that the year 2000 appears as extremely dry at all the stations and the year 1983 appears at two of the stations and the rest of them only once. These facts show the approximately homogeneous repartition of the amounts of precipitations distribution in the Plain of Banat.

CONCLUSIONS

From the analysis of the data presented by the all 3 meteorological stations it can be observed that the multiannual average of the amounts of precipitations is situated under 600 mm and the minima are diminished up to 218,5mm and the maxima are up to 915,2mm. The deviations from the average can fluctuate in time and even from year to year, the frequency of the deficitary years being over 40%. The tendency of the amounts of precipitations evolution is being characterized by periods of diminution, followed by the excedentary ones. The deficit periods register on a large number of consecutive years, interrupted by isolated years a lot over the multiannual average and the excedentary periods are in few years. In conclusion, in the Plain of Banat, the annual amounts of precipitations are fluctuant on long periods of time but the frequency of deficitary years is larger than the one of the normal or excedentary years.

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