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ASPECTS REGARDING THE MEAN ANNUAL QUANTITIES OF RAINFALL IN THE CRIŞUL REPEDE HYDROGRAPHIC BASIN

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Abstract: ***Aspects regarding the mean annual quantities of rainfall in the Crişul Repede hydrographic basin.*** The object of this paper is represented by the expression of annual averages of rainfall and of non-periodical variations of annual quantities of rainfall in multi-annual regime (calculated for the observation period 1970 – 2005), as well as their distribution in the Crişul Repede hydrographic basin.

Key words: Crişul Repede hydrographic basin, rainfall, annual quantities, non-periodical variations.

Introduction

The atmospheric rainfall represents the climate element with the largest variability in space and time regarding the frequency, intensity and duration. This characteristic is determined by a series of factors, such as: circulation of air masses, intensity of thermal and dynamic convection, altitude and exposure of slopes, local conditions.

The geographical positioning of the Crişul Repede hydrographic basin and the character of local topography determines some pluviometrical characteristic features specific for this region. Thus, the shelter offered by the Apuseni Mountains, in the Eastern part, and the large opening towards the circulation of moister air masses, from the West result in more abundant rainfall in the Crişul Repede geographical basin than in the Romanian Plain or in the Moldavian Plain. The Crişul Repede hydrographic basin is under the influence of air masses coming from West and North-West, meaning of oceanic moist air masses.

Encountering the orographic barrier of air masses, it enters into an upward movement, getting colder adiabatic until reaching a point of dew which generates important quantities of rainfall on the Western slopes. From a certain altitude, the air masses poor in water steams continue their ascension, but do not produce rainfall anymore or generate smaller quantities. After reaching the level of the highest peaks, they get into a downward movement on the Eastern slopes where they are heating adiabatic, they get away from the temperature of dew point, fact which determines the breaking-up of cloudy systems and the registration of a smaller quantity of rainfall in comparison to the Western slopes.

1. Working method

In order to emphasize the characteristics of rainfall, data from the period 1970 – 2005 was used, obtained from the observations made at five meteorological points from the Crişul Repede hydrographic basin (Oradea, Săcueni, Borod, Huedin, Stâna de Vale), situated in the plain area, as well as in the mountains area, thus covering the investigated area.

The medium annual quantities of rainfall are calculated by totalling the monthly values registered.

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In order to emphasize the non-periodical variations of annual quantities of rainfall, the deviations of the respective quantities of rainfall towards the multi-annual average are calculated.

2. Results and remarks

2.1. Medium annual quantities of rainfall

On the relatively small space of the area researched, we register the significant territorial variations of the annual quantities of rainfall.

For an authentic and accurate analysis of the space distribution of rainfall quantities, the dates form the pluviometrical observations were used from the period 1970 - 2005 from five meteorological points from the Crişul Repede hydrographic basin.

Analyzing the distribution of medium annual quantities of rainfall emphasized by figure no.1, we notice the fact that they increase in the same time as the altitude from 580.6mm as registered at Săcueni, to 721.9 at Borod, after which the decrease, reaching 588.5 at Huedin, then they increase again, reaching 1657.8, as it is registered in Stâna de Vale, the highest point in the basin.

The reduced quantity of rainfall from Huedin (588.5mm) in comparison to the Borod point (721.9mm) is due to the positioning of this point in an areal of depression situated on the North-Eastern slope immediately under the laps of Vlădeasa. The air masses and the fronts discharge their condensation products on the Western slope, and after crossing the high peak, they become poot in water vapors, and, in addition, they get into a downward position which reduces the chances of rainfall (figure 1).

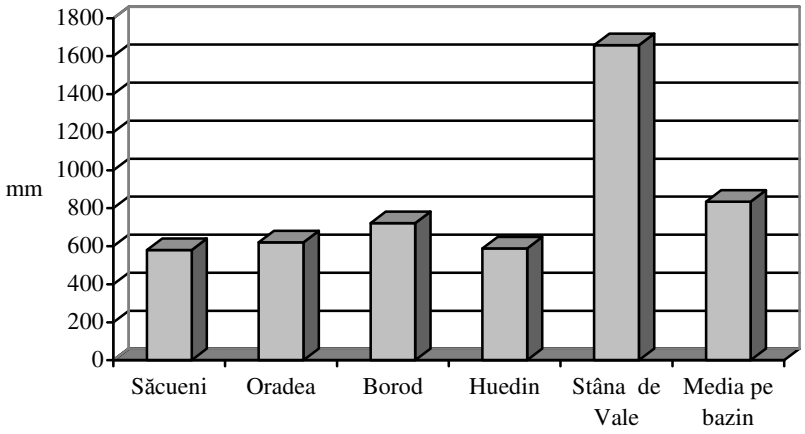

Figure 1 The medium annual quantities of rainfall in the Crişul Repede hydrographic basin during 1970 – 2005

The highest annual quantity of rainfall is registered at Stâna de Vale (1657.8mm), due to the positioning of this point on the Western slope, in the way of oceanic air masses, at the level of pluviometrical optimum from Apuseni Mountains (1000-1200m), as well as due to relief which is risen suddenly in from of the Beiuş Depression, the air masses being forced to rapidly enter into a forced upward movement and to precipitate (figure 1).

2.2. Non-periodical variations of annual quantities of rainfall

From one year to another, the quantities of rainfall from the Crişul Repede hydrographic basin evolve between very large limits.

The variability of annual quantities of rainfall towards the average are shown in the figures 2, 3, 4, 5, 6.

The annual quantities of rainfall higher than the average are produced when the activity of oceanic cyclones is developed at the periphery of Azores anticyclone and that of the Mediterranean cyclones is more intense.

Thus, in the conditions of a persistent cyclone activity or of active convective thermal processes, the quantities of rainfall are rich, determining a high humidity which may increase until pluviometrical or hydrological surplus.

The deviations of quantities of rainfall from the multiannual average in the Crişul Repede hydroprahic basin (1970 – 2005) **Table 1**

Point/Year	Deviations				
	Săcueni (580.6mm)	Oradea (620.1mm)	Borod (721.9mm)	Huedin (588.5)	Stâna de Vale (1657.8mm)
Positive deviations	47.2%	44.4%	38.9%	55.6%	51.9%
Negative deviations	52.8%	55.6%	61.1%	44.4%	48.1%

The years in pluviometrical surplus are less numerous: 47.2% at Săcueni, 44.4% at Oradea, 38.9% at Borod and only in the highest area they own at Huedin 55.6% and at Sâna de Vale 51.9% from the number of years in which there were observations in the period 1970-2005 (table 1).

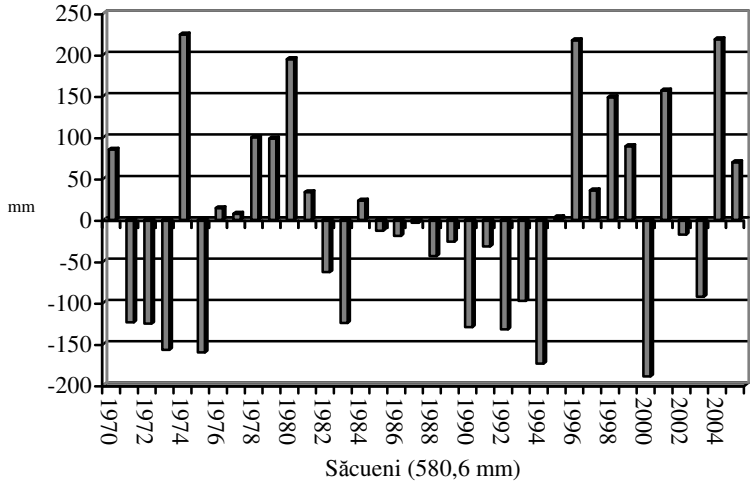

Figure 2: The deviations of annual quantities of deviations towards the multiannual average at Săcueni during 1970-2005

The highest values of the positive deviation at Săcueni are of over 200 mm: 224.4 mm in the year 1974; 218.6 mm in the year 2004 and in the year 1996 the deviation is of 217.5 mm.

The lowest values of the positive deviation are: 3.2 mm in the year 1995; 7.6 mm in the year 1977 and 14.4 in the year 1976.

The highest values of the negative deviation of over -150 mm are: -189.1 mm in the year 2000; -173.7 mm in the year 1994; -160.1 mm in the year 1975 and -157.0 mm in the year 1973.

The lowest values of the negative deviation are: -3.2 in the year 1987, followed by the value -12.8 in the year 1985; -17.7 in the year 2002 and -19.2 in the year 1986 (figure no:2).

The positive deviation in the 36 years studied of the medium multiannual quantities at Săcueni is smaller (47.2%) than the negative deviation (52.8%) of the medium multiannual quantities (figure no:2).

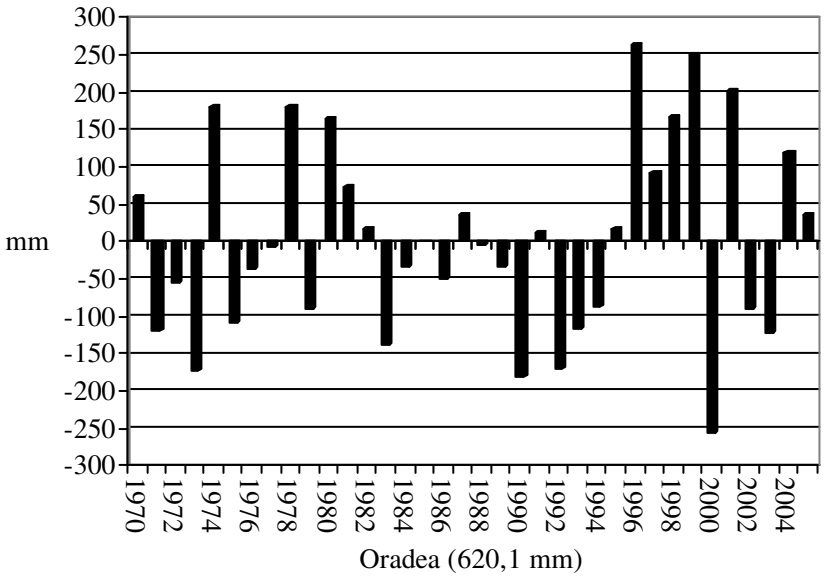

Figure 3: The deviations of annual quantities of rainfall towards the multiannual average in Oradea in the period 1970-2005

In Oradea, the highest values of the positive deviations of over 200 mm are: 263.9 mm in the year 1996; 249.6 mm in the year 1999 and 201.7 in the year 2001.

The lowest values of the positive deviations are: 11.3 mm in the year 1991; 16.5 mm in 1982 and 18.1 mm in the year 1995 (figure no:3).

The highest negative deviation at Oradea of over -250 mm is in the year 2000 (-255.9 mm). Values of over -150mm are in the years 1973 (-171.9 mm), 1990 (-179.8 mm), 1992 (-171.1 mm).

The lowest negative deviations are -2.6 mm in 1985, -3.3 in 1988, -6.4 in 1977.

At Oradea the negative value represents 55.6% from the cases and the positive one 44.4% (figure no: 3).

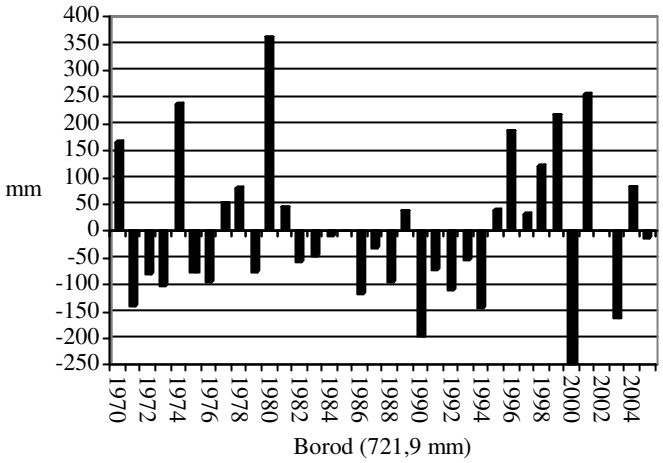

Figure 4: The deviations of the annual quantities of rainfall in comparison to the multiannual average at Borod in the period 1970-2005

At Borod the highest positive deviation is of over 350 mm (361.9 mm in 1980), of over 200 mm are three values 256.9 mm in the year 2001, 237.5 mm in 1974 and 216.8 in 1999.

The lowest positive deviations under 50 mm are: 31.7mm in 1997, 37.4mm in 1989, 40.0mm in 1995, 54.2mm in 1981 (figure no: 4).

The highest negative deviation of over -200 mm is registered in the year 2000 in value of -246.5 mm, followed by the year 1990 with the value of -197.4 mm

The lowest negative deviations are: -1.0mm in 2002, -1.6mm in 1985, -8.4mm in the year 1984, -13.4mm in 2005 and -31.9mm in the year 1987.

In percentage, the negative deviation is higher (61.1%) than the positive one (38.9%) (figure no: 4).

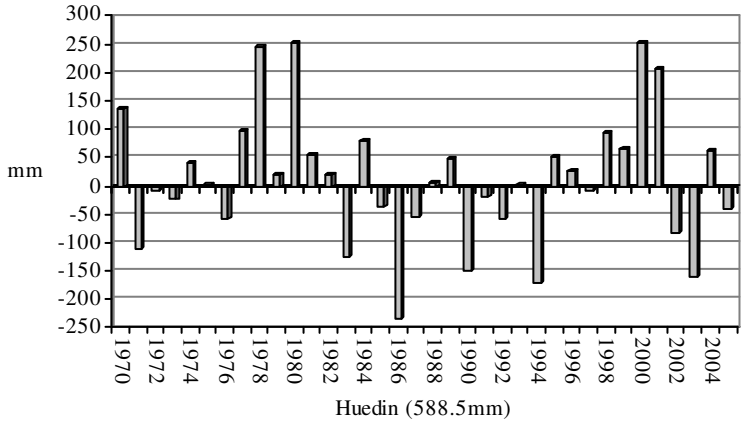

Figure 5: The deviations of annual quantities of rainfall towards the multiannual average at Huedin during 1970-2005

At Huedin the positive deviations of over 250mm are in 1980 with 252.7mm and 251.3mm in 2000, deviations of over 200mm are two that is 245.8mm in 1978 and 207.3mm in 2001.

The positive deviations smaller than 50mm are in eight years, the smallest being: 3.2mm in 1975, 3.6mm in 1993, 7.2mm in 1988, 18.2mm in 1979, 18.6mm in 1982.

The negative deviation of over -200mm is in the year 1986 with the deviation of -235.3mm, deviations of over -150mm are three: -170.4mm in 1994, -159.8mm in 2003 and -148.6mm in 1990 (figure no:5).

Negative deviations under -50mm are in six years, the lowest being: -8.8mm in 1997, -9.1mm in 1972, -19.3mm in 1991.

At Huedin, the percentage in the 36 years investigated the positive deviation has a higher value (55.6%) than the negative deviation (44.4%).

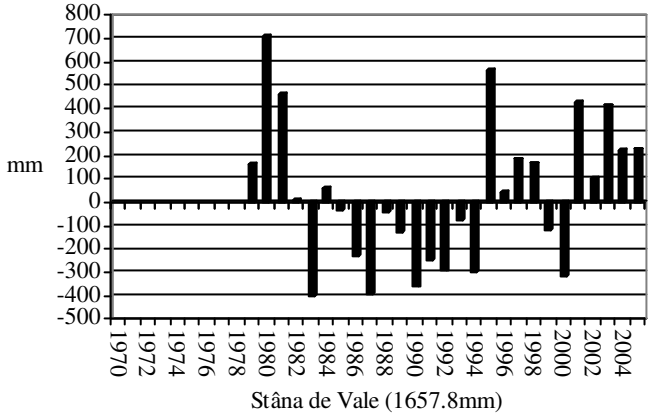

Figure 6: The deviations of annual quantities of rainfall in comparison with the multiannual average at la Stâna de Vale during 1970-2005

At Stâna de Vale, the deviations are calculated on a period of 27 years in comparison with the other stations where the values are calculated on a period of 36 years.

The positive deviations here are much more elevated, the highest value of 712.2mm was registered in the year 1980, followed by the year 1995 with the deviation of 563.2mm, the deviations of over 400mm are three, as follows: 462.4mm in the year 1981, 426.2mm in the year 2001 and 413.8mm in the year 2003.

The positive deviations under 50mm are found in two years, 1982 with the value of 10.4mm and 43.7 in 1996 (figure no: 6).

The highest negative deviation of -400.6mm was registered in the year 1983, followed by 1987 with: -391.2mm, -362.0mm in 1990 and 12.9mm in 2000.

The negative deviations of fewer than 50mm are found in two years, as follows: -39.7mm in 1988 and -32.1mm in 1985.

In percentage, in the 27 years, the positive deviations are of 51.9% in comparison to the negative deviations which are smaller (48.1%) (figure no: 6).

In the Crişul Repede hydrographic basin, the highest positive deviation in the period of the 36 years was at Stâna de Vale of 712.2mm in the year 1980, followed by Borod with 361.9mm the whole year 1980, at Oradea 263.9mm in the year 1996, at Huedin 252.7mm in 1980 and at Săcueni 224.4mm in 1974. The highest positive deviations were in the year 1980 in the mountains and in the depression areas.

The highest negative deviation was in the mountains -400.6mm in 1983, followed by Oradea with -255.9mm in the year 2000, by Borod with -246.5mm in the same year 2000, Huedin with -235.3mm in 1986 and the lowest negative deviation from the studied area is at Săcueni of -189.1mm in the same year 2000. It results that in the plain area and in the Borod depression area the negative deviations were in the year 2000.

Conclusions

The highest annual quantity of rainfall is registered at Stâna de Vale (1657.8mm), due to the positioning of this point on the Western slope, in the path of oceanic air masses, as well as due to the relief which rises suddenly before Beiuş Depression, the air masses being compelled to enter rapidly into an upward forced movement and to precipitate.

At Săcueni, Oradea, Borod the positive deviations are lower (from 38.9% at Borod until 47.2% at Săcueni) than the negative ones, and at Huedin and Stâna de Vale the positive deviations are higher (51.9% at Stâna de Vale and 55.6% at Huedin) the the negative ones. In the Crişul Repede hydrographic basin the highest positive deviation during the 36 years was at Stâna de Vale of 712.2mm in the year 1980. The highest negative deviation is in the mountains -400.6mm in 1983.

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