REGIONAL DIFFERENTIATIONS FOR THE TEMPORAL VARIATIONS OF ATMOSPHERIC PRECIPITATIONS IN THE TRANSYLVANIAN DEPRESSION

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ABSTRACT - This study refers to the trends in precipitation amounts in the central part of Romania (the Transylvanian Depression) between 1961-2000. The general trend was calculated using the least-squares linear fitting for the whole period and for every decade of the period: 1961-1970, 1971-1980, 1981-1990, 1991-2000. The main results of our research are: during the whole period there is a general decreasing trend in this region, especially in its southern area; during the first two decades, there was an increase trend, between 1981-1990 the general trend was a decrease and the trend for the last decade of the 20th century was variable.

Key words: precipitation, trend, central area of Romania (the Transylvanian Depression)

INTRODUCTION

In most Regional Geography studies the Transylvanian Depression is considered a well-defined region both from the physico-geographical and the economic development point of view. This region is characterized by minimal variations of various parameters. However, from a climatic point of view, there are important variations in the Transylvanian Depression. The most evident variations are the quantities of atmospheric precipitations. In this study we will try to point out these variations using the evolution trends of the precipitations and other specific methods.

Recent similar global studies have emphasized the fact that the 20th century was characterized be significant trends of atmospheric precipitations which can be observed at global and hemispherical levels with considerable variability and depending on time (Nicholls et al., 1996, Easteling et al., 2000). Thus, after processing the data streams, negative trends have been identified, which are specific mostly to the winter season (Jacobait, 2000, Giorgi, 2002, Xoplaki et al. 2004).

On the other hand, some researches have shown that at a hemispherical level, precipitations increased until the early 1960's and constantly decreased afterwards (Xoplaki et al., 2004). We will show that this conclusion is only partially confirmed in the Depression of Transylvania,.

METHODOLOGY

In this study we have used the precipitation amount data recorded at 12 meteorological stations. 11 of them are situated in the area under consideration (Dej, Bistriţa, Odorheiu Secuiesc, Făgăraş, Sibiu, Sebeş, Blaj, Turda, Cluj-Napoca, Tg. Mureş, Dumbrăveni). The 12th station (Zalău) is situated in the NW of the Depression. Most of the stations from the Depression are distributed on all the territory. They cover all the sub-units of the region and are slightly more numerous in the southern half of the Depression. We have processed the data for the 196 –2000 period.

In this study the linear trend was computed using the least-squares linear fitting method for intervals of various lengths (for all the temporal-climatic units that are specific to the temperate zone): one month, three

months (seasons), six months (semesters), twelve months (annually). The trends were computed both for the entire interval in order to identify the general trend of the atmospheric precipitations in the area and for each decade in order to determine the periodical fluctuations.

We should also mention that the trends are statistically significant with a 95% confidence level.

In order for our analysis to be as accurate as possible, we have also made a qualitative analysis of our data. According to the values recorded in the area, we have determined several thresholds. Table 1 shows both our qualifiers and the thresholds we have chosen.

Table 1. Qualifiers and thresholds of the trends of the precipitation quantities in the Depression of Transylvania

Increase		Decrease	
Qualifier	**Threshold**	**Qualifier**	**Threshold**
+++ intense increase:	≥ 10 mm/10 years	-/0 very small decrease:	0.1…1.0 mm/10 years
++ moderate increase:	9.9…6.0 mm/10 years	- small decrease:	1.1…5.9 mm/10 years
+ small increase:	5.9…1.1 mm/10 years	-- moderate decrease:	6.0…9.9 mm/10 years
+/0 very small increase:	1.0…0.1 mm/10 years	--- intense decrease:	≥ 10 mm/10 years
	0 stationary:	0.0 mm/10 years	

RESULTS

The trend for the quantities of precipitations in the Transylvanian Depression between 1961-2000.

If we look at the values for all the 1961-2000 interval in the entire Depression, and if we take into account the annual amounts of precipitations, we notice that a small decreasing trend in the annual amounts of precipitations was recorded (4.63 mm/decade). Obviously these statements are valid for the region as a whole, although, as we will further see, there are other characteristics for the small areas.

As to the regional mean value, there are various trends: decrease in the center, the south, the southwest and the north of the Depression and increase in the east and, partially, in the west of the Depression (table 2).

We can say that the southern half of the Depression was mostly characterized by a high or moderate decreasing trend, while in the northern half a similar moderate or high increasing trend was recorded (table 3, fig. 1).

Fig. 1. Trends in precipitation amounts between 1961-2000 (see table 1 for legend)

The monthly values have recorded unitary trends only in the Depression in January, August, and November, when the amounts of precipitations decreased, while September was the only month when there was a generalized increase all over the Depression. This increase was, however, differentiated. Intense increase was recorded in the northeastern and western parts of the Depression. Small increase was characteristic of the central and southern parts. During the other months, although there is no unitary trend for the entire depression, we can emphasize some regional characteristics. Thus, most of the month the same trend was recorded in the marginal eastern zone and the northern part of the Depression. The same is valid for the southern stations. It is worth noticing that the data recorded by the Cluj-Napoca meteorological station are very similar with those from the Dumbrăveni station. But the data from Blaj and Sebeş, the southwestern stations, are very different except for the months when the trend was generalized all over the Depression.

As for seasonal values we notice that, on the whole, in the Transylvanian Depression three of the four seasons were characterized by a small decrease trend (spring, summer, winter). If we take into account the fact that the autumn, when there was a small increasing trend, is one of the dry seasons of the year, we can say that the excess of precipitations in this season can compensate only, to a very small extent, the decreasing trends of the other seasons.

Semestrial values vary a lot, from one station to another, because of the small increase in the amounts of precipitations in the hot semester (1.24 mm/decade) and a small decrease in the amounts of precipitations in the cold semester (3.77 mm/decade). This somewhat contradictory situation is because September, which was characterized by increasing trends in all meteorological stations, was included in the autumn season in the seasonal analysis, while it was included in the hot semester in the semestrial analysis. This peculiarity of the month of September modifies the whole situation.

It is very important to know the precipitation variability in the wet semester of the year which overlaps the hot semester (April – September) in Romania. This influences the hydrological budget of the region and the regional management of water resources, agriculture, ecosystems, environment, economy, as well as the development and the social behaviour of the communities in the region.

THE TREND OF THE AMOUNTS OF PRECIPITATIONS IN THE TRANSYLVANIAN DEPRESSION

The *1961–1970 decade* was characterized by an intense increase of yearly amounts of precipitations in the entire region. Values range between 14.9 – 40.5 mm/year (table 4, fig.2).

The monthly analysis shows a general increase only in February and June. In all the stations, the increase trend months were predominant. Also, it is worth mentioning that the slopes of the increase trends were much higher than those of the decrease trends.
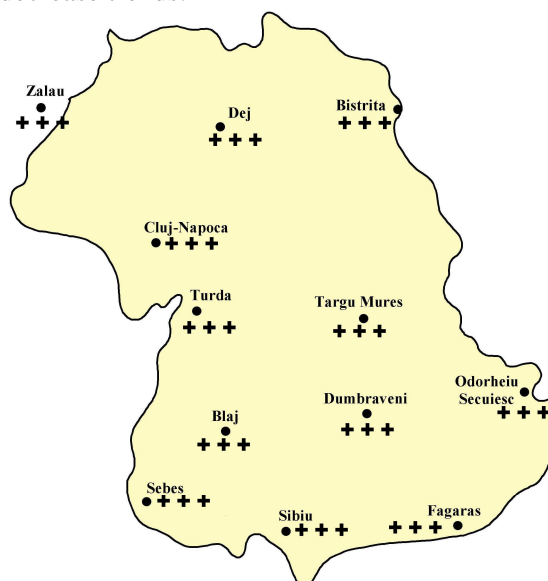

Fig. 2. Trends in precipitation between 1961-1970 (see table 1 for legend)

Seasonal values have an increase trend as follows: intense increase during the summer and small increases for the other seasons.

The increase trend of the hot semester is obvious all over the Depression in the semestrial amounts of precipitations while the cold semester is characterized by small decrease trends, also for the entire area.

We should, however, mention that this increase trend of the amounts of precipitations in the 1961-1970 decade is mostly due to the precipitations in the last year of the decade (1970), one of the rainiest years in the entire period.

The next decade, *1971-1980*, was also characterized by an increase trend. During this decade the generalized increase trend of the amounts of precipitations in the entire Depression (at all the stations) was recorded for the cold temporal-climatic units (December, January, March, winter, October-March semester) (table 5, fig.3). On the other hand, the values of the increase slopes are much smaller than those in the previous decade. The decrease trend characterized the entire area only in October. Mean annual precipitation amounts increased in 11 out of the 12 meteorological stations (except Turda where an intense decrease trend was recorded).
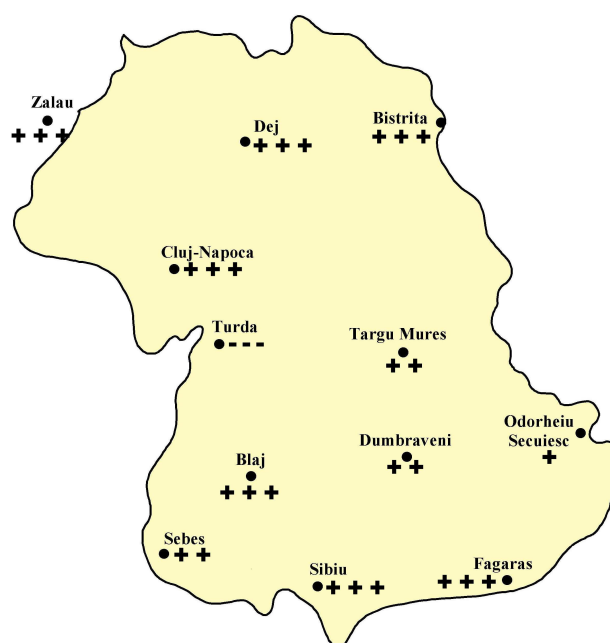
Fig. 3. Trends in precipitation amounts between 1971-1980 (see table 1 for legend)

The *1981-1990* decade was characterized by a general decrease trend in the whole Depression and by an intense decrease trend at most of the stations (table 6, fig. 4). If we take into consideration the annual amounts of precipitations we observe an intense decrease, ranging between 10.8 and 33.9 mm/year, at 9 of the 12 stations and a small or moderate decrease at the other three stations (Blaj, Cluj-Napoca, Zalău). Trends decrease in January, in spring, in winter, and during the cold semester. The decrease trends are also predominant in the other temporal-climatic units. Mean values in the Depression have small increase trends (0.2 mm/year) only in February and April, no such trends were recorded in November. The most intense decreases were characteristic of the hot temporal-climatic units which had the largest amounts of precipitations (summer and the hot season). Therefore, the intense decreases of the annual precipitation values are mostly due to the decreases during the summer. Thus, the increase in the two decades presented before corresponds to the intense decrease in this decade.

Fig. 4. Trends in precipitation amounts between 1981-1990 (see table 1 for legend)

During the final decade, *1991-2000*, there was a small increase all over the Depression (3.56 mm/year), but there were also negative values, in the southern and, partially, in the eastern and in western parts of the region (table 7, fig.5). This is the decade when there is visible non-uniformity of the trend of the annual amounts of precipitations. We can, however, distinguish the following sub-regions: increase trends in the central area, the north and the southwest of the Depression and decrease trends in the southeast and, partially, in the west. As for the temporal-climatic units, in November there were very small decreases at all the stations and in January and in winter there were very small increases of the amounts of precipitations at all the stations.
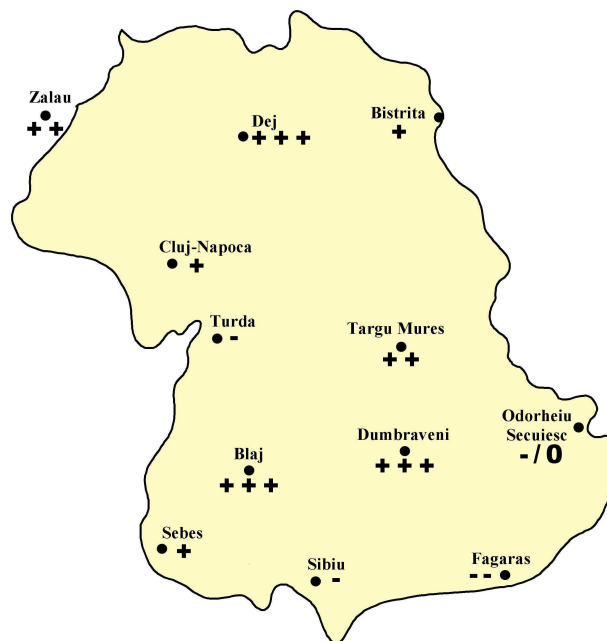
Fig. 5. Trends in precipitation amounts between 1991-2000 (see table 1 for legend)

CONCLUSIONS

Although the general trend was small decrease in the entire Depression between 1961-2000, the analysis of shorter periods (decades) showed the existence of big fluctuations (both negative and positive) of the amounts of atmospheric precipitations in the area. Thus, all over the Depression the first two decades were characterized by significant increases, the third decade was characterized by an almost generalized decrease and the last decade by contradictory trends.

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Table 2. The trend of the monthly and annual amounts of precipitations
in the Transylvanian Depression (1961-2000) (mm/decade)

Period	Dej	Bistriţa	Od.Sec.	Sibiu	Făgăraş	Sebeş	Blaj	Turda	Cluj-Napoca	D-veni	Tg. Mureş	Zalău	Average
January	-2.2	-1.5	-4.5	-2.3	-1.9	-1.8	-3.5	-5.7	-1.5	-4.1	-3.5	-1.5	-2.8
February	-1.7	-1.6	-0.9	-1.2	0.7	-0.1	-1.0	-2.6	-0.5	-1.9	-0.4	-0.7	-1.0
March	-1.9	-1.2	-0.7	0.8	0.6	-0.5	-2.6	-4.7	-1.3	-0.7	-3.0	-3.5	-1.5
April	2.3	5.1	1.4	-1.5	-0.6	-1.0	1.3	0.0	5.0	1.6	-0.6	1.9	1.2
May	-6.3	-2.2	-6.2	-3.6	-5.6	-4.8	0.5	-2.3	-3.4	-3.4	-5.7	-1.4	-3.7
June	1.8	-0.3	4.4	0.8	4.3	-3.0	5.8	9.9	6.6	4.7	4.9	3.4	3.6
July	-1.6	4.6	-3.5	-3.4	-3.1	-2.9	0.1	-6.9	-4.8	-5.0	-3.9	0.8	-2.5
August	-7.3	-2.7	-3.0	-0.9	-2.2	-1.4	-1.9	-6.1	-5.0	-1.9	-5.1	-7.0	-3.7
September	9.7	14.8	5.3	5.9	1.9	6.1	6.4	0.2	9.5	8.4	5.7	12.2	7.2
October	1.2	3.8	0.9	-2.7	0.2	-2.1	1.2	-1.5	1.8	1.0	0.8	2.7	0.6
November	-1.9	-3.6	-2.8	-4.4	-4.2	-5.0	-5.9	-4.0	-0.4	-4.2	-2.7	-0.8	-3.3
December	1.4	3.6	3.7	1.5	2.9	1.7	0.7	-0.5	1.2	1.5	1.1	0.8	1.6
Spring	-5.9	1.7	-5.5	-4.3	-5.6	-6.3	1.1	-7.0	0.4	-2.5	-9.3	-3.0	-3.9
Summer	-7.1	1.6	2.5	-3.5	-1.0	-7.2	-0.8	-3.2	3.2	-2.2	-4.0	-2.7	-2.0
Autumn	9.0	14.9	6.6	-1.2	-2.1	-1.1	3.8	-5.4	11.0	5.2	3.8	14.1	4.9
Winter	-6.2	-1.2	-2.7	-2.7	1.0	-0.4	1.7	-9.8	-1.1	-7.0	-3.7	-0.8	-2.7
April-Sept.	-1.4	19.2	4.2	-2.8	-5.2	-7.0	-4.6	-5.3	7.9	4.4	-4.6	10.0	1.2
Oct.-March	-10.5	0.5	-1.0	-7.6	-0.9	-7.4	12.1	-16.4	0.8	-7.3	-7.1	-0.4	-3.8
Annual	-6.5	18.7	1.8	-11.2	-6.9	-14.7	-10.6	-24.4	7.4	-4.0	-12.2	7.1	-4.6

Table 3. The value qualifiers of the monthly, seasonal, semestrial, and annual trends
of the amounts of precipitations in the Depression of Transylvania (1961-2000)

Period	Dej	Bistriţa	Od.Sec.	Sibiu	Făgăraş	Sebeş	Blaj	Turda	Cluj-Napoca	D-veni	Tg. Mureş	Zalău	Average
January	-	-	-	-	-	-	-	-	-	-	-	-	-
February	-	-	-/0	-	+/0	-/0	-/0	-	-/0	-	-/0	-/0	-/0
March	-	-	-/0	+/0	+/0	-/0	-	-	-	-/0	-	-	-
April	+	+	+	-	-/0	-/0	+	0	+	+	-/0	+	+
May	--	-	--	-	-	-	+/0	-	-	-	-	-	-
June	+	-/0	+	+/0	+	-	+	++	+	+	+	+	+
July	-	+	-	-	-	-	+/0	--	-	-	-	+/0	-
August	--	-	-	-/0	-	-	-	--	-	-	-	--	-
September	++	+++	+	+	+	++	++	-/0	++	++	+	+++	++
October	+	+	+/0	-	+/0	-	+	-	+	+	+/0	+	-/0
November	-	-	-	-	-	-	-	-	-/0	-	-	-/0	-
December	+	+	+	+	+	+	+/0	-/0	+	+	+	+/0	+
Spring	-	+	-	-	-	--	+	--	+/0	-	--	-	-
Summer	--	+	+	-	-/0	--	-/0	-	+	-	-	-	-
Autumn	++	+++	++	-	-	-	+	-	+++	+	+	+++	+
Winter	--	-	-	-	+	-/0	+	--	-	--	-	-/0	-
April-Sept.	-	+++	+	-	-	--	-	-	++	+	-	++	+
Oct.-March	---	+/0	-/0	--	-/0	--	+++	---	+/0	--	--	-/0	-
Annual	--	+++	+	---	--	---	---	---	++	-	---	++	-

Table 4. The trend of the monthly and annual amounts of precipitations in the Depression of Transylvania (1961-1970) (mm/year)

Period	Dej	Bistriţa	Od.Sec.	Sibiu	Făgăraş	Sebeş	Blaj	Turda	Cluj-Napoca	D-veni	Tg. Mureş	Zalău	Average
January	1.4	3.2	2.2	-2.4	1.8	-0.6	0.5	-2.9	-0.6	2.0	1.4	-0.5	0.5
February	4.2	4.1	4.0	3.5	3.6	5.5	3.6	1.9	4.7	3.6	4.7	5.0	4.0
March	-1.0	0.2	-2.1	-0.3	1.8	0.8	-1.9	-4.8	-3.7	-1.0	-2.6	-3.4	-1.5
April	0.8	2.2	0.7	2.7	-0.4	1.0	-0.3	-0.7	-0.1	1.1	-0.4	-0.6	0.5
May	9.1	11.6	1.4	0.2	4.8	-0.2	1.5	5.2	11.1	0.5	6.3	7.7	4.9
June	7.2	5.4	3.6	8.6	5.4	4.9	2.6	6.2	6.3	1.1	5.5	6.9	5.3
July	-0.4	3.3	-1.1	2.8	5.4	6.2	4.8	1.9	11.1	4.1	3.2	2.4	3.6
August	6.2	3.8	2.9	5.7	0.7	3.3	-1.1	4.5	8.0	2.1	2.7	6.1	3.7
September	2.3	2.6	3.2	1.4	1.8	-1.9	3.8	4.1	2.8	2.9	3.3	3.1	2.5
October	1.9	1.6	0.3	-0.1	1.2	-0.8	2.7	0.1	0.6	3.3	3.0	1.0	1.2
November	-0.4	-0.1	-0.4	-1.9	0.7	-0.8	0.4	0.6	-0.7	1.1	0.7	-2.1	-0.2
December	1.5	2.7	0.9	0.9	-0.3	1.2	-0.2	-1.3	0.2	0.6	0.3	0.0	0.5
Spring	8.9	14.0	0.0	2.6	6.2	1.5	-0.7	-0.3	7.3	0.5	3.3	3.8	3.9
Summer	13.0	12.4	5.3	17.0	11.5	12.4	6.3	12.6	25.5	7.2	11.4	15.4	12.5
Autumn	3.8	4.1	3.1	-0.7	3.7	0.3	7.0	4.9	2.7	7.3	7.0	2.0	3.8
Winter	1.3	4.7	1.0	2.2	1.9	4.1	1.1	-5.2	0.6	3.1	2.8	0.4	1.5
April-Sept.	25.2	28.8	10.1	21.4	17.7	15.1	11.2	21.2	39.3	11.7	20.7	25.6	20.7
Oct.-March	-0.9	4.3	-2.0	-3.6	3.8	-0.1	-0.5	-7.5	-5.9	4.1	0.6	-6.3	-1.2
Annual	32.7	40.5	17.0	23.2	26.5	20.3	16.4	14.9	39.9	21.2	28.3	25.6	25.5

Table 5. The trend of the monthly and annual amounts of precipitations in the Depression of Transylvania (1971-1980) (mm/year)

Period	Dej	Bistriţa	Od.Sec.	Sibiu	Făgăraş	Sebeş	Blaj	Turda	Cluj-Napoca	D-veni	Tg. Mureş	Zalău	Average
January	4.9	4.0	4.3	3.4	4.1	2.6	2.2	0.6	3.5	2.9	2.5	3.6	3.2
February	1.8	1.2	2.7	-1.1	0.2	0.6	0.7	0.9	0.5	0.3	1.3	1.8	0.9
March	5.1	4.9	2.8	4.1	4.6	3.4	3.0	2.3	2.5	4.0	3.5	4.4	3.7
April	3.5	5.7	4.6	5.9	4.1	2.5	5.0	-1.0	1.7	5.4	3.0	4.1	3.7
May	4.5	1.3	0.2	1.3	0.2	-3.2	-0.5	-5.5	1.0	3.4	1.4	4.9	0.8
June	-3.1	-1.8	-1.9	-1.6	0.5	0.3	0.1	-4.8	-6.8	-2.2	-5.0	1.1	-2.1
July	5.8	5.7	-0.9	3.6	5.3	0.0	1.6	0.5	5.2	0.0	-1.6	6.1	2.6
August	0.4	2.5	-4.8	2.2	2.8	-0.2	0.8	-3.7	-1.7	0.7	2.0	-1.1	0.0
September	2.6	3.2	-2.3	-3.1	-0.5	1.2	0.6	-0.3	3.8	-0.8	1.5	1.9	0.6
October	-1.5	-0.7	-3.4	-4.4	-2.5	-3.4	-2.8	-3.5	-2.7	-2.7	-0.8	-1.2	-2.5
November	1.5	-0.3	-1.8	-0.5	-2.6	1.0	-0.5	-1.2	2.7	-3.0	-2.4	1.2	-0.5
December	1.3	1.6	1.9	2.9	2.6	3.3	1.8	4.1	0.5	1.7	2.3	1.1	2.1
Spring	13.1	9.3	7.7	11.2	-12.2	2.7	7.5	-4.2	5.2	12.8	7.9	13.4	6.2
Summer	3.2	6.4	-7.7	4.3	8.5	0.1	2.4	-8.0	-3.3	-1.4	-4.5	6.1	0.5
Autumn	2.7	2.2	-7.5	-8.0	-5.6	-1.3	-2.8	-4.9	3.7	-6.4	-1.7	1.8	-2.3
Winter	6.9	5.8	7.9	6.6	6.8	6.6	4.5	4.6	3.2	5.6	5.8	5.6	5.8
April-Sept.	13.8	14.0	-5.1	8.4	15.7	0.5	7.5	-11.7	3.2	6.5	1.4	16.9	5.9
Oct.-March	14.8	11.5	6.5	5.5	1.7	8.2	4.0	1.2	8.0	3.9	6.5	11.3	6.9
Annual	26.9	24.7	1.4	12.7	22.0	7.9	11.8	-11.5	10.2	9.7	7.8	27.8	12.6

Table 6. The trend of the monthly and annual amounts of precipitations in the Depression of Transylvania (1981-1990) (mm/year)

Period	Dej	Bistriţa	Od.Sec.	Sibiu	Făgăraş	Sebeş	Blaj	Turda	Cluj-Napoca	D-veni	Tg. Mureş	Zalău	Average
January	-2.3	-1.9	-2.4	-1.5	-2.7	-1.8	0.0	-1.7	-1.0	-1.5	-0.9	-1.7	-1.6
February	0.6	0.9	1.0	-0.1	0.8	1.1	0.0	-2.7	-0.7	0.6	0.8	0.4	0.2
March	-3.2	-0.7	-0.3	-0.9	-0.4	-1.5	-1.1	-1.2	-2.2	0.5	0.0	-0.2	-0.9
April	-0.4	2.6	0.1	-0.7	-2.1	-0.7	1.7	-1.7	0.1	0.3	0.2	2.6	0.2
May	-0.8	-6.2	-0.2	-1.8	-4.8	-0.4	-1.0	-5.7	1.1	-1.9	-1.7	0.0	-2.0
June	-1.1	-6.0	-5.7	-1.3	-5.5	1.3	-0.1	-1.0	6.2	1.3	-0.9	-2.9	-1.3
July	-4.4	-3.2	-10.4	-9.5	-12.2	-3.5	-3.3	1.0	-6.6	-10.9	-8.2	-6.1	-6.4
August	2.3	-1.1	-2.5	-1.3	-2.8	-1.8	-0.4	-1.6	2.3	-5.0	-1.3	5.3	-0.6
September	0.2	1.4	-1.0	-3.4	-2.2	-2.7	-1.6	-0.7	1.2	-0.8	-0.8	1.9	-0.7
October	-2.9	-2.7	0.9	0.5	1.8	1.6	-0.2	2.6	-2.7	0.4	-1.7	-0.9	-0.3
November	0.9	2.6	-0.7	-0.6	-2.8	-0.2	0.1	-0.9	0.5	-0.5	-0.2	2.3	0.0
December	-2.2	-2.2	-1.5	1.4	-1.0	-2.6	-1.1	1.0	-1.5	-1.5	-2.2	-1.9	-1.3
Spring	-4.4	-4.3	-0.4	-3.4	-7.3	-2.7	-0.4	-8.7	-0.9	-1.2	-1.4	2.4	-2.7
Summer	-3.2	-10.3	-18.6	-12.1	-20.5	-3.9	-3.8	0.3	1.9	-14.6	-10.7	-3.6	-8.3
Autumn	-1.8	0.3	-0.8	-3.5	-3.2	-1.3	-1.7	1.0	-1.0	-1.0	-2.7	3.4	-1.0
Winter	-6.2	-5.9	-4.3	-1.4	-4.9	-5.5	-2.8	-5.3	-6.4	-3.5	-4.9	-6.3	-4.8
April-Sept.	-4.1	-12.5	-19.6	-17.9	-29.7	-7.8	-4.7	-7.8	4.3	-17.1	-12.9	0.9	-10.8
Oct.-March	-9.5	-7.6	-5.1	-2.9	-5.9	-5.4	-4.4	-3.9	-9.4	-5.2	-7.7	-4.1	-5.9
Annual	-13.2	-17.5	-22.6	-19.2	-33.9	-11.2	-7.1	-10.8	-3.3	-19.1	-17.1	-1.1	-14.7

Table 7. The trend of the monhtly and annual amounts of precipitations in the Depression of Transylvania (1991-2000) (mm/year)

Period	Dej	Bistriţa	Od.Sec.	Sibiu	Făgăraş	Sebeş	Blaj	Turda	Cluj-Napoca	D-veni	Tg. Mureş	Zalău	Average
January	0.9	1.1	0.9	1.7	1.3	0.9	1.1	0.2	1.5	0.5	0.3	0.9	0.9
February	2.5	2.8	3.0	0.9	-0.4	1.9	2.0	1.3	1.8	1.4	2.1	4.0	1.9
March	2.9	1.3	1.0	4.1	2.4	0.4	1.0	-1.5	1.3	2.2	1.6	0.3	1.4
April	0.8	2.5	2.2	0.6	2.1	0.7	1.8	-0.1	2.5	4.3	3.0	1.3	1.8
May	-2.3	-1.9	-3.9	-3.8	-7.1	-0.5	0.0	2.4	-2.6	-2.2	0.3	-2.9	-2.0
June	1.7	-0.7	0.4	-2.5	-2.2	0.4	3.1	-1.1	2.6	2.2	-0.9	5.7	0.7
July	7.7	1.4	-3.6	-4.6	-3.0	-0.3	3.2	3.0	2.1	3.9	4.8	3.2	1.5
August	1.5	1.1	2.5	-2.2	0.6	-0.9	-2.6	-3.7	-2.7	-0.6	-2.1	-0.9	-0.8
September	0.4	-0.3	-0.7	4.3	0.2	2.3	3.2	-3.1	0.9	0.6	-0.4	-1.2	0.5
October	-4.5	-3.7	-2.5	-0.4	0.6	-0.6	-0.9	-1.7	-3.0	-1.5	-1.9	-5.1	-2.1
November	-2.7	-2.1	-1.1	-3.8	-1.9	-2.2	-2.6	-3.6	-3.6	-1.4	-0.8	-1.3	-2.2
December	2.8	3.8	1.8	1.1	0.7	1.9	1.7	-0.1	1.4	2.5	2.8	2.1	1.9
Spring	1.5	1.9	-0.7	0.9	-2.6	0.6	2.8	0.7	1.2	4.3	4.9	-1.3	1.2
Summer	10.9	2.0	-0.7	-9.3	-4.5	-0.8	3.6	-1.9	2.1	5.5	1.9	8.1	1.4
Autumn	-6.7	-6.1	-4.3	0.1	-1.0	-0.5	-0.2	-8.5	-5.6	-2.3	-3.1	-7.6	-3.8
Winter	1.8	8.9	8.1	5.5	1.7	6.6	6.1	1.4	5.1	1.3	6.4	10.1	5.3
April-Sept.	9.9	2.4	-3.2	-8.1	-9.3	1.7	8.6	-2.7	2.9	8.2	4.8	5.4	1.7
Oct.-March	6.1	7.5	8.6	9.3	4.5	6.6	-0.2	-1.6	2.4	7.4	8.9	5.3	5.4
Annual	11.9	5.6	0.0	-4.6	-6.6	4.1	11.0	-8.2	2.3	12.0	8.9	6.3	3.6