THE PARTICULARITIES OF PRECIPITATION WITHIN THE UPPER RIVER BASIN OF MUREȘ

GORON NICOLETA DANIELA[1]

ABSTRACT. – The Particularities of precipitation within the upper river basin of Mureș. The climatic factors play a key role in the formation of the river flow as it is a very complex natural process conditioned by a variety of geographical factors that are closely interdependent. The climatic factors influence the river flow regime mainly through the amount, nature and distribution of rainfall, temperature and evaporation process.

The study focuses on analyzing the average precipitation on a monthly and seasonal basis within a period of 25 years namely 1986-2010, from eight hydrological stations in the upper river basin of Mureș.

The data referring to precipitation is categorized on a daily, monthly, seasonal and annual basis.

Precipitation, in whatever form, represents a positive component of the water balance in the area. Describing this climatic element in terms of trend within the given period of time represents a key to understanding the evolution of the flow regime characterizing the upper river basin of Mureș.

Keywords: average precipitation, seasonal rainfall, monthly rainfall, precipitation trend

1. INTRODUCTION

The climatic factor, given the location of the basin in a mountain area is under a major influence represented by the geomorphologic elements such as slope, orientation and altitude determining a separation of the area into two parts: the gorge area, namely the sector of Toplița-Deda where the geomorphologic factors inflict a concentration upon the air masses coming from the west and the second part which is the depression area where the air masses that are now mostly depleted of precipitation.

The precipitation quantity evolution in the superior river basin of Mureș as it assumes the influence of the relief scales down from the hydrometrical station of Gălăoaia, that is situated at the entrance in the gorge area where the humid air masses concentrated under the effect of the tightening relief summarize a total quantity of 887mm/m^2/year towards the hydrometrical station of Suseni situated near the Mureș source within the Gheorgheni depression where the annual precipitation quantity reaches only 518mm/m^2/year.

[1] "Dimitrie Cantemir" University, Faculty of Geography, Târgu-Mureș, Romania, e-mail: dana_goron@yahoo.com

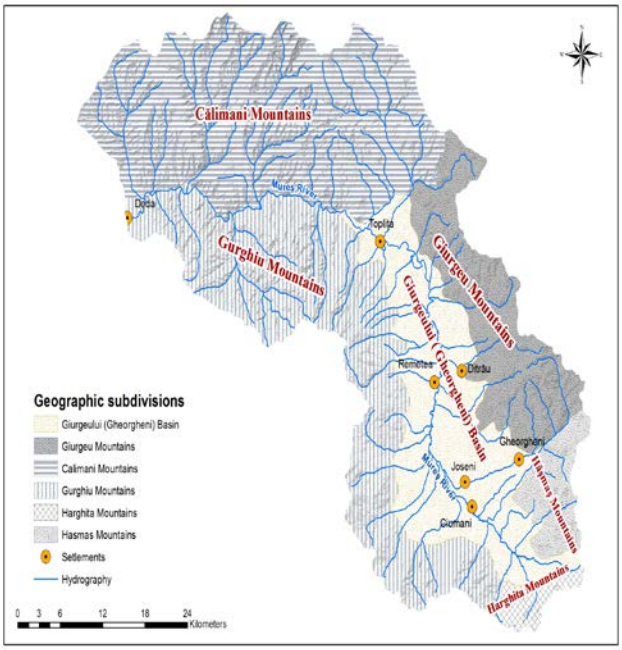


Figure 1. The localization of the upper river basin of Mureș

2. DATA AND METHODS

This study is based on the analysis of statistical data strings representing quantitative parameters for: mean annual precipitation recorded at seven stations in the upper river basin area of Mureș, namely Suseni, Gheorgheni in the Gheorgheni depression, Toplița situated at the boundary between the gorge area and the Gheorgheni depression, Răstolița and Bistra situated on the tributaries of the river Mureș within the gorge area and lastly the stations of Stânceni and Gălăoaia also from within the gorge area situated on the Mureș river.

The data is representative for a period of 25 years corresponding to the interval of 1986-2010. This period was selected due to the common operational period of the seven stations, as the station of Toplița was only initiated in 1986.

Table 1 – The average multiannual rainfall within the superior river basin of Mureş

River	Station	Altitude (m)	Average multiannual rainfall (mm)
Mureș	Suseni	987	518
Mureș	Toplița	935	619
Mureș	Stânceni	967	658
Mureș	Gălăoaia	988	887
Belcina	Gheorgheni	1115	586
Răstolița	Răstolița	1174	780
Bistra	Bistra	1104	725

Based on the data referring to daily precipitation measured at the seven stations mentioned and with the use of the Microsoft Excel program there have been calculated the average multiannual precipitation, the seasonal precipitation sum, the monthly variation of precipitation and the precipitation evolutionary trend within the 25 year time period.

3. RESULTS

Precipitation in both liquid and solid form poses a direct influence in the rivers flow regime. The ones in liquid form generate an immediate effect especially in the case of smaller hydrographical basins.

The vegetation cover is rather dense, as the forests dominate the superior sector of the Mureş River, especially in the sector of Topliţa-Gălăoaia fact that constitutes a factor that attenuates the velocity and amplitude of flash-floods.

3.1 The precipitation sum variation on a monthly basis

Based on the geographic location of the stations the data has been assembled into two groups, the first referring to the area corresponding to the depression and the contact frame and the second referring to the gorge area.
Within the period of 25 years, within the depression area as well as at the merge of the depression with the gorge area (figure 2) the most humid months, during which most precipitation falls, are June and July. On the other hand the months of January and February are the driest.

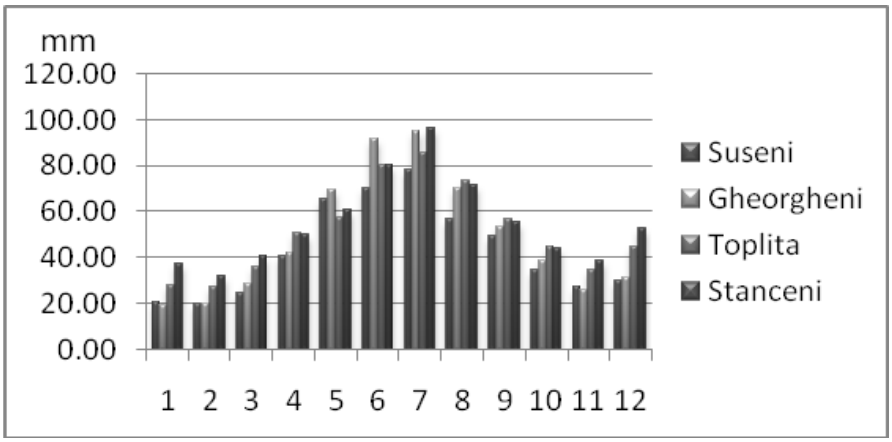


Figure 2. The precipitation sum variation on a monthly basis in the depression and contact areas

In the gorge area (figure 3) the peak time of rainfall is represented by three months namely May, June and July, especially at the contact with the subcarpathian area, as it emerges from the station at Gălăoaia, also the closing station upon the river Mureş within this sector. The two minimum precipitation

periods namely the months of January, February and Octomber, November coincide with a period of minimum flow within this area.

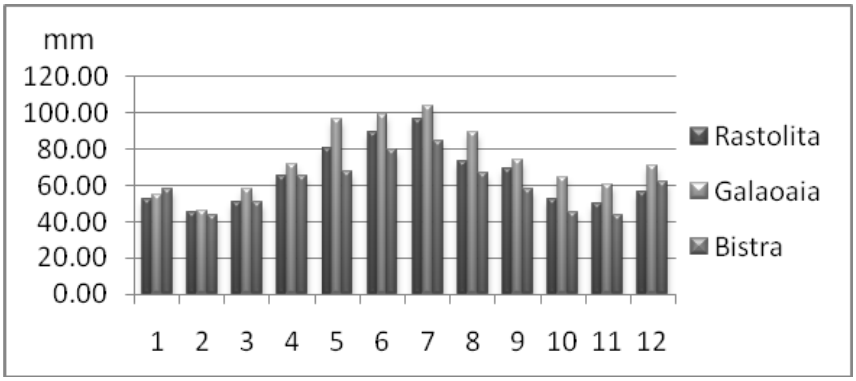


Figure 3. The precipitation sum variation on a monthly basis in the gorge area

In order to better observe the evolution of precipitation within the chosen area there have been chosen three particular stations: Suseni situated within the depression area, closest to the Mureș source, Toplița situated at the contact area between the depression area and the gorge one, and Gălăoaia, the closing station upon Mureș, situated in the gorge area.

At the station of Suseni the maximum monthly precipitation sum varies from 57,4mm/m^2/month during the month of October 2007 to 142,5 mm/m^2/month during the month of May 1991. The period of 1998-2002 the months of June and July record precipitation sums that surpass 100mm/m^2/month.

The minimum monthly precipitation sum here varies from 1mm during the month of October 1986 and February 1995 to 16,7mm/m^2/month during January 2001.

Athough, on average, at the station of Toplița the highest precipitation sum occurs in the months of June and July, the highest precipitation sum varies from the one that was calculated for the month of August 1987 – 76,6mm/m^2/month towards 166mm/m^2/month associated with the month of July 2009. The period of 1995-2002 is characterized by precipitation sums that exceed 100mm/m^2/month during June and July.

The minimum precipitation sum varies from 1 mm/m^2/month measured during the month of January 1986 to 23,4mm/m^2/month calculated for the month of December 1994. The period of 1986-1993 is characterized by rather low precipitation sums measuring under 20mm/m^2/month achieved especially during the winter season.

The maximum precipitation sum for the closing station of Gălăoaia in the gorge area vary from 91mm/m^2/month calculated for the month of December 1986 to 203,7mm/m^2/month calculated for the month of August 2006. The period ranging from 2000 to 2003 is characterized by maximum monthly precipitation sum that exceeds 150mm/m^2/month during the months of July and August, while

the period of 2005- 2007 the maximum monthly precipitation sum exceeds 180mm/m^2/month all during the month of August.
The minimum precipitation sum for the station of Gălăoaia ranges from 4,5mm/m^2/month calculated for the month of November 1986 to 45,2mm/m^2/month during October 2004.

3.2. THE SEASONAL PRECIPITATION SUM ALLOCATION

The period of 25 years taken into consideration is analyzed distinctly for the depression area and the gorge area. Within the depression and contact area the season that is characterized by the highest proportion of precipitation is summer, and is opposed by winter with minimum precipitation.
At the station closest to the source, Suseni, the winter precipitation sum takes a percentage of 14,13%, the spring and autumn season have a close share (spring 24,89%, and autumn 22% precipitation share of total) while the peak percentage is is left out for summer that gathers 38,97% of the total precipitation.

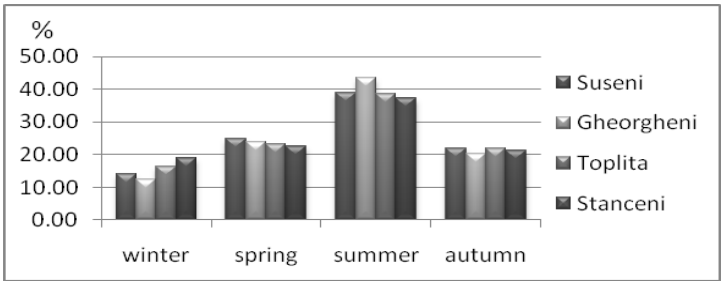


Figure 4. The seasonal variation of the precipitation sum in the depression and contact area

At the station of Topliţa, that comes between the depression area and the gorge, winter registeres a slightly higher percentage than at Suseni namely 16,41% the spring season is represented by 23,08% of the annual precipitation,similar to the autumn season 21,90% while summer similar to the situation at Suseni is represented by 38,61% of the total precipitation.

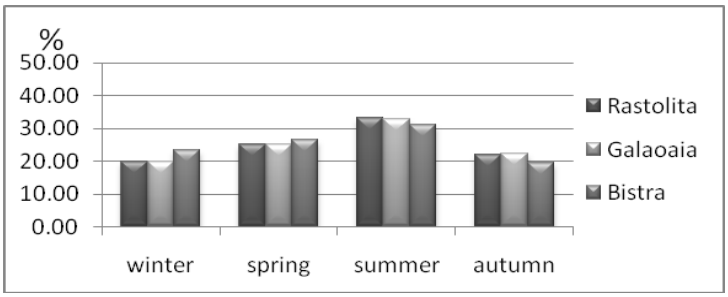


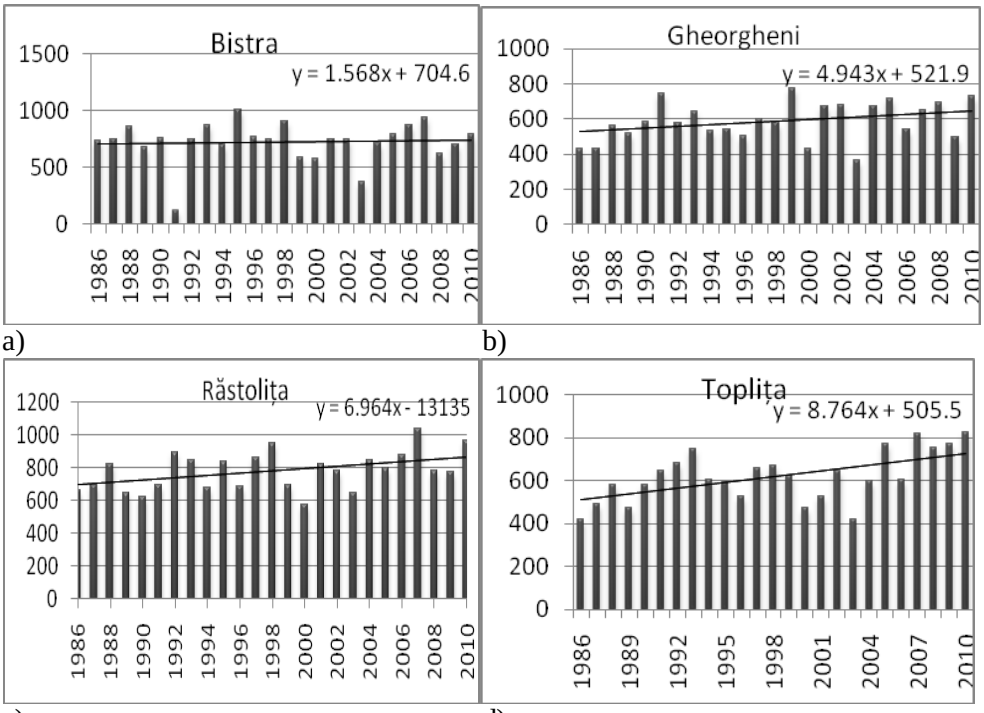
Figure 5. The seasonal variation of the precipitation sum in the gorge area

At the closing station upon the Mureș river, Gălăoaia, the winter share of precipitation is highest among all the seven stations taken into consideration in the area, namely 19,66%, while spring and autumn share 25,19% and 22,42% of the annual precipitation and summer 32,73% representing the lowest share of all the summer quota in the region.

By comparing figure 4 and 5 one can detect a rather more homogenous repartition of season shares in the annual precipitation within the gorge area as compared to the depression area, occurring mainly under the influence of the relief.

3.3 THE AVERAGE PRECIPITATION TREND

While analyzing the evolution of the average precipitation one can describe an ascending trend characterizing almost all the region of the upper river basin of Mureș.



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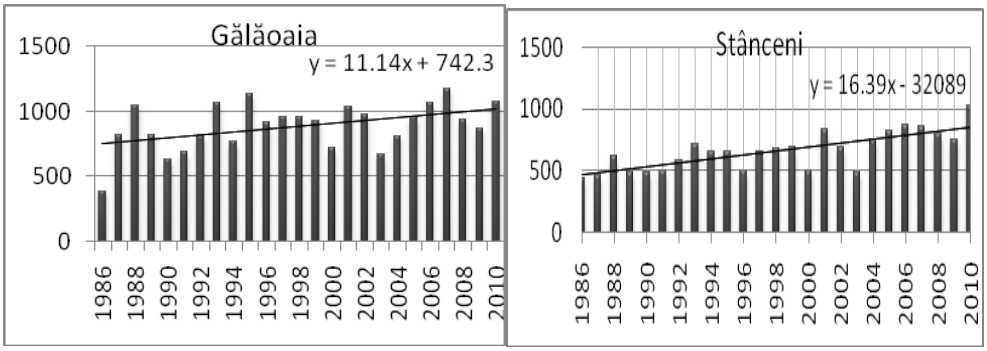

e) f)

Figure. 6. The average precipitation trend

4. CONCLUSION

The evolution of the precipitation quantity within the superior river basin of Mureș on a monthly, seasonal and multiannual level can be depicted as it assumes the influence of the relief and it recedes from the hydrometrical station of Gălăoaia, situated at the entrance in the gorge area where the humid air masses concentrate under the effect of the geomorphologic elements towards the hydrometrical station of Suseni situated near the Mureș source within the Gheorgheni depression.

Although the general trend of evolution characterizing the precipitation during the 25 year time period is ascending one can depict periods of extreme precipitation both high and low that in turn influence the flow regime within the area.

REFERENCES

1. Apostol L, Machidon D, Machidon O, Buruiana D, (2012) *Characteristics of Precipitation Trends in the area of Iași, Bacău and Suceava over the last 50 years*, Vol Air and Water, Components of the Environment, Edit Presa Universitară Clujeană
2. Goron N, Cigher M, Negru R, (2012) *The influence of climatic factors upon the flash-floods occuring in the superior basin of the river Mureș*, Vol Riscuri și Catastrofe, Vol 11, Nr 2, Edit Casa Cărții de Știință, Cluj-Napoca
3. Tudose T, Moldovan F (2011), *Characteristics of heavy rainfall parameters in the north western Romania*, Vol Air and Water, Components of the Environment, Edit Presa Universitară Clujeană
4. **** Data from the Mureș River Association