

**CONSIDERATIONS ON THE AVERAGE NUMBER OF DAYS  
WITH DIFFERENT QUANTITIES OF PRECIPITATION AND THE  
MAXIMUM QUANTITY OF PRECIPITATION IN 24 HOURS, IN  
THE BÂRLAD DRAINAGE BASIN**

**Liviu Apostol<sup>1</sup>, Ovidiu-Miron Machidon<sup>2</sup>**

**Key words:** maximum quantity in 24 hours, days with precipitation, Bârlad basin.

**Abstract.** Being a the climatic element which, together with the air temperature, leaves its mark on the general geographic landscape, atmospheric precipitation have a great practical importance in various economic sectors such as agriculture, silviculture, transportation, construction, tourism, land planning and management etc. Large quantities of precipitation fallen in small intervals of time are often the cause of overflows, floods, excess of moisture in lowlands, erosion acceleration of the sloping agricultural lands, destruction of homes and elements of infrastructure, wild and domestic animals victims and human casualties. The paper is based on data relating to atmospheric precipitation, measured at the six weather stations located in the Bârlad drainage basin.

**1. The average number of days with precipitation  $<10$ ,  $\geq 10$ ,  $\geq 20$  and  $\geq 30$  mm of the Bârlad drainage basin, in the period 1961-2009**

The variation of the number of days with different amounts of precipitation depends on the particularities of the active area (altitude, the display of the slopes towards the direction of the moist air masses, land inclination, land morphology, etc.) and general circulation of the atmosphere.

During a year, the number of days with precipitation amounts exceeding certain thresholds decreased gradually according as the daily analyzed amounts of precipitation went up.

Out of the total number of days with precipitation in 68.7% occurred amounts of precipitation  $<10$  mm, 25.6% had amounts of precipitation  $\geq 10.0$  mm and only 1.6% of days with precipitation had quantities that had reached or exceeded 30.0 mm. In Fig. 1 is conveyed the evolution of the average annual number of days with more or equal precipitation than the pluviometric thresholds of 10, 20 and 30 mm

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<sup>1</sup> Prof. PhD., Alexandru Ioan Cuza University, Iași, apostolliv@yahoo.com

<sup>2</sup> PhD. Stud., Alexandru Ioan Cuza University, Iași.

for the stations in the Bârlad drainage basin and for the entire unit, as the average of the period 1961-2009.

In the area of the Bârlad drainage basin, the number of days with more or equal amounts of precipitation than certain thresholds do not vary too much between the extreme points, the annual average precipitation quantities being directly related to the number of days with various quantities of precipitation.

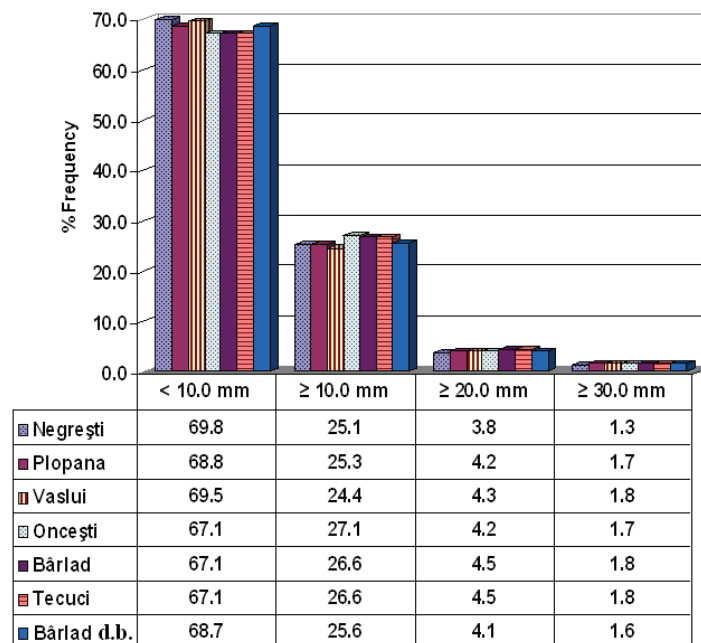


Fig. 1 - Frecvența (%) numărului anual de zile cu precipitații <10, ≥ 10, ≥20 și ≥30 mm, în bazinul hidrografic Bârlad (1961-2009)

In the case of the average number of days with precipitation amounts < 10,0 mm, the highest values were recorded in late Spring and early Summer. They ranged annually between 106.3 days at Tecuci and 122.6 days at Plopana (tab. 1). The average number of days with precipitation ≥ 10,0 mm was the highest in June, and the lowest, typically in the month of January. Annually, the mean of this parameter oscillated between 14.2 days at Negrești and 15.5 days at Oncești (tab. 1).

The average number of days with amounts precipitation ≥ 20.0 mm had a decreasing frequency, as approaching the value of 30.0 mm. The highest frequency

was recorded in the Summer months (tab. 1). In the analyzed period, annually, all weather stations from Bârlad drainage basin recorded 4-5 days with precipitation  $\geq 20.0$  mm.

The number of days with precipitation amounts  $\geq 30.0$  mm was much more reduced, compared to the other classes, surpassing 2.0 days annually only at the stations in the central area of the drainage basin.

The monthly maximum number of days with quantities equal or more than certain thresholds per year are recorded in the most humid period of the year, that is May-June-July. The most rainy month of the year, June, stands out to be the one with the largest number and highest frequency of days with different amounts of precipitation.

Tab. 1 - The average number of days with precipitation  $<10, \geq 10, \geq 20$  și  $\geq 30$  mm for the weather station in the Bârlad drainage basin (1961-2009)

Limit	Station	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Sum
$< 10,0$ mm	Negrești	10,9	10,5	10,4	10,8	11,8	12,6	11,0	8,3	8,1	7,3	9,2	10,7	121,7
	Flopana*	9,6	10,9	10,1	11,3	12,7	12,6	11,3	8,7	8,2	7,8	9,4	10,0	122,6
	Vaslui	11,0	11,1	10,5	10,4	12,1	12,0	11,0	8,0	8,0	7,3	9,8	10,9	122,3
	Oncești	9,5	10,6	9,7	10,7	13,2	12,7	11,3	8,6	8,1	7,2	9,0	9,9	120,5
	Bârlad	11,2	11,6	10,6	10,8	11,8	11,9	10,7	8,0	7,4	7,0	9,9	10,9	121,9
	Tecuci	8,7	9,4	8,7	9,8	10,9	10,4	9,4	8,1	7,3	6,6	8,1	8,8	106,3
$\geq 10,0$ mm	Negrești	0,2	0,3	0,5	1,1	1,6	2,7	2,3	1,9	1,5	0,9	0,5	0,5	14,2
	Flopana*	0,4	0,3	0,4	1,3	1,7	2,8	2,3	1,8	1,6	0,8	0,7	0,5	14,5
	Vaslui	0,5	0,5	0,6	1,0	1,7	2,4	2,3	1,8	1,5	1,0	0,9	0,6	14,7
	Oncești	0,5	0,5	0,6	1,3	2,1	3,1	2,1	1,5	1,6	0,7	0,8	0,6	15,5
	Bârlad	0,6	0,4	0,7	1,2	1,7	2,4	2,2	1,7	1,4	0,9	0,9	0,6	14,9
	Tecuci	0,6	0,6	0,6	1,4	1,8	2,0	2,0	1,7	1,4	0,9	0,9	0,7	14,5
$\geq 20,0$ mm	Negrești	0,0	0,0	0,1	0,1	0,4	1,1	0,8	0,8	0,6	0,3	0,3	0,1	4,6
	Flopana*	0,1	0,1	0,1	0,3	0,6	1,1	1,0	0,9	0,9	0,3	0,1	0,1	5,2
	Vaslui	0,1	0,0	0,1	0,3	0,6	1,1	0,9	0,7	0,7	0,3	0,3	0,1	5,2
	Oncești	0,1	0,1	0,2	0,4	0,6	0,8	0,9	0,7	0,7	0,3	0,3	0,1	5,1
	Bârlad	0,1	0,0	0,1	0,3	0,4	0,9	0,9	0,8	0,5	0,3	0,2	0,2	4,7
	Tecuci	0,2	0,1	0,1	0,3	0,4	0,7	0,8	0,8	0,6	0,3	0,3	0,3	4,8
$\geq 30,0$ mm	Negrești	0,0	0,0	0,0	0,1	0,1	0,4	0,4	0,3	0,2	0,1	0,0	0,0	1,6
	Flopana*	0,0	0,0	0,0	0,1	0,1	0,5	0,4	0,4	0,3	0,1	0,1	0,1	2,1
	Vaslui	0,0	0,0	0,0	0,1	0,2	0,4	0,4	0,4	0,3	0,1	0,1	0,1	2,2
	Oncești	0,0	0,0	0,0	0,2	0,2	0,4	0,4	0,4	0,3	0,1	0,1	0,0	2,0
	Bârlad	0,0	0,0	0,0	0,1	0,1	0,4	0,4	0,4	0,2	0,1	0,0	0,0	1,8
	Tecuci	0,1	0,0	0,0	0,1	0,1	0,3	0,4	0,4	0,3	0,1	0,1	0,1	1,9

\*Negrești(1966-2009); \*Flopana(1964-1999); \*Oncești(1961-1999)

The trends regarding the evolution of the annual number of days with precipitation  $\geq 30$  mm at the weather stations in the Bârlad drainage basin indicate a shifting of the deviations above average at 4 of the 6 weather stations (Negrești, Flopana, Vaslui and Tecuci weather stations) (fig. 2).

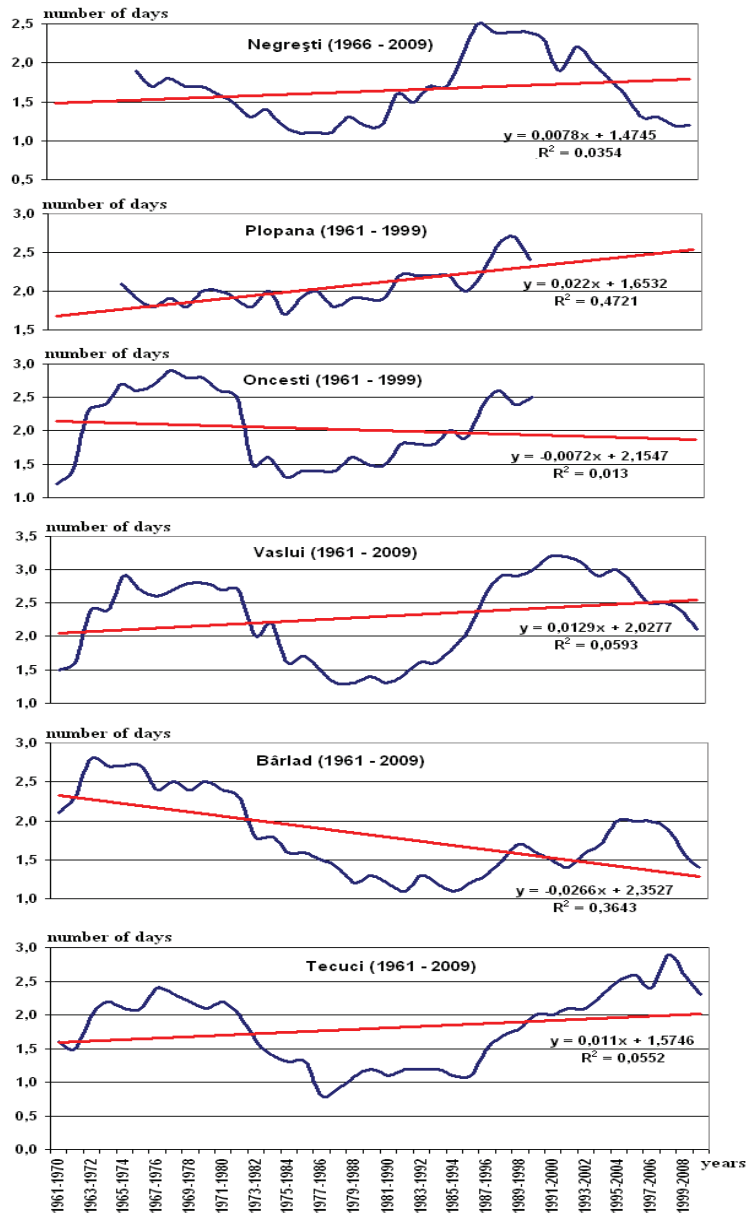


Fig. 2 - The moving average graphics, calculated on 10-years shifted by one year, of the annual number of days with precipitation  $\geq 30$  mm at the weather stations in the Bârlad drainage basin

## 2. The highest precipitation amounts in 24 hours

According to data collected during the years 1961-2009 at the stations of the herein studied area, the highest precipitation quantities in 24 hours over several years, had a wide range, between 81.9 mm and 135,7 mm (tab. 2). The maximum annual precipitation quantities fallen in 24 hours, are between 15.3% of the average amounts per year at Plopana and 24.6% of the same at Oncești. In all the cases, the maximum annual precipitation quantities in 24 hours were higher than the average for the month in which they occurred.

Tab. 2 - The highest precipitation amounts in 24 hours (mm) for the weather station in the Bârlad drainage basin (1961-2009)

Station		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Year
Negrești*	mm	15,8	17,8	23,0	42,6	44,1	55,6	86,9	91,4	63,8	47,4	29,2	26,2	<b>91,4</b>
	ziua/ anul	21/ 1998	20/ 1986	28/ 1992	23/ 2008	7/ 2005	8/ 1984	29/ 1991	20/ 1972	16/ 1981	4/ 1998	1/ 1974	28/ 1993	<b>20.08.72</b>
	mm	35,5	24,6	22,8	39,6	53,4	77,0	81,9	79,8	47,7	42,6	40,9	36,6	<b>81,9</b>
Plopana*	ziua/ anul	8/ 1966	2/ 1978	5/ 1971	18/ 1978	27/ 1991	27/ 1996	12/ 1970	25/ 1970	24/ 1996	4/ 1972	1/ 1974	3/ 1966	<b>12.07.70</b>
	mm	30,1	22,6	38,2	61,0	49,8	73,2	91,1	88,0	60,8	55,6	43,6	33,1	<b>91,1</b>
	ziua/ anul	20/ 1965	15/ 1969	28/ 1992	27/ 1976	28/ 1975	22/ 1999	22/ 1980	20/ 1972	6/ 2001	4/ 1998	15/ 2004	5/ 2007	<b>22.07.80</b>
Vaslui	mm	33,4	29,0	34,0	55,6	69,7	63,7	89,9	61,7	135,7	35,7	40,7	29,8	<b>135,7</b>
	ziua/ anul	20/ 1965	26/ 1973	5/ 1971	21/ 1961	24/ 1963	30/ 1991	12/ 1969	6/ 1972	1/ 1988	7/ 1994	1/ 1974	11/ 1976	<b>1.09.68</b>
	mm	26,2	22,4	33,4	59,3	53,7	66,6	82,3	86,4	87,3	62,6	29,7	36,2	<b>87,3</b>
Bârlad	ziua/ anul	10/ 1961	10/ 1984	28/ 1992	14/ 2004	30/ 2002	11/ 1968	12/ 1969	20/ 1968	2/ 2007	5/ 1992	2/ 1966	5/ 2007	<b>2.09.07</b>
	mm	40,8	23,9	32,3	59,0	57,1	82,5	75,8	71,7	66,7	76,1	42,7	50,0	<b>82,5</b>
	ziua/ anul	3/ 2006	10/ 1984	24/ 2007	14/ 2004	7/ 2005	22/ 1999	12/ 1969	4/ 1997	5/ 2007	11/ 1972	22/ 1987	8/ 1990	<b>22.06.99</b>

\*Negrești(1966-2009); \*Plopana(1964-1999); \*Oncești(1961-1999)

The highest amount of fallen precipitation in 24 hours per year in Bârlad drainage basin, was of 135.7 mm, recorded in Oncești, on the 1<sup>st</sup> September 1968 and the lowest maximum was the one at Plopana.

The lowest amounts of fallen precipitation in 24 hours per year ranged between 15.8 mm at Negrești (21<sup>st</sup> January 1998) and 29.0 mm at Oncești (26<sup>th</sup> February 1973).

On a monthly criteria, in 77.8% of the cases, the highest amount of fallen precipitation in 24 hours exceeded the sum of the precipitation quantities in the respective month, and in 2.8% of the cases, the sum of the month concerned has been exceeded more than twice (for example: in the month of September at Oncești and in October at Tecuci).

Over the period of a year, at the stations from Bârlad drainage basin, the highest monthly maximum amounts in 24 hours, were recorded in July (50% of the cases), September (33.3%) and August (16.7%), while the lowest monthly maximum amounts in 24 hours occurred in February (66.7% of the cases) and in January and March, with 16.6% each. The annual regime of the monthly maximum precipitation within 24 hours is depicted in Fig. 3 a and b, the highest and the lowest monthly values being highlighted separately for each station.

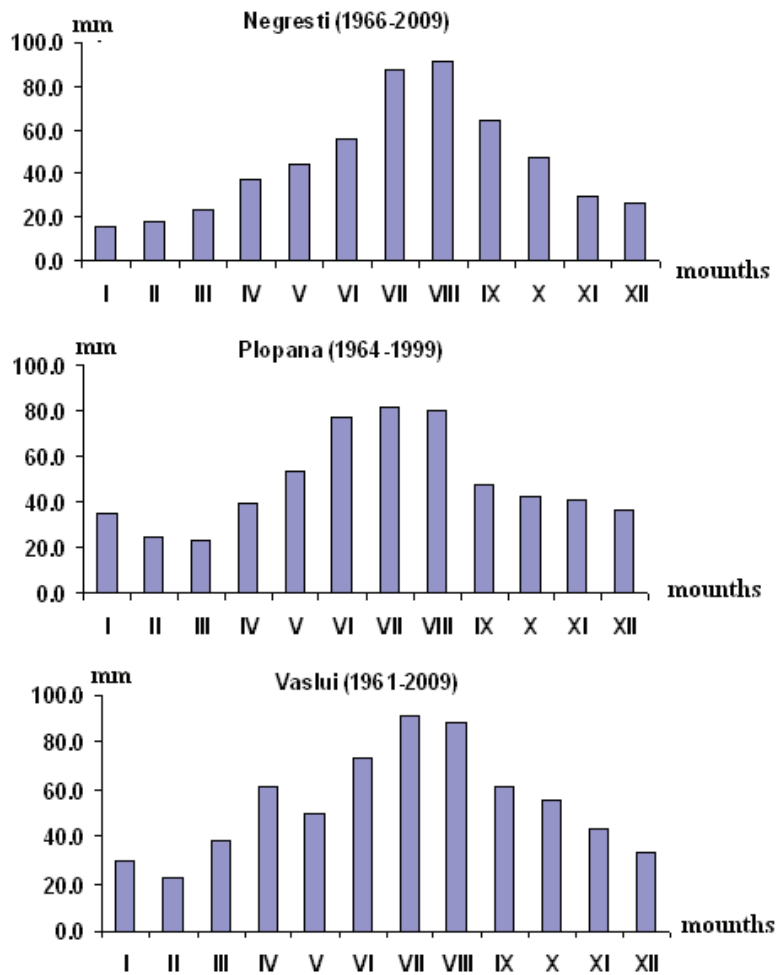


Fig. 3 a - The regime of highest precipitation amounts in 24 hours (1961 – 2009)

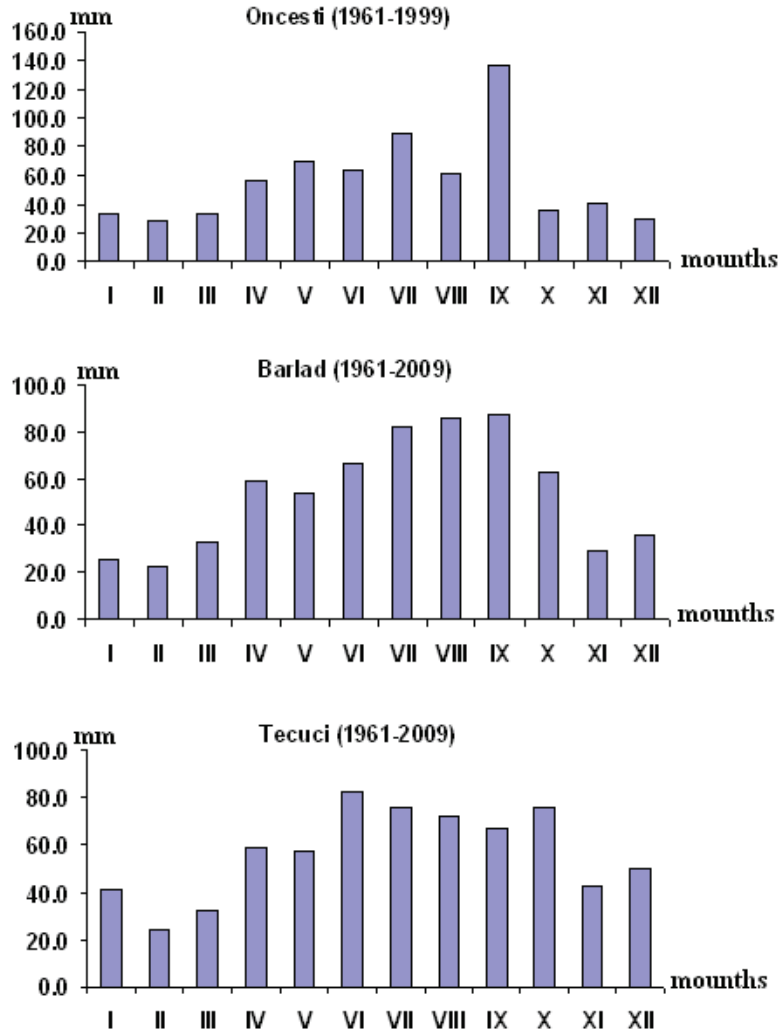


Fig. 3 b - The regime of highest precipitation amounts in 24 hours (1961 – 2009)

### Conclusions

The variation of the number of days with different amounts of precipitation depends on the particularities of the active area (altitude, the display of the slopes towards the direction of the moist air masses, land inclination, land morphology, etc.) and general circulation of the atmosphere.

In Bârlad drainage basin, the number of days with higher precipitation or equal to certain thresholds, don't differ too much between the extreme points; there is a direct link between the recorded average annual precipitation quantities and the number of days with different precipitation values, in more humid areas the number is bigger and in dryer ones the days with precipitation are fewer in the course of an average year.

The evolution trends of the annual number of days with precipitation  $\geq 30$  mm recorded at the weather stations in Bârlad drainage basin indicates a shifting of the deviations above average values at 4 of the 6 weather stations (Negrești, Plopana, Vaslui and Tecuci weather stations). This aspect may be an argument in favor of the increasing torrential character of precipitation for the last 49 years, in the biggest part of the Bârlad drainage basin, except for some areas where the trend is descending (e.g. Bârlad, Oncești).

In all cases, the maximum annual precipitation quantities in 24 hours were higher than the average of the month in which they occurred. The highest annual quantities of precipitation fallen in 24 hours, hold between 15.3% of the average amounts per year at Plopana and 24.6%, at Oncești. During one year, at the weather stations of Bârlad drainage basin, the highest monthly amounts in 24 hours were recorded in July (50% of the cases), September (33.3%) and August (16.7%).

#### **Acknowledgments**

O. Machidon is supported by a POSDRU grant no. 89/1.5/S/49944 „Developing the innovation capacity and improving the impact of research through post-doctoral programs”, Alexandru Ioan Cuza University, Iasi.

#### **References:**

- Apostol, L. (2004)**, *Clima Sucevei*, Edit Univ. Suceava.
- Bradu Tatiana (2004)**, *Clima Colinelor Tutovei*, Teza de doctorat, Facultatea de Geografie-Geologie, Univ. „Al. I. Cuza”, Iași, mss.
- Machidon, O. (2009)**, *Fenomenul de grindină în bazinul hidrografic Bârlad*, Teza de doctorat, Facultatea de Geografie-Geologie, Univ. „Al. I. Cuza”, Iași, mss.
- Mihăilă, D. (2006)**, *Câmpia Moldovei - Studiu Climatic*, Edit. Univ. Suceava.
- \* \* \* (1961-2009), *Meteorological tables TMI-1M*, N.M.A, Bucharest.