COMPARATIVE ANALYSIS OF THE FLOODS FREQUENCE ON TELEORMAN AND GALBEN RIVERS

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ABSTRACT.– Comparative analysis of the floods frequence on Teleorman and Galben rivers. The study deals with comparative analysis of flood occurrence on Teleorman and Galben rivers. Teleorman River is the tributary on the left side of the Vedea River and flows across the Teleormanul Plain from the north to the south. Galbenul River is the tributary on the left side of Gilort River flowing across the Parâng Mountains and Oltenia's Subcapathians. The analysis is done due to the similarities concerning the numbers of floods generated although the rivers have different physical and geographical characteristics. The data used were recorded at the hydrometric stations Tătărăştii de Sus and Teleormanu (on the Teleorman River) and Baia de Fier (on the Galben River) for a common period of 13 years (1995-2007). It was determined the seasonal and monthly frequency, depending on the genetic criterion of all floods produced on the two rivers during the analized period. The conclusion that emerged is that on the Teleorman river most flash floods occur in winter and have mixed genesis, compared to the Galbenul River, where most occur in summer and have pluvial genesis.

Keywords: flood, frequency, seasonal, monthly, Teleorman River, Galbenul River.

1. INTRODUCTION

This study started from the idea of comparing two rivers with different characteristics of the natural background. One (Teleorman River) crosses the low plateau and the plain regions, the other(Galbenul River) crosses the mountainous subcarpathian regions. Both of them recorded approximately equal number of floods during the analysed period.

The main aim of this paper is to identify the differences between the flood behaviour of the two rivers located in very different local conditions.

Teleorman River belongs to the hydrographic basin of Vedea and it is one of the tributary on the left side of the Vedea (the collector river), while the Galbenul River belongs to the hydrographical basin of Gilort, and it is one of the tributary on the left side of the river Gilort.

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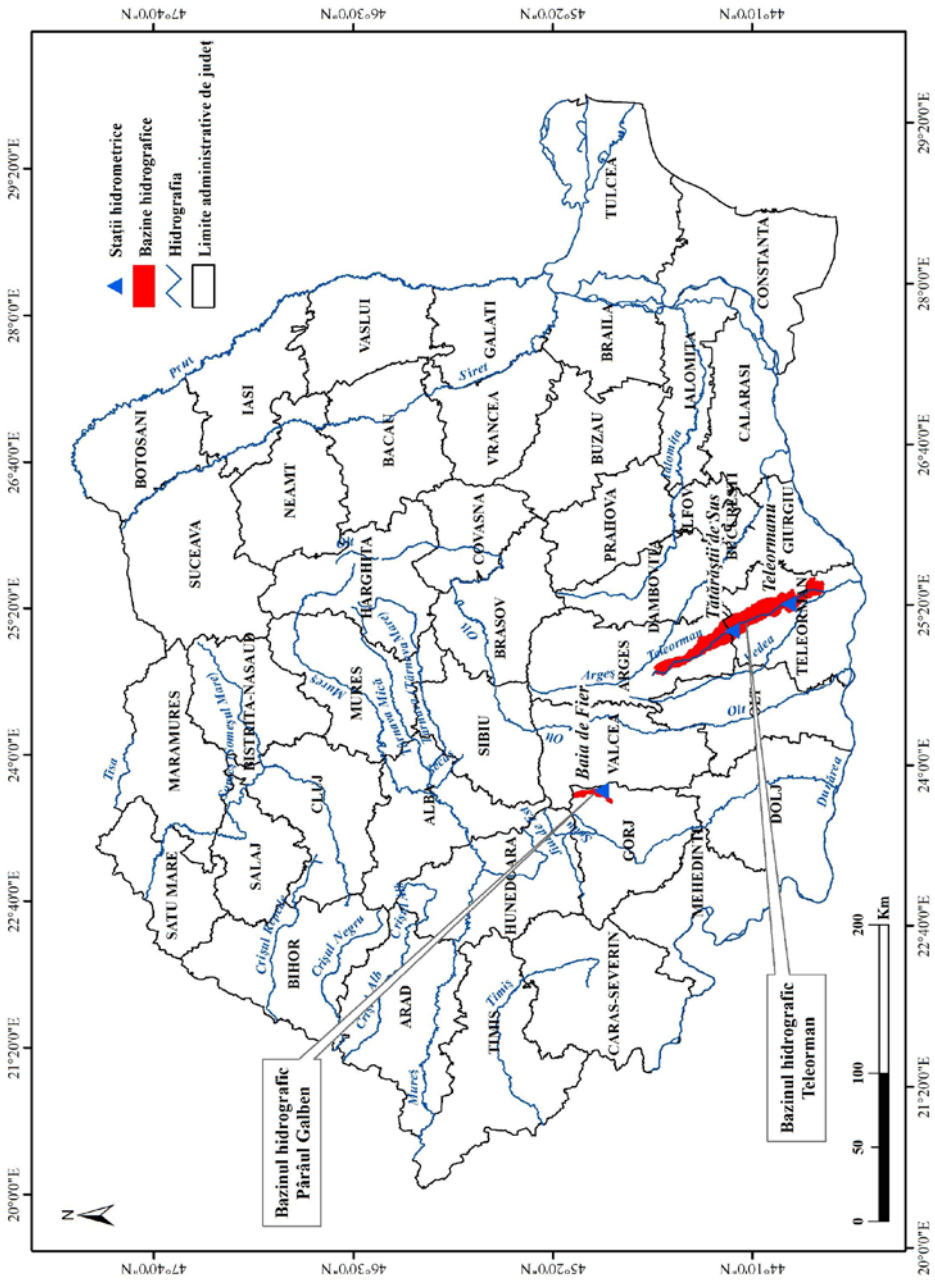

Fig. 1. The location of Teleorman and Galbenu hydrographical basins

Teleorman springs on the eastern slope of Cotmeana Platform, from an altitude of 390 m above Black Sea level. It flows into the Vedea river at an altitude of 29 m. It crosses from north to south the Teleorman Plain (Posea and Badea, 1984, Geografia României, 2005, Toma, 2011), it has a length of 169 km, an area of the catchment 1427 square km^2 and it is monitored by two hydrometric stations: Tătărăştii de Sus and Teleormanu (Figure 1).

The Galbenul River springs near the southern slope of Parâng Mountains, flows from an altitude of 1900 m above sea level upstream to an altitude of 328 m, downstream, having a length of 32 km and an area of the hydrographic basin of 112 square km^2 (Ujvari, 1972,Minoniu 2011). The River crosses the mountain regions from north to south, and when is flows out of this region it carves a region of rocks (named Cheile Galbenului) where, due to the existent Jurassic limestone bars, the Polovragi cave appears in the landscape.

In the Subcarpathian region, Galbenul River changes its direction and flows from NE to SW and crosses Polovragi region and, finally, flows into Gilort. It is monitored at the Hydrometric station Baia de Fier(Figure 1).

A brief analysis of the general hydrological features was made for the two rivers (Diaconu 1971, Ujvari, I., 1972, Zaharia, L., 1993, 2004).

Other syntetic papers considering the whole Romanian territory, for the study of Teleorman and Galben rivers presented the annual regime of flow and of the floods (Diaconu, 1988, Mustăţea, 2005).

For the two rivers basins, the detailed analyses of the floods including frequency, occurance probability, calculation of floods parameters were previously done considering longer period (Minoniu, 2009, 2011, Toma, 2011, Toma and Barbu 2011).

2. DATA AND METHODS

The data used were recorded at the Hydrometric stations Tătărăştii de Sus, Teleormanu (on Teleorman River) and Baia de Fier, (on Galbenul River) for a period of 13 years (1995-2007) and they were provided by Vedea, Argeş and Jiu Water Departments Data processing was done using statistical and mathematical methods.

To determine the frequency of floods recorded on the two analyzed rivers, all floods were extracted from the three existing Hydrometric stations over the common period, 1995-2007.

The Tătărăşti station is located in the upper sector of the Teleorman river and at altitude of 242 m, with a total surface of the controlled basin of 415 km^2. The second station, Teleormanu is located in the lower sector, near the confluence with the Vedea river, with an average altitude of 155 m and a total hydrographic controlled surface of 1341 km^2.

Baia de Fier hydrometric station is located in the lower sector of the Galbenu river and it controls a surface of 57 km^2 with an average altitude of 1239 m.

The rise of the flow volume and the increased level of the river, overlapping the winter phenomena (ice bridge, and ice to the bank in the case of

the Galbenul River) and the periods represented by the high waters in the spring, have not been taken into account in data processing.

3. RESULTS

The comparative analyses of the frequency of producing floods on the studied rivers has been made by comparing the total number of the floods, their monthly ans seasonal frequency and the genetic type of the floods

Analyzing the total number of floods that occurred on the rivers under study, one can notice that although the rivers have different geographical positions, different sources, and different types of flows, the number of floods recorded during the analyzed period is almost equal, 46 floods occurred on the Teleorman River and respectively, 47 on the Galben River (Table 1). Thus, in 7 out of 13 years under study, the total number of the floods was similar: 3 floods/year in 1995 and 2003, 4 floods/ year in1999, 2005 and 2007, and 5 floods/year in1996 and 2004.

Table 1. ***Analysis of the total number of floods occurred on the Teleorman and Galben Rivers (1995-2007)***

Year	Number of floods			
	Teleorman River			Galben River
	Tătărăştii de Sus	Teleormanu	Total	
1995	1	2	3	3
1996	3	2	5	5
1997	1	2	3	2
1998	2	2	4	3
1999	2	2	4	4
2000	0	2	2	3
2001	2	1	3	4
2002	2	1	3	5
2003	2	1	3	3
2004	3	2	5	5
2005	2	2	4	4
2006	1	2	3	2
2007	2	2	4	4
Total	**23**	**23**	**46**	**47**

* ***Data source : DAAV Piteşti, DAJCraiova***

Concerning the monthly occurrence of the floods recorded on the two rivers, the Teleorman and Galben rivers, it is obvious that on the Teleorman river the most floods are specific to March, January and February (12, 11 and respectively 6) while on the Galben river the most floods were recorded in July, September, April, May and August (7..5 floods/month) (Figure 2).

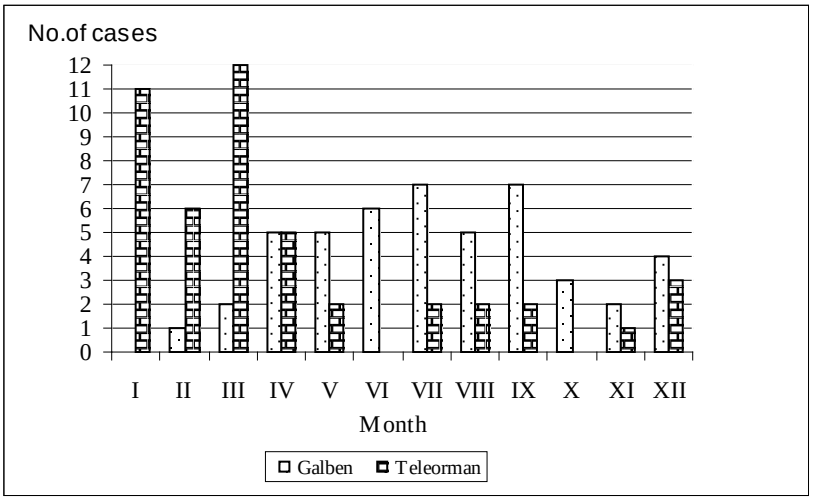

Fig. 2. ***Monthly flood frequency occurred on the Teleorman and Galben rivers (1995-2007 - data source DAAV Piteşti, DAJCraiova)***

On the Galben river, no floods were registered in January, when winter phenomena occur with intensity. On the Teleorman river, no floods were registered in June and October.

A judicious analyses of flood frequency recorded on the two rivers, required the identification of their seasonal values as well (Figure 3).

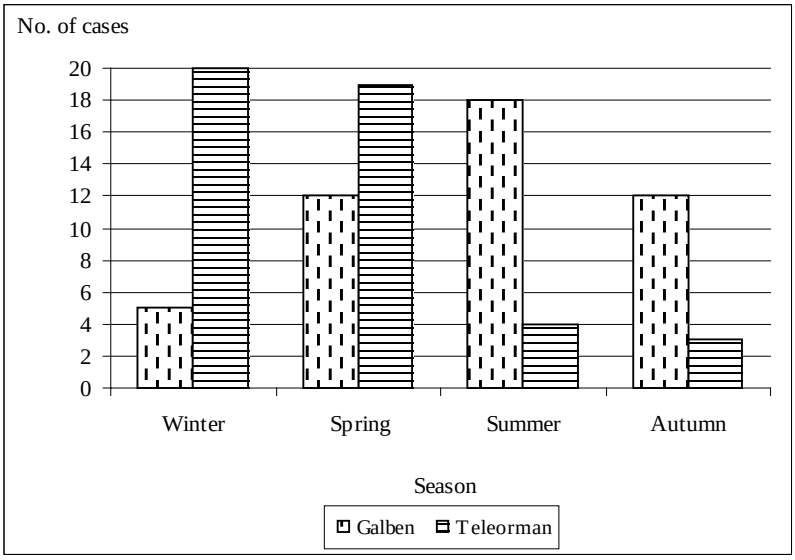

Fig. 3. ***Seasonal flood frequency occurred on the Teleorman and Galben rivers (1995-2007 - data source DAAV Piteşti, DAJCraiova)***

Out of the total number of the floods recorded in the analyzed period, on the Teleorman River, the most occur in winter (20 floods), while on the Galben River the most floods occur in summer (18 floods). On the Galbenu River, 12 floods were recorded in spring, and on the Teleorman River, in the same season, occurred 19 floods. The least number of floods was specific on the Teleorman River during the autumn (3 floods), as a result of the frequently dry summers in the Teleorman Plain, while on Galben river the least floods occurred in winter (5 floods).

The relative analyses of seasonal flood occurrences on the analyzed rivers highlights the huge percentage of floods occurred in winter (43.47%) and spring (41.3%) on the Teleorman river, compared to the Galben river which accounts for the most flood occurrence in summer (38.29%) and in equal proportion in winter and spring (25.53%).

On the Teleorman river there is a huge difference (36.95 %), between the percentage of flood occurrence in winter (the most of them) and in autumn (the least of them) compared with the Galben river, where the difference between the highest value (recorded in summer) and the lowest value (recorded in winter) is (27.66 %).

The differences between the two rivers imposed making a comparative analysis of the floods occurred on the two rivers according to their genetic type.

It is found that on the Teleorman river, the mixed floods prevail, while on the Galben river the pluvial ones prevail (Table 2, Figure 4).

Table 2. ***Analysis of the genetic flood type occurred on the Teleorman and Galben rivers (1995-2007)***

River	Hydrometric station	Pluvial floods	Mixed floods
Teleorman	Tătărăştii de Sus	12	11
	Teleormanu	15	8
Galben	Baia de Fier	38	9

(data source DAAV Piteşti, DAJCraiova)

On the Teleorman River, 27 pluvial floods were recorded, while on the Galben River 38 cases are specific. An analyses according to the hydrometric stations where the data were recorded shows that Tătărăştii de Sus station accounts for 12 floods, Teleormanu station accounts for 15 floods for the Teleorman River, while on the Galben River, the 38 pluvial floods were recorded at Baia de Fier station.

The mixt origin floods usually occur when high amounts of precipitations associate with abrupt temperature increase that lead to the snow melting. Their intensity increases with the soil humidity, low evaporation and lack of vegetation in the area.

Concerning the floods of mixt origin it is noticed that on the Galben River occurred 9 floods, while on the Teleorman River 19 similar cases occurred.

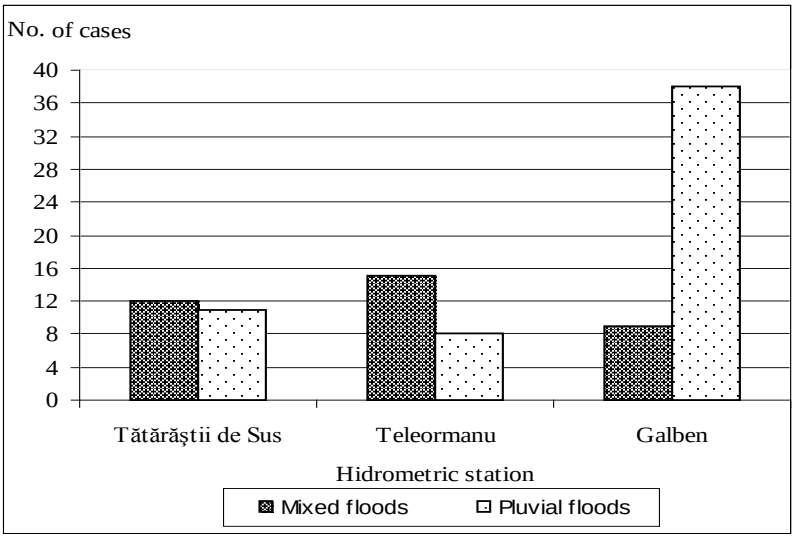

Fig. 4. ***Analysis of the genetic flood type occurred on the Teleorman and Galben Rivers (1995-2007- data source DAAV Piteşti, DAJCraiova)***

The distribution of those floods on the hydrometric stations that monitor them is as follow: 11 cases at Tătărăştii de Sus, 8 cases at Teleormanu station, compared to the Baia de Fier station where 9 such floods were recorded.

5. CONCLUSIONS

Acccording to the comparative analysis of flood occurrences on the Teleorman River and on the Galben River, one can notice that during the studied period (1995-2007), on both rivers occurred approximately the same number of floods; 46 on the Teleorman River, and respectively 47 on the Galbenu River. Although the number of flood is similar, the differences are obvious; on the Teleorman River the most floods are mixt (29 cases), while on the Galbenu River, pluvial floods prevail (38 cases).

The highest number of floods recorded on the Teleorman River occurred in winter (20 cases), while those occurred on the Galbenu River are produced during the summer (18 cases).

The frequency of the monthly flood occurence recorded on the rivers under study highlights that on the Teleorman river the highest number of floods are in March, while on the River Galbenu they prevail in July and September. The months in which no floods were produced were June and October for the Teleorman River, and January for the Galben River.

After analysing the floods on both rivers, one can say that despite the similar number of the total floods recorded in the 13 years considered period (1995-2007), there is an important diference between the two rivers regardidng both genesis and the period of the year when those floods ocurred.

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