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HISTORY OF FLOODS OCCURRED IN BANAT

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Abstract. *History of Floods Occured in Banat*. The maximum run-off represents the most important phase in the river flow, because of the share of destructive effects that waters and their features have and which should be taken into account in the design, execution and operation of hydrotechnical buildings. The floods occurred on the rivers from the Banat region constitute a frequent natural phenomenon. Their analysis on a period of 250 years reveals that the regularity of the major floods is approximately 30 years. There are also cases when these phenomena happen at only a few years, as is the example of the floods occurred in 2005 only five years from the ones from 2000. The historical data confirm the occurrence of the catastrophic floods which influenced the economic life of Banat and which occurred in chronological order from 1753 until 2005.

Rezumat. *Istoricul inundaţiilor produse în Banat*. Scurgerea maximă reprezintă cea mai importantă fază din regimul de scurgere al unui râu, datorită ponderii efectelor distructive pe care le pot avea apele şi caracteristicilor ei, de care trebuie să se ţină seama atât în proiectarea, cât şi la executarea şi exploatarea construcţiilor hidrotehnice. Inundaţiile produse pe cursurile râurilor din Banat constituie un fenomen natural frecvent, iar o analiză a acestora pe un interval de aproximativ 250 de ani relevă că periodicitatea inundaţiilor majore este de circa 30 de ani, existând şi cazuri când aceste fenomene se produc la intervale de numai câţiva ani, cum este şi exemplul inundaţiilor din 2005 petrecute la doar cinci ani după cele din 2000. Datele istorice atestă producerea câtorva inundaţii catastrofale care au influenţat viaţa economică a Banatului, şi care s-au succedat în ordine cronologică începând cu anul 1753 şi terminând cu anul 2005.

Key words: *floods, pluvial floods, hydrotechnical works, causes, effects, damages, Banat.*
Cuvinte cheie: *inundaţii, viituri pluviale, lucrări hidrotehnice, cauze, efecte, pagube, Banat.*

1. INTRODUCTION

The floods mean the temporary coverage with water of a land as a consequence of the growth of the water level of a river, lake or another mass of water. From a hydrological point of view, a flood may be any growth in the level of water or of the flow over the level which exceeds the banks of the minor river bed. In other opinions, the land is wrongly used and confused with the land of the flash flood, which represents only the significant growth and reduction of the run-off through a certain river bed (Mustățea, citat de Stângă, 2007).

The floods represent extreme hydrological phenomena generated by the high waters or the flash floods. The knowledge about the genesis and the mechanisms of flood occurrence offers the possibility of preventing the effects they can cause.

As a consequence of adding in a various range of relief forms by this region which determine a superposition of the climate parameters, as well as the result of the exposure of the basin in the way of the advection of the western, northern and south-eastern masses of air, which produces high waters and flash floods all year round in the studied area.

2. FLASH FLOODS FEATURES

Within this region, many of the floods happen during spring, when either the sudden melting of the snow or the heavy rain occur on the water saturated soils, leading to the formation of large flash floods. Many times, the two factors may combine or the warm rains may melt the snow accumulated during winter.

In the Banat region the most important types of flash floods that have happened so far are:

a. *The pluvial flash floods due to the heavy rain on small areas, but with very high intensity*. Such floods occurred in Reşiţa and Bocşa through the overflow of the streams and the powerful development of the run-off from the mountains, with level growths from 0 to 150. These are different from other types of flash floods because in several minutes they produce important damages. The water enters the houses and the household annexes of the people; they affect the industrial sites, the street and hydrological networks, the national, county, commune and forestry roads. Due to the hilly and mountainous relief, the times of concentration are very low (even under 30 minutes), determining the impossibility of warning or taking precautionary measures (The report related to the flood from April 2005 in the hydrographical space of Banat).

b. *The pluvial flash floods formed because of the heavy rain* on extended areas from one or more hydrographical basins, with the development of the levels over the limit of flooding on the whole river flow and its tributaries. These flash floods usually take place in April, May and July.

c. *The snow and pluvial floods are the result of significant quantities of liquid precipitations*, fallen simultaneously with a sudden rise in air temperature and the quick melting of the snow layer. This phenomenon usually takes place twice a year: the first flash flood happens in February and the second one in the second part of December.

This type of floods is characterized by a special development of the flows on medium and inferior sectors of river flows, exceeding the capacities of the hydrotechnical works with a defence role against the floods and even damaging them (The report related to the flood from April 2005 in the hydrographical space of Banat).

3. THE HISTORY OF FLOODS

The hydrographical space of Banat is located in the south-west of Romania and stretches from the Mureş river up to the confluence of the Cerna and the Danube rivers, summing up a surface of 18,393.15 km^2, on which there are parts of other hydrographical basins, such as: Bega, Timiş, Caraş, Nera, Cerna, Aranca and the Danube (Aldescu, 2010).

The Banat region, especially its low field area, was affected years in a row by the occurrence of large floods that lead to the flooding of more parts of land, with numerous damages and the saddest cases, even losses of life.

Although without knowing the clear hydrological data about them, the oldest floods occurred within the hydrographical space and recorded in certain historical documents of that period are the ones from **1753** (Figure 1).

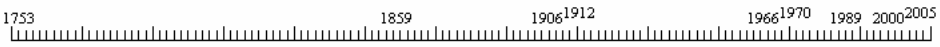

***Figure 1**: The chronological representation of the years with the largest flash floods recorded in Banat*

The problem of the protection against floods became more and more important after these floods, around the middle of the 18th century. The Austro-Hungarian empire leaders reached the conclusion that the construction of hydrotechnical buildings for the reduction of the negative effects produced by high waters was necessary (Cozma, et al., 1974).

They tried to solve this problem by constructing some dams in the high risk sectors of rivers, by building permanent accumulations and by transforming some surfaces of land in non-permanent accumulations, which are very important for the controlled flooding in special situations.

The information supplied by the issue 57 of the "Drapelul" newspaper from 1992 and presented in a study from 1982 states that the following major flash flood affecting Banat was the one from 1816, which was similar with what happened almost 100 years ago, the catastrophic flooding from 1912, when the maximum recorded flow on the Timiş river was 1,500 m^3/s (Teodorescu, Macridin, 1982).

The following flood that affected the Banat region was the one occurred in the Timiş river basin, in 1859, when catastrophic floods took place, covering with water entire localities and lands, "almost half of one joch" (a joch is 0.5755 ha) (Rodica Munteanu şi Dorina Bălănescu, 1993), in other words 280,000 ha of land, 46 localities, including Timisoara, as described by the records of the period (Figure 2).

In the second picture we notice that the largest surfaces of land were flooded in 1859 compared to other years (The report related to the flood from April 2005 in the hydrographical space of Banat).

After that catastrophic year from the point of view of floods, there followed a period with high waters recorded in 1906 and 1912. In 1906, the maximum flow recorded on Timiş was 1,150 m^3/s (Teodorescu, Macridin, 1986).

The flash flood from 1912 has a historical significance because it was the first major flood recorded hydrometrically. This occurred in May because of heavy falling of precipitations during a period of time of 36 to 48 hours. The rains were distributed on the

hydrographical space of Banat as two nuclei. The layer fallen during this flooding had the value of 100.3 mm/m^2, while the total time of the flood had close values to 130 hours. The time of flood growth was of 39 to 40 hours, and the flood volume of 183,240 million m^3 (Teodorescu, Macridin, 1986). All these features of the flood led to the flooding of numerous rural localities, even Lugoj, as well as approximately 25,000 ha of lands (Figure 2) (The report related to the flood from April 2005 in the hydrographical space of Banat).

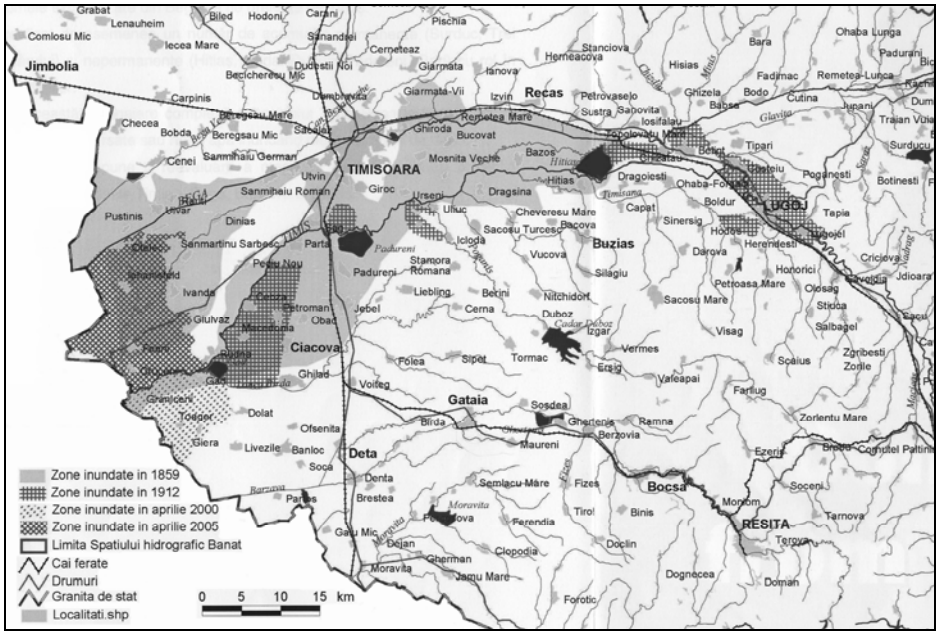

***Figure 2**: The flooded surfaces from the Timiş – Bega basin between 1859 and 1912*
(source: The report related to the flood from April 2005 in the hydrographical space of Banat)

High waters and flash floods, but of a smaller size, occurred as well in: 1919, 1925 (during winter), 1926 (during summer), 1932, 1938, 1940, 1942, 1949, 1955 and 1956.

After 1960, the floods were fewer in number, the higher intensity flash floods threatening the dam systems on Timiş river in five instances as follows: 1966, 1970, 1989, 2000 and 2005.

The flood from 1966 was caused by heavy rain and had two centres, one located on the north-western slope of Semenic Mountains and another one located on the northern slope of Ţarcu Mountains, which caused important flows on the main rivers from the hydrographical space of Banat, especially on the Timiş river (1100 m^3/s in Lugoj and 1200 m^3/s in Şag). The dam on the Timiş river, crossed by high flows like the ones mentioned above, broke right next to the locality of Gad (The report related to the flood from April 2005 in the hydrographical space of Banat).

In 1970, as it happened in the whole country, the rivers from Banat recorded major floods, because of smaller quantities of water (585 m^3/s in Lugoj and 650 m^3/s in Şag), but compromised the crops on 188,000 ha of land and the surface of numerous localities (The report related to the flood from April 2005 in the hydrographical space of Banat).

The flood from 1989 occurred in May as well as the one in 1912, when heavy precipitations were recorded with values from 40 to 80 l/m^2, approximately half of the multiannual normal values for this month. After a few days without rain, significant precipitations had been recorded every day since 20 May until 7 June, which were attributed to some hot and cold atmospheric fronts carrying humid masses of air in the area. They caused precipitations upon the contact with the masses of air, more important during the last day, because of a new atmospheric front which led to the sudden increase of the levels and flows on the rivers of Banat the following day (Munteanu, Bălanescu, 1993).

The year 1999 was characterised by the production of significant floods in the hydrographical basin of the Bega river, which were generated by significant precipitations in quantity and warming of the weather in February, leading to the sudden melting of the snow. The existing hydrotechnical works in the area of the basin such as: the permanent accumulation of Surduc, the Timiş-Bega supply canal, the Topolovăț discharge canal, the non-permanent accumulation of Hitiaş, played an important role, because they reduced the centre of the flash flood and reduced our damages produced by these floods considerably (Teodorescu, 2008).

The following year, an important year for floods, 2000, is very important because of the snow and pluvial flash flood occurred during the period 5 – 11 April because of an unfavourable synoptic situation characterised by: the presence of a large mass of hot air which determined the formation of positive temperatures, the formation of two nuclei of precipitations which led to the precipitation discharge on a period of 24 hours, precipitations overlapping the existing snow layer. The snow began melting because of the precipitations and of the high temperatures. The effects of the flash floods have been important, because water exceeded the dam in the area of the locality of Grăniceri, forming a breach in the left bank dam leading to the death of two persons and the flooding of 16,000 ha of land (Macridin, Harabagiu, 2001-2002).

The last year is 2005 when the worst flooding from the last 35 years occurred and had as factors the high quantities of precipitations fallen during that period, generated by the intense cyclonic movement at the level of the entire continent. Secondly the high temperatures of the air and, last but not least, the quantity of water coming from the sudden snow melting are other important reasons. All these causes finally led to the record of several successive flash floods, which on the inferior course of Timiş formed the overflow of water over the dam's canopy, which led to the accelerated erosion and the formation of two breaches in two locations of the dam, on the right bank of Timiş, around Crai Nou (Nichita, et al., 2006).

Based on these conditions, the backwater was added because of the abundant vegetation from the major riverbed of Timiş on the downstream sector from Iasa Tomici. The recorded historic maximum levels led to the flooding of river lands, through propagation towards the localities of Crai Nou, partially Rudna, Cruceni, Foeni, Ionel, Otelec, partially Sînmartinul Sârbesc. The phenomenon was worsened by the building of a transversal landfill on the Serbian territory between the Timiş river and the Bega river (The report related to the flood from April 2005 in the hydrographical space of Banat).

Although the flash flood occurred in 2005 was a major one, determining the excess of the quantity carried by the riverbeds because of the fact that the defence dams had been built for flash floods with a once every 20 years probability of occurrence. The other hydrotechnical constructions existing in this region had a special role in the reduction of the flood wave and the damages produced (Domăşneanu, 2009).

4. CONCLUSIONS

By analysing the annual maximum levels recorded starting with 1893 at the hydrometrical plant in Lugoj, representative for the hydrographical basin of Timiş, but also for Banat, based on the recorded flows during the period 1950 – 2005 (presented in Table 1), the most serious flood occurred in 1912, followed by the one from April 2000, then the one from 1906, and the one from April 2005 ranking number 4.

Table 1: The features of the worst floods recorded by the hydrological plant from Lugoj (The report related to the flood from April 2005 in the hydrographical space of Banat)

Year	H (cm)	Q (m^3/s)	Notices
1906	468	1150	Re-enacted flood
1912	614	1500	Re-enacted flood
1926	380	825	Measured flow
1966	450	1100	Measured flow
1978	380	825	Measured flow
2000	560	1403	Re-enacted flood
2005	494	1135	Measured flow

Analyzing the major floods in Banat hydrographical area which have produced in the last 250 years, one can see that their frequency is of about 30 years. There are also cases when they occur every few years (floods occurred in 2000, followed by the ones in 2005). Because the floods in this area represent a frequent natural phenomenon, which may have strong negative effects, the improvement of the flood control strategy is necessary by implementing the concept called "more space for the rivers", dam consolidation and dam height, where there is the case, and applying of non-structural measures for flood management (Stănescu, Drobot, 2006).

This new concept that must be taken into account in preventing the negative effects of floods in Banat hydrographical area, called "more space for the rivers ", involves the construction of dams at greater distances from the river banks to give more space for rivers to flow during periods of high water (Olaru, 2006).

REFERENCES

Aldescu, C. (2010), *Studiul inundaţiilor pe râul Timiş amenajat în conceptul „Mai mult spaţiu pentru râuri”* – PhD thesis, Editura Politehnica, Timişoara.

Cozma, M., Oprea, V., Văcaru, P. (1974), *Pământuri renăscute, sisteme de desecări în Judeţul Timiş*, Edited by Direcţia Generală a Agriculturii, Industriei Alimentare şi a Apelor din Judeţul Timiş pe baza programului de tipărituri aprobat de Biroul Comitetului Judeţean Timiş al P.C.R..

Domăşneanu, Andreea (2009), *Influenţa lucrărilor de amenajare asupra viiturilor produse în Banat*, Sesiunea anuală de comunicări ştiinţifice cu tema „Cercetarea geografică şi modificările mediului”, Institutul de Geografie al Academiei Române din Bucureşti, 19.06.2009.

Macridin, Z., Harabagiu, Carmen (2001-2002), *Viitura din 5 – 11 Aprilie 2000 în bazinele hidrografice Timiş – Bega,* vol. XI – XII, Analele Universităţii de Vest din Timişoara, seria Geografie, Editura Universităţii de Vest din Timişoara.

Munteanu, Rodica, Bălănescu, Dorina (1993), *Viitura din bazinul hidrografic al Timişului din luna iunie 1989*, vol. II, Analele Universităţii Timişoara, Seria Geografie, Editura Universităţii de Vest din Timişoara.

Nichita, C., Hauer, Eliza, Croitoru, Adina Eliza (2006), *Situaţii de vreme severă cauzate de producerea precipitaţiilor abundente: inundaţiile din Banat, aprilie 2005,* vol. III, Riscuri şi catastrofe, Editura Casa Cărţii de Ştiinţă, Cluj Napoca.

Stănescu, V., Al., Drobot, R. (2006), *Hydrometeorological characterisation of the flood from the period 14 – 30 April 2005 in the Timiş – Bega River Basin, Water Observation and Information System for Balkan Countries (BALWOIS) Conference, 2006, May 23–26, Ohrid, Macedonia*.

Stângă, I., C. (2007), *Riscurile naturale, noţiuni şi concepte*, Editura Universităţii „Alexandru Ioan Cuza”, Iaşi.

Teodorescu, **Macridin** (1986), *Fenomene hidrometeorologice rare petrecute în bazinul râului Timiş*, Simpozionul Naţional " 15 ani de gospodărire a apelor în judeţul Caraş-Severin"-Reşiţa.

Teodorescu, **Macridin** (1982), *Unele consideraţii asupra viiturii din 25 – 30 mai 1912 pe râul Timiş la staţia hidrometrică Lugoj,* manuscript.

Teodorescu, N., I. (2008), *The Main Characteristics of the High Water Registered in the River Basin Bega in February 1999*, XXIV Conference of the Danubian countries on the hydrological forecasting and hydrological bases of water management, 2-4 June 2008, Bled, Slovenia.

*** *The report related to the flood from April 2005 in the hydrographical space of Banat*, made by I.N.H.G.A şi Administraţia Naţională de Meteorologie, Bucureşti, 2005.