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HYDROLOGICAL PHENOMENA OF RISK IN THE CRASNA BASIN

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Résumé: Les phénomènes hydrologiques de risque du bassin hydrographique de la rivière Crasna. Cette catégorie des phénomènes a des évidentes implications d´ordre géomorphologique déterminant une modération cyclique des crues mineures et des plaines. Les crues et les innondations se produisent soit grâce aux pluies de l´intervalle avril - novembre, soit grâce à la fondue des neiges pour la période froide, associées aux chutes des précipitations liquides (surtout à la fin de l´hiver et au début du printemps). Qui que soit la cause de leur production, elles sont des phénomènes de risque hydrologique au grand impacte sur les crues et les plaines du bassin hydrologique de Crasna.

Mots-clés: innondations, crues d´eau, modération du relief.

The Crasna Basin presents climatic influences from the west, north-west and south-west of the continent, which cause a rich amount of rainfalls, but the quantities vary from one area to the other. Rich rainfalls which happen in a short period of time can represent hydrological phenomena of risk because they produce floods and high floods.

The geomorphological implications are obvious because the intensity and frequency of these phenomena determine intense modelling activities in the minor river beds and river meadows in the Crasna Basin. The high floods are caused mainly by the torrential rains, which are specific for the hot season, or by the long-term rainfalls, and for the cold season and the beginning of spring the increase of level and quantity can depend on the melting of the snow layer, to which we can frequently add the rainfalls due to the sudden increase of the air temperature.

In the hydrological basin of the Crasna River, during 1970-2001 a series of high floods happened, but for this analysis we have taken into account the highest increases of the levels and quantities in the Crasna River, in the hydrometric stations of Şimleul Silvaniei and Crasna, and Zalău River at the hydrometric station Borla.

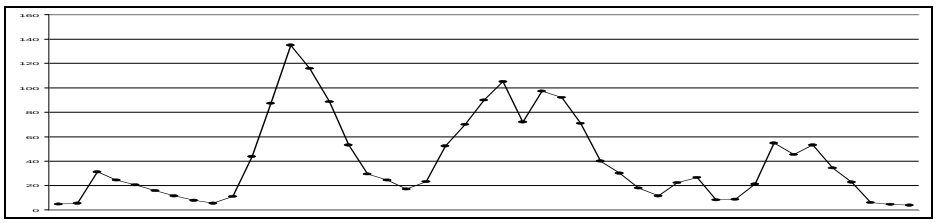

Figure.1. The high flood wave on the Crasna River (hydrometric station Crasna) June 1970

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The high flood from June 1970 on the Crasna River, at the hydrometric station Crasna, has more high points and for this reason this high flood can be considered with many waves. In this case the high flood caused floods in the river meadow of Crasna, because of its inability of evacuating such a great amount of water. Its usual average is 2 m3/s. The maximum amount of Crasna output during this high flood reached 135 m3/s, being 67 times higher that the multiannual average.

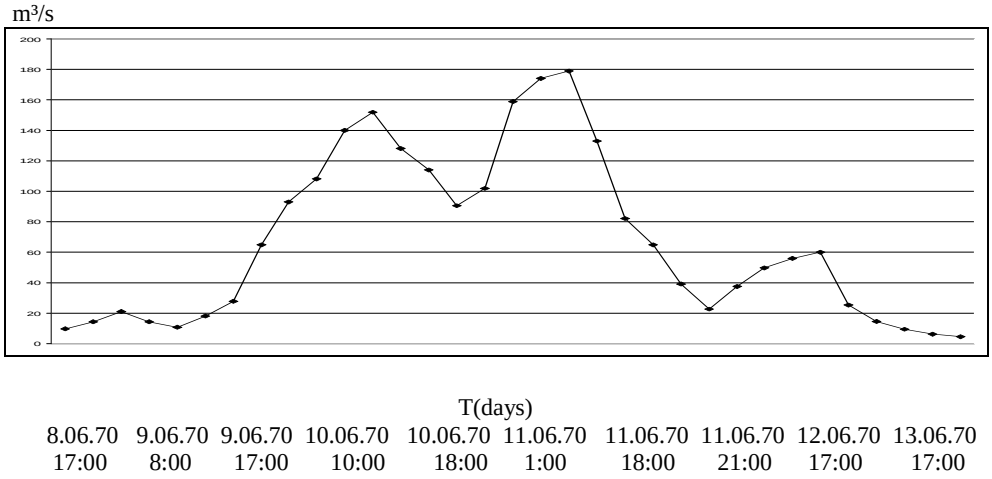

Figure.2. The high flood wave on the Crasna River (hydrometric station Simleul Silvaniei) June 1970

In 1970 serious high floods occurred on Crasna and Zalău Rivers, as well as in the whole north-west part of the country. Because of these rich rainfalls, during 12-15 May, (at Crasna during this period fell 192,7 mm), the output of Crasna increased significantly, producing floods which were caused by torrential rains.

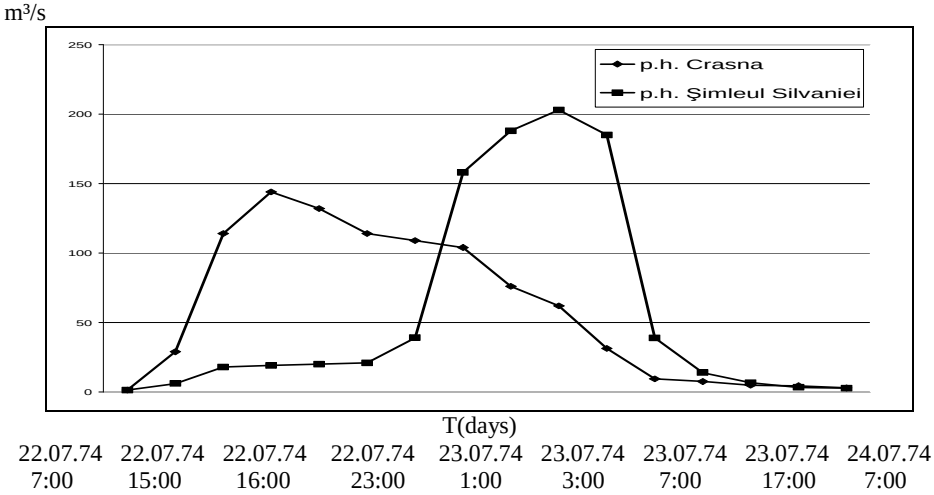

Figure.3. The high flood on the Crasna River (hydrometric stations Crasna and Simleul Silvaniei) July 1974

During 8-13 June 1970 due to massive rainfalls associated with a soil soaked with water, unable to ensure an adequate infiltration, flowing processes were stimulated on the mountain slopes, in areolar form but especially in organized form.

A characteristic of the high floods recorded at Crasna and Şimleul Silvaniei (on the Crasna River), during 22-24 July 1974, is the fact that they have single wave feature, where the high point reaches the maximum values very fast, and the decreases are a bit slower at Crasna and more sudden at Simleul Silvaniei. The high flood wave reaches its highest points differently at the two hydrometric stations, 144 m3/s at Crasna and 203 m3/s at Simleul Silvaniei. This increase of output between the two locations can be explained through the contribution of the right affluent (Calița and Catrici Streams).

During April 1989 - September 2001 there were one or two high floods a year, and for reducing the negative effects produced by the floods a series of river beds were arranged, both on Crasna downstream of Cehei Defile, and on Zalău on the area of the town with the same name.

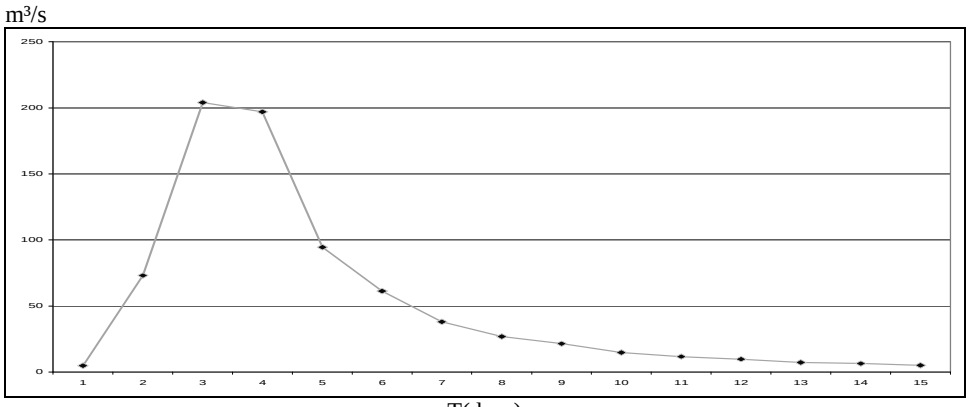

Figure.4. The high flood wave on Crasna River (hydrometric station Crasna) October 1998

The maximum output recorded in October 1998 at Crasna was 204 m3/s, and at the Crasna river level reached at 480 cm. These phenomena of hydrological risk were diminished due to the arrangement from Varsolt which besides providing with potable water the two towns Zalău and Şimleul Silvaniei, has another role, that of diminishing in the area near the downstream of the high floods, with a very important role of modeling the minor river beds.

During April 1989 - September 2001 on the Zalău River there were recorded 14 hydrological risk phenomena, and of all these we have chosen the high flood from 15-16 June 1997, due to the maximum water outputs recorded in this period, 132 m3/s at hydrological station Borla, and the maximum level of the water was of 420 cm.

In the Crasna basin high floods occur either because of rain during April to November or due to melting snow from December to March, or by overlapping of the two phenomena in late winter and early spring. Whatever the cause of their generation, they are phenomena of hydrological risk with a large impact on the modeling of the river beds and meadows of the studied river basin.

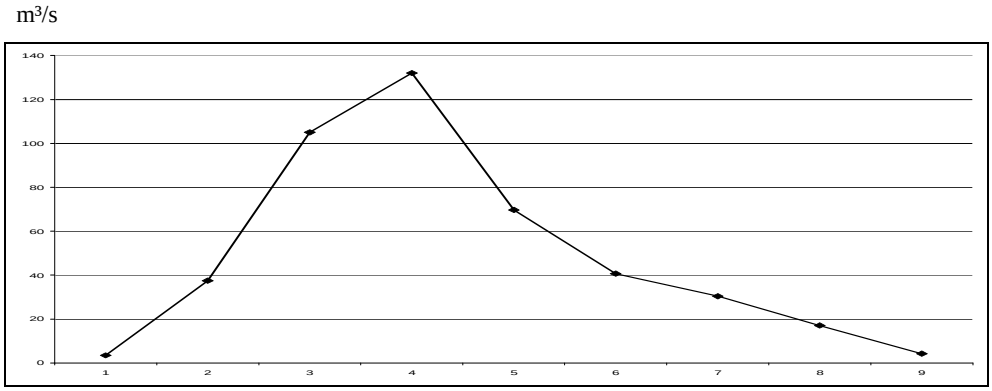

Figure 5. The high flood wave on the Zalau River (hydrometric station Borla) in June 1997

We have to mentioned another specific cause of the cold season that could cause floods in some areas. This is the accumulation of ice floes or their assemblage in the narrowest parts of the river beds or in the places where they meet obstacles (e. g bridges).

Taking into account these aspects, we can say that the mountainous side of the basin, where the inclination is higher, the impermeable rock, with a layer of soil less able to retain large quantities of rainfalls generated by heavy rain (800-1000mm/year) there are two distinct situations, in terms of frequency level increases.

The first situation refers to the mountainous areas which do not have a forest vegetation, as in the case of Oşteana Peak, between Tusa-Vânători (on areas) where the use of agricultural land is higher.

Here because of the high inclination, the storage capacity of the water is lower and usually rapid growth of level occur and even high floods when strong rain falls, felt on the Crasna affluents: Boului Valley, Priei Valley and Malului and Sâgului Valleys.

A second situation refers to the forest areas, where the amount of water fallen is intercepted and detained in large part, so that increases in rates are less amplified and high floods less frequent.

For the area of piedmont hills, where the slopes are preserved, but the rate of infiltration is higher, the response of the basin to the high floods is diminished, but here the same variables also appear, and that can determine level increases, which in turn may change the aspect of the river in the minor river bed within a relatively short period of time.

For the present study the high floods on the main courses in the Crasna Basin are of great importance, because the intensity of the erosion and the transport of materials in suspension or dragged, increase proportionally with the flowing water.

The river bed and river meadow of Crasna and their affluents are two elements which evolve in a close relationship of complementarity, forming the transport area of deep waters and high floods. The movement of the big alluvia occur only during high floods, when the transport capacity of the Crasna River grows and the reduction of the size of the transported fragments varies depending on the distance covered by them and their composition.

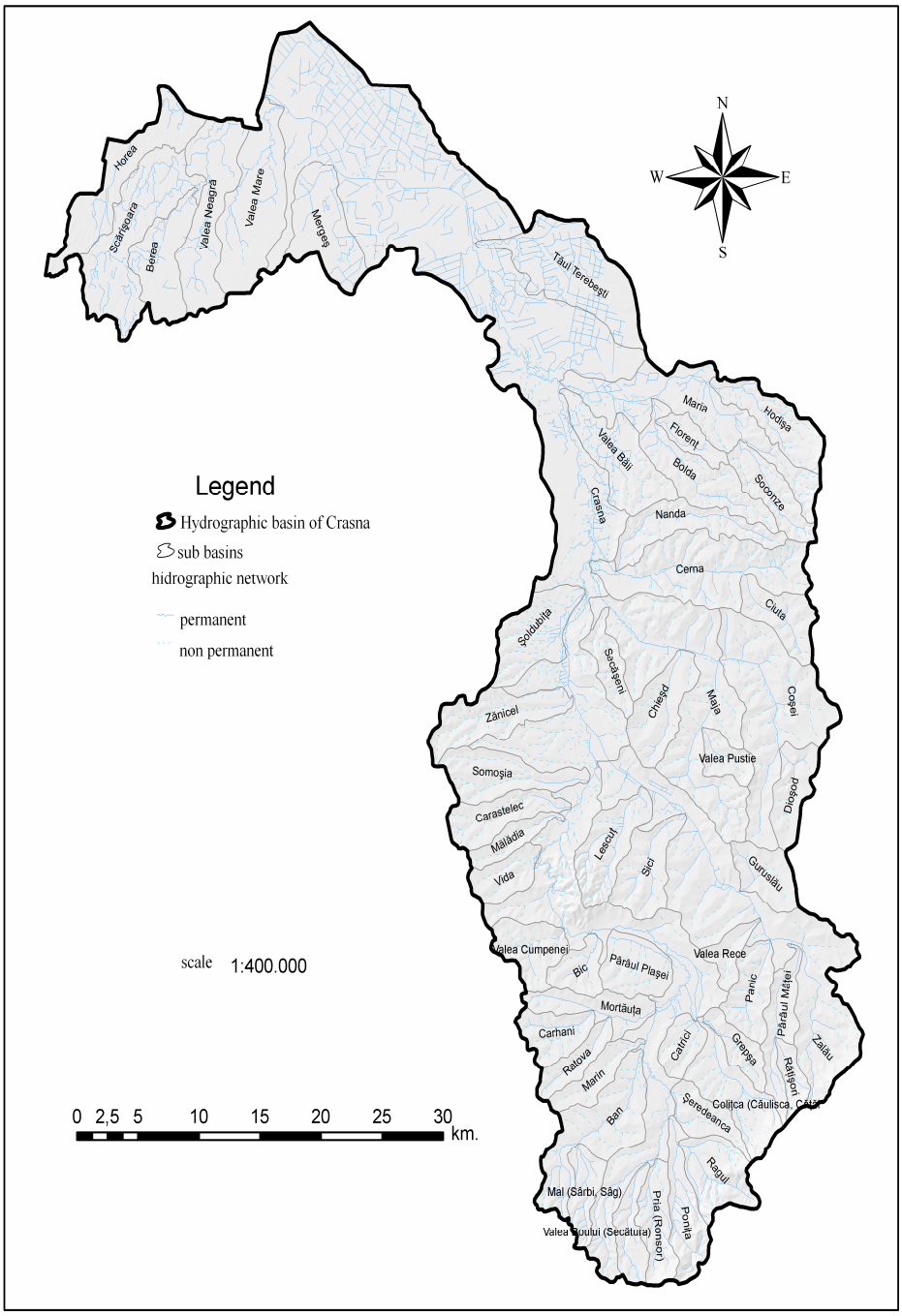

Figure 6. Map of hidrographic basin of Crasna (sourse: numerical number of land-- Shuttle Radar Mission Topography (SRTM)

We can conclude by pointing out that any significant level increase leads to changes of longitudinal and transverse profile of the bed of the river bed, and river modelling is developed as a continuous process upon the river beds and banks, amplified by

the increased flow and level. We can notice that this process is extended during the flood and at the level of the meadows, where alluviation generally prevails.

We have insisted on the importance of the big high floods analysis in the Crasna Basin, because they carry more alluvial lands than in the time when the flows were below average values, taking part directly to discharge the materials from the river bed bottom.

Also, the big high floods wash the dejection cones of the Crasna tributary valleys: Poienița Valley, Şeredeanca, Maja, Maria, inducing a cyclical sequence of the periods of erosion and accumulation, which induce impulses in the process of erosion and transport and these accentuate the erosion of the valley.

BIBLIOGRAPHY

Ichim, I., Bătucă, D., Rădone, Maria, Duma, Didi (1989), *The morphology and dynamics of the river beds*, Editura Tehnică, Bucharest.

Imbroane, A. M. (2002), *Applications of the variational calculus to determine the balance of the river profile*, Studia Univ. "Babeş-Bolyai„ Cluj-Napoca, Seria Geographia, an XLVII, nr.1.

Ioniță, I. (2000), *Applied geomorphology. Degradation processes of the hilly areas*, Edit. Universității, „Al. I. Cuza", Iaşi.

Josan, N., Petrea, Rodica, Nistor, S. (1998, a), *Glacis in the Western Hills of Romania*, in Analele Universității of Oradea, Section Geography-Geomorphology, Tom VIII-A, Oradea.

Mustățea, A. (2005), *Exceptional high floods in Romania. Genesis and effects*, National Institute of Hydrology and Water Management, Bucharest

*** (2004), *The development plan of the North-West part of Romania-major coordinates*, Presa Universitară Clujeană, Cluj-Napoca.

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