

Exceptional flood events in the summer of 2018 in the Trebes-Negel Representative Basin (Romania)

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Abstract

In the summer of 2018, the general unstable weather throughout the central and eastern parts of Romania has led to significant rainfall, sometimes exceeding 60 mm/day, and therefore to a massive runoff on the slopes that rapidly increased the flow on tributaries and the main course of the river Trebes from the Moldavian Subcarpathians. The majority of the hydrometric basin stations recorded exceedances of the caution levels, and the hydrometric station Bacau registered the maximum historical level (H= 348 cm). In order to demonstrate this, there were performed analysis and data processing using programs and hydraulic calculations for different probabilities.

Keywords: exceptional floods, historical levels, hydraulic calculation, Trebes-Negel Representative Basin

1. Introduction

Floods are among the most important natural hazards all over the world and in Romania, which are continuously approached and discussed from various points of view (Ceobanu and Grozavu, 2009; Romanescu and Stoleriu, 2013; Romanescu et al., 2017).

Between June 15th and July the 1st 2018, there was recorded significant rainfall in the central and eastern parts of Romania and because of the significant runoff from the slopes the flows on tributaries and also on the main course of the River Trebes have increased. The most important flood wave has occurred at the end of June 2018 when rainfall has exceeded 60 mm/day. The majority of the hydrometric stations recorded exceedances of the caution levels, and the hydrometric station Bacau, located in the lower sector of the basin, registered the maximum historical level (H= 348 cm) on the 30th of June 2018.

Our attention in this study is directed to the significant contribution of rainfall and geo-morphometric characteristics (shape, area, slope, roughness, and rapid propagation times) of small basins to produce exceptional events.

2. Study Area

The Trebes River Basin is a small hydrographic basin, of about 140 km², which belongs to the important basin of

Bistrita River from the Eastern Carpathians in Romania. It crosses the Eastern slope of the peak Pietricica Bacaului in the Moldavian Subcarpathians and the lower areas around it, with NW-SE orientation (Fig. 1). The Trebes - Negel Representative Basin is considered as a reference point for all small basins with similar geographic features and is closely watched by the Romanian Waters Administration (RWA).

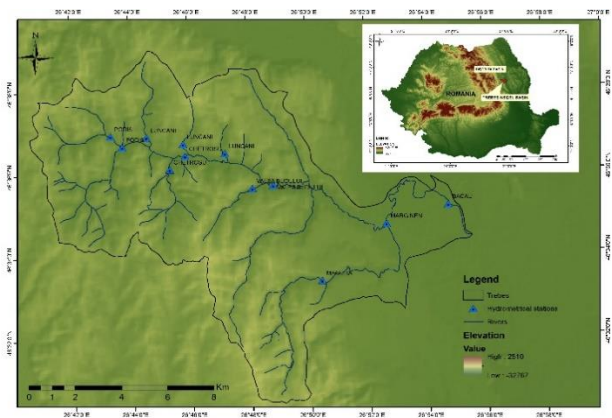


Figure 1. The geographical location of the Trebes-Negel Representative Basin

3. Methodology

Various methods have been used to determine maximum flows (Lekkas D.F. et al., 2001). For this study the hydrological data, the water level observations, the flow determinations, the rainfall quantities and the time of their recording (Table 1), and some other data, were obtained from the Siret Water Basin Administration in Bacau (a branch of the RWA). Water observations and measurements were analyzed throughout the floods, according to procedures submitted by National Institute of Hydrology and Water Management (NIHWM). The procedure consists in calculating flows and determining if they fall within the probability of exceeding 0.5%, 1%, 5% and 10%.

In parallel, the monthly and annual average water and flow data were also analyzed. The data collected includes warning, flood and danger levels before and after floods, daily and monthly runoff and hourly runoff fluctuations during the floods.

Table 1. Amounts of rainfall recorded in June 2018 at the hydrometric stations of the Trebes River

Hydrometric Station	12. VI	13. VI	14. VI	15. VI	16. VI	17. VI	18. VI	Sum
Podis	1.6	2		1	14	17	3.8	39.4
Magura	1.5	4.5		4.8	14.7	7	4.8	37.3
Chetrosu		5.1	1.2	0.3	17.3	18		41.9
Valea Budului	1.4	5.1	1.5	0.3	17.5	18		43.8
Margineni	8.9	1.6			18.3	10.2	7	46.0

Table 2. Calculations of the probabilities of exceeding the maximum flows (m^2/s) at the hydrometric stations of the Trebes River

	0.50%	1%	5%	10%
Podis	69.6	60	34.2	25.2
Magura	71.2	62	35.3	23
Chetrosu	101	87	49.6	34.0
Valea Budului	116	100	57	42
Margineni	171.7	148	84.4	62.2
Bacau	197	170	96.9	71.4

4. Results and Discussion

Data processing led to the flood hydrograph (Fig. 2.) and to the calculation of the probabilities of exceeding the maximum flows (Table 2).

The situation of the damages caused by this hydro-meteorological phenomenon indicates destruction of 6 dwellings, 3 small bridges, 10 km of communal road, and 3.83 acres of agricultural land.

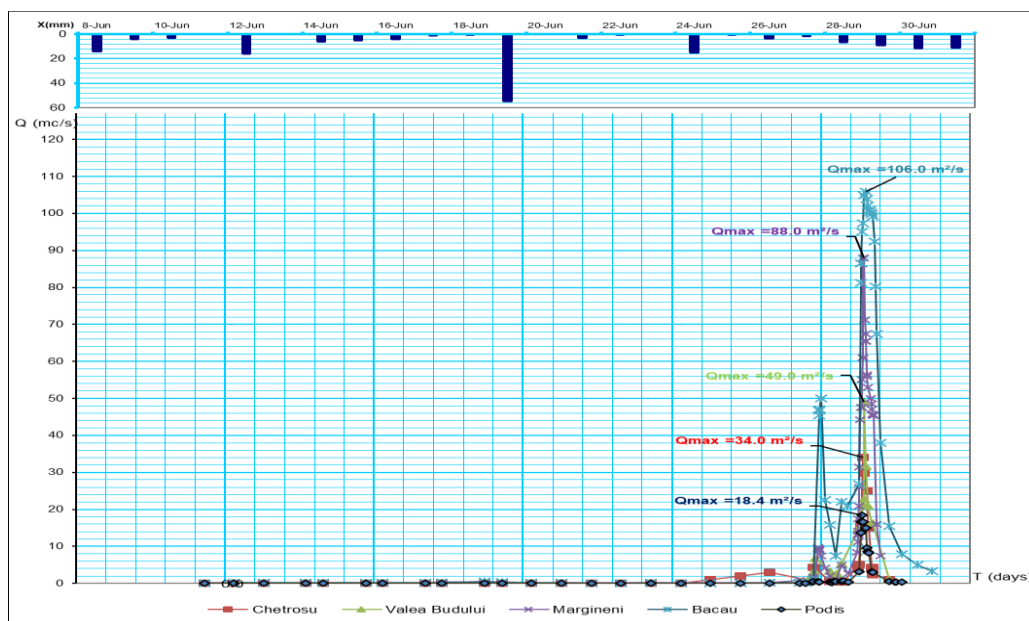


Figure 2. The flood hydrograph and rainfall rates at the Trebes River hydrometric stations

5. Conclusions

As a result of the hydraulic calculations it was found that the Chetrosu hydrometric station reaches the 10% probability, the Valea Budului hydrometric station exceeds the probability of 10%, and the Margineni and Bacau hydrometric stations exceed the probability of 5%. Among the measures to prevent such events can be considered removing obstacles from the river bed, providing polders to accumulate excessive water, etc.

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