

## SPATIAL ANALYSIS OF PRECIPITATION DISTRIBUTION THAT FORMED FLOODS ON THE RIVERS OF THE PRUT AND SIRET BASINS (WITHIN UKRAINE) IN JUNE 2020

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### INTRODUCTION

The region of river runoff formation in the Prut and Siret basins is part of a potentially flood-hazardous area of Ukraine, where regular rain and snow melts-rain floods are recorded, some of which become catastrophic and are accompanied by negative consequences. The probability of flooding on the rivers of the basin increases with the fall of 20 mm of precipitation per day, and with the fall of more than 100 mm floods are becoming catastrophic (Kosteniuk, 2009). As a result of heavy and extreme torrential rains on June 20-25, 2020, a high rain flash flood was formed on the rivers of the Prut and Siret basins against the background of high water levels.

### RESULTS

The weather situation on June 20-25, 2020 was associated with a series of sedentary cold atmospheric fronts, which were pressed to the Carpathians by eastern flows and due to convection and the formation of a single-center high-altitude cyclone (with very slow filling), caused very heavy and prolonged rains that caused the formation of several waves of high floods on rivers with catastrophic consequences.

Very similar conditions were in the formation of high floods on the Carpathian rivers in July 2008, where the main cause of heavy, very heavy and prolonged rains on July 22-27, 2008, was a sedentary high-altitude cyclone over the Balkans and atmospheric fronts, whose activity intensified convection and orography (Kulbida et al, 2009).

Table 1. Characteristics of precipitation (mm), which formed a flood in June 2020, according to meteorological stations within the catchment area of the Prut and Siret rivers

Meteorological station	The June norm	The amount of precipitation for 20-25.06	Percentage to the June norm
Pozhezhevskaya	185	192	104
Yaremche	150	242	161
Kolomyia	106	124	117
Seliatyn	140	127	91
Chernivtsi	105	68	65

Precipitation for 6 days - June 20-25, 2020 fell daily, heavy, violent and prolonged rains were observed, but especially intense rains were observed on June 22-23, when the amount of precipitation reached the criteria of natural disasters.

The highest amount of precipitation per rain was recorded by meteorological stations in Chernivtsi and Ivano-Frankivsk regions:

- ❖ □ June 21 at the meteorological station Seliatyn (Chernivtsi region, Siret basin) heavy rain **43 mm in 10 hours**;
- ❖ □ June 23 at the meteorological station Yaremche (Ivano-Frankivsk region, Prut basin) violent rain **106 mm in 12 hours**;
- ❖ □ June 24 at the meteorological station Pozhezhevskaya (Ivano-Frankivsk region, Prut basin) heavy rain, **33 mm in 4 hours**.

### References

- Kulbida M., Boyko V., Petrenko L., Savchenko L. (2009). The analysis of time and spatial distribution of the precipitations which have generated floods on the rivers of Carpathian Mountains in July, 2008, *Hydrologist, hydrochemistry and hydroecologist.*, Issue 16, pp. 92-98
- Kosteniuk L.(2009). The catastrophic floods in a pool of the river Prut, *Scientific notes [Vinnytsia State Pedagogical University named after Mykhailo Kotsyubynsky]. Series: Geography . - 2009. - Vip. 19. - P. 43-49.*

### MAPPING RESULTS

According to the measurement of precipitation at meteorological stations and hydrological posts within the Prut and Siret basins, a map of the distribution of total precipitation for the period 20-25 June 2020 was constructed, which formed an intense flood runoff

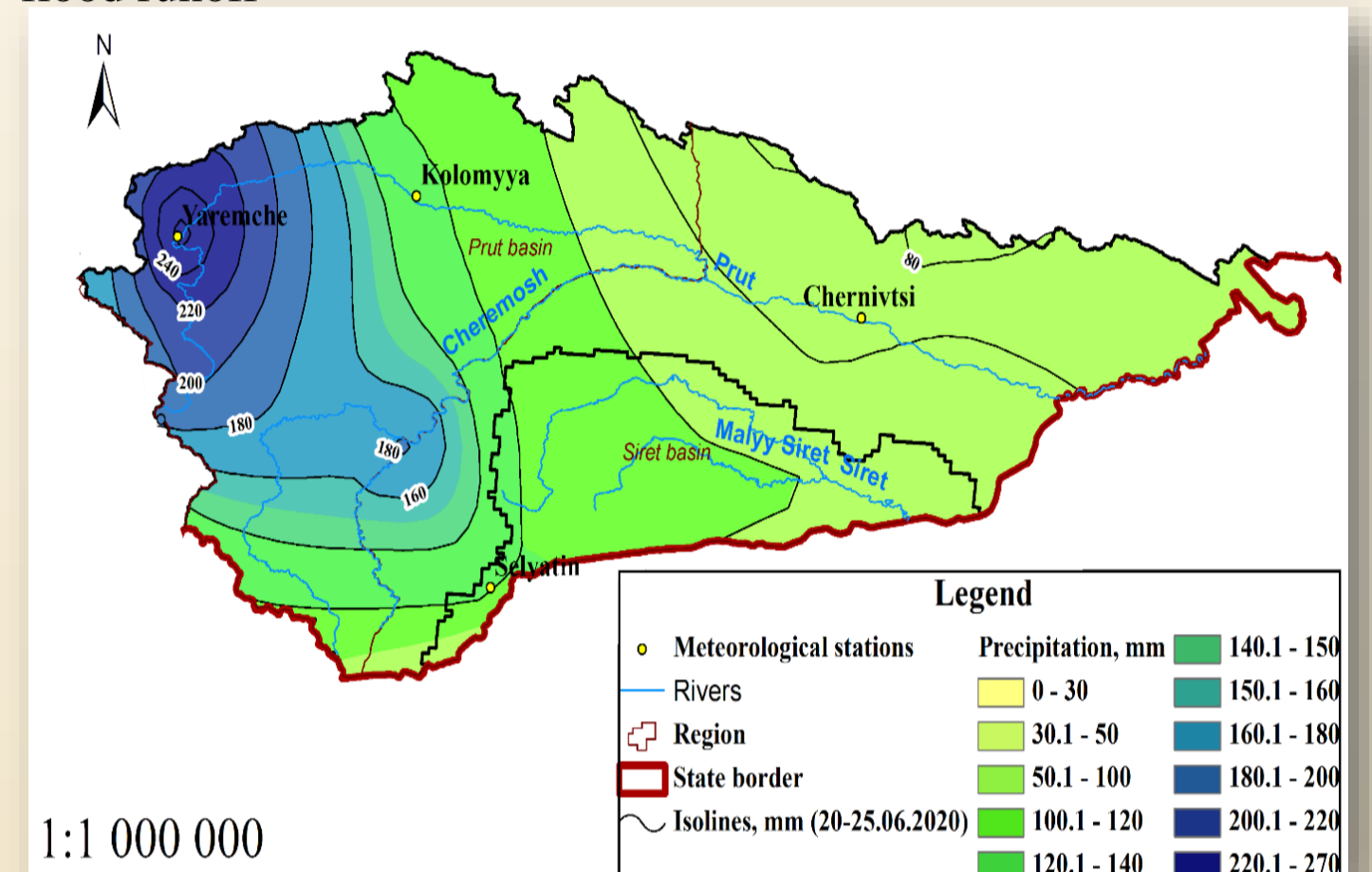


Figure 1. Total precipitation for June 20-25, 2020 according to meteorological stations and hydrological posts within the Prut and Siret basins (within Ukraine)

Analyzing the map (Figure 1), the maximum values of the total precipitation for June 20-25, 2020 were observed in the upper reaches of the Prut river (Vorokhta - Yaremche section), where the total precipitation was 200-240 mm, which is 1.6 monthly norm.

In the upper reaches of the Bilyi Cheremosh and Chorny Cheremosh rivers and at their confluence, the total rainfall was 150-190 mm. On the Prut river near the Kolomyia meteorological station, on the Cheremosh river near the Kutuy hydrological post and in the basin of the Siret river, precipitation was distributed in the range of 90-130 mm.

In the Prut area near Chernivtsi, the total rainfall was 56 mm.

### CONCLUSIONS

The formation of floods with dangerous consequences was caused by heavy and prolonged rains in western Ukraine from June 20-25, 2020.

The total amount of precipitation that formed floods on the rivers of the Prut and Siret basins: in the upper reaches of the Prut 200-240 mm, amounted to 1.6 monthly norm. The rest of the region received 80-180 mm of precipitation (monthly norm 0.6-1). The main reason for such precipitation was a series of settled cold atmospheric fronts pressed against the Carpathians by the eastern currents and due to convection and the formation of a single-center high-altitude cyclone (with a very slow filling).

As a result of the flood, significant damage was inflicted on settlements and infrastructure in Chernivtsi and Ivano-Frankivsk regions.