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EXTREME LOW FLOW CHANGE ANALYSIS ON THE TYSA RIVER WITHIN UKRAINE

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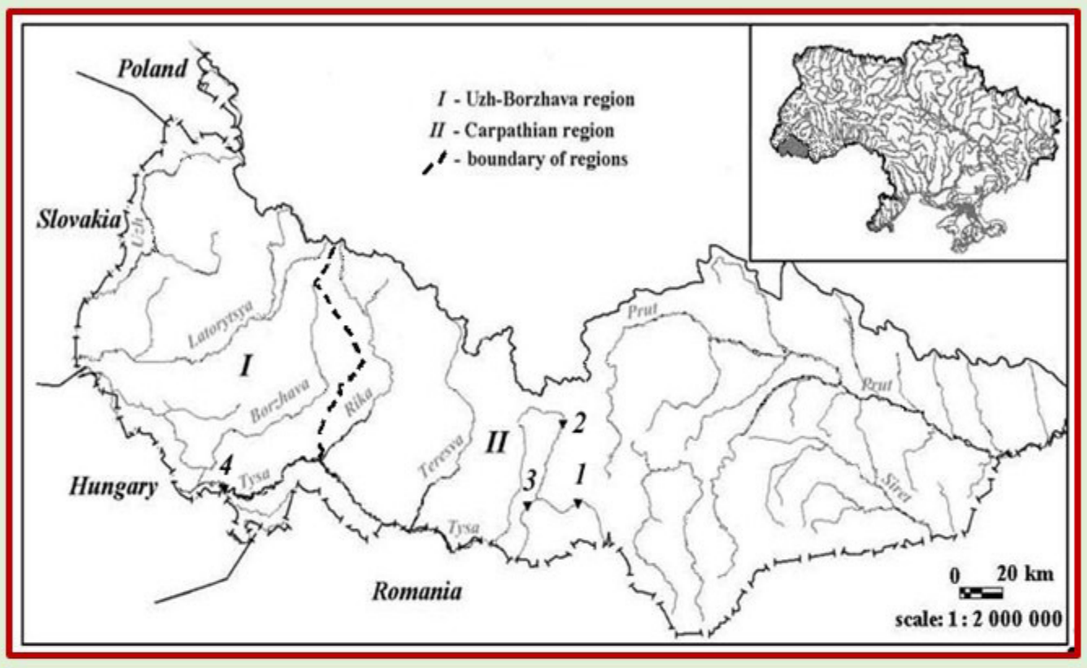
INTRODUCTION

Extreme low flows, just like floods are causing a significant material damage. It should also be borne in mind that many scientists predict that in the warmer climate the droughts will become more common in the future. The research of low flow is an actual task for the Tysa River, which is characterized by low flow twice a year, namely in winter and summer-autumn. Usually, the assessment of trends and changes in river flow is caried out on the basis of statistical approaches that allow to determine some quantitative indicators. Indicators of Hydrologic Alteration method is one of the most common of these approaches.

MATERIAL AND METHODS

The research was carried out based on observations of 4 gauge stations that are located along the Tysa River (Table 1). In the upper Tysa River the low flow analyze was carried out by the observation series at the rivers Chorna Tysa and Bila Tysa.



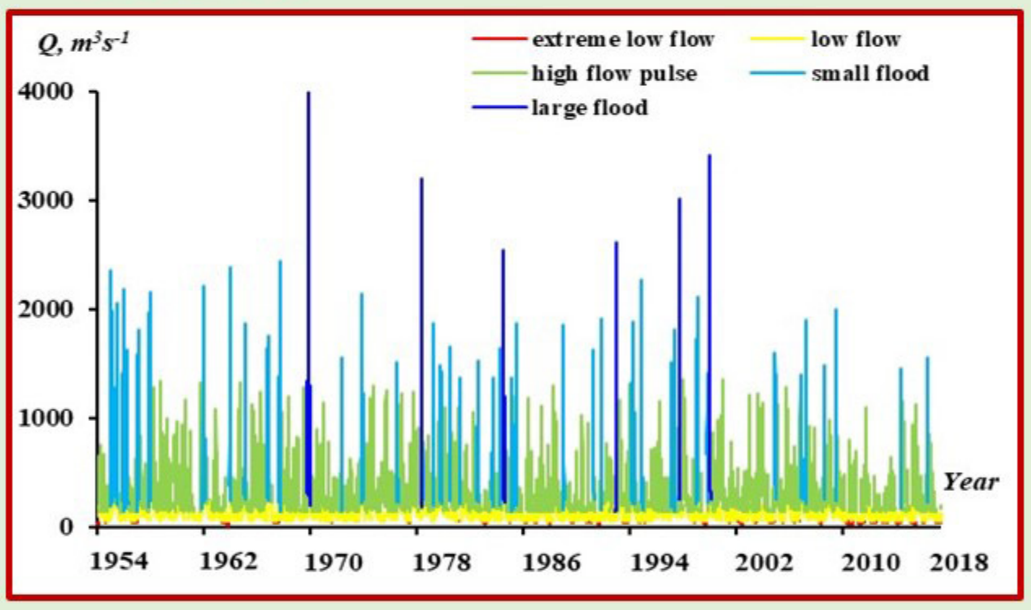
Scheme of the Tysa River Basin within Ukraine and location of the main gauge stations on its channel (numbering of posts corresponds to Table 1)

Table 1. List of the gauge stations on the Tysa River within Ukraine

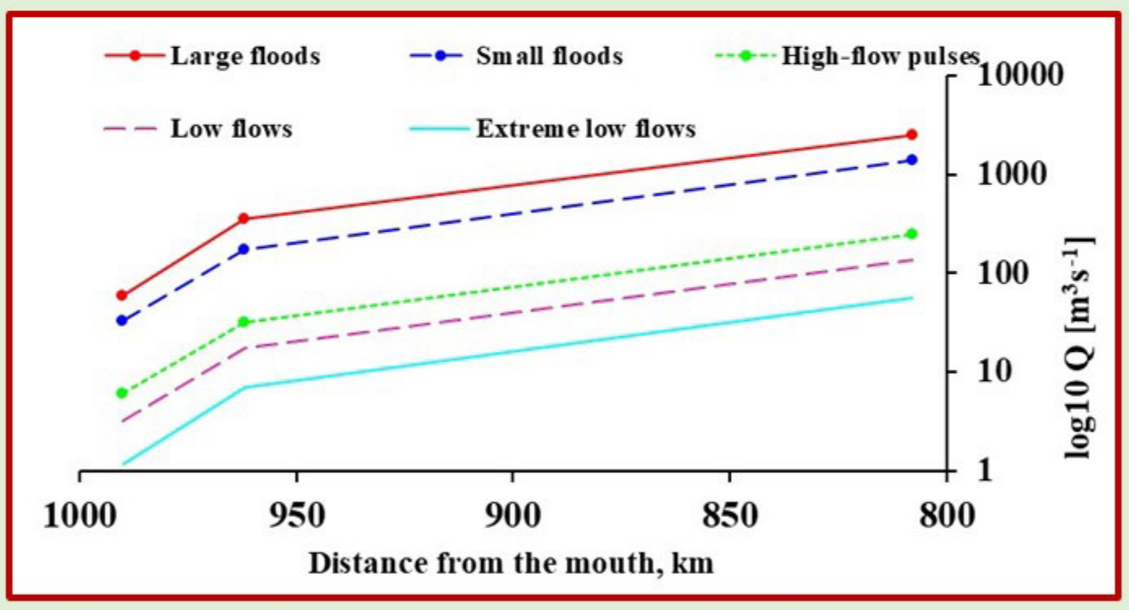
№	Name of gauge station	Distance from the mouth, km	Catchment area, km^2	Latitude	Longitude	Altitude, m.a.s.l.	Daily data, years	Q_a, m^3 s^{-1}
1	Bila Tysa River – Luhy village	15*	189	48° 04′ N	24° 56′ E	652	1955-2018	5.13
2	Chorna Tysa River – Yasynay village	28*	194	48° 16′ N	24° 21′ E	650	1956-2018	4.78
3	Tysa River – Rakhiv town	962	1070	48° 03′ N	24° 12′ E	430	1947-2018	25.4
4	Tysa River – Vylok village	808	9140	48° 06′ N	22° 50′ E	117	1954-2018	202

The mean daily discharges from the beginning of observations until 2018 inclusive was used. The river flow at each gauge station was divided into five components: "Extreme low flows", "Low flows", "High-flow pulses", "Small floods", "Large floods", according to the method described by The Nature Conservancy (2009). This made it possible to separate from the total flow the extreme low flow, for which the IHA statistics were calculated.

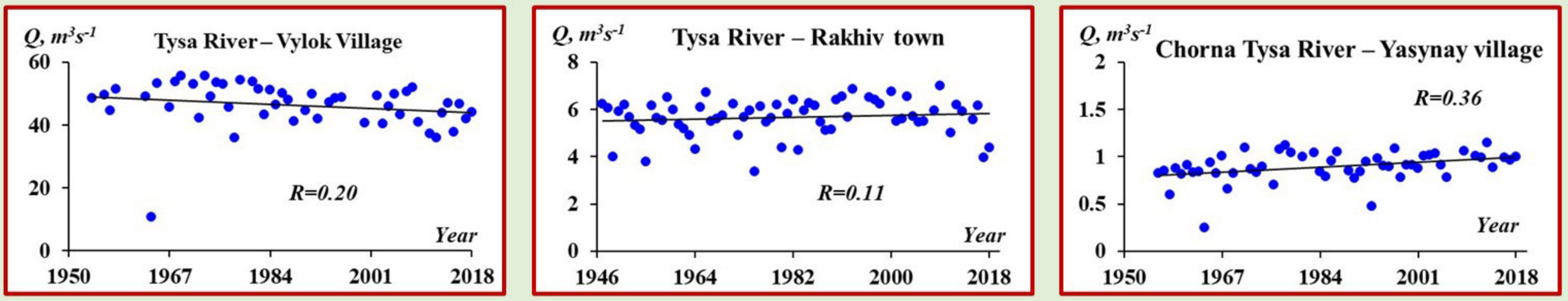
RESULTS



Separation of hydrographs into different flow types for gauge station of the Tysa River - Vylok village



Discharge thresholds at the gauge stations in the upper part of the Tysa River, [m^3 s^{-1}]



Trends identification in the mean values of the extreme low discharges (peaks) during for each year in the upper part of the Tysa River

CONCLUSION

The application of the IHA method for the study of low flow allow to gain a new knowledge and expand the understanding about its statistical indicators. At the same time, some features of the extreme low runoff of the Tysa River were founded. It is clear that the explanation of such trends in extreme low runoff requires further research with additional observation data as along the riverbed and its main tributaries.