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Floods on the territory of Polesie

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Abstract

The article presents the analysis of the formation of floods in Polesie on the r. Pripyat during the period of instrumental observations. Polesie is a unique physiographic region, located on the territory of four countries: Belarus, Poland, Russia and Ukraine. The total area is about 130 thousand km². The Pripyat, the main river of Polesie, is an average river according to the European scale. The length of the r. Pripyat is 761 km; the catchment area is 173.7 thousand km². The article describes the most outstanding floods. The basic measures to reduce the negative effects of floods and priorities for floods research in Polesie are outlined.

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Keywords: Polesie; Pripyat; flood; risks.

1. Introduction

Polesie is a unique physiographic region, located on the territory of four countries: Belarus, Poland, Russia and Ukraine. The total area is about 130 thousand km². The Pripyat, the main river of Polesie, is an average river according to the European scale. The length of the r. Pripyat is 761 km, the catchment area – 173.7 thousand km². Spring high water is a characteristic phase of the natural hydrological regime of the rivers of Polesie. They are accompanied by

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floods of the river, which at the maximum water level rise acquire the character of catastrophic events, leading to the flooding of human settlements, agricultural land, destruction of bridges, roads, etc.

According to many scientists, in the next few years, the number of natural disasters in the world will increase. This is primarily due to climate change and population growth. According to the UN statistics, floods account for 26 % of the total number of victims and 32 % of the value of the damaged property [1]. Floods rank the first among natural disasters on the repetition, covered areas and damage to property. Growth of the losses in economy inflicted by flooding is associated with an increase in the intensity and frequency of floods due to the intensification of the economic use of water catchment areas, river valleys and floodplains [2, 3]. However, there is still no reliable long-term forecasts of the appearance of floods, reliable and generally accepted calculation methods of the damage caused and generally accepted concept of protection.

2. Methodology

The methodological basis of the study were the scientific statements about the stochastic nature of variability of floods, which made it possible to use modern statistical methods to analyze time series. The methods of water and heat and power balance of the underlying surface and mathematical modeling were used. System analysis of the accumulated information and comparative geographic method yielded the most important key points of space-time fluctuations of floods.

The standard observational data on hydrometeorological network were used as the basic material, as well as library materials of different organizations and institutions during the period of instrumental observations, maps and literature references.

3. Results

The flood in the spring is formed each year as a result of snowmelt and rainfall during snowmelt. For the rivers of Polesie, it usually begins in the first half of March, but in some years it can be shifted to February or April. Average long-term duration of flooding of floodplain is 80-110 days, and in some years it can be up to 150-180 days. The width of the spring flood on the Pripyat varies from 5 to 15 km and in some areas it is 1-2 km, the largest is in the area of town of Pinsk and reaches 30 km. The dependence of the flooded area of the floodplain of r. Pripyat on different probabilities of exceedance level is shown in Table 1 [2]. The duration of spring floods on small rivers varies from 40 to 45 days. The depth of spring flooding is typically 0.3-0.8 m, sometimes up to 2-2.5 m [4]. The most endangered by floods areas are the catchment area in the middle and lower reaches of the r. Pripyat. This is due to a narrowing of the floodplain to 6-8 km in the area of Turov and up to 1.5-2 km near the Mozyr, as well as the sharp increase in lateral inflow. On this site such large inflows as the r. Goryn (catchment area 27,000 km²), the r. Sluch (5350 km²), the r. Ubort (5820 km²), the r. Ptich (9480 km²) fall into the Pripyat.

Table 2 presents the water flow of 10 most significant spring floods on the r. Pripyat.

Table 1. Surface of flooding of the floodplain of r. Pripyat

The probability of exceedance of the level, %	1	5	10	25	50
Flooded area, thousand ha	579	550	487	404	197

Table 2. Maximum water flow (Q) of floods of r. Pripyat (the town Mozyr) and their probability of exceedance (P)

Year	1845	1877	1895	1888	1889	1940	1979	1932	1970	1958
$Q, m^3/s$	11000	7500	5670	5100	4700	4520	4310	4220	4140	4010
$P, \%$	0.8	1.6	2.3	3.1	3.9	4.7	5.4	6.2	7.0	7.6

The maximum flow of the spring flood on the r. Pripyat was noted in 1845. That year an extremely high spring flood on a large area of Eastern Europe was formed [5]. There was a significant autumn water accumulation in the Pripyat basin. Rivers with deep water were covered with ice while there were extensive floods in the marshes and on the surrounding areas. Winter in 1844 started unusually early. November and December, and February (1845) were

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