IMPROVING RIVER SEDIMENT DISTRIBUTION CALCULATION IN MOUNTAIN RIVERS

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Abstract. *The article describes the improvement of the calculation of river sediments based on the data obtained in natural field studies.*

Keywords: *River, sediment, bedload, deformation, chanel, bank*

СОВЕРШЕНСТВОВАНИЕ РАСЧЕТА РАСПРЕДЕЛЕНИЯ НАСАДОВ В ГОРНЫХ РЕКАХ

Аннотация. *В статье описано усовершенствование расчета речных наносов на основе данных, полученных в натурных полевых исследованиях.*

Ключевые слова: *Река, наносы, донный наносы, деформация, русло, берег*

INTRODUCTION

One of the important issues is the improvement of computational methods and technologies for the assessment of processes in the riverbed and prediction of the deformation of the riverbed. In this regard, special attention is paid to the scientific research works aimed at improving the technologies for preventing silting of hydrotechnical structures in the river bed and canal.

The processes in the river basin and the dynamics of the distribution of river sediments are an integral process. Deformation changes occurring in the river bed and channel bed directly depend on the amount, composition and distribution dynamics of sediments.

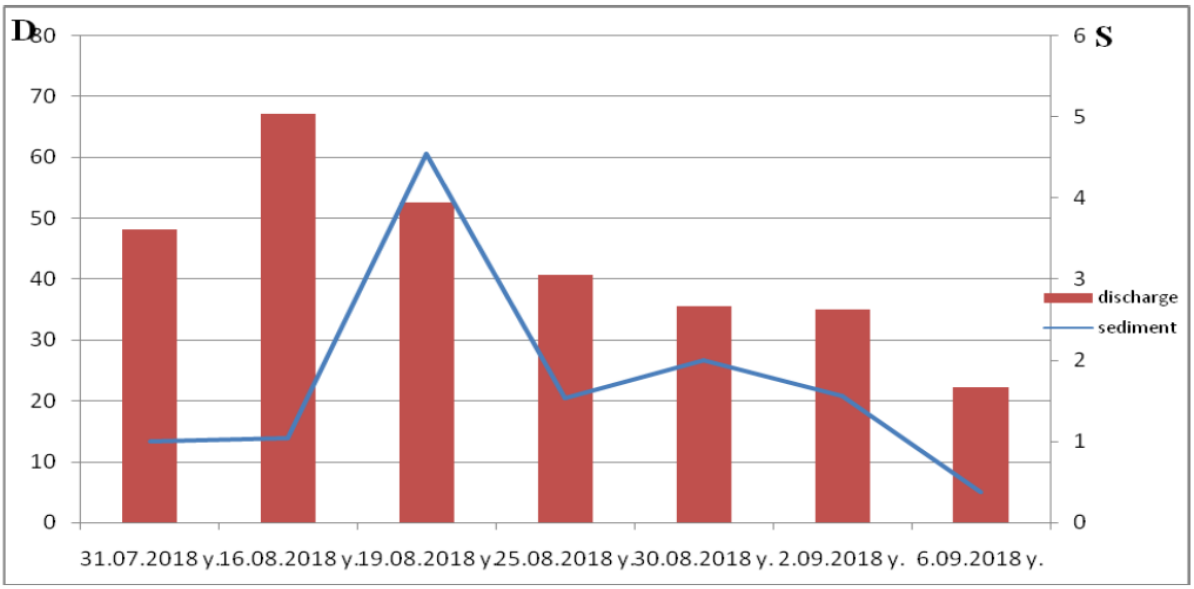
This year, the data obtained on erosion and accumulative processes in the Sokhsoy basin located in the Sokh river basin under natural field conditions were analyzed.

RESEARCH MATERIALS AND METHODOLOGY

The influence of sediments on changes in the structure's hydraulic elements has been studied for many years [1,2,3,4,5]. Some progress has been made in this direction. However, despite this, the problems of analyzing the mechanical composition of sediments and determining the characteristics of sediments have not been fully solved [6,7,8,9,10]. It is necessary to carry out research on the study of the mechanical composition of bottom sediments in mountain rivers and to evaluate their influence on river bed formation.

In natural field research, studies on the amount and composition of sediments were conducted in several pickets in the Sokhsoy basin, which receives water from the Sarikurgon hydroelectric station.

In order to determine the amount of turbidity, the amount of sediments, and the fractional composition of the Sokhsoy basin, samples of water and sediments were taken at several pickets. In the research conducted on the obtained samples, the amount of sediments, changes in the



fractional composition along the length of the well and other hydraulic parameters were studied, and information was obtained about the distribution of sediments by pickets (Fig. 1).

Fig. 1 PK-12 Graph of the dependence of the amount of turbidity on water consumption

The grain composition of the sediments obtained in the natural field studies in the Sokhsoy basin according to the pickets (Fig. 2) is presented.During periods of low water consumption, sediment movement is almost imperceptible. In times of high water consumption, measurement is complicated due to the high flow rate. The peculiarity of Sokhsoy, which is considered as a research object, is that water flows in this river only at certain times. This research can be considered as a laboratory plot under natural field conditions.

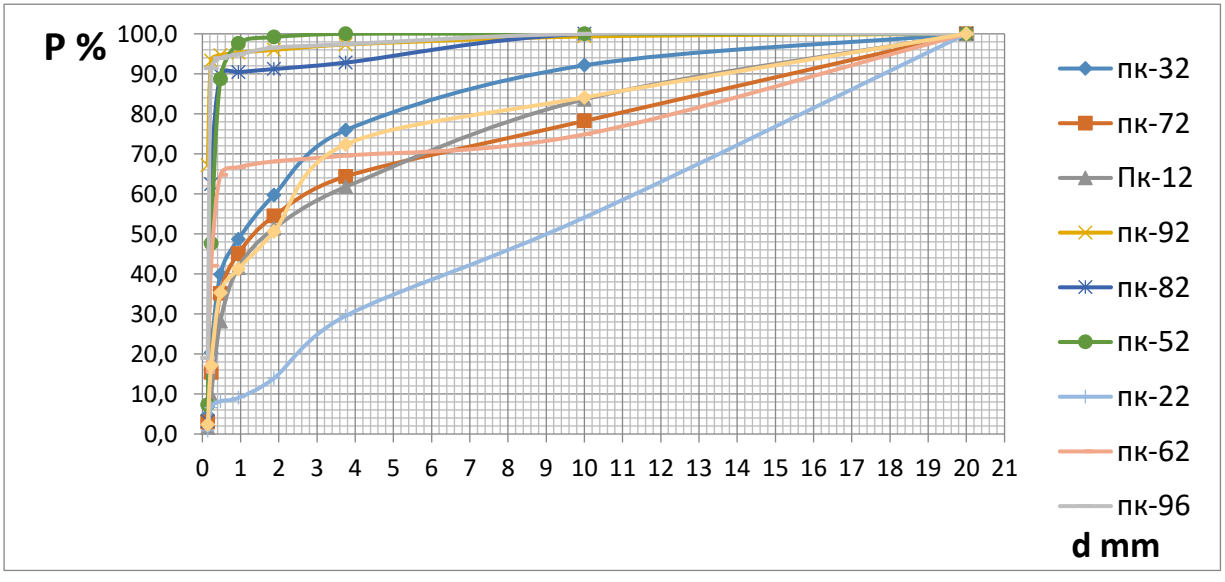


Figure 2. The graph of the grain composition of the sediments in the Sokhsoy basin

RESULTS OF THE STUDY

On the basis of the data collected in the natural field conditions in the Sokhsoy basin, the consumption of bottom sediments was analyzed on the basis of several available calculation formulas.

The average values of the data obtained in natural field conditions are presented in the table below (Table 1).

Table 1

H, m	i	d, mm	Q, m^3/s
1,1	0.01	0.0055	60

Here: $H-$ the average depth of the water flow, $i-$ the slope of the river bed, $d-$ the average diameter of the sediment particle, $Q-$ average water consumption.

According to G.I. Shamov formula, bottom sediment consumption and initial speed are determined as follows.

$$q = k\left(\frac{\vartheta_{average}}{\vartheta_{initial}}\right)^3 \left(\vartheta_{average} - \vartheta_{initial}\right)\left(\frac{d}{H}\right)^{0.25} \quad (1)$$

k - coefficient depending on the composition of the sediment particle.

$\vartheta_{average} = 4{,}4d^{1/3}H^{1/6}$

According to the formula of I.I. Levi, the consumption of the bottom sediment and the initial speed are determined as follows.

Here: $\vartheta_{average}-$ average speed, $\vartheta_{initial}-$ initial speed

$$q = 0{,}002\left(\frac{\vartheta_{average}}{\sqrt{gd}}\right)^3 \left(\vartheta_{average} - \vartheta_{initial}\right)\left(\frac{d}{H}\right)^{0.25}$$

(2)

$$\vartheta_{average} = 3{,}2\sqrt{gd}\,\lg\frac{H}{7d}$$

(3)

Below is the calculation of sediment consumption and initial velocity determination (Tables 2, 3).

Table 2.

Calculation of bottom sediment consumption

№	The author	Formula	Result m^2/s
1	G. I. Shamov	$q = k\left(\frac{\vartheta_{average}}{\vartheta_{initial}}\right)^3 \left(\vartheta_{average} - \vartheta_{initial}\right)\left(\frac{d}{H}\right)^{0,25}$	0,0003
2	I.I. Levi	$q = 0{,}002\left(\frac{\vartheta_{average}}{\sqrt{gd}}\right)^3 \left(\vartheta_{average} - \vartheta_{initial}\right)\left(\frac{d}{H}\right)^{0,25}$	0,0098

Table 3.

initial speed calculation

№	The author	Формула	Result

			m/s
1	G. I. Shamov	$\vartheta_{average} = 4{,}4d^{1/3}H^{1/6}$	0,61
2	I.I. Levi	$\vartheta_{initial} = 3{,}2\sqrt{gd}\lg\frac{H}{7d}$	0,59

CONCLUSION

It is necessary to improve the hydrological and hydraulic conditions of each region when using the proposed formulas for determining the consumption of bottom sediments.

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