SANGARDAC RIVER FLOW NORM AND ITS CALCULATION FOR DIFFERENT PERIODS

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Annotation: In this work, the Sangardac river flow norm and its indicators in different periods are calculated in different formulas and drawings, and brief information is given about the average annual flow rate of the river, determination of the variability cofficent and their methods.

Keywords: $Q_{o'rt}$ - the average value of the current for the observed perennial period, Q_0 - flow meori m^3/c, module cofficent, empirical point, integral curve, vibration amplitude, asymmetry cofficent, variability cofficent.

When calculating the main characteristic of the river flow, the following hydrological and natural-geographical elements of the river and river basin are used;

1) river catchment area – G'_s, km^2;
2) river length – L, km;
3) average slope of the river – Y %;
4) average height of the river basin – h, m;
5) the degree to which the basin is covered by forests, lakes, swamps and glaciers – f_{forest}, f_{lake}, f_{ice}, %;

The river flow varies year after year, which means that if there is a lot of water in the river for a year, the second year may be less than it. These changes depend on climatic factors and do not obey a specific law, but fluctuate around a certain average amount of current. The vibration amplitude will have different mints in different rivers.

The line formed by continuous observation of the river flow for several years can be viewed as a series of random quantities. For a full cycle of low-water and multi-water cycles, the amount of average perennial flow that is maintained represents the flow norm.

According to the mathematicians explanation, the flow norm is expressed as follows, saying the average perennial flow value obtained for the "n" series striving for Infinity.

$$Q_0 = \frac{\Sigma Q1}{n}, \quad N \to \infty$$

But, the range observed in hydrology is “n” the limiting value hence the average perennial amount of current ($\bar{Q}$)

$$\bar{Q} = \frac{\Sigma Q1}{n}$$

To accept the average Perennial Value of the river flow ($Q_{o'rt}$, m^3/c) as the meior of the flow, the average square error of this line is considered:

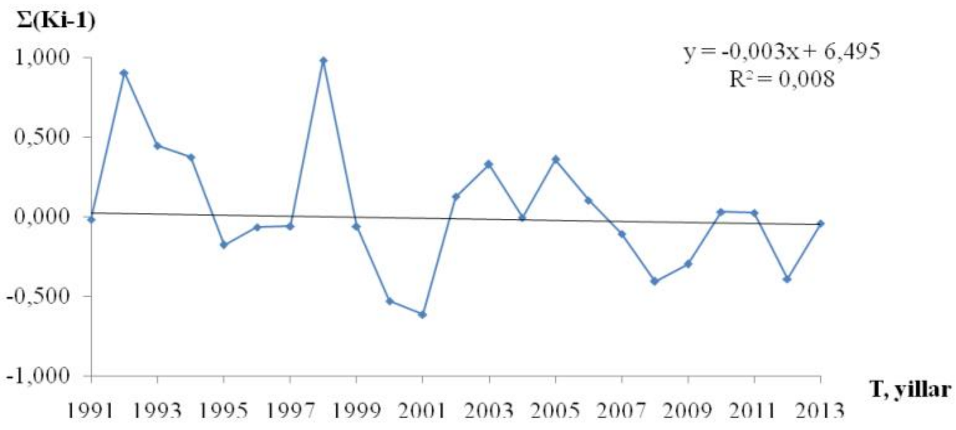
$$Q_0 = Q_{o'rt} \pm \varepsilon_Q$$

Here Q_0 - is the flow meori m^3/c; $Q_{o'rt}$ - is the average value of the flow for the observed perennial period, ε_Q- is the average quadratic error of the line. This error is determined using the formula:

$$E_0 = \frac{100 \cdot Cv}{\sqrt{n}}$$

As can be seen from this expression, the mean quadratic error of a row is the invariance cofficent of the annual flow, true to (C_v), and the number of years observed is inversely proportional to (n). In hydrological calculations, it is recommended that the value of the average quadratic error does not exceed 5-10%. If Eq<5-10%, the average perennial flow amount is taken as a flow meter $Q_0 = Q_{o'rt}$;

When determining the flow norm, it is important to determine the calculation period, since the flow of the river changes depending on both solar activity and periodic changes in climate. In order to calculate the flow rate, it is necessary that the selected range covers multi-water and low-water periods in one go. For this purpose, a drawing of the aggregate (integral) curve of the river flow is used. When drawing an Integral curve, the expression of the river flow through the modular cofficent creates great convenience. This curve clearly shows periods of cyclical change in river flow by years(Figure 1).



Firgure 1. Collected integral curve of sangardac river flow.

As can be seen from the graph, the modular kofficent of the Sangardac river flow fluctuated in different values during 1980-2013. For example, in 1980, the modulus cofficent of flow was equal to (-0.024), while this value reached -0.179 in 1982. On the Sangardak River, the smallest value of the modular cofficent of the current (-0,614) in 2001 was 0.982, while the largest value was 0.982, and this was observed in 1998[1]. In the sangardak River, the modulus cofficent (-1, 1) of the current fluctuated in the range during 1980-2013.

The variability of the river flow and its statistical assessment for the purposes of the water management system, it is not enough to have information only about the flow rate of the river in its effective use of its waters. In doing so, it is also necessary to know the amount of flow in years of high water and low water, the results of their recurrence and supply. River flow is a quantity that varies from year to year under the influence of various natural and anthropogenic factors. The influence of relief, including absolute height, on the variability of the flow of rivers located in mountainous areas is great.

The influence of absolute height on the variability of the flow of rivers of Central Asia was initially determined by V.L.Schulz was able to make a quantitative assessment. Based on the results of the studies carried out, V.L.Schulz recommended the following empirical expression:

$$C_v = \frac{E}{H^n}$$

[1] Rasulov A.R., Hikmatov F.H., Aytbayev D.P. – Fundamentals of Hydrology. – T.: University, 2003. – p.233

in this expression: E – is the coefficient of aggregation, which characterizes the naturalgeographic conditions of the river basin; $N_{o'rt.}$ - middle height of the river basin, meter; n is a hydrological magnitude and represents the angular cofficent of the $S_v = f(N_{o'rt.})$ bond[2]. In the Sangardac River, the modulus cofficent (-1, 1) of the current fluctuated in the range during 1980-2013[3].

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When hydrometric data, that is, the observed years, are a sufficiently long series ($n \geq 25-30$), the quantitative assessment of the river flow variability cofficent (S_v) is carried out on the basis of the laws of probability theory, and its value is calculated using the following expression:

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[2] Hikmatov F.H., Aytbayev D.P., Khayitav Yo.Q. Practical exercises from General hydrology. – T.: University, 2004. – p.343
[3] Baratov P., Mamatkulov M., Rafikov A. – Natural geography of Central Asia. Teacher, 2002. – p. 154

$$C_v = \sqrt{\frac{\sum (K_i - 1)^2}{n-1}},$$

here: K_i –module cofficent and it is determined by the expression $K_i = Q_i / Q_i$; n – is the number of years of observation. Well-Known I.P.Druzhinin, G.P.The Bride, D.YA.The results of research by scientists such as Ratkovich show that the periodic change in river flow is repeated in 23, 57, 1012, 2228[4].

The supply curve is drawn based on observation data. The provision of river flow is found using the following expression and is expressed in percentages:

$$P = \frac{m-0{,}3}{n+0{,}4} \bullet 100\%$$

here: m – is the ordinal number determined by the decreasing number of flow quantities observed in rivers in a given year; n – is the number of years of hydrological observation. In order to determine the characteristic years observed in the sangardac River, a drawing of a supply curve was drawn(Figure 2).

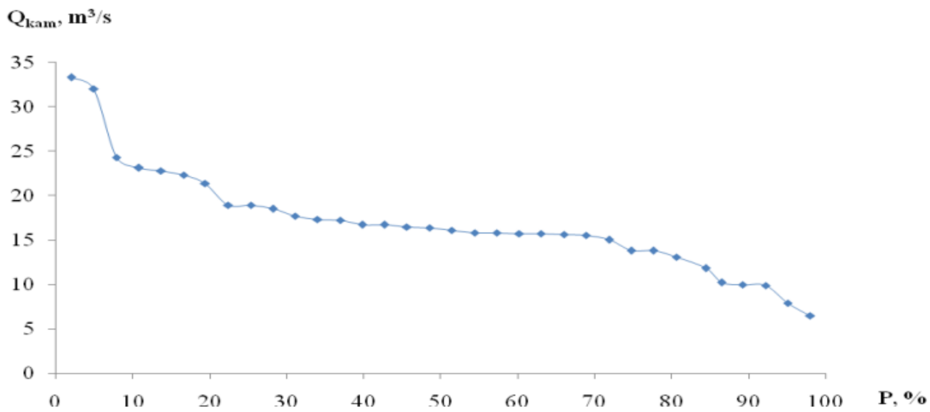

Figure 2. Sangardac river water lines supply curve

To distinguish characteristic years, the following criteria were selected:

1) $Q \leq 33\%$, that is, if the water consumption is smaller than the 33 percent supply, there is a lot of water;
2) $33\ \% \leq Q \leq 67\ \%$ moderately juicy, if the condition is met;
3) $Q \geq 67\ \%$ while the condition is met, it is less watery;

[4] Kovalev YU.S., Mevlanov A.A. – O probleme malovodya v swimming pool rek Sirdari i Amudari / material Republican nauchno-prakticheskoy konferensii. –Tashkent: HYDROINGEO, 2008. – P. 15-20.

We will analyze the graph presented in Figure 1 above. As can be seen from the graph, a value equal to 50% provided corresponds to the average perennial water consumption (16.8 m^3/s) of the Sangardac River. The low-water years observed in the river based on the above criteria are $Q \leq 12.54$ m^3/s, while the multi-water years are Q ≥ 19.1 m^3/s and the average water year is 12.54 $m^3/s \leq Q \leq 19.1$ m^3/s.

The experience of hydrological calculations shows that if the relationship between the cofficent of variability (S_v) and the cofficent of asymmetry (S_s) corresponds, empirical (measured) points are located close to the curve of theoretical supply, that is, in a dense state to it[5]. If the Mobodo empirical points are located in a scattered position, far from the theoretical curve, then the relationship between Sv and S_s is mutually incompatible. D.L.Sokolovsky's analysis mentions that for plain rivers (S_s) and the relationship between the variability cofficent (S_v) is suitable $S_s = 2* S_v$.

We calculate the average perennial flow according to the Sangardak River King-Guzar hydrological post in the following expression:

$$Q_{o'rt}=\frac{\Sigma Q_1}{n}=\frac{572,12}{34}=16,83 \text{ m}^3/\text{c}$$

As can be seen from the calculation results, the average perennial flow according to the Sangardak King-Guzar water measurement post was equal to 16.83 m^3/c (1980-2013).

We used the following expression when calculating the coefficient of viscosity of the annual flow:

$$C_v=\sqrt{\frac{\sum(K-1)^2}{n}}=\sqrt{\frac{3,868}{34}}=\sqrt{0,114}=0,34$$

As can be seen from the calculated data, the value of the cofficent of variability corresponds to (0.34). In place of the conclusion, it should be said that the average perennial flow norm of the Sangardac River, the flow variability cofficent, was calculated, and a supply curve was drawn. It was found that the flow norm is 16.8 m^3/s, and the coefficient of variability is 0.34.

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