J.J.Karamoldoev, O.J.Kalashnikova
(CAIAG, Bishkek)

FORECAST OF WATER INFLOW INTO TOKTOGUL RESERVOIR DURING VEGETATION PERIOD

Naryn river belongs to the basin of Aral Sea and is the largest tributary of Syr-Darya river. The volume of Naryn river watershed is about 58 000km², height marks of the watershed vary within 0,7-5,0km.

In order to forecast the water inflow into Toktogul reservoir during vegetation period (April-September) the meteorological information, collected for over 1967-2011 from 7 meteostations and meteoposts, which were located at different heights and slope expositions in basins of the main Naryn river tributaries, were used.

The main feeding sources of analyzing rivers are meltwaters and, first if all, meltwaters of seasonal snows. In feeding the main part of rivers with high-mountainous watersheds the meltwaters of "eternal" snows and glaciers are of major importance. Rainwaters in feeding the river runoff are of minor importance. Underground waters are of major importance in feeding of so called "basis runoff" and low runoff.

Physical-statistical methods are widely-used in hydrological forecasting. The general theoretical basis for developing long-term forecasts of the river runoff is an equation of water balance in the watershed. When developing practical methods of seasonal runoff forecast, the equation of water balance substitutes for other approximate equation, which includes only the main factors.

Besides contribution of rainfalls (in mm) into the runoff, the low (basis) runoff was considered in multiple regression, which improved a closeness of correlation dependence with the water inflow into Toktogul reservoir during vegetation period (April-September).

Forecasting the water content of rivers was analyzed using physical-statistical methods, meanwhile it was assumed that not only precipitations during cold period influence on river runoff during vegetation period, but also low runoff.

For these purposes the linear correlation dependences and equations of coupling the average amount of precipitation during cold period in modular ratios (Fig.1) in 7 meteostations, located in Naryn river watershed, with the water inflow into Toktogul reservoir during vegetation period were made. Moreover, multiple regression method was also used, where low runoff of the water inflow into Toktogul reservoir was used as second predictor (Fig.2).

As a result, the following equations were made for calculating the water inflow into Toktogul reservoir during vegetation period:

1. Q aver.veg.=385,7*$\Sigma\kappa\upsilon$(Tien-Shan+Naryn+Itagar+Suusamyr+Baetovo+ At-Bashy+Chaek)/7+212,4 R^2=0,66.

2. Q aver.veg.=1,44*Q low water+362*$\Sigma\kappa\upsilon$(Tien-Shan+Naryn+Itagar+Suusamyr+ Baetovo+At-Bashy+Chaek)/7–26,1 $R^2 = 0,75$.

where Q aver.veg.–average vegetation water discharge, м^3/с;

$\Sigma\kappa\upsilon$ – amount of precipitation in modular ratios;

Q low water – average water discharge during low-water season, м^3/с
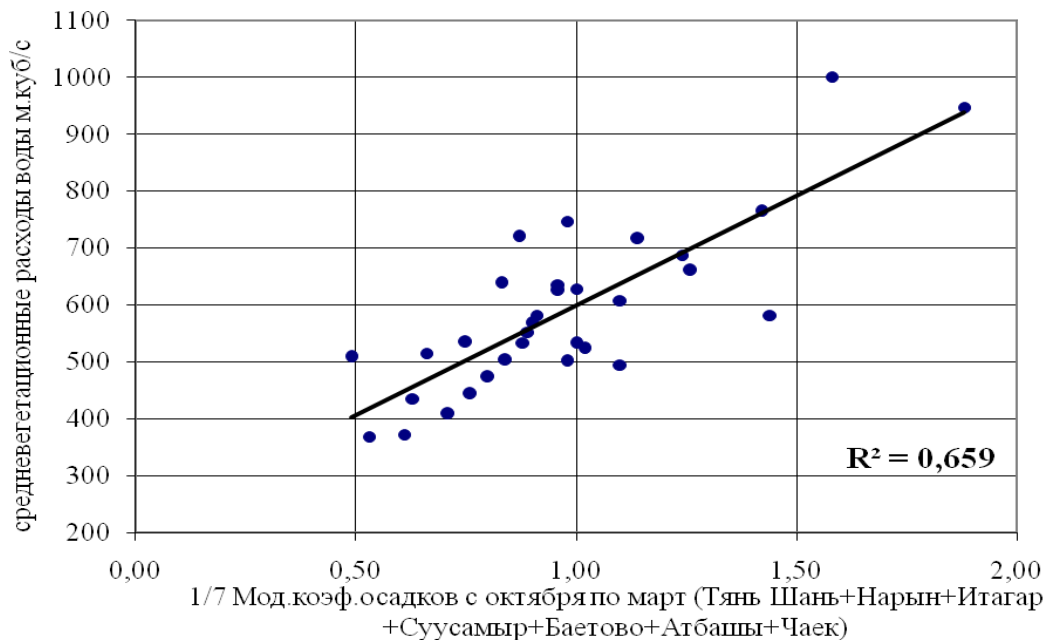
R^2 – regression coefficient.

Fig.1. Graph of coupling the water inflow into Toktogul reservoir during vegetation period with average amount of precipitation in Naryn river watershed.
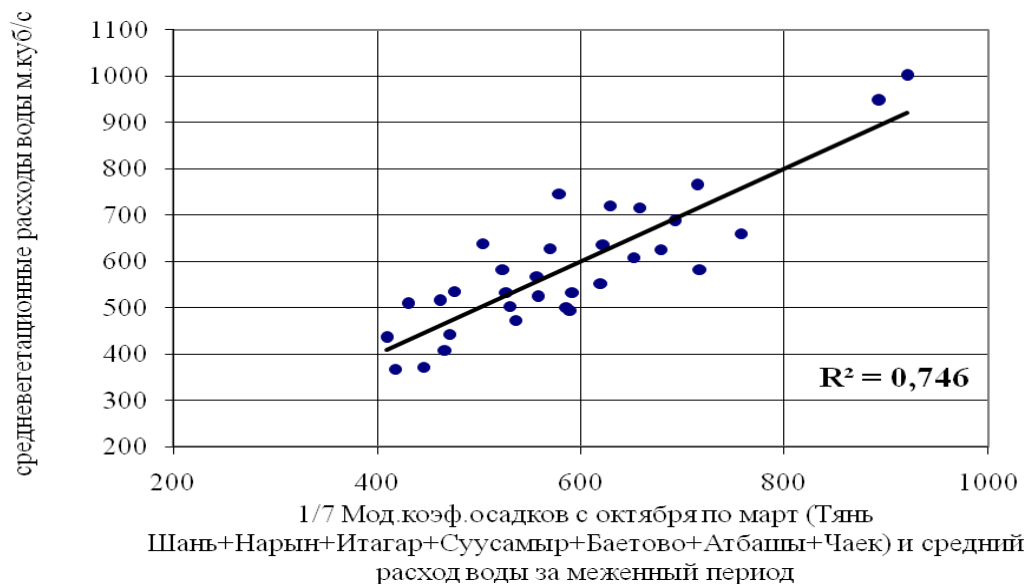

Fig.2. Graph of coupling the water inflow into Toktogul reservoir during vegetation period with average amount of precipitation in Naryn river watershed and average water discharge during low-water season.