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ASSESSMENT OF THE INFLUENCE OF METEOROLOGICAL FACTORS ON THE FLOW OF THE OHANGARON RIVER

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Abstract

The article describes the network of meteorological stations located in the Ohangaron river basin and the stations that are currently operating and conducting regular monitoring, as well as their height above sea level, the measured air temperature at the stations, atmospheric precipitation, and the effects of air temperature on snow cover and snowmelt. Additionally, the article explores influence of air temperature on the recorded air temperature, atmospheric precipitation, and snow cover at Angren and Kamchik meteorological stations.

Key words

Ohangaron river basins, meteorological stations, sea level, air temperature, atmospheric precipitation, snow cover.

Introduction. The various consequences of global climate change have a dramatic effect on the weather and nature of Uzbekistan. For example, the temperature increase in Central Asia is twice the world average, the number of extremely hot days has doubled in recent years, and a third of the glaciers are melting. Taking into account the above, in this article it is necessary to study the influence of global climate change on atmospheric precipitation observed in the Ohangaron river basin. For this, the data of meteorological stations available in the basin is used.

14 of the 25 meteorological stations opened at various times in the Tashkent region are currently operating, and 5 of them have an observation period of more than 70 years.

A.I. Voeykov classification of rivers in terms of climate. Classification of M.I. Lvovich by sources of saturation of rivers. Scientific research is being carried out on the classification of rivers of Central Asia according to the sources of saturation by V.L. Shults, O.P.shcheglova.

The purpose of the research. Assessment of air temperature changes in the Ohangaron Basin and its impact on atmospheric precipitation.

Research materials and method. Thus, for the description of the meteorological and hydrological regime of the basin in the current climatic period, when the catchment area of the research object is 1110 km2, there are only observational data from one meteorological station.

This situation leads to certain difficulties in researching the distribution of air temperature and, especially, the amount of atmospheric precipitation over the basin area. Numerous studies have shown that air temperature in the Ohangaron basin has a sufficiently well-defined homogeneous distribution in latitude and altitude. Therefore, in the study of the air temperature regime of the basin, we are limited to the monitoring data of Kamchik station. In contrast to air temperature, the distribution of atmospheric precipitation over latitude and altitude regions is not uniform. This situation requires a specific approach to studying the distribution of rainfall over the basin area.

Analysis and results. The air temperature regime is based on the above-mentioned considerations. We will consider the meteorological regime of the Ohangaron river - Ertash village catchment area based on the observation data of the Kamchik meteorological station located in its territory. For the sake of presentation, we will compare the data of the Angren station, which is the closest to the basin, and the monitoring data of these two stations in the past base climate period (1990-2022). In accordance with the purpose set in the work, the article deals with the research of the influence of air temperature, atmospheric precipitation and snow cover regimes on the river flow. In current practice, meteorological quantities and hydrological indicators are analyzed. According to the statistical analysis of the observation series, this situation leads to certain inconsistencies in the consideration of the meteorological parameters that cause the formation of the river flow, especially the amount of atmospheric precipitation. For this reason, we will analyze the interrelationship of these quantities in the work. Figures 1, 2-3, 4 show annual changes in the annual average monthly air temperature of Angren and Kamchik stations. As can be seen from the comparison of Figures 9, 10 and 11, 12, the annual graphs of the annual average monthly air temperature were compared.

The interannual variation of the average annual air temperature shows that this indicator increased with certain fluctuations from 1991 to 2001 in Angren, and to 2006 in Kamchik, and then a decreasing trend is observed (Figures 1, 2, 3, 4).

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In both stations, the average annual air temperature was below the norm for the period in 1992-1994, 1996, 2003 and 2008, in Angren in 2001, 2002, 2004-2007 and 2010, and in Kamchik in 1997, 2001, 2002, 2004, In 206, 2007 and 2010, its values above the norm were observed.

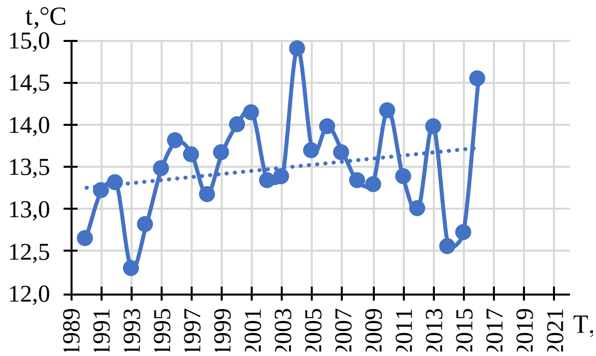

Figure1. Interannual variation of average annual air temperature observed at Angren weather station (1990-2022).

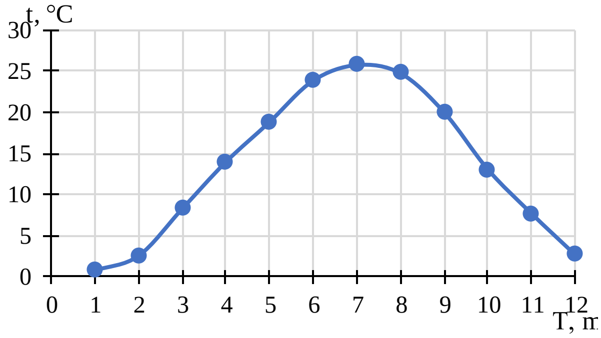

Figure 2. Annual graph of annual average monthly air temperature at Angren weather station. °C (1990-2022)

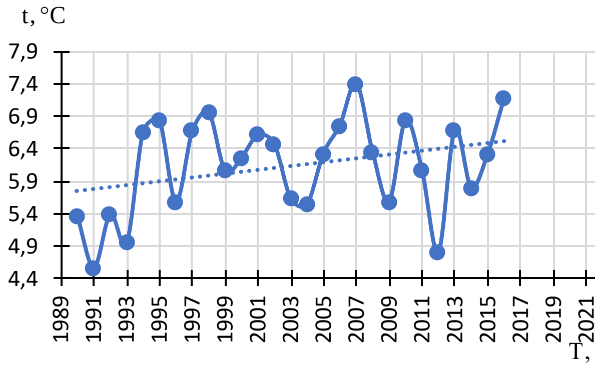

Figure 3. Interannual variation of the average annual air temperature observed at Kamchik weather station. °C (1990-2022)

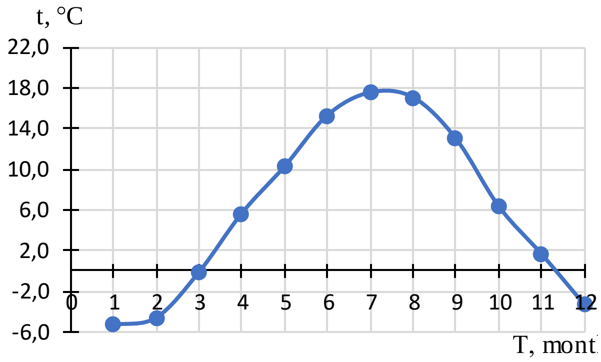

Figure1. Graph of the change of annual average monthly air temperature in Kamchik weather station. °C (1990-2022)

Data on the average monthly and annual values of the amount of atmospheric precipitation at the stations located in the study area of atmospheric precipitation were analyzed. In Angren and Kamchik stations, an increase in the amount of annual precipitation was observed compared to the values in the base period. Average annual rainfall in Angren increased by 17.2 mm, and in Kamchik by 57.4 mm. Such an increase in the amount of annual precipitation at the Angren station was mainly due to the cold half-year, while in Kamchik the contribution of the warm half-year to the increase of the annual amount was large. Average monthly and annual atmospheric precipitation at Angren meteorological station (1990-2022).

Such changes in the amount of atmospheric precipitation depend on the changes in Central Asian synoptic processes and the temperature and humidity of the air masses they bring to the region, that is, the geographical type of these masses, and are considered one of the issues of meteorology that require a separate, in-depth analysis.

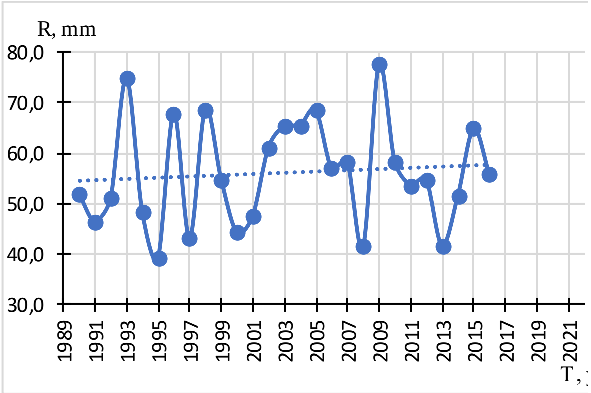

Figure 5. Fluctuation graph of average annual atmospheric precipitation at Angren weather station. (1990-2022).

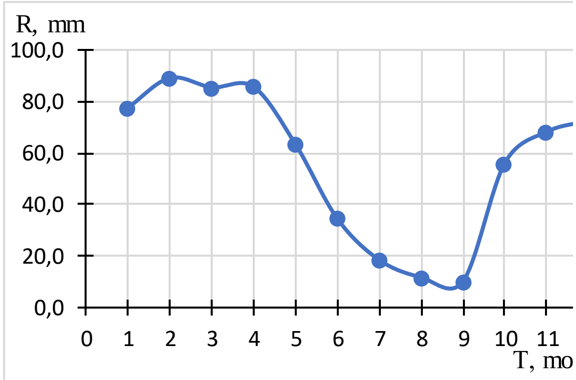

Figure 6. Fluctuation graph of multi-year average monthly precipitation at Angren stations

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Distributions of multi-year average monthly amounts of atmospheric precipitation observed at Angren and Kamchik stations within the hydrological year are presented in Figures 5.6 and 7.8, respectively. We consider changes in the amount of precipitation in the past (1990-2022) and current climate periods. At both stations, there are two clearly expressed maxima in the distribution of annual precipitation during the past climatic period by months, in Angren they are December (84.4 mm) and March (92.0 mm), and in Kamchik they are November (83.1 mm) and April (94.4 mm) corresponded to the months.

In the current climatic period, there have been significant changes in the composition of monthly distributions of precipitation. In Angren, the main maximum was shifted to February (99.2 mm), and in Kamchik, three peaks (81.8, 92.4, and 93.5 mm, respectively) with values corresponding to November, February, and April were formed.

Effect of air temperature on snow cover. Snow cover is of great importance in the formation of mountain river flows. Therefore, we will consider the regime of snow cover formed in the Ohangaron Valley in the cold half of the year without taking into account its density.

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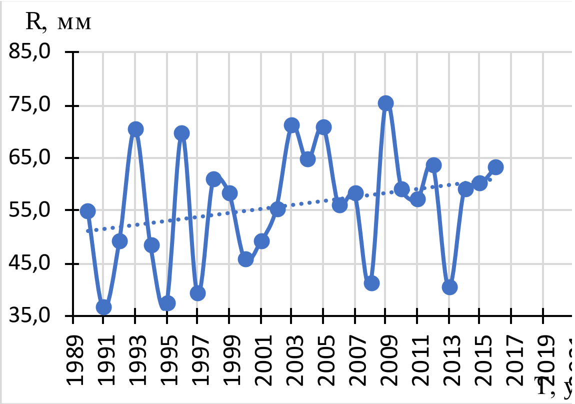

Figure 7. Fluctuation graph of average annual atmospheric precipitation at the Kamchik meteorological station (1990-2022).

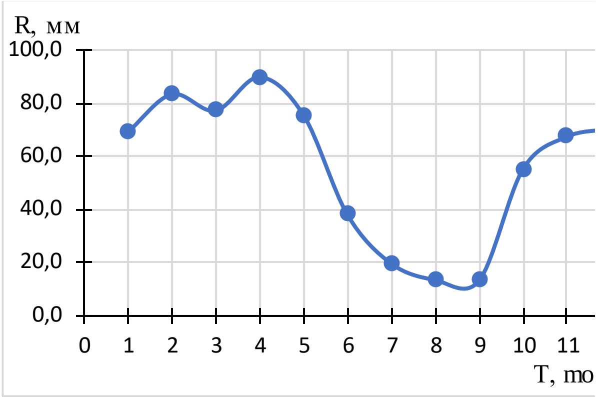

Figure 8. Fluctuation graph of multi-year average monthly precipitation at Whiplash stations.

In the current climatic period, the earliest period of stable snow cover formation at the Kamchik station is October 28, the latest period is December 18, and the long-term average period starts from November 23. The earliest term of the period of stable snow cover is recorded here on March 20, the latest term on April 29, and the long-term average term on April 10.

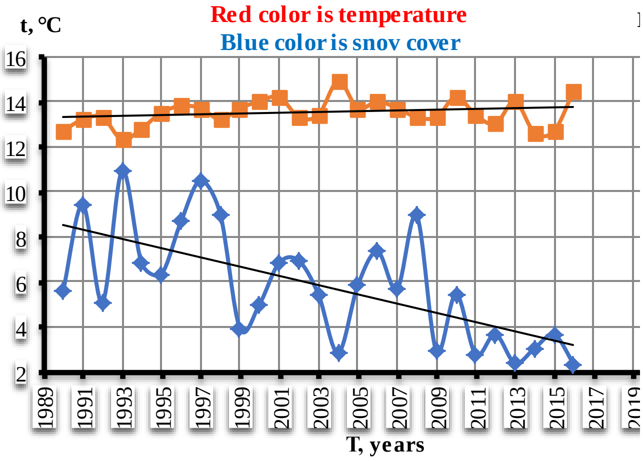

Figure 9. Average annual air temperature and interannual variation of snow cover observed at Angren weather station. °C (1990-2022).

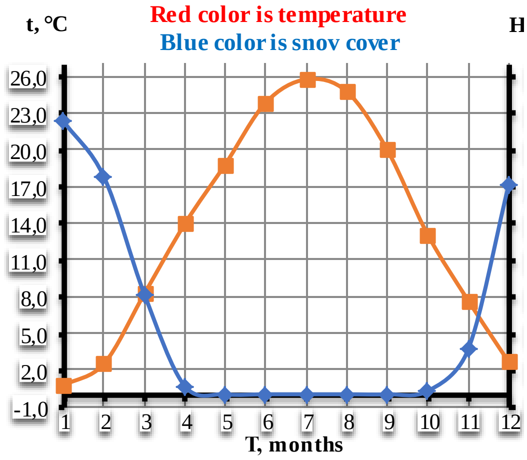

Figure 10. Fluctuation of average annual air temperature and snow cover during the year at Angren weather station.

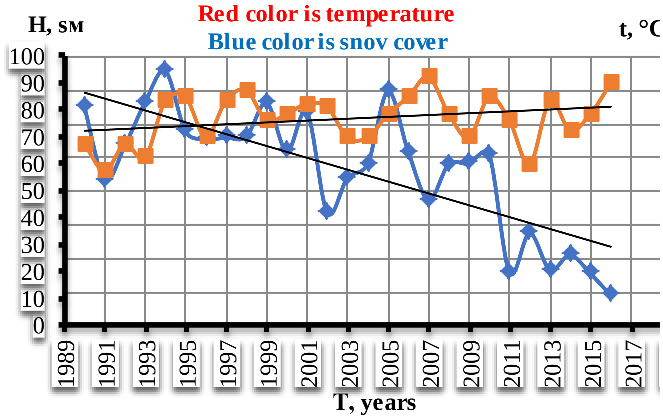

Figure 11. Average annual air temperature and interannual change of snow cover observed at Kamchik weather station. °C (1990-2022).

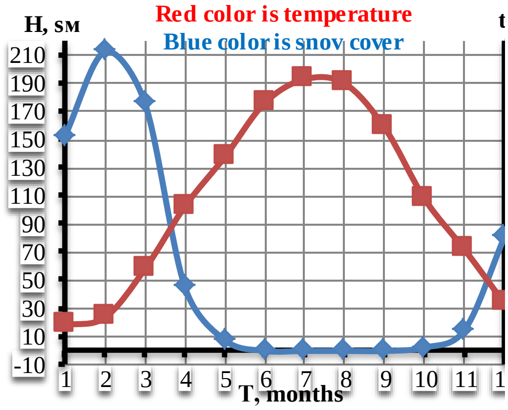

Figure 12. Average annual air temperature and snow cover fluctuation graph at Kamchik weather station.

There are certain differences between the indicators of the Angren and Kamchik meteorological stations, as well as the average annual indicators of air temperature and atmospheric precipitation, as well as the thickness of the snow cover.

Conclusion. In the Ohangaron valley basin, the average annual air temperature of the current period has increased compared to the base climatic period. The temperature increase in Angren was 0.4°C, and in Kamchik it was 0.3°C. There have also been changes in the structure of rainfall indicators in the basin area.

At both stations, there was an increase in the multi-year average annual precipitation compared to the base period, while significant changes occurred in the intra-annual distribution of maximum precipitation. The coldest month of the year in both stations is January, the average temperature of this month in Angren is 0.8°C, in Kamchik -5.6°C. The hottest month of the year is July, with average temperatures of 25.7°C and 17.5°C, respectively.

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