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Distribution of Atmospheric Precipitation During the Year by Months and Seasons (Example of Bukhara Region)

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Annotation: This work is dedicated to the determination of changes in atmospheric precipitation by months and seasons during the year in the example of Bukhara region. In the implementation of the work, the information about the atmospheric precipitation observed at the meteorological observation points located in the studied area was used. As a result, it was determined that the rainfall in the region is unevenly distributed by months and seasons throughout the year.

Key words: atmospheric precipitation, Bukhara region, meteorological station and posts, Jongeldi, Ayakogitma, Karakol, Yakka-Tut;

Introduction. Precipitation is the main source of water in Uzbekistan and is distributed unevenly across regions and seasons. It mainly depends on the nature of the air masses, the structure of the earth, the direction and height of the mountains. Precipitation is also the main source of nutrition for small rivers and streams starting from the Kulyuktov Range, located in the northern part of the Bukhara region. Flooding of watercourses in winter and spring, saturation of groundwater reserves mainly occurs due to autumn, winter and spring precipitation. It is known that the bulk of precipitation falls in the autumn, winter and spring periods. In addition, the amount of precipitation increases slightly in the second half of autumn.

The summer months in Uzbekistan, including in the Bukhara region, are practically without precipitation, with the exception of some years. There are also sharp differences in the seasonal distribution of precipitation. According to G. R. Tashov, 44-48% of precipitation falls in spring, 36-45% in winter, and 10-13% in autumn. Their number varies dramatically in different years, sometimes up to 2-4 times.

The main purpose of this work is to study the distribution of annual precipitation by months and seasons in the Bukhara region, taking into account the circumstances described above.

In our work, as primary data, we used the amount of precipitation observed at the Jongeldi, Ayakogitma, Karakol weather stations and the Yakka-Tut weather station located in the Bukhara region in 1951-2021. They were first processed and analyzed. At the same time, annual and periodic changes and regional differences in precipitation were studied.

Main results and discussion. First, in accordance with the established goals and objectives, the distribution of precipitation by months during the year was considered. The long-term average monthly precipitation for the reference period was calculated using the following expression:

$$\bar{X}_j = \frac{\sum_{i=1}^{n} X_{ji}}{n},$$

here: - average long-term monthly precipitation, mm; j – months, I, II,... XII; - monthly precipitation amounts recorded in observation years = 1.2,... n, where n is the number of years of observations. The results of the calculations are given in the table below (table - 1).

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Rainfall	MONTHS												year
	I	II	III	IV	In	WE	VII	VIII	IX	X	XI	XII	
Jongeldi													
mm	10,4	14,8	18,9	16,4	12,1	2,5	1,0	0,5	0,6	4,1	9,0	11,2	101,4
%	10,2	14,6	18,6	16,1	11,9	2,4	1,0	0,5	0,6	4,0	8,9	11,0	100,0
Ayakogitma													
mm	13,8	18,4	26,1	23,2	11,8	2,4	1,2	1,3	0,5	5,4	13,1	15,9	133,1
%	10,4	13,9	19,6	17,4	8,9	1,8	0,9	1,0	0,4	4,1	9,8	11,9	100
Bukhara													
mm	17,6	20,8	27,9	22,8	10,2	1,6	0,7	0,3	0,9	3,6	12,6	16,2	135,2
%	13,0	15,4	20,7	16,9	7,6	1,2	0,5	0,2	0,6	2,7	9,3	12,0	100,0
Karakol													
mm	18,0	19,1	27,4	20,1	9,6	1,6	0,9	0,3	0,5	4,1	11,5	14,5	127,6
%	14,1	15,0	21,5	15,7	7,6	1,3	0,7	0,2	0,4	3,2	9,0	11,4	100
Yakka-tut													
mm	17,4	20,2	26,6	20,2	10,9	1,6	0,5	0,4	0,5	4,2	11,5	15,0	128,9
%	13,5	15,6	20,7	15,6	8,4	1,2	0,4	0,3	0,4	3,2	8,9	11,7	100,0

According to the results of calculations in the form of a diagram, the distribution of the amount of precipitation recorded at each of the five weather stations during the year by month was expressed.

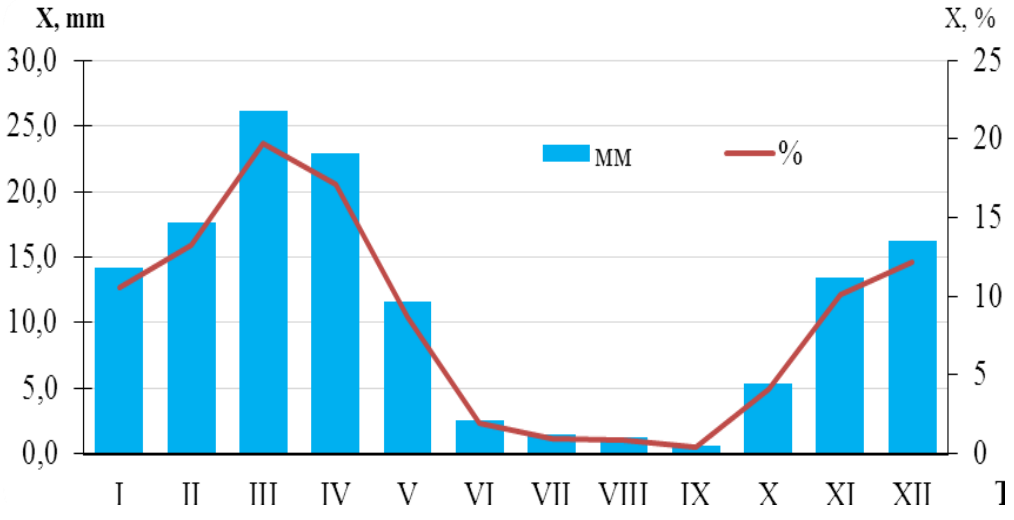

Figure 1. Distribution of annual precipitation by month throughout the year, Ayakogitma MS

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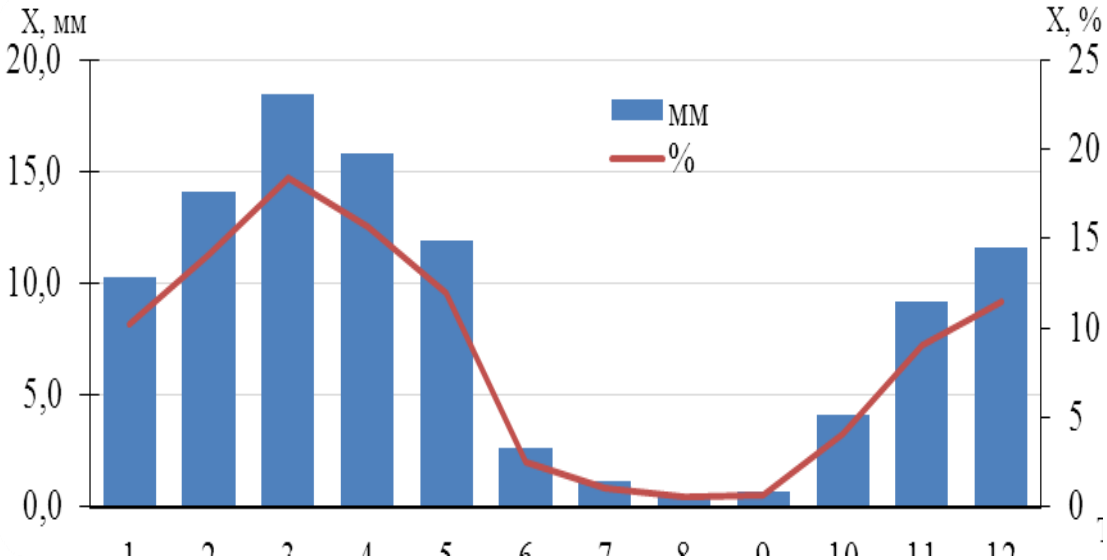

Figure 2. Distribution of annual precipitation by month throughout the year, Jongeldi MS

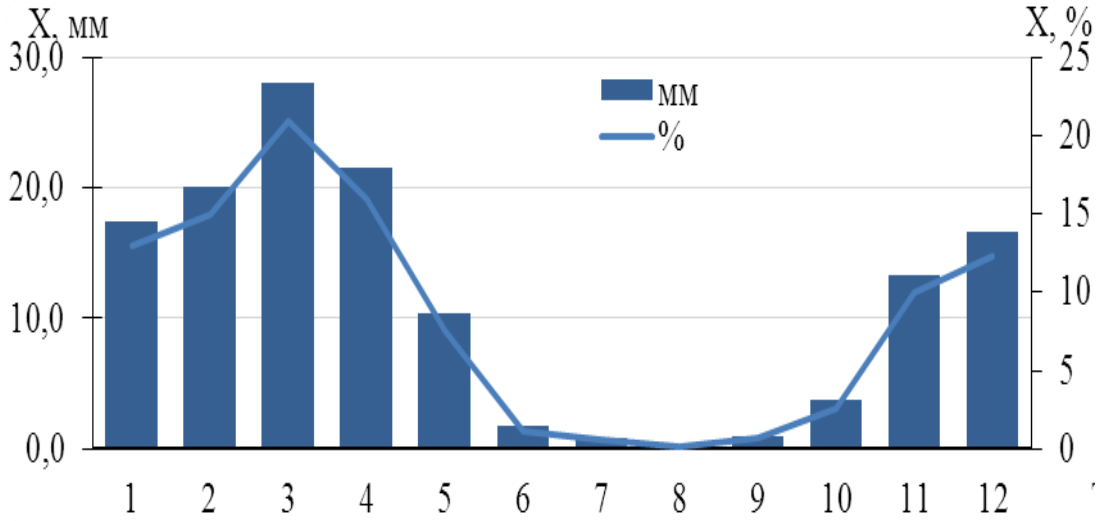

Figure 3. Distribution of annual precipitation by months during the year, Bukhara MS

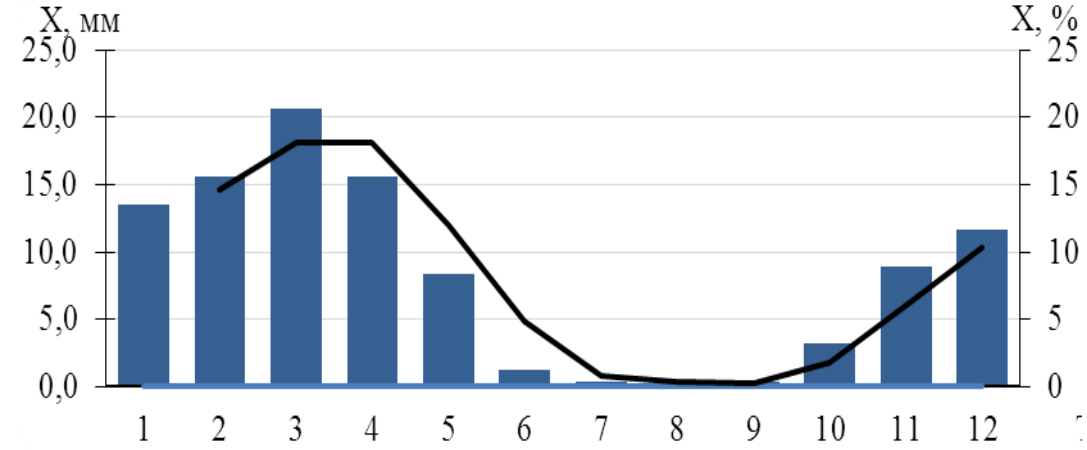

Figure 4. Distribution of annual precipitation by months throughout the year, Yakka-Tut MP

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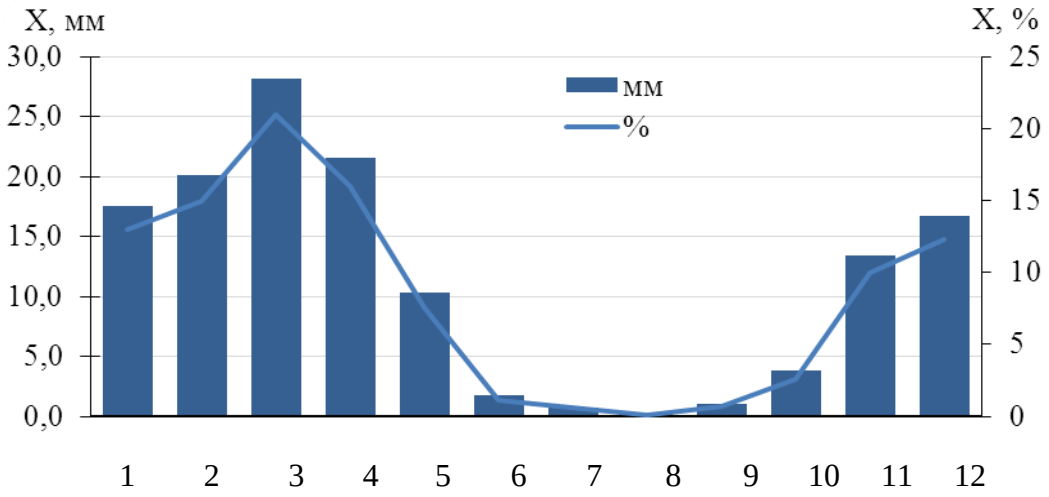

Figure 5. Distribution of annual precipitation by months during the year, MS Karakol

In the course of our work, by adding the values of the months during the year, the average annual precipitation observed at the meteorological observation points of the Bukhara region was determined. As a result, the distribution of annual precipitation in the region by months was determined. (Figure 6).

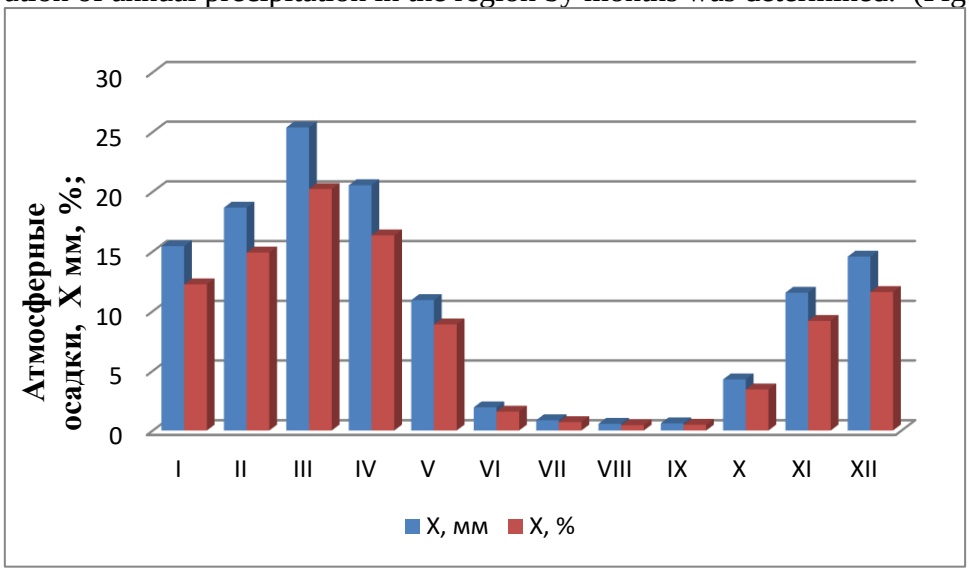

Figure 6. Distribution of annual precipitation by months in Bukhara region

At the next stage of the work, the issue of the seasonal distribution of precipitation in the study area was considered. For this purpose, the results of calculations performed in the process of determining the distribution of precipitation by months were used (Table 1). As a result, based on the data in Table. 1 determines the amount of precipitation for the winter, spring, summer and autumn seasons. 2-table).

2-table Precipitation at weather stations Seasonal distribution (1951-2021) (in mm and %)

P.h	**Weather stations (height, m)**		**Winter** (XII-II)	**Весна**(III-V)	**Summer** (VI-VIII)	**Autumn** (XI)	**annual**
1	Джонгельди (209)	mm	36,5	47,4	4	13,8	100,1
		%	36	46,6	4	13,5	100
2	Аякогитма (184)	mm	48,3	61,1	4,9	19,1	133,4
		%	36,2	45,8	3,7	14,3	100
3	Bukhara(225)	mm	54,7	71,5	12,7	17,3	135,5
		%	40,4	45	1,9	12,8	100
4	Karakol (196)	mm	51,6	57,1	2,8	16,1	127,6
		%	40,5	44,8	2,2	12,1	100
5	Yakka-Tut (208)	mm	52,6	57,7	2,5	16,1	129
		%	40,9	44,7	1,9	12,5	100

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Based on the results of the calculation of the seasonal distribution of precipitation in the studied meteorological observation points, a special diagram was created that reflects this process. This diagram shows the seasonal distribution of precipitation in the Bukhara region. (Figure 7).

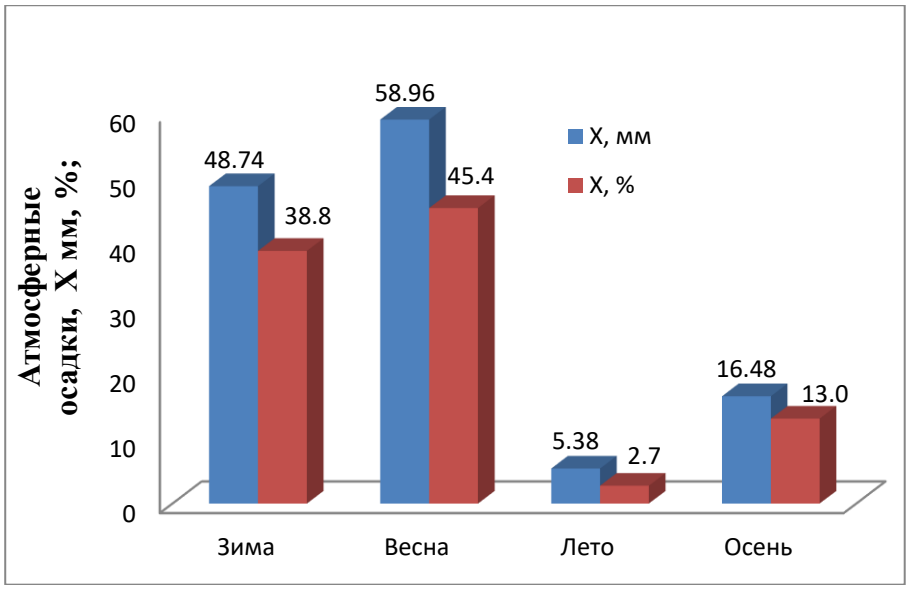

Figure 5. Seasonal distribution of precipitation in the Bukhara region (1951-2021)

Based on the analysis of the results of the study, the following can be noted as a conclusion:

1. The seasonal distribution of annual precipitation observed at the Jonggeldi weather station was as follows: 36.4 mm or 35.8% in winter, 47.3 mm or 46.7% in spring, 4 mm or 4% in summer, 13.7 mm or 13.5% in autumn. ;
2. The seasonal distribution of annual precipitation observed at the Ayakogitma weather station is 48.1 mm or 36.2% in winter, 61.1 mm or 45.8% in spring, 4.9 mm or 3.7% in summer, and 19.1 mm or 3.7% in autumn. 14 per cent;
3. The seasonal distribution of annual precipitation observed at the Bukhara weather station is 54.7 mm or 40.4% in winter, 71.5 mm or 45% in spring, 12.7 mm or 1.9% in summer, and 17.3 mm or 12.8% in autumn;
4. The seasonal distribution of annual precipitation observed at the Karakol weather station is 51.6 mm or 40.5% in winter, 57.1 mm or 44.8% in spring, 2.8 mm or 2.2% in summer, 16.1 mm or 12.1 percent in autumn.
5. The seasonal distribution of long-term precipitation observed at the Yakka-Tut weather post is 52.6 mm or 40.9% in winter, 57.7 mm or 44.7% in spring, 2.5 mm or 1 in summer. It was 9%, in autumn it was 16.1 mm or 12.5%.
6. Summarizing the data of meteorological observation points located in the Bukhara region, 48.74 mm or 38.8% of the annual precipitation in the region falls in the winter season, 58.96 mm or 45.4% in the spring, and 2.7% in the summer. season., 5.38 mm, 16.48 mm, a decrease of 13.0%.

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