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The Monitoring of Changes in Meteorological Quantities in Different Periods

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Abstract: The article analyzes the monitoring of air temperature changes in different periods during months at the Samarkand meteorological station. The temperature changes in the autumn months are 30.2º÷3.9ºC, in the winter months 0.8º÷8.2ºC, in the spring months 6.7º÷26.6ºC and in the summer months 19.4º÷34.3ºC, the temperature amplitude in the autumn months is 3.1º÷6.8ºC, in winter months – 2.6º÷3.2ºC, in spring months – 3.3º÷6.2ºC, in summer months – 6.3º÷7.1ºC. Between the periods of observation, a sharp rise in air temperature is observed in the summer months. The main reason for this is the difference in the distribution of the duration of the Sun's rays over the months.

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Keywords: Agriculture; vegetation; cotton; wheat; station; air temperature; period; maturity; meteorological quantities; changes

1. Introduction

Agricultural crops (cotton, grain crops) in Uzbekistan germinate, grow, and develop under the influence of soil and climate conditions and various environmental factors, the most important of which are air, soil temperature, air humidity, precipitation, etc. These sizes reduce the growth limitations of the planted crop and increase the likelihood of obtaining optimum yield during the growing season. To use these factors, we must first pay special attention to planting periods, and then determine the optimal planting period for each region by understanding how the factors affect the plant. Several scientists have conducted scientific research on air temperature changes abroad [9, 13, 14]. In addition, a number of other scientists have carried out several scientific studies aimed at studying the changes of these quantities in Uzbekistan [3, 4, 7, 8, 10, 12]. However, the aforementioned studies were conducted in a particular direction, and their results, as well as the scientific and practical conclusions derived from their analysis, were consistent with the scope of this study.

On the basis of meteorological observation data, the normal reference period is used to determine the regional climate. For the growth and development of all types of vegetation, the temperature of the air and soil must not fall below specific thresholds. The minimum temperature at which a plant can grow is known as the biological minimum. Temperature plays an essential role in numerous physiological processes and has a substantial effect on the rate of crop development. Additionally, air and soil temperatures influence the onset and duration of plant development phases.

2. The main part

Meteorological quantities are various descriptions of weather conditions and some atmospheric phenomena. Meteorological conditions (weather conditions) are the values of meteorological quantities over a given period of time.

A network of hydrometeorological stations (several thousand stations) covers the entire planet. At these stations, the near–surface atmosphere is monitored eight times per day (at 00, 03, 06, 09, 12, 15, and 21 hours GMT).

The hydrometeorological service often uses the average air and soil temperatures during the observation period for agriculture. Air and soil temperatures are known to fluctuate during the observation period.

The purpose of the study is to compile data from the Uzgidromet archive for the years 2009–2021, and then use this data to determine changes in relative humidity and atmospheric precipitation during different observation periods at meteorological stations in Samarkand (725 m), Jizzakh (343.5 m), and Sirdarya

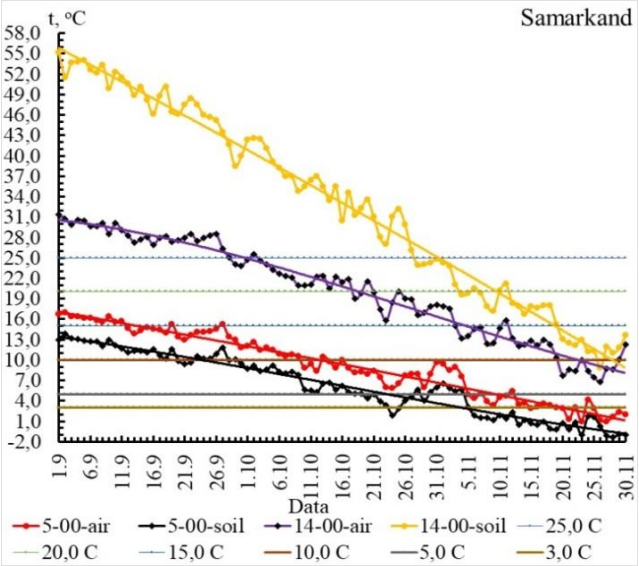
(264 m) located at different heights compared to sea level. To achieve this goal, the following tasks are set:

– compilation of data for 2009–2021;

– determination of maximum and minimum values of air, soil temperature, relative humidity, and atmospheric precipitation using statistical analysis.

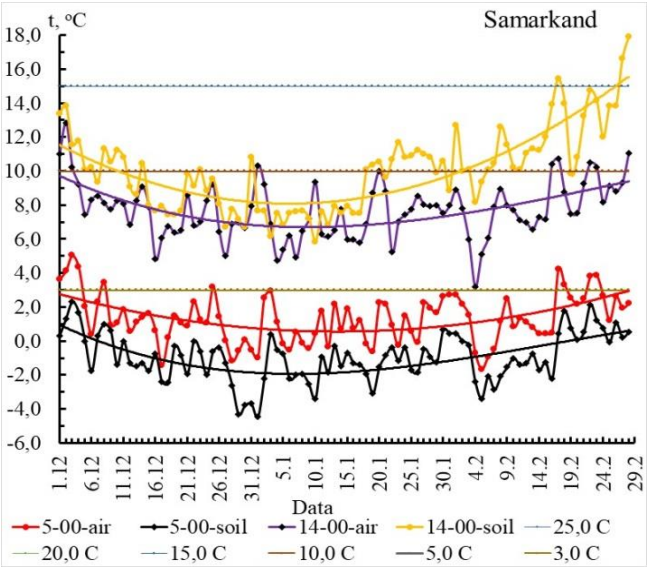
As the research object, meteorological stations in the irrigated regions of Samarkand, Jizzakh, and Sydarya were chosen. Monitoring the changes in the maximum and minimum values of air, soil temperature, relative humidity, and atmospheric precipitation for distinct time periods is the subject of change monitoring.

Initial data. Meteorological variable data for various observation periods from 2009 to 2021 were obtained from the Uzgidromet archival fund's TM–1 database in accordance with the guidelines [2]. Using data from the meteorological stations in Samarkand, Jizzakh, and Sirdarya, variations in the maximum and minimum values of air, soil temperature, relative humidity, and atmospheric precipitation were calculated for various observation periods.



3. Methodology of research.

The task was completed using the methods described in the sources [1, 5, 6] and employed in them.

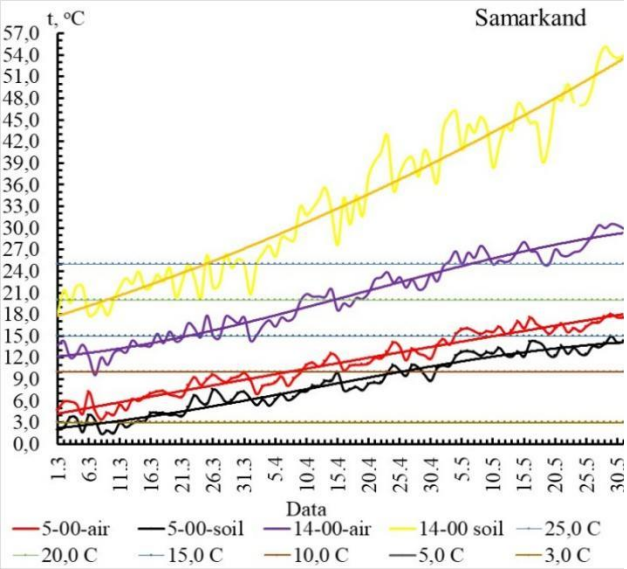


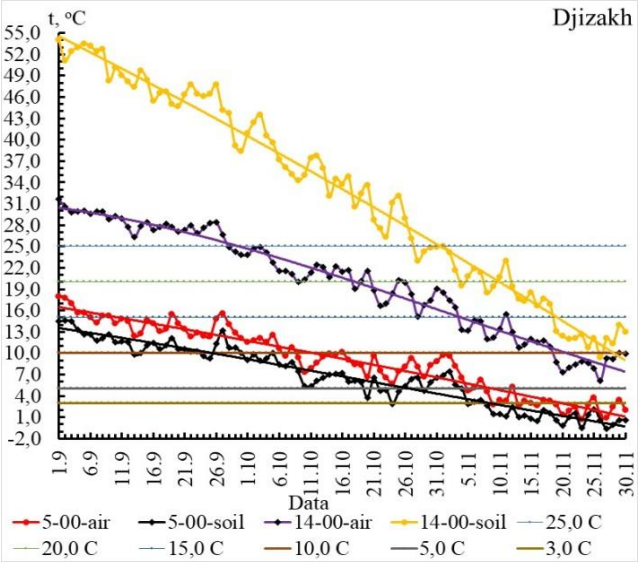
4. Main results.

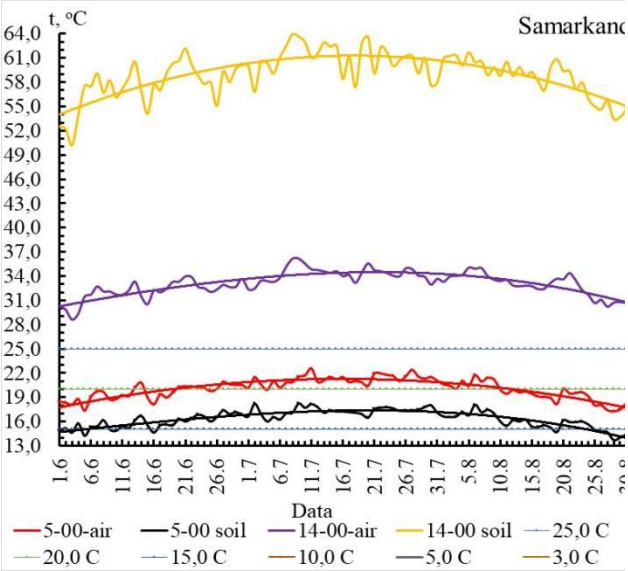
The natural geographical and soil–climatic conditions of the regions of Uzbekistan vary, but each region is not composed of regions with identical natural conditions. Consequently, it is common practice to choose plant varieties for each region based on their biological requirements for the external environment and the soil–climatic conditions of that region. The optimal days for dispersing plant seeds, planting and burying vegetable seedlings in the ground are initially determined by the soil (air) temperature being adequate for each plant's development [4].

Winter wheat is grown in Uzbekistan from September to June, while cotton is grown from March to October. First, we will analyze the variations in average air temperature during the growing season at agrometeorological stations in Samarkand, Jizzakh, and Sirdarya.

Figures 1–3 compare the variations in air and soil temperature during the growing season at agrometeorological stations in Samarkand, Jizzakh, and Sirdarya during the 500 and 1400 observation periods from 1991 to 2021.







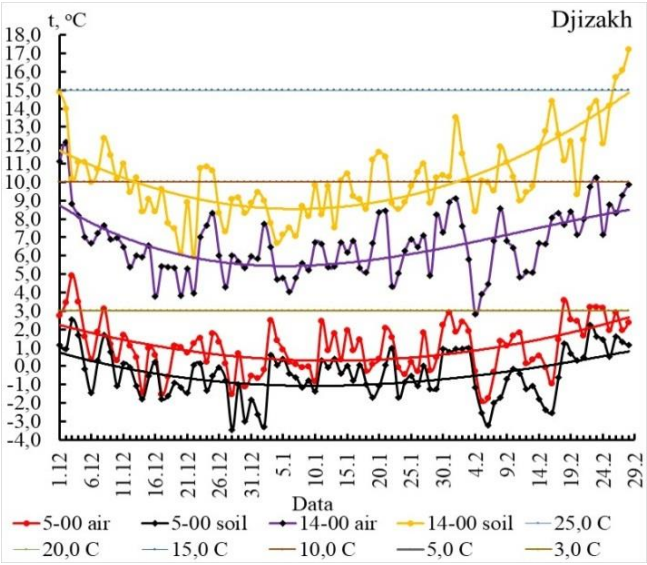
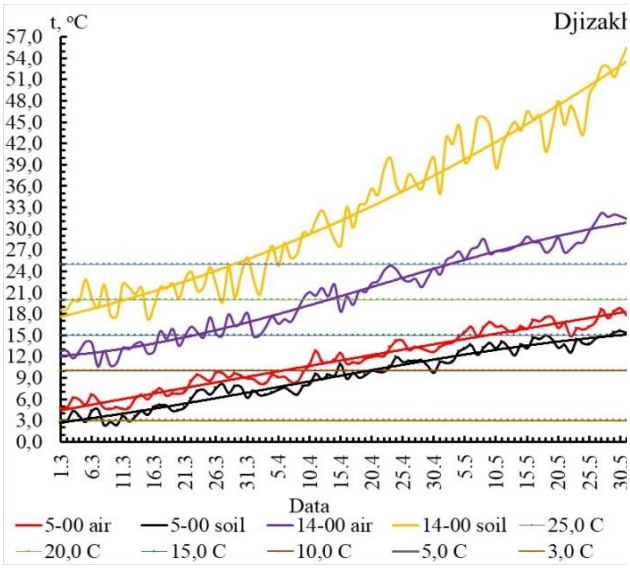
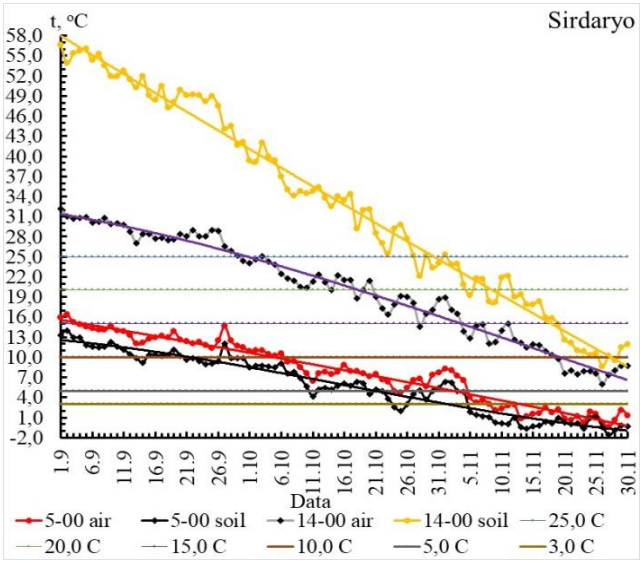
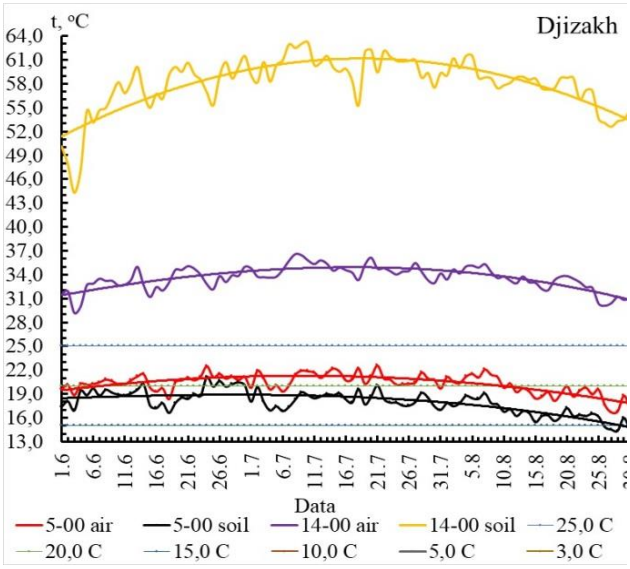


Figure 1. Changes in air and soil temperature at the

Samarkand meteorological station during the vegetation period during the observation period of 500 and 1400 and temperature passing through different levels







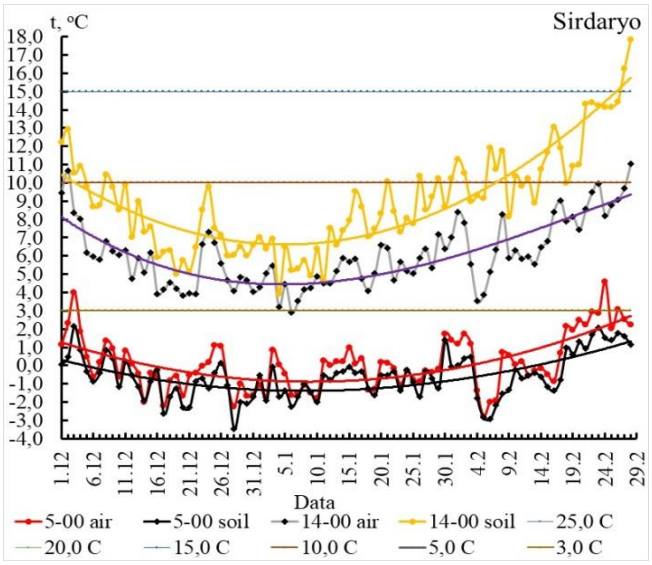


Figure 2. Variations of air and soil temperatures at the Jizzakh meteorological station during the vegetation period during 500 and 1400 observation periods and temperature transitions

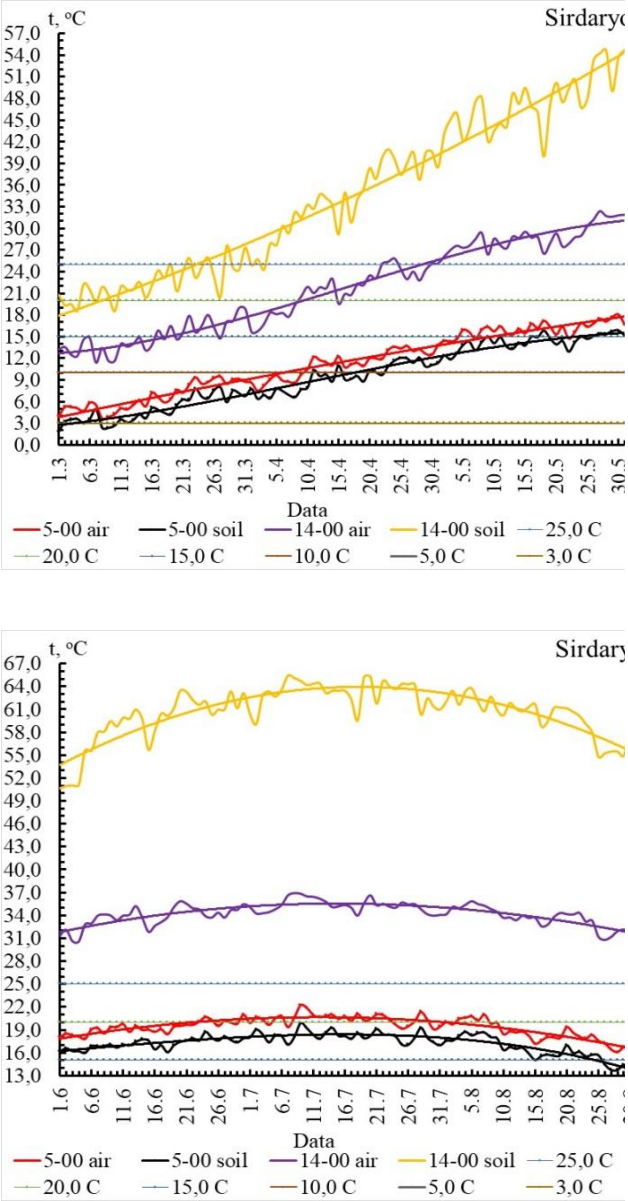


Figure 3. Changes in air and soil temperature during the 500 and 1400 observation periods at the Sirdarya meteorological station during the vegetation period and temperature transitions at different levels

As shown in the image, the minimum air temperature in the autumn months is 500 in September–October and 800 in November; the maximum temperature is 1400; the minimum temperature in the winter months is 800; the maximum temperature is 1400; the minimum temperature in the spring months is 500; the maximum temperature is 1400; and the minimum temperature in the summer months is 500; the maximum temperature is 1400.

In general, temperature changes during the autumn months range from 30.0ºC to 4.0ºC, during the winter months from 1.2ºC to 7.9ºC, during the spring months from 6.6ºC to 26.8ºC, and during the summer months from 19.3ºC to 34.3ºC. During the summer months, a significant increase in air temperature is observed between the periods of observation. This is primarily due to the different distribution of the duration of the Sun's beams across the months.

The influence of daily air temperature changes on both wild and cultivated plants is substantial, and the fact that daytime and nighttime temperatures differ considerably is manifested in both the zonal and microclimate influences. To date, however, the average daily air temperature has been used as an indicator of thermal conditions in all agrometeorological and agroclimatic scientific–research projects pertaining to the classification of thermal conditions for the vegetation period. In some instances, changes in the average daily air temperature and its primary characteristics (minimum, maximum, and daily amplitude of air temperature) are used as supplementary indicators.

$$t_{daytime} = \frac{\Sigma t_{day,hour}}{n_{observations\ number}}; \quad (1)$$

$$t_{nighttime} = \frac{\Sigma t_{night,hour}}{n_{observations\ number}}; \quad (2)$$

here: $\sum t_{day,hour}$ – refers to the daytime degree–hour (from sunrise to sunset); $\sum t_{night,hour}$ – refers to the nighttime degree–hour of the day (from sunset to sunrise); $n_{observations\ number}$ – number of observed hours per day and night period.

The Hydrometeorological Information Service of Uzgidromet and the regional agro– and hydrometeorological stations and posts of the hydrometeorological departments provide agrometeorological services.

In this table below, based on multi–year observation data collected at the Samarkand Meteorological Station, the air and soil temperatures in months and distinct periods are calculated during the growing season (winter wheat (September–June), cotton (March–October)) during different periods (day, night) [Table 1].

Table 1

The monthly measurement of air temperature in pentades

Months	Pentade	Samarkand			Jizzakh			Sirdarya		
		Air temperature, ºC			Air temperature			Air temperature		
		nighttime observation periods, hour	daytime observation periods, hour	difference	nighttime observation periods, hour	daytime observation periods, hour	difference	nighttime observation periods, hour	daytime observation periods, hour	difference
		20-23-2-5	8-11-14-17	tday-tnight	20-23-2-5	8-11-14-17	tday-tnight	20-23-2-5	8-11-14-17	tday-tnight
September	1	19,7	27,0	7,3	19,8	27,4	7,6	19,6	27,2	7,6
	2	19,0	26,0	7,0	18,2	26,2	8,1	18,6	26,0	7,4
	3	17,5	24,4	6,8	16,8	24,6	7,8	16,9	24,4	7,5
	4	16,9	24,0	7,1	16,8	24,3	7,5	16,8	24,0	7,2
	5	16,6	24,1	7,4	15,8	23,7	7,9	16,1	23,8	7,7
	6	15,9	22,2	6,3	16,0	22,2	6,2	15,7	22,1	6,4
Average		17,6	24,6	7,0	17,2	24,7	7,5	17,3	24,6	7,3
October	1	14,2	20,6	6,4	14,1	20,5	6,4	13,8	20,3	6,5
	2	12,5	18,1	5,7	11,7	17,5	5,8	11,7	17,4	5,7
	3	11,4	17,8	6,4	11,0	17,9	6,9	10,5	17,1	6,7
	4	10,7	17,0	6,3	10,4	16,9	6,5	10,5	16,5	6,0
	5	8,7	14,6	5,9	8,8	14,7	5,8	8,6	14,0	5,4
	6	9,3	14,4	5,1	9,4	14,3	4,8	8,6	13,4	4,8
Average		11,1	17,1	6,0	10,9	17,0	6,0	10,6	16,4	5,8
November	1	9,0	12,5	3,5	9,2	12,8	3,6	8,8	12,4	3,7
	2	5,7	10,3	4,6	5,4	10,1	4,6	5,3	9,6	4,3
	3	5,3	10,2	4,9	4,9	9,3	4,4	4,1	8,5	4,4
	4	4,2	7,9	3,7	4,0	7,3	3,3	3,5	6,7	3,2
	5	3,2	6,2	3,0	3,1	6,0	2,9	2,4	5,0	2,7
	6	2,8	6,3	3,5	3,1	6,2	3,1	2,0	4,8	2,8
Average		5,1	8,9	3,9	5,0	8,6	3,7	4,3	7,9	3,5
December	1	4,4	7,5	3,1	4,1	6,9	2,8	3,1	5,8	2,7
	2	2,7	5,5	2,9	2,4	4,7	2,4	1,4	3,6	2,3
	3	2,0	5,2	3,2	1,4	3,9	2,5	0,7	3,0	2,4
	4	1,2	3,8	2,6	0,8	2,9	2,1	-0,2	1,8	2,0
	5	2,4	5,4	3,0	1,8	4,4	2,5	0,9	3,3	2,4
	6	0,8	3,8	3,0	0,8	3,5	2,7	-0,1	2,1	2,1
Average		2,2	5,2	3,0	1,9	4,4	2,5	1,0	3,3	2,3
January	1	1,8	4,7	2,9	1,7	3,7	2,0	0,4	2,4	1,9
	2	0,8	4,1	3,4	0,9	3,2	2,2	-0,6	1,6	2,2
	3	1,9	4,3	2,4	2,2	4,2	2,0	1,1	3,0	1,9
	4	1,5	4,8	3,3	1,6	4,2	2,6	0,8	2,9	2,2
	5	2,1	4,7	2,6	1,6	4,0	2,4	1,0	3,1	2,1
	6	2,6	5,5	2,9	2,3	4,7	2,4	1,5	3,9	2,4
Average		1,8	4,7	2,9	1,7	4,0	2,3	0,7	2,8	2,1
February	1	1,7	4,1	2,4	1,7	3,9	2,1	1,4	3,4	2,0
	2	1,7	5,0	3,2	1,7	4,5	2,8	0,9	3,6	2,7
	3	1,8	4,7	2,9	1,4	3,7	2,3	1,2	3,6	2,4

	4	3,5	6,7	3,2	3,2	5,8	2,6	2,8	5,6	2,8
	5	4,0	7,0	3,0	4,2	6,5	2,3	4,3	6,5	2,2
	6	3,9	7,1	3,2	4,3	6,9	2,6	4,5	7,4	2,9
Average		2,8	5,8	3,0	2,8	5,2	2,5	2,5	5,0	2,5
March	1	6,9	10,5	3,6	7,1	10,3	3,1	6,9	10,2	3,3
	2	6,1	9,1	3,0	6,8	9,6	2,8	6,9	9,8	2,9
	3	7,3	10,9	3,7	7,6	10,7	3,1	7,6	11,0	3,4
	4	8,5	12,2	3,7	8,9	12,0	3,1	9,0	12,2	3,2
	5	9,7	13,5	3,8	10,5	13,4	2,9	10,7	14,0	3,3
	6	10,9	14,3	3,4	11,1	14,5	3,3	11,3	14,8	3,5
Average		8,2	11,8	3,5	8,7	11,7	3,1	8,7	12,0	3,3
April	1	9,9	13,6	3,8	10,8	14,0	3,1	11,1	14,6	3,5
	2	11,5	15,9	4,5	11,8	16,3	4,5	12,3	16,8	4,5
	3	13,5	17,9	4,4	13,9	18,2	4,3	14,3	18,7	4,5
	4	13,0	17,9	4,9	13,7	18,6	4,9	14,2	19,3	5,1
	5	15,0	20,5	5,5	16,0	21,2	5,3	16,1	21,8	5,7
	6	14,7	19,7	5,0	15,7	20,7	5,0	16,3	21,2	5,0
Average	0	12,9	17,6	4,7	13,6	18,2	4,5	14,0	18,7	4,7
May	1	17,0	22,5	5,4	17,4	23,1	5,7	18,0	23,8	5,8
	2	17,9	23,8	6,0	18,6	24,8	6,1	19,0	25,2	6,1
	3	18,3	24,1	5,8	19,1	25,2	6,1	19,3	25,6	6,3
	4	18,5	24,0	5,4	19,7	25,5	5,8	19,9	25,7	5,8
	5	18,8	24,5	5,7	19,5	25,6	6,1	19,8	26,1	6,3
	6	20,7	27,5	6,9	21,8	29,0	7,3	21,7	28,8	7,1
Average		18,5	24,4	5,9	19,3	25,5	6,2	19,6	25,9	6,2
June	1	21,0	27,3	6,3	22,4	28,7	6,3	21,9	28,7	6,8
	2	22,5	29,3	6,8	23,7	30,6	6,9	23,5	30,7	7,2
	3	22,8	29,3	6,5	24,0	30,7	6,7	23,8	30,8	7,0
	4	22,8	29,9	7,0	23,7	31,0	7,4	23,9	30,9	7,1
	5	23,6	30,4	6,8	24,8	31,7	6,9	24,7	31,7	6,9
	6	23,9	30,2	6,3	24,7	31,6	6,9	24,6	31,5	7,0
Average		22,8	29,4	6,6	23,9	30,7	6,9	23,7	30,7	7,0
July	1	24,0	30,7	6,7	24,9	31,8	6,9	25,2	31,7	6,6
	2	24,8	32,3	7,5	25,5	33,2	7,7	25,8	33,0	7,1
	3	24,9	31,7	6,8	25,8	32,8	6,9	25,7	32,4	6,7
	4	24,4	31,5	7,1	25,3	32,5	7,2	25,2	32,0	6,8
	5	24,9	31,4	6,5	25,2	32,0	6,8	25,2	31,8	6,6
	6	24,8	31,0	6,2	24,6	31,7	7,1	24,8	31,2	6,4
Average		24,6	31,4	6,8	25,2	32,3	7,1	25,3	32,0	6,7
August	1	24,1	31,2	7,1	24,7	31,9	7,2	24,7	31,7	7,0
	2	24,2	31,1	6,8	24,8	31,9	7,1	24,6	31,2	6,7
	3	22,9	29,7	6,8	23,1	30,4	7,4	22,9	30,1	7,2
	4	22,3	29,7	7,4	22,5	30,2	7,8	22,5	29,9	7,3
	5	22,3	29,1	6,8	22,4	29,6	7,2	22,2	29,4	7,1
	6	20,7	27,4	6,7	20,5	27,9	7,4	20,6	27,8	7,2
Average		22,7	29,7	6,9	23,0	30,3	7,3	22,9	30,0	7,1

The temperature amplitude between night and day observation periods it fluctuates around 3.1º÷6.8ºC during the autumn months, 2.6º÷3.2ºC during the winter months, 3.3º÷6.2ºC during the spring months, and 6.3º÷7.1ºC during the summer months.

5. Conclusion

In general, spring and autumn evening temperatures do not fluctuate drastically. During the summer months, a significant increase in air temperature is observed between the periods of observation. This is primarily due to the different distribution of the duration of the Sun's beams across the months. If the difference in temperature between the monitoring periods is minor in March–April and November, the differences between May and the second day of October are significant.

This research has yielded information that can be utilized in the provision of hydrometeorological services to the national economy and in the education of students.

References:

[1] Абдуллаев А.К., Холбаев Г.Х., Сафаров Э.Ю. Агрометеорологияда муносабатли тенгламаларни топишда математик статистикани қўллаш, ЭҲМ ва География ахборот тизимларидан фойдаланиш учун кўрсатма. – Тошкент: НИГМИ Ўзгидромет, 2009. – 150 б.

[2] Гидрометеорологик станция ва постларга йўриқнома. 11 нашр. Станция ва постларда агрометеорологик кузатувлар: 1 қисм. Асосий агрометеорологик кузатувлар. Тошкент, 2009. – 325 б.

[3] Группер С.Р. Агрометеорологическая оценка продуктивности озимой пшеницы в Узбекистане. – Ташкент: САНИГМИ, 1998. стр. 156.

[4] Муминов Ф.А., Абдуллаев Х.М. Агроклиматические ресурсы Республики Узбекистан. Ташкент: САНИГМИ, 1997. стр. 178.

[5] Руководящие указания ВМО по расчету климатических норм. Издание 2017 г., Женева. стр. 21.

[6] Уланова Е.С., Забелин В.Н. Методы корреляционного и регрессионного анализа в агрометеорологии. – Л.: Гидрометеоиздат, 1990. стр. 206.

[7] Холбаев Г.Х., Абдуллаев А.К. Иқлим ўзгаришини ҳаво ҳароратининг турли даражадан ўтишига таъсири ҳақида (Самарқанд вилояти мисолида). География асрда: Муаммолар, ривожланиш истиқболлари. РИАК материаллари. Самарқанд: 2017. 246–249 б.

[8] Чуб В.Е. Изменение климата и его влияние на гидрометеорологические процессы, агроклиматические и водные ресурсы Республики Узбекистан. – Ташкент: НИГМИ, 2007. стр. 132.

[9] Dana Magdalena Micu, Vlad Alexandru Amihaesei, Narcisa Milian & Sorin heval. Recent changes in temperature and precipitation indices in the Southern Carpathians, Romania (1961–2018). Theoretical and Applied Climatology. 2021. https://link.sprin ger.com/article/10.1007/s00704–021–03560–w.

[10] Kholbaev G.Kh, Abdullaev A.K. Change of meteorological values in the autumn of Republic of Karakalpakstan and Khorezm region. International Journal of Advanced Research in Science, Engineering and Technology. Vol. 7, Issue 3, March, 2020. – p. 13123–13130.

[11] Kholbaev G.Kh., Egamberdiev Kh.T., Egamberdiev H.Kh. Change of meteorological values in autumn of Samarkand region. International Journal of Psychosocial Rehabilitation. Vol. 24, Issue 05, 2020. – p. 6652–6660.

[12] Kholbaev G.Kh., Khadjaeva G. The air temperature changes in the irregated areas of the Republic of Karakalpakistan. SJIF Impact Factor: 7.001 EPRA International Journal of Research and Development (IJRD) Volume: 5 | Issue: 5 | May 2020. https:/ /doi.org/10.36713/epra2016 | www.eprajournals.com.

[13] Mohammad Reza Kousari & Mohammad Amin Asadi Zarch. Minimum, maximum, and mean annual temperatures, relative humidity, and precipitation trends in arid and semi–arid regions of Iran. Arabian Journal of Geosciences. 2011. Volume 4. – p. 907–914.

[14] Yılmaz Akdi & Kamil Demirberk Ünlü. Periodicity in precipitation and temperature for monthly data of Turkey. Theoretical and Applied Climatology. Volume 143, 2021. – p. 957–968.

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