

**Gat Analysis Of Maximum And Minimum Changes In Air Temperature In Syrdarya Region By Month**

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**Abstract:** Due to the fact that the Syrdarya region is an appropriated desert territory and due to the large anthropogenic impact, unique climatic characteristics of this region have been formed. Also, the introduction of quarantine due to the Covid-19 virus in 2020 had a sharp impact on the change in air temperature. Contents of the study: using GAT, the annual change in the maximum and minimum air temperature of the region by month in 2000-2020 was analyzed.

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**Keywords:** climate; maximum and minimum annual temperature; anthropogenic factor; Covid-19; QGIS.

**Introduction.**

*Climate change* is a long-term change in the average weather conditions that determine the local, regional and global climate of the Earth [1]. The climate of the interior plains of the temperate region is distinguished by its continentality, hot and long summers, on the contrary, cold and short winters, and uneven distribution of precipitation over the seasons. Besides these, the orography, hydrography, soil and vegetation cover of the place and anthropogenic factors also have a great influence.

Climate change is affecting every component of nature and society, not only on a global scale, but also on a local scale. In order to mitigate the effects of climate change, it is an urgent task for geographers, cartographers and hydrometeorologists to be able to correctly assess it and develop a future forecast. In order to make a forecast, it is first necessary to study its historical change and the factors affecting it. The research work was conducted in the territory of Syrdarya region as a result of reliable sources. The region is mainly located in the eastern part of Mirzachol on a plain with a temperate continental climate [3]. Despite its small area (area 4280 km<sup>2</sup> [2]) and the fact that it is located on a complete plain, climate change will vary significantly ( up to 1.4 °C) between 2000 and 2020.

**Research methodology.**

The historical climate data of the climate of Syrdarya region for the years 2000-2020 were analyzed using the data of the regional administration of the Gyrometeorological Service Agency of the Republic of Uzbekistan under the Ministry of Ecology, Environmental Protection and

Climate Change and the following official international internet sources :

- ✓ The official site for global climate and weather data [https://www.worldclim.org/data/monthlywth.html#google\\_vignette](https://www.worldclim.org/data/monthlywth.html#google_vignette) ;
- ✓ The official website of the US National Oceanic and Atmospheric Administration - <https://www.noaa.gov/climate> ;
- ✓ United States Geological Survey government research organization - <https://www.usgs.gov/science/science-explorer/climate> ;
- ✓ Historical-climatic site by region - [https://www.meteoblue.com/en/weather/historyclimate/climatemodelled/sirdaryo\\_uzbekistan\\_1512770](https://www.meteoblue.com/en/weather/historyclimate/climatemodelled/sirdaryo_uzbekistan_1512770) .

**Research results.**

Maps of the region's annual average maximum and minimum temperatures for the years 2000-2020 were developed through the QGIS program. Maximum annual temperatures in 2000, 2005, 2010, 2015 and 2020 were mapped and analyzed using 1 year of data at a scale of 1:750,000. In 2000, the maximum average annual temperature for months was around 21.5°C in most parts of the region, while in the central part (large part of Mirzaabad district, northwestern part of Khavos district and eastern part of Sardoba district) it was 22°C and above. temperature was observed.

In 2005, the maximum average annual temperature of 21.5°C was observed in almost 95% of the region. It was around 22°C in the central regions of Mirzaabad district. The air temperature was 21°C in the northern (northern part of Syrdarya district), western (western edge of Aqoltin and

Sardoba districts) and southeastern (southeast of Khovos district) regions of the province.

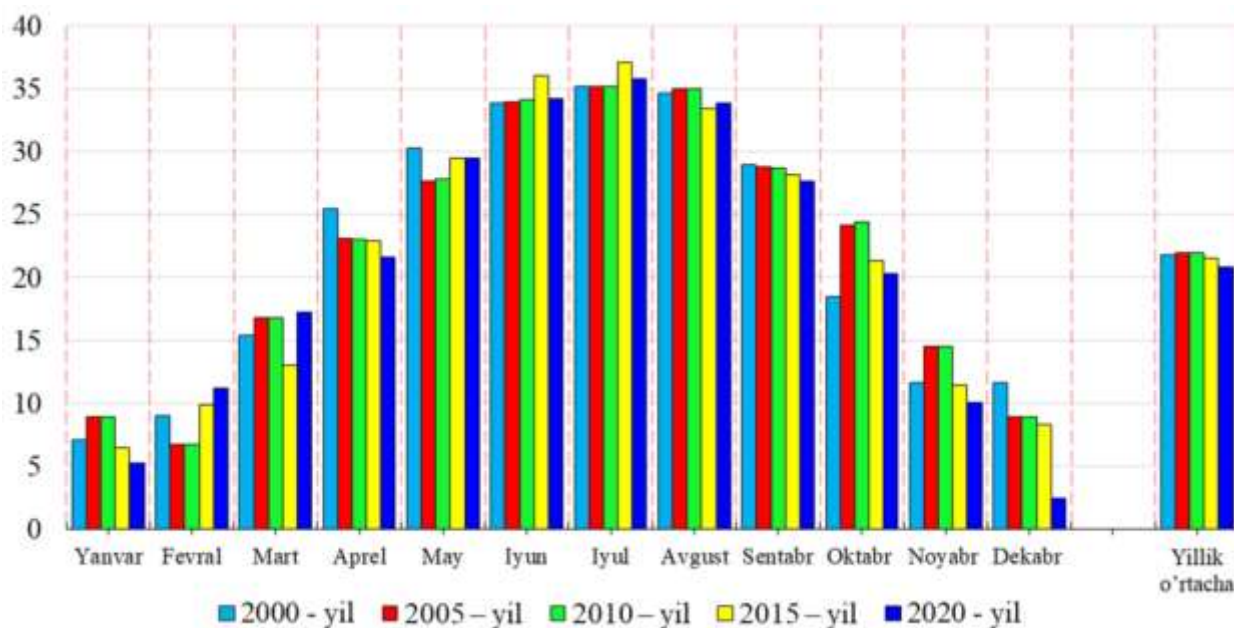
In 2010, the air temperature in the region increased relatively. The maximum annual temperature of 22°C was observed in most of the region. A temperature of 22.5-23°C was recorded in some places (40°15' N, 68°43' E in the southeast of Mirzaabad district). 21.5 in the northern large part of Syrdarya district and along the banks of Syrdarya, the northwestern quarter of Aqoltin district, the western edge of Sardoba district, the eastern and southeastern large parts of Khavos district, and the southern and southeastern parts of Boyovut district. °C air temperature observed.

In 2015, the air temperature in the region varied by geographical latitude. Importantly, it was 21°C in the northern and southern parts, while it was 21.5°C in the central latitude. That is, 40°20' N and 40°40' N (Sardoba, Mirzaabad, Gulistan districts, Gulistan and Yangiyer cities, southern half and eastern part of Aqoltin district, southern half of Saykhunabad district, south-south of Sirdarya district between the western edge, the northern half

of Boyovut district and the southwestern quarter and the western half of Khovos district) 21.5°C, 21°C was observed in other parts. Only in the southeastern part of Mirzaabad district (40° 22' N, 68° 44' E) air temperature of 22°C was recorded.

The lowest air temperature was observed in 2020 during the years of research in the territory of Syrdarya region. In the central part of the region (Mirzaabad and Gulistan districts, Gulistan and Yangiyer cities, the southern half of Saykhunabad district, the southern edge of Sirdarya district, the southeastern half of Aqoltin district, the eastern half of Sardoba district, the western half of Khavos district, the air temperature is 21°C. in other parts it was 20.5°C, in the south-eastern parts of the center of Mirzaabad district A temperature of 21.5°C was observed.

The main reason for the observed low temperature in 2020 compared to other years is the limitation or complete cessation of anthropogenic factors due to the introduction of quarantine due to the Covid-19 virus (see Figure 1).



**Figure 1.** Average monthly maximum air temperatures of Syrdarya region by year

The average minimum annual temperatures of Syrdarya region in 2000, 2005, 2010, 2015 and 2020 were compiled using QGIS software on a scale of 1:750000 using periodic 1-year data and geographical analysis was carried out for each period. This analysis differs from the average of maximum annual temperatures, where the temperature difference is taken to be 0.2 °C. Average minimum annual air temperature has increased from 9.2°C to 11°C in 2005, 2010, 2020 compared to 2000. In 2020, it decreased compared to 2005, 2010 and 2020.

In 2000, the average annual minimum temperature in the region varied from 10°C to 9.2°C from southeast to north and west. In particular, 10°C

in the city of Shirin, around Shirin and in the northwestern part of the Syrdarya district at 40° 50' N. and 40° 53' N. and 60° 42' N. and 60° 46' E was 9.8°C along the river. From the south-eastern part of the province to the north-west and north, the air temperature decreased by 9.6 degrees.

The administrative-territorial units that registered air temperature of 9.6°C in the region include: Gulistan and Yangiyer cities, the northern half and eastern part of Khavos district, a large part of Boyovut and Gulistan districts, the eastern half of Mirzaabad district, a small northeastern part of Aqoltin district. part, southwestern small part of Syrdaryo district and 40°48' N. and between 40° 56'

N, 68°38' E and 68°48' E, are the southeastern quarter of Saykhunabad District. In the northern, western and southern parts of Saykhunabad district, the air temperature was 9.4°C. This area includes all parts of Sirdarya, Saykhunabad, Boyovut, Mirzaabad and Khavos districts except for 9.6-9.8°C, the central part of Akholtin district and the eastern half of Sardoba district. The area where air temperature of 9.2°C was observed in the western part of Okoltin district and the western half of Sardoba district is considered h.

In 2005, the air temperature will decrease from 10.2 °C to 9.4 °C from the south-eastern edge of the region to the north and west. In particular, the air temperature of 10.2°C was recorded in the city of Shirin and its surroundings, the eastern edge of Khavos district, the southeastern edge of Boyovut district and the eastern part of the Sirdarya coast, the southeast of Mirzaabad district and the northern part of Khavos district bordering it. The air temperature of 10°C was observed in the part outside the 10.2°C area of Boyovut district, the northern part of Khavos district, the southeastern half of Mirzaabad district, the southern half of Gulistan district, and the cities of Gulistan and Yangiyer. South-western and western edge parts of Khavos district, north-western large part of Mirzaabad district, northern half of Gulistan district, a very large part of Saykhunabad district, eastern riverside area and southern part of Sirdarya district, The air temperature of 9.8°C was recorded in the eastern parts of Okoltin and Sardoba districts. Large parts of Sardoba and Aqoltin districts in the meridional direction from 68°15' N to the 9.8°C isotherm in the east, the central large part of Syrdarya district, the northwestern and eastern edge of Saykhunabad district. 9.6 °C isotherm is limited on the shores of Oyi. The air temperature of 9.4°C was recorded in the western part of Sardoba and Okoltin districts, in the northwestern part of Syrdaryo district.

In 2010, the annual average of the minimum air temperature in the region varied from 10.6°C to 9.8°C depending on the south-eastern and southern parts. The air temperature was 10.6 °C in the city of Shirin and its surroundings, the southeastern coastal part of Boyovut district and the southeast of Mirzaabad district at 40° 22' N, 68° 48' E. The eastern edge of Khavos district and the central area around the city of Yangiyer, the southeastern and southwestern parts of Yangiyer city, Boyovut district and the suburbs of Gulistan, the city of Gulistan, the southeastern edge of Gulistan district, the southeastern part of Mirzaabad district, and The air temperature around the city of Gulistan was recorded at 10.4°C. The central part in the eastern region of Khavos district, the southern and western parts, the areas outside the 10.4°C isotherm of Boyovut district, the southern part of Gulistan district, the northeastern part of Gulistan city (Ishanch neighborhood), the southeastern and eastern edge of

Mirzaabad district. regions and the northwestern part (between 68°30' and 68°34' E), the eastern part of Syrdaryo District The temperature was 10°C in the coastal small area (between 40°48' and 40°54' N and 68°41' and 68°46' E), in the remote eastern parts of Sardoba and Aqoltin districts. Saykhunabad district, the central and southern parts of Sirdarya district, all parts of Aqoltin district except for the 10°C isotherm, the rest of the western, central and northern areas of Mirzaabad district, the remote northwestern part of Khavos district, the very large eastern part of Sardoba district 9, An air temperature isotherm of 8°C was observed. A temperature of 9.6°C was recorded in the north-western part of Syrdaryo district and the western and south-western part of Sardoba district.

In 2015, just like the annual average of maximum temperatures, the annual average of minimum temperatures was much higher than in other years. The air temperature changed from 10.8°C to 10°C from the south-eastern and eastern coastal areas towards the surroundings. The air temperature of 10.8°C was recorded in the city of Shirin and its surroundings, the eastern edge of Khavos district, the small part of the southeastern and western borders of Boyovut district, and the southeastern edge of Mirzaabad district. The eastern and northern parts of Khavos district, the northern outskirts of Yangiyer city, the southeastern, western and eastern coastal areas of Boyovut district, the southeastern part of Mirzaabad district, the eastern part of Sirdarya district (40°52' and 40°55' N .k., between 68°43' and 68°45' east) the air temperature is 10.6 °C organized. The rest of the large part of Boyovut district, the southern part of Yangiyer city, the central, northern, eastern and western small parts of Khavos district, the city of Gulistan, the central large part of Mirzaabad district, the southern and eastern large part of Gulistan district, the eastern part of Sayhunabad district, Sirdarya district southern edge and eastern part (40° 48' and 40° 55' N and 68 °38' and 68°46' shq.uz. lar), the air temperature was 10.4°C in the eastern and southeastern part of the Oqoltin district, in the central, northeastern and southeastern parts of the Sardoba district. A large part of the western and northwestern part of the Khavos district, large parts of the north, central, western and southern and eastern regions of the Sardoba district, a very large part of the Aqoltin district, the southwestern and northeastern parts of the Mirzaabad district, the northwestern part of Gulistan district and the northern small part, the southern, central, western and eastern coastal areas of Saykhunabad district, the eastern part of Sirdarya district and the air temperature in the southern part was 10.2°C. The air temperature in the northern part of Saykhunabad district, the northern, central and western part of Sirdarya district, the northwestern edge of Aqoltin district and the southwestern edge of Sardoba district is limited by the 10°C isotherm.

According to the sources, in 2020, the average minimum annual temperatures in the region will decrease from the southeast to the surroundings, especially to the northwest. The maximum air temperature was 10°C in the southeastern part, and 9.2°C in the extreme north. The areas where the air temperature is 10°C are the cities of Shirin, Yangiyer, Gulistan and their surroundings, the far eastern part of Khavos district and the suburbs of Yangiyer city, the southeastern, southwestern and northwestern regions of Boyovut district, the southeastern part of Mirzaabad district. (Yangiyer suburbs) and eastern (Gulistan suburbs) parts are included. The air temperature was 9.8 °C in the remaining areas of Boyovut district, the eastern and northern parts of Khavos district, the southwestern part of Gulistan district, and the southeastern and eastern parts of Mirzaabad district. Central, north-western and western parts of Khavos district, southern, central and northern large areas of Mirzaabad district, southern and central areas of Gulistan district, southern and south-eastern small part of Saykhunabad district, south-western and eastern part (40°50' and 40°55' N and 68°42' and 68°46' E range), an isotherm of 9.6 °C was formed in the eastern part of Sardoba district and the eastern edge of Okoltin district. The air temperature is 9.4 in the south-western part of Khavos district, the south-western part of Mirzaabad district, the rest of Sardoba, Aqoltin, Saykhunabad districts, the northern part of Gulistan district, the central, southern and southeastern parts of Sirdarya district. recorded °C. An isotherm with an air temperature of 9.2°C was formed only in the northwestern part of the Syrdarya district [4].

### Conclusion.

Maximum average monthly and annual temperatures were obtained as there were no significant changes in average temperatures in Syrdarya region between 2000 and 2020. Based on this data, the state and dynamics of air temperature in 2000, 2005, 2010, 2015 and 2020 were developed. Based on the processed data, a 1:750000 scale map was created and analyzed as follows:

✓ Due to the lack of differences in the relief of the regional territory, the composition of almost the same landscape, and the lack of temperature-influencing biomass, the dynamics of temperature changes were developed in the section of the average indicator of the months of the period;

✓ maximum average annual temperatures were taken from 0.5°C, minimum average annual temperatures from 0.2°C for regional differences;

✓ the maximum annual temperature in 2010 was 22°C in most of the region, and in 2020 the temperature was up to 21°C in the region;

✓ the minimum annual temperature isotherm was determined from 9.4°C in a large part of the region in 2000 to 10.4°C in the main part of the region in 2015;

✓ In the study periods (2000, 2005, 2010, 2015 and 2020), it was found that the introduction of quarantine due to the Covid-19 virus in 2020 had a drastic effect on climate change in the maximum and minimum temperatures;

✓ It was also found that local factors (Bekobad wind, Sirdarya, Sardoba reservoir) had a great influence on the difference in air temperature, despite the fact that the Syrdarya region consists mainly of a flat landscape.

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