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O 6. MODERN DISTRIBUTION FEATURES OF THE MULTI-YEAR TEMPERATURE REGIME IN AZERBAIJAN LAND

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ABSTRACT: The distribution of temperature regime in the territory of the Republic of Azerbaijan in 1961-2016 was studied, observation data of hydrometeorological stations operating in this period were used in this research study. As a result of mathematical, statistical and cartographic analysis, it has been again clarified that the temperature regime of the republic varies from north to south and from the plains to the highlands. In addition, multi-year average and seasonal indicators of temperature in different regions of the country were determined. The stations used in the analysis are located in the range of -25 ÷ 2218 m. In higher areas the determination of the abovementioned quantity is based on the variation of the vertical gradient. The study shows that the maximum values of the perennial average temperature are observed in the Kur-Araz plain in the range of 14.6-15.4 ^{0}C. The average perennial temperature decreases at higher elevations. The results of the study can be used in future research on climate regime and change, agriculture, tourism and the creation of other large-scale industries in the region.

Keywords*: Hypsometric features, transformation, convergence, climate types, climate change, interpolation, correlation, variation*

INTRODUCTION

It is known that the formation of the Earth's climate regime begins with the uneven heating of the Earth's surface by rays from the sun. On an uneven surface, all climatic parameters, including key elements and manifestations such as the pressure, the wind, the evaporation, and the precipitation, are distributed completely differently. [1,7,24]. Therefore, the climate regime is observed in different regions of the planet with different characteristics. Each region is characterized by its own climate. The physical-geographical position, the hypsometric features, the complexity of the relief of the territory of Azerbaijan Republic, located in the South Caucasus region, have led to the diversity of climatic regimes [1,2]. Therefore, 8 climate types out of 11, identified by V.P. Keppe exist in the territory of the republic [4,7].

The complexity of the relief and its location on the shores of the Caspian Sea, with a difference on 4494 m between the highest peak (Bazarduzu, 4466 m) and the lowest point (Caspian lowland, -28 m), play a key role in the formation of diversifying in the distribution of the climate [1,13]. Scientists such as A.M.Shikhlinsky, A.A.Madatzade, A.M.Eyyubov, G.A.Hajiyev, A.S.Mammadov, S.A.Safarov, S.H.Safarov, R.N.Mahmudov, N.Sh.Huseynov and others have been engaged in the research of the temperature regime in the territory of the republic [2, 8, 9, 13].

Nowadays, global climate changes, which is observing all over the Earth, is affecting the climate regime of all regions. The growing of climate change affects, time ranges of observations year by year makes necessary the conducting of new research in this area. Also, previous studies did not include a comprehensive research of the multi-annual temperature regime of the region.

MATERIAL AND METHOD

Generally, in the research work there has been used data from 58 hydrometeorological stations, functioning in Azerbaijan. The used observation data cover 34 main stations, which is covering 1961-2016 y.y., in particular, the 55-56-year observation ranges. Other station data are from different periods and have been used for general clarifications of neighboring stations.

By the method of mathematical averaging of the temperature observation data there has been obtained the temperature of mean monthly, seasonal and multi-year indicators. At the same time, the mean quantities of temperature fluctuations in 1991-2016 y.y. compared to 1961-1990 y.y. have been found.

The variation, the intra-row correlation, the asymmetry coefficient, standard deviation, and statistical significance of ranges have been tested by Fisher and Student criteria [6]. In statistical analysis, the coefficients of the variation, the asymmetry, and the inter-row correlation of ranges have been determined with the help of SBSS, Stokstat programs. Tables, histograms and graphs from the obtained results have been developed in Microsoft Excell and the electronic map in the ArcGIS software.
The purpose of the work. The purpose of the research is to determine the distribution of the temperature regime in the territory of Azerbaijan over 1961-2016 y.y., to redefine the characteristics of vertical and horizontal zoning, also the clarification of the impact of global climate change on the mean temperature in 1991-2016 y.y. compared to 1961-1990 y.y. At the same time, the attention is paid to the impact of global climate indices on the region over multi-annual period. On mapping the results, certain regularities in the distribution of the mean annual temperature over the area are investigated.
Discussion of the research. Statistical clarifications have been made to verify the statistical significance of the observation data used over the analysis. The identified results are given in the table below (Table 1).
The mean square inclination, which characterizes the variability of the ranges, characterizes the spread or disintegration of a given ranges around the mathematical expectation (mean value) in the change of the parameter depending on the time [21]. The standard deviation of the analyzed ranges is around 0.65-0.97, which indicates the conformity to the reality of our observational data.

RESEARCH FINDINGS

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The variation has been used to clarify the difference between the mean values for the two periods (1961-1990 y.y. , 1991-2016 y.y.) over the 55-56 years under consideration [22]. As it can be seen from the table, the coefficient of the variation has been ranged from 0.01 to 0.17.
The statistical ranges are symmetric when the positive and negative values of the inclination of its members from the mean number have the same repetition (frequency). However, the ranges of hydrometeorological quantities are asymmetric [22]. The asymmetry coefficient of the ranges used has been distributed around -0.38 ÷ 0.39
Over the calculation of the internal correlation, the ranges for 1961-2016 y.y. has been divided into two equal parts and positive or negative correlations of the repetition of the limits have been revealed. The internal correlation has been found around 0.03 ÷ 0.54, and it indicates that the correlation between the two ranges is less.

Table 1. Statistical indicators of mean annual temperature of hydrometeorological stations for 1961-2016 y.y.

№	Station	n	S	C_v	C_s	r	t_0, ^{0}C	A,^{0}C	5%	
									Fisher	Student
1	Khachmaz	56	0,73	0,06	0,06	0,5	12,8	0,7	+	-
2	Guba	56	0,83	0,09	0,21	0,38	10,6	1.0	+	-
3	Kiriz	56	0,83	0,17	0,39	0,24	5,0	0,8	+	-
4	Altiaghaj	56	0,89	0,01	0,19	0,34	8,9	0,7	+	-

5	Baku	56	0,65	0,06	0,20	0,04	14,8	0,2	+	+
6	Sumgayıt	55	0,72	0,05	-0,10	0,18	14,6	0,6	+	-
7	Mashtagha	55	0,82	0,06	-0,10	0,41	14,4	0,8	+	-
8	Pirallahi	56	0,77	0,05	-0,14	0,47	14,7	0,7	+	-
9	Chilov	56	0,77	0,05	0,01	0,22	14,7	0,6	+	-
10	Neft Dashlari	56	0,69	0,05	0,02	0,46	14,8	0,6	+	-
11	Zagatala	56	0,84	0,07	0,11	0,34	13,2	0,8	+	-
12	Sheki	56	0,85	0,07	0,05	0,34	12,5	0,8	+	-
13	Gabala	56	0,95	0,08	0,11	0,54	11,6	1,1	+	-
14	Shemakha	56	0,89	0,08	0,27	0,1	11,4	-0,1	+	-
15	Maraza	56	0,8	0,07	-0,14	0,42	11,0	0,7	+	-
16	Mingechevir	56	0,83	0,06	0,09	0,41	15,4	0,7	+	-
17	Yevlakh	55	0,76	0,05	-0,07	0,27	15,2	0,6	+	-
18	Goychay	56	0,8	0,06	-0,21	0,48	15,0	0,9	+	-
19	Kurdemir	55	0,84	0,06	-0,1	0,4	15,3	0,9	+	-
20	Zerdab	55	0,80	0,06	-0,32	0,34	15,2	0,8	+	-
21	Beylegan	55	0,75	0,07	0,33	0,32	14,6	0,7	+	-
22	Jafarkhan	56	0,70	0,05	0,05	0,28	14,7	0,6	+	-
23	Hajigabul	55	0,77	0,05	-0,2	0,29	15,4	0,7	+	-
24	Bilesuvar	55	0,76	0,05	0,01	0,3	14,9	0,6	+	-
25	Neftchala	55	0,81	0,07	0,36	0,36	15,1	0,6	+	-
26	Lenkeran	56	0,77	0,06	-0,34	0,39	14,5	0,8	+	-
27	Yardımli	56	0,69	0,06	-0,06	0,22	12,1	0,1	+	+
28	Aghstafa	56	0,83	0,07	0,24	0,37	13,0	0,8	+	-
29	Gedebey	56	0,81	0,11	0,4	0,23	8,1	0,6	+	-
30	Shemkir	55	0,74	0,05	0,04	0,44	14,2	0,8	+	-
31	Ganja	55	0,70	0,06	0,13	0,48	13,8	0,9	+	-
32	Nakhchivan	56	0,96	0,08	-0,38	0,29	12,6	0,7	+	-
33	Ordubad	56	0,97	0,07	-0,23	0,31	13,8	0,6	+	-
34	Shahbuz	55	0,92	0,08	0,12	0,03	11,7	0,4	+	+

n- number of ranges (years); S- mean square inclination; Cv- variation; Cs - asymmetry coefficient; r- autocorrelation; t_0- mean annual temperature; A- temperature anomaly in 1991-2016 y.y. compared to 1961-1990 y.y. ;

In the research there have been determine variabilities of the mean temperature in 1991-2016 y.y. compared to 1961-1990 y.y. The results show that the temperature in the country increased averagely 0.7 0C in 1991-2016 y.y. This quantity is between -0.1 0C and 1.1 0C at other stations. However, there is the low indicator in Shamakhi (-0.1 0C) and Yardimli (0.1 0C) stations, and we believe there are technical failures and non-professional measurements for many years.

The statistical significance of the ranges has been tested with a 5% and 10% assurance of the Fisher and Student criteria [6]. The statistical significance of Fisher's clarification gives a positive result at all stations. But in the Student criteria, negative results have been obtained at other stations than Baku, Yardimli and Shahbuz stations.

One of the main local reasons for the different distribution of climate regimes in the country is the hypsometric features of the relief. The complex orography of the country's territory plays a key role in

the formation of the climate, the temperature regime of the air, as well as local air circulation (mountains-valleys, black-and-white winds, breezes, etc.) [9,11].

The mitigating effects of the Caspian Sea can always be felt in the coastal regions of the Republic of Azerbaijan. Thus, the sea in the coastal plains, islands and peninsulas softens the harsh characteristics of air masses from the north (cold), east (hot, dusty) and south (hot, dry) over the year. The above reasons cause both horizontal and vertical changes in temperature in the country.

The absolute heights of the stations used in the research are listed in the table (table 2). Stations belonging to natural regions are also indicated in parentheses. As can be seen from the table, Pirallahi (-25 m) is the lowest and Paragachay (2218 m) is the highest stations above the sea level compared to other stations.

On the north-eastern slope of the Greater Caucasus region (Khachmaz, Altiaghaj, Khaltan, Guba, Khinalig, Giriz) in 1961-2016 y.y., the mean annual temperature decreases from 12.8 0C (Khachmaz) to -5.0 0C (Kyrgyz) from the coastal plains to the mountain lands (table 1). Multi-annual temperature values are already reached below 0 0C in areas with glaciers and permafrost over the year (3000-3100 m). However, in the extensive research conducted by A.A. Madatzade and A.M.Shikhlinsky before us (1968), the mean annual temperature has been set at 12.2-4.7 0C for this area.

The mean seasonal distribution of the temperature is also different here. Thus, in winter it is 3.0 0C in the coastal plains, 0.4 0C in the lowlands (500-600 m), -0.8 0C in the 1000-1100 m zone of the middle mountain range, -3.4 0C at the height of 2000-2100 m. In the spring, it has been 10.6 0C at the coast, 9.4 0C in the lowlands, 8.0 0C in the middle mountain range of 1000-1100 m, 4.0-4.5 0C at the height of 2000-2100 m, and below 00C at the height of 2700-2800 m. In autumn, the mean seasonal temperature decreases to 13.9-14.4 0C, accordingly to 11.4 0C, 9.6 0C, 6.2-6.5 0C, and but above 3100-3200 m it consists of below 0 0C.

On the southern slope of the Greater Caucasus natural region (Alibey, Zagatala, Sheki, Oguz, Gabala, Shamakhi, Maraza) there are slightly different temperature regimes. Starting from the middle mountains (450-500 m) to the altitude of 1500-1600 m, the mean annual temperature decreases in the range of 13.2 0C (Zagatala) -6.3 0C (Alibey). It is likely that it receives values below 0 0C at an altitude of 2400-2500 m in accordance with the vertical change of the temperature (0.65 0C /100 m) (table 2). These indicators are observed between 12.5 0C and 5.7 0C in A.M.Shikhlinsky's research work.

On the southern slope of the Great Caucasus, it decreases to 1-3 0C in the foothill from 450 m to 700 m in the winter, and to 0.8 0C (0.5-1.0 0C) at 750-800 m at the south-eastern end. Already in the middle mountain lands, at an altitude of 1500-1600 m, this quantity is equal to -2.3 0C for the winter season (table 1). For the spring season, these values have been 13.9 0C, 12.3 0C, 11.1 0C, 9.6 0C, 4.7 0C and 26.0 0C, 23.6 0C, 22.8 0C, 22.3 0C, 15.3 0C, respectively. Also, in autumn it has been 15.8 0C, 14.0 0C, 13.1 0C, 11.6 0C, 7.4 0C.

The Absheron waters of the south-eastern end of the Great Caucasus region covers the peninsula of the same name (Sumgayit, Baku, Mashtagha, Alat) and several small islands (Pirallahi, Chilov, Neft Dashlari).

Due to the lack of large relief forms in the water area, strong winds sometimes have a speed of 25-30 m / s. Over this period, accidents occur in the infrastructure, farms, especially on platforms, built for the oil production [3,12].

The mean multi-annual temperature in the territory of the peninsula in 1961-2016 y.y. has been 14.7 0C (14.6-15.0 0C). These indicators are higher than those of A.M.Shikhlinsky (Baku, 14.2 0C).

The homogeneous of the relief does not enable the distribution of the vertical temperature gradient, and is characterized by 5-6 0C in winter, 11.3-12.3 0C in spring, 24-25 0C in summer and 16.4-17.2 0C in autumn. The sea area is 1.0 0C warmer in winter than in land, and 1-2 0C mild in summer. Temperatures continue to rise to the south of the province.

Table 2. Annual tendency of the temperature at hydrometeorological stations

Station	Period	H,m	To	Tos	Winter	Spring	Summer	Autumn
Khachmaz	1961-2016	27	12.8	12.2	2.8	10.9	23.6	13.9
Guba	1961-2016	550	10.6	9.8	0.4	9.4	21.4	11.4
Kırız	1961-2016	2071	5.0	4.7	-3.5	4.0	13.3	6.2
Altıaghac	1961-2016	1099	8.9	8.1	-0.3	8.0	18.3	9.7

Khınalıg	1991-2016	2049	5.5	-	-3.3	4.5	14.2	6.5
Khaltan	1991-2016	1104	8.8	-	-1.3	8.0	18.9	9.6
Baku	1961-2016	2	14.8	14.2	5.2	12.4	25.2	16.4
Sumgayıt	1961-2016	-20	14.6	-	5.1	12.1	24.8	16.3
Mashtagha	1961-2016	27	14.4	-	5.0	11.8	24.6	16.1
Pirallahı	1961-2016	-25	14.7	-	5.6	11.6	24.6	16.9
Chilov	1961-2016	-17	14.7	-	6.0	11.2	24.3	17.2
Neft Dashları	1961-2016	-17	14.8	-	6.7	11.0	23.8	17.6
Alat	1961-2016	-18	15.0	-	5.1	12.7	25.6	16.6
Zagatala	1961-2016	487	13.2	12.5	2.9	12.3	23.6	14.0
Sheki	1961-2016	639	12.5	-	2.5	11.4	22.9	13.3
Gabala	1961-2016	679	11.6	-	1.2	10.4	22.2	12.6
Oghuz	1961-2016	582	12.6	-	2.3	11.4	23.2	13.4
Alibey	1961-2016	1540	6.3	5.7	-2.3	4.7	15.3	7.4
Maraza	1961-2016	775	11.0	10.1	0.5	9.4	22.1	11.8
Shamaxı	1961-2016	750	11.1	11	1.0	9.8	22.4	11.4
Mingechevir	1961-2016	93	15.4	14.8	4.8	13.7	26.5	16.5
Yevlakh	1961-2016	13	15.2	-	4.0	14.3	26.6	15.9
Goychay	1961-2016	107	15.0	-	4.2	13.9	26.0	15.8
Kurdemir	1961-2016	2	15.3	14.5	3.9	14.1	27.0	16.3
Zerdab	1961-2016	-5	15.2	-	4.2	14.1	26.3	16.0
Beylegan	1961-2016	62	14.6	-	3.9	13.5	25.6	15.4
Jafarkhan	1961-2016	-16	14.7	-	3.9	13.4	25.6	15.8
Hajıgabul	1961-2016	-7	15.4	-	4.2	13.9	26.9	16.5
Bilesuvar	1961-2016	75	14.9	-	4.5	13.4	25.7	16.1
İmişli	1961-2016	-1	15.0	-	4.2	13.9	26.0	16.0
Salyan	1961-2016	-21	15.1	14.6	4.7	13.5	25.8	16.3
Neftchala	1961-2016	-24	15.1	-	5.4	13.0	25.2	16.8
Goytepe	1961-2016	2	14.8	-	4.7	13.0	25.3	16.1
Lenkaran	1961-2016	-20	14.5	14.1	5.0	12.7	24.3	15.9
Yardımlı	1961-2016	730	12.1	-	3.0	10.8	21.6	13.0
Lerik	1961-2016	1115	9.9	9.8	1.8	8.8	18.3	11.1
Kelvez	1992-2016	1567	8.8	-	-0.6	8.1	17.9	9.9
Astara	1961-2016	-23	15.0	-	6.2	12.8	24.5	16.6
Gedebey	1961-2016	1480	8.1	7.4	-1.0	7.0	17.0	9.3
Ganja	1961-2016	312	13.8	13.1	3.5	12.8	24.5	14.6
Aghstafa	1961-2016	331	13.0	-	2.2	12.1	23.8	13.9
Dashkesen	1961-2016	1655	7.4	6	-1.2	6.0	16.3	8.6
Shemkir	1961-2016	404	14.2	-	3.6	13.3	24.8	15.0
Jeyranchol	1961-2016	419	13.1	-	2.2	12.1	24.2	13.9
Nakhchıvan	1961-2016	875	12.6	12.9	-0.9	12.2	25.2	14.1
Sherur	1961-2016	812	12.5	-	-1.1	12.4	24.8	13.9
Shahbuz	1961-2016	1205	11.7	11.2	-1.3	10.9	24.0	13.2
Ordubad	1961-2016	861	13.8	11.6	1.0	13.3	25.5	15.2
Paraghachay	1992-2016	2218	6.9	-	-4.3	5.1	17.7	9.0

H-absolute height of the station; To-multi-annual mean temperature; Tos- A.M.Shikhlinsky's research results (1968).

Because the Kura mountain depression is surrounded by the physical and geographical region (Jeyranchol, Goychay, Mingachevir, Yevlakh, Kurdamir, Zardab, Imishli, Beylagan, Jafarkhan, Hajigabul, Neftchala, Salyan) from the north-east and south-west to the Great and Little Caucasus Mountains the influence of air masses from Iranian plateau from south, from the Caspian Sea from the

southeast and the Jeyranchol plain from the northwest dominates. Humid air masses formed on the sea cannot penetrate the lowlands, although they affect the coastal areas [5].

The region is in the north-western highlands (Jeyranchol, 400-450 m) and the multi-annual mean temperature is 13.1 0C. The mean annual temperature at all stations of the Kur-Araz lowland over 1961-2016 y.y. has been 15.0 0C (14.6-15.4 0C). While the quantities calculated by A.M.Shikhlinsky for these areas (Salyan, Kurdamir, Mingachevir) have been 14.6 0C (14.6-14.80C), now this indicator has increased on 0.3 0C.

In Kur-Araz intermountain depression in winter, it is 2.2 0C in Jeyranchol plain, 12.1 0C in spring, 24.2 0C in summer, 13.9 0C in autumn, it has been observed in the range of 4-50C in winter, 13.3-13.80C in spring and 25.6-26.20C in all parts of Kura-Araz lowland, 15.9-16.40C in autumn. Seasonal estimates show that the maximum temperature is higher in the coastal areas for the winter, in the west of the province, in the central parts in the summer, and in the western and coastal parts in the autumn.

The multi-annual (1961-2016 y.y.) mean temperature of the Little Caucasus mountainous region (Aghstafa, Dashkasan, Gadabay, Shamkir, Ganja, Aghdam), located in the west of the Kura basin, is in the range of 130C-7.40C in the west from lowland (300-400 m) to medium highland (1450-1650 m). Considering the vertical gradient, at an altitude of about 2,900 m, this quantity is below 00C. In the research of A.M.Shikhlinsky, the mean temperature for these areas (Ganja, Gadabay, Dashkasan) is changed in the range of 6.0-13.10C. This is at least 0.70C lower than the current values.

Also, in this part of the region, it rises to 2.20C in winter at an altitude of 300-400 m, and to 3.50C in the east at the same altitude near the Kur-Araz lowland. Also, at an altitude of 1450-1650 m, this quantity decreases to -1.10C. In spring it varies between 13.00C, 14.00C, 6-70C, respectively. For summer, it decreases to 24-250C in all parts of the low mountain lands and 16-170C in the middle mountain. In autumn, it is 14-150C in the lowlands and 8.5-9.30C in the middle mountains.

In the eastern and south-eastern part of the Little Caucasus, the influence of hot and dry air masses from the south is felt over the year [4,12]. The mean annual temperature in the low mountain lands (150-200 m) is 14.50C (Tartar, 160 m), 150C in the southern part of the Araz region (Mincevan, 200 m), 130C in the low mountain lands (Aghdam 378 m, Fizuli 439 m), 120C in the lower parts of the middle mountains. (Khankendi, 827 m), as well as in the upper part of the middle mountain (Lachin, 1152 m) around 110C. The mean temperature for winter in the east and south-east of the region is 4.60C in the Arazboyu plain (100-200 m), 2.5-3.30C for the 350-450 m zone, 1-20C for the 800-850 m area, 10C for 1100-1200 m altitude. 10C. In spring, 13-140C in Arazboyu plain, 11.6-12.30C in the lowlands, 100C in the highlands of 800-850 m in the middle mountains, and 90C at 1100-1200 m. Summer is around 250C, 240C, 210C, 200C, respectively. In autumn, it decreases to around 150C, 14-14.50C, 12.30C, 11.70C. At an altitude of 3000 m, which is a permafrost zone of the Little Caucasus, the temperature is below 00C in all seasons.

In the west of the country there is Nakhchivan (Middle Araz) region (Nakhchivan, Sharur, Ordubad, Shahbuz, Paragachay), which has a complex hypsometry from the plains of the Araz (600 m) to the highest peak of the Zangazur-Daralayaz range of the Little Caucasus Mountains (Gapijig, 3904 m). The area surrounded by mountains plays a key role in the distribution of high-amplitude temperatures along the slopes of Arazboyu plain. In these areas with a continental climate, the country's maximum (+ 460C) and minimum (-440C) temperatures have been recorded in Julfa. The mean annual temperature in the Arazboyu plains in 1961-2016 y.y. has been 12-140C. In the highland zones of the middle mountain (2100-2200 m), this value decreases to 70C. The multi-annual mean temperature starts at an altitude of 3300 m and gets below 00C, where there is a permafrost zone here. According to A.M.Shikhlinsky (Nakhchivan, Ordubad, Shahbuz), while this is in the range of 12.20C in the Arazboyu and middle mountains now, it has now risen to 12.70C in those regions.

The mean seasonal temperature in the region varies between -0.9-1.00C in Arazboyu in winter, -1.3 - (-4.50C) in the middle mountains (1200-2200 m). Although it is 12.30C -13.30C in Arazboyu in spring, it decreases from 110C to -50C in the middle mountains. In summer, it decreases to 25-260C in Arazboyu and 180C at 2200-2300 m in the middle mountains. Only in summer, in July and August, short-term temperatures in the high mountain lands are higher than 00C, but the daily high temperature anomaly does not allow large-scale melting of the frost zone. In autumn, it is 14-15.20C in Arazboyu, 13.20C at 1200 m altitude in the middle mountains, 90C at 2100-2200 m altitude.

One of the regions of the Republic of Azerbaijan distinguished by the different climatic features is Lankaran natural region (Goytapa, Lankaran, Astara, Yardimli, Lerik, Kelvaz). The Talysh mountain

ranges (Talysh, Peshtasar and Burovar), located to the west of the wide plains on the shores of the Caspian Sea, do not allow to pass the range of moist air masses, evaporating from the sea [10,11,12]. For this reason, the type of climate on the rainfall is evenly distributed has been widespread in the area. The mean multi-annual temperature decreases from 15.10C to 8.80C from the coastal plains to the altitude of 1500-1600 m highlands. There is no permafrost zone in the Talysh mountains, and the temperature here is above 00C all year round, except for the winter months. A.M.Shikhlinsky showed that the mean annual temperature for these areas (Lerik, Lankaran) has been 12.00C, while in 1961-2016 y.y. it has been 12.20C.

In Lankaran region, the temperature has been 4.5-6.20C in winter in the coastal lowland. It is around 30C in the lower part of the middle mountain (700-800 m), 1.80C in the middle part (1100-1200 m) and -1.00C in the upper part (1500-1600 m). In the spring it has been 12.7-13.00C, 10.80C, 8.80C, 80C respectively. In the summer months it varies around 24.3-25.30C, 21.60C, 18.30C, 180C, respectively. It is in the range of 15.9-16.60C, and 130C, 110C, 100C in autumn.

Changes in the mean annual temperature of several hydrometeorological stations with synchronous operation in the territory of the republic over 1961-2016 y.y. are given (Figure 1). If we pay attention, we can say that all stations change with the same trajectory. It can also be observed that over the multi-annual, the mean temperature in 1964, 1969, 1972, 1976, 1982, 1993, 2004, 2011 has been colder, and in 1966, 1971, 1995, 1998, and 2010, the mean temperature has been warmer than the multi-annual changes. From the trend curve, there has been an increase in the mean indicators of the temperature at all stations for multi-annual. Such growth has been sharp since the early 1990s (Figure 1). Over the research, there has been analysed that of which global circulation is most affected by the temperature quantities, observed in the territory of Azerbaijan in 1961-2016 y.y. [16,17, 18, 25, 26].

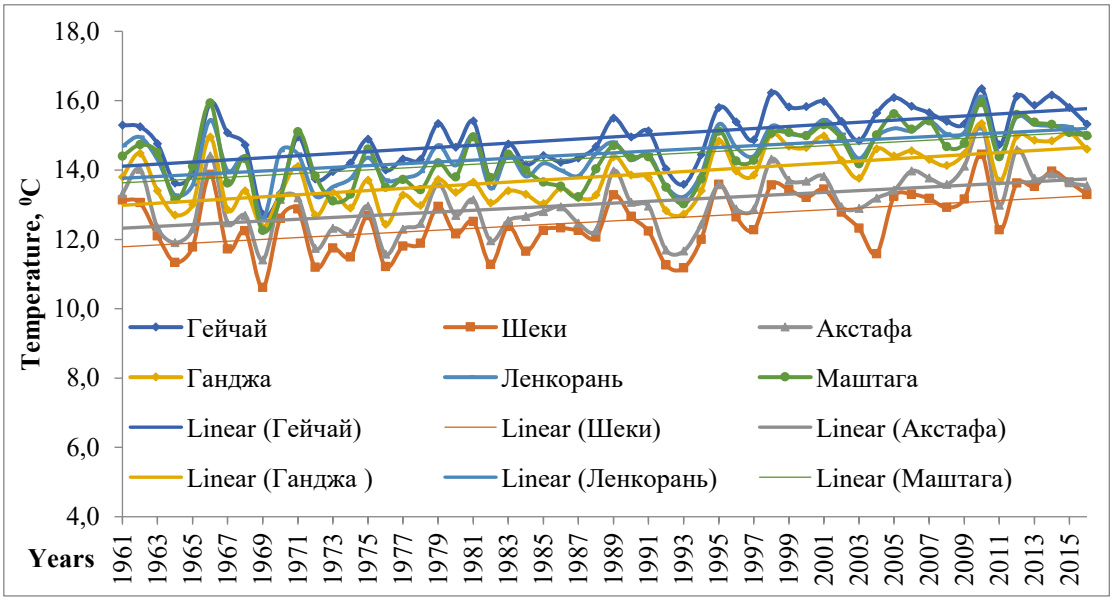

Figure 1. The variation of multi-annual mean temperature indicators

For this purpose, the 5-year polynomial of the West Russian / East Atlantic (east Atlantic / west Russian-EA / WR), Scandinavian (scandinavia pattern-SP), East Atlantic (east atlanti-EAP) and East Atlantic oscillation-EAO indices trends have been used [13,14,15,26].

The multi-annual temperature fluctuations of 1961-1965 y.y. have been mainly influenced by the West Russian and East Atlantic earthquakes. From 1963 to 1984, the Scandinavian indices, and again from 1984 to 2014, the West Russian and East Atlantic indices are dominated the country. In 2014-2016 y.y., the effects of the East Atlantic earthquake are dominated. The interdependence of these quantities has been tested by the correlation and regression analyses [20]. The correlation value between the global indices and the mean annual temperature of the analysed stations is higher than -0.7. In the analysis of the regression model, the quantities p and F do not exceed the critical values. The determination coefficient R satisfies the condition of the accepted quality model. The analysis shows that the country's climate, especially the temperature regime, varies depending on global earthquakes. It is no coincidence

that in 1991-2016, a temperature increases of 0.7-0.80C has been observed in the country. And it correspond to global warming indicators

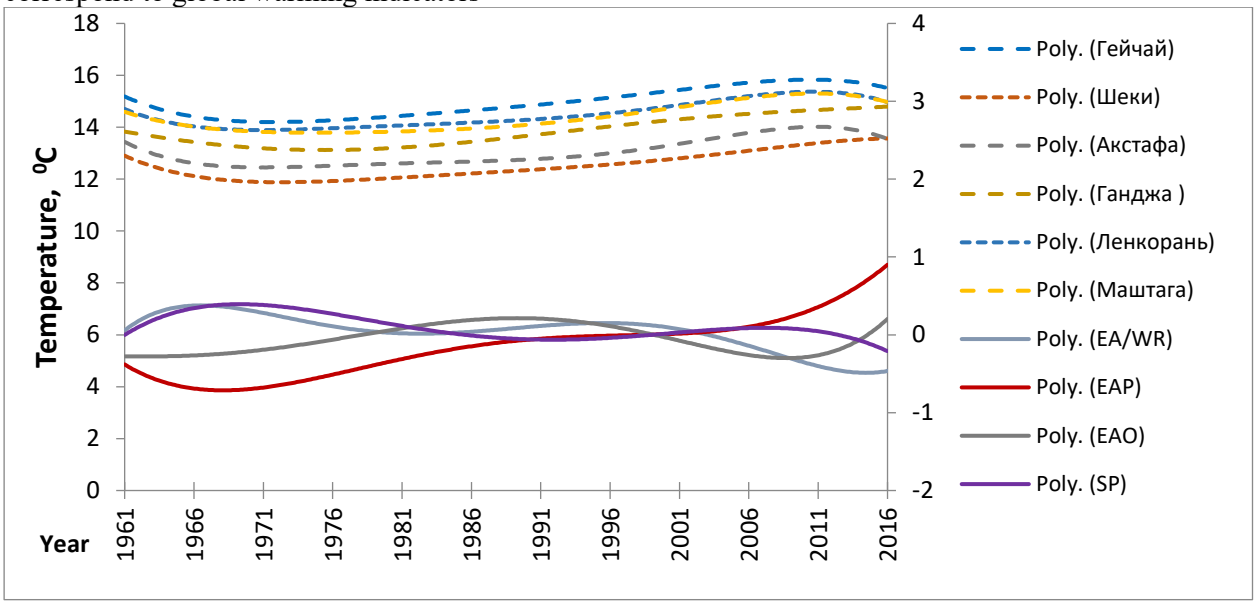

Figure 2. The polynomial variation of mean multi-annual temperature and global indices

The distribution of the mean multi-annual temperature indicators in the research is given by the electronic cartographic presentation (Figure 3).

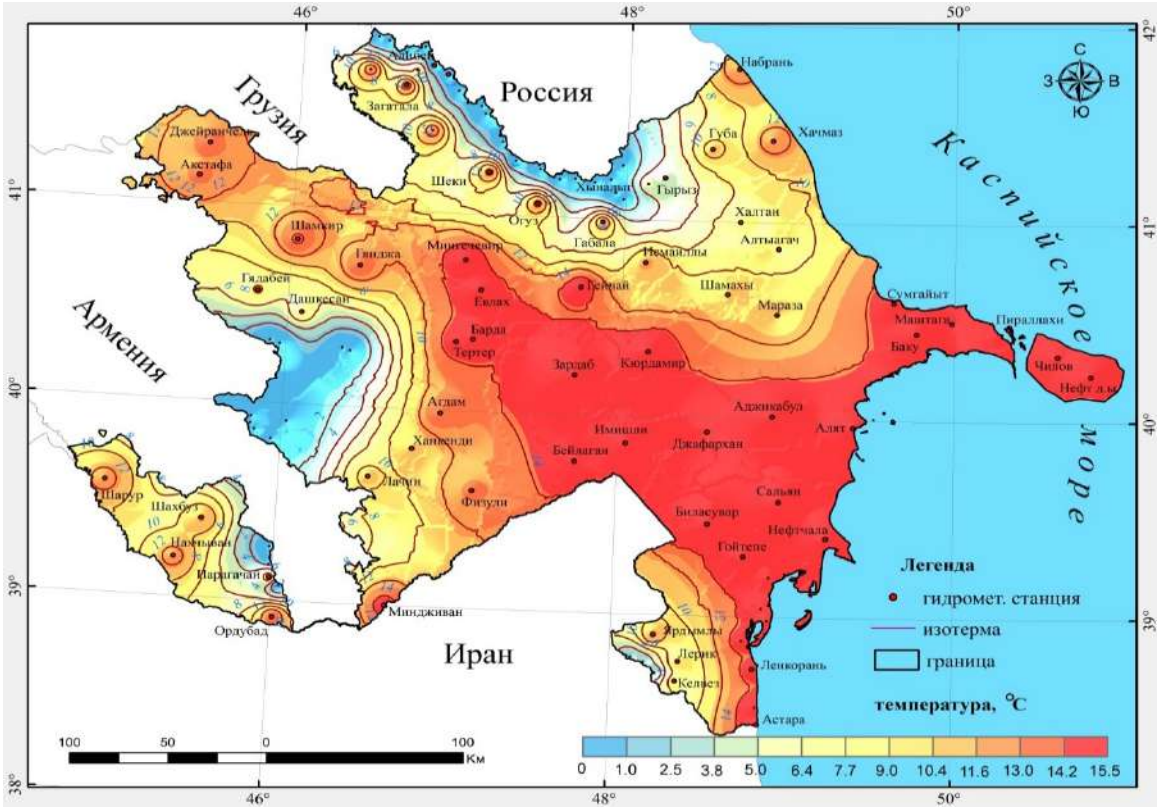

Figure 3. Mean annual temperature indicators for 1961-2016 y.y.

The presentation has been illustrated on using an empirical model of the interpolation in ArcGIS. As can be seen from the description, higher temperature quantities of the republic can be found in the Absheron Peninsula, coastal plains, Kur-Araz lowland and Jeyranchol plain, as well as in the Arazboyu

of the Nakhchivan Autonomous Republic. From north to south, the temperature rises even more, and there is also a decrease in the distribution of the temperature regime as it rises.

CONCLUSIONS AND DISCUSSION

There have been obtained a number of results over the research of the distribution of mean multi-temperature values in the territory of the Republic of Azerbaijan in 1961-2016 y.y. The results of the analysis are presented as follows:
1. There is an increase in the mean annual temperature trend in the country for the whole 55-year period from 1961 to 2016 y.
2. Based on previous research, the mean annual temperature in 1991-2016 y.y. increased by 0.7-0.80C compared to 1961-1990 y.y.
3. Over the year the sea has a 1-20C temperate effect (warm in winter, mild in summer) in coastal areas compared to other regions of the country, and the annual temperature amplitude in such areas is lower than in other areas.
4. The highest mean temperature in the country has been 15.0-15.40C in Kur-Araz lowland, Arazboyu, south of Lankaran province.
5. In 1961-2016 y.y., the territory of Azerbaijan has been mainly affected by global climate indices such as the western Russian / eastern Atlantic (west Russian / east Atlantic) and the Scandinavian pattern.
The results obtained over the climate research can be used in the future formation of the economy in the country. In areas with high temperatures, global warming will accelerate its effects, and vulnerabilities such as salinization, erosion, and low groundwater levels will appear in these areas. In the middle and high mountainous areas, the annual amplitude is expected to increase. Breeze effects weak in coastal areas and the precipitation at sea continues to decline. Due to the harsh climate, it may be recommended to cultivate livestock and plant species that will withstand extreme temperatures in areas dominated by the agro-industry.

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