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Tourism Climate Index in Some Localities of Georgia and North Caucasus (Russia)

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ABSTRACT

Results of investigation of monthly values of the Tourism Climate Index (TCI) in some localities of Georgia (21 localities) and North Caucasus (Russia, 6 localities) are represented. Height of these localities varied from 3 to 2194 m above sea level.

Correlation and regression analysis of the connection of mortality by cardiovascular deceases in Tbilisi with the values of TCI and its separate components is carried out. This analysis confirmed the representativeness of the use of the scale of TCI as bioclimatic indicator for the investigated region (as a whole, with an increase of values of TCI it is noted the decrease of mortality).

The statistical characteristics of values of TCI are represented. In particular it is obtained that with an increase of the height of locality, as a whole occurs the passage of bimodal intra-annual distribution of TCI to the single-modal. The vertical distribution of values of TCI on the average in the year, in the warm and cold periods, and also in the central months of year is studied. The detailed information about the categories of TCI for all investigated localities is represented.

Key words: **tourism climate index, bioclimate**.

INTRODUCTION

Health resort-tourist industry is one of the most important sectors of the world economy. This sector in many respects depends on geographical position, topography, landscape, vegetation, fauna, ecological situation, weather, climate, etc. Weather and climate are two factors, in many respects of the determining bioclimatic resources of localities, which should be visited for the treatment, leisure or tourism [1-5]. Therefore, a special attention is paid to a study of these resources, which can be useful for organization or development of the health resort-tourist of branch in many countries. In early studies was used the set of the simple and combined meteorological and climatic indices for the health resorts and the tourism, and also studying the reaction of the human organism to their changeability.

In last almost one hundred years in the world are carried out sufficiently many studies in the field of bioclimatology, biometeorology and medical meteorology [6-8]. Thus, the analysis of the experiments of the influence of separate meteorological elements and their complexes on the health of people is carried out in the work [6], also the detailed information about different bioclimatic indices used in the different countries in 1925-1970 is presented. It is noted in the same work, that the interest in the problem "person - environment" in Europe in the scientific literature was fixed several centuries ago [9-10].

On the post Soviet space, including Georgia, it was very popular the use of the bioclimatic index air equivalent-effective temperature (EET- combination of the air temperature, relative humidity and wind

speed) and air radiation equivalent effective temperature (REET- combination of the air temperature, relative humidity, wind speed and solar radiation intensity) [7,8,11].

Together with the physical quantities of the value of bioclimatic indices is described by the terms ("Coldly", "Comfortably", "Warmly", etc.). A similar terminology is more intelligible for the wide circle of population, than physical quantities. Let us here note, that about three centuries ago for describing the climate of Georgia similar terms were used by the well-known Georgian historian and geographer Vakhushti Bagrationi [12].

The several new indices for evaluating the fitness of climate for the tourist activity were developed in the recent decades [2,13,14]. The most widely known and used index is the Tourism Climate Index, proposed by Mieczkowski [13]. The "Tourism Climate Index" of Mieczkowski (TCI) was developed for using climatic data, which practically are located in all countries. This index is the sum of the marks of five factors, which with the aid of the special tables and the nomograms are determined by the combination of seven meteorological parameters (average monthly and maximum temperature of air, the average monthly and minimum relative humidity of air, monthly total precipitation, monthly insolation duration, average monthly wind speed).

One of the important advantages of this index is the possibility of using archive data, which makes it possible to trace the dynamics of change TCI in time in connection with climate change. Another merit of this index is the possibility of the comparison of the bioclimatic resources of different countries with each other, which can contribute to international collaboration during the determination of the optimum periods of health resort-tourist season for so-called average individual (average tourist). It should be noted, that unfavorable season of year, for the average individual the bioclimatic conditions are not always occasion for the curtailment into this season of tourist activity as a whole. Depending on local conditions for the specific category of people in the indicated months of year it is possible to develop winter, sport, extreme and many other forms of tourism, including medical and sanitary.

TCI is used in many countries of the world [1-3,14-19], including Black Sea-Caspian region countries, such as Turkey [20,21], Iran [22-28], Russia (Sochi, Krasnaya Polyana, Anapa, Tuapse, Primorsko-Akhtarsk, Taganrog, Kislovodsk, Makhachkala) [29]. In this case the authors of work [29] proposed the original method of TCI calculation according to the data of standard three-hour observations of the meteorological parameters.

In the South Caucasus countries the average monthly values of TCI were calculated for Georgia (Tbilisi, Batumi, Anaklia, Telavi, etc.), Armenia (Yerevan), Azerbaijan (Baku) [30-35]. In particular, in the work [34] it was shown that in period 1986-2010 in comparison with period 1961-1985 in average for 4 seaside and alpine points of Adjara (Batumi - capital of Adjarian Autonomous Republic, Kobuleti, Khulo and Goderdzi) substantial changes of the values of TCI was not observed.

For tourism climatology this bioclimatic parameter has also been used lately as Physiologically Equivalent Temperature (PET, one of the most popular physiological thermal indices derived from the human energy balance which is used in the analysis to describe the effect of the climate), Standard Effective Temperature – (SET), Universal Thermal Climate Index (UTCI) – a combination of daily air temperature, relative humidity, wind velocity, mean cloud cover, solar radiation, etc. [36-44].

In recent years, in connection with the problem of global and local climate change, with an increase of anthropogenic pollution of atmosphere, which increased the vulnerability of people to the environmental factors, the analyses of ambient effect on the health of people acquired an even larger urgency [45-64]. In particular, the influence of different separate and complex astro-meteorological and geophysical factors on the general mortality and the mortality apropos of the cardiovascular diseases of the population of Tbilisi city with different scales of averaging - hour, daily, monthly, annual [45,47,48,52-54,56-59,62], was studied. The evaluations of the influence of an increase in the temperature of air, associated with the global warming-up, on the mortality of population in different countries are carried out [50,60,61].

It is possible to soften an increase in the negative ambient effect on human health by the development of the health resort-tourist industry, which makes it possible for people to pass the course of treatment, sanitation- rehabilitative measures, actively to rest. Therefore, in recent years for the development of this sector of economy, and with respect to the refinement of known and to the development of new bioclimatic resources in the acting and promising health resort-tourist zones, is inverted special attention [3,4,63].

Georgia and North Caucasus are noted for their health resort-tourist potential. A lot of studies of different bioclimatic resources and their changeability for the known and promising health resort and tourist zones are conducted [65-73], the plans of the development of health resort-tourist industry, traveling papers of health resort-tourist zones, the refinement of the methodologies of the evaluation of the bioclimatic

potential of these zones, medical weather forecast, etc. are refined regularly [74-83]. In particular, significant attention is paid to questions of the organization of ionotherapy [84-92]. Nevertheless, is observed explicit scarcity in the study of the Tourism Climate Index both in Georgia [30-35] and in North Caucasus [29]. This work is the continuation of the foregoing studies about TCI. Below they are represented the data about the average monthly values of TCI for 21 locations of Georgia and 6 locations of North Caucasus.

STUDY AREA, METHOD AND DATA DESCRIPTION

Study area (Table 1) is Georgia (21 locations) and Nord Caucasus (6 locations). Information about coordinates and heights of the meteorological stations is presented in the Table 1.

Table 1

Coordinates and heights of the 27 meteorological stations of Georgia and North Caucasus

Location	Latitude, N°	Longitude, E°	Height, m, a.s.l.
		Georgia	
Batumi	41.64	41.64	9
Kobuleti	41.82	41.78	3
Khulo	41.64	42.3	921
Goderdzi	41.63	42.52	2025
Anaklia	42.4	41.57	3
Mukhuri	42.63	42.18	260
Abastumani	41.75	42.83	1265
Bakhmaro	41.85	42.32	1926
Bakuriani	41.73	43.52	1665
Gudauri	42.47	44.48	2194
Sairme	41.9	42.75	910
Tskaltubo	42.33	42.62	121
Tbilisi	41.72	44.8	403
Telavi	41.93	45.48	568
Mestia	43.05	42.75	1441
Zugdidi	42.52	41.88	117
Dedoplistskaro	41.47	46.08	800
Kvareli	41.97	45.83	449
Sagarejo	41.73	45.33	802
Signagi	41.62	45.92	795
Martvili	42.42	42.38	170
		North Caucasus	
Kislovodsk	43.9	42.72	890
Pyatigorsk	44.10	43.00	576
Yessentuki	44.04	42.86	614
Zheleznovodsk	44.14	43.02	629
Teberda	43.45	41.73	1328
Nalchik	43.53	43.63	441

Tourism Climate Index (TCI) developed by Mieczkowski [13] is used in the work. TCI is a combination of seven parameters, three of which are independent and two in a bioclimatic combination:

$$TCI = 8 \cdot Cld + 2 \cdot Cla + 4 \cdot R + 4 \cdot S + 2 \cdot W$$

Where Cld is a daytime comfort index, consisting of the mean maximum air temperature Ta, max (°C) and the mean minimum relative humidity RH (%), Cla is the daily comfort index, consisting of the mean air temperature (°C) and the mean relative humidity (%), R is the precipitation index, S is the daily sunshine duration index, and W is the mean wind speed index.

In contrast to other climate indices, every contributing parameter is assessed. Because of a weighting factor (a value for TCI of 100), every factor can reach 5 points. TCI values >= 80 are excellent, while values between 60 and 79 are regarded as good to very good. Lower values (40 – 59) are acceptable, but values < 40 indicate bad or difficult conditions for understandable to all tourism.

The data of M. Nodia Institute of Geophysics about the daily mortality of the population of Tbilisi city from the cardiovascular diseases (Mortality) into the period from 1980 through 1992, and also data of hydrometeorological service of Georgia about mean monthly values of meteorological parameters in Tbilisi during the indicated period of time (156 months) are used in the work., also archive data of hydrometeorological services of Russia and Georgia about monthly average value of meteorological parameter on the lasting period of time, necessary for TCI calculation is used in the work.

The analysis of data with the aid of the standard methods of mathematical statistics [93] was conducted. The following designations will be used below: Min – minimal values, Max - maximal values, St Dev - standard deviation, Rc – coefficient of linear correlation, R^2 – coefficient of determination, Relative Range = 100*(Max-Min)/Average, (%).

RESULTS AND DISCUSSION

Results in Fig. 1-18 and Table 2-5 are presented.

The bioclimatic indices of locality, as a rule, with the health of the population of this locality are connected. However, the nature of these connections, although bears as a whole the universal nature, in many respects depends on the specific character of the stay of people in the data of locality (economic position, demographic situation, the level of medical service, etc.). Therefore, during the use of various bioclimatic indices for the specific locality is desirable to conduct the estimation on of their representativeness via the comparison of bioclimatic data with the data about the health of the population of this locality. As it was noted above, similar studies in the investigated region into [47,47,50,51,53,54,57,59,62] were carried out.

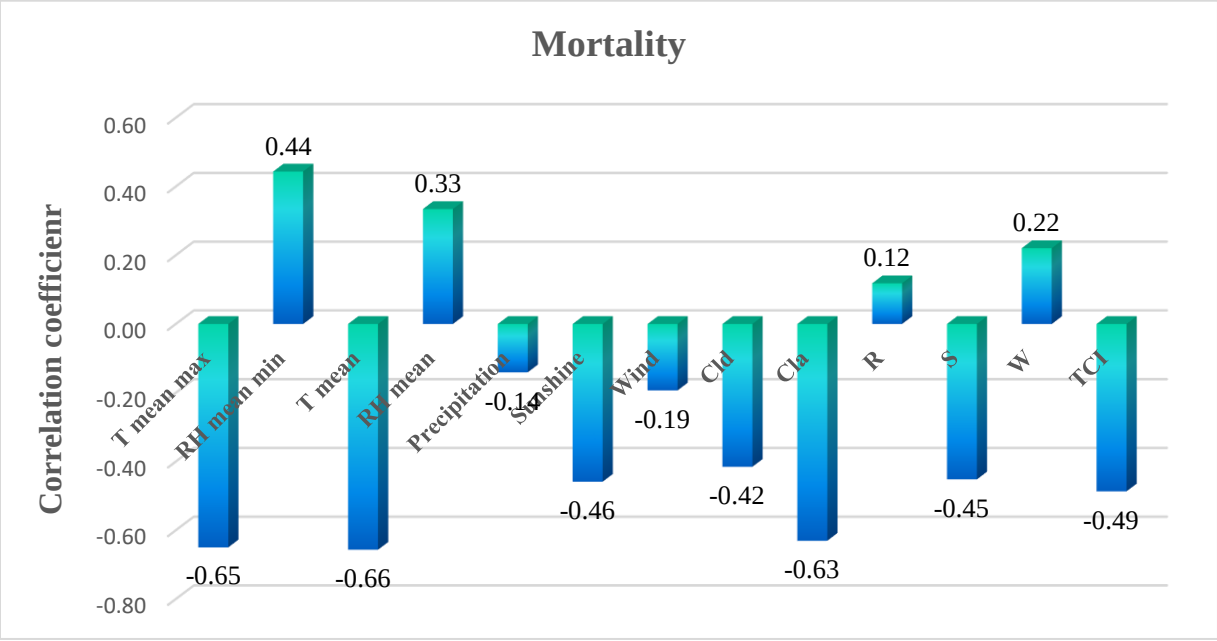

Fig. 1. Linear correlation between mean monthly decade mortality by cardiovascular deceases and simple and complex constituent of TCI and TCI in Tbilisi.

Results of studying of connection of TCI and its simple and combined components with the mortality of population for reasons the cardiovascular diseases based on the example of Tbilisi city are represented below (Fig. 1-4). As follow from Fig. 1 value of the coefficient of linear correlation between the

average monthly decade mortality of the population of Tbilisi for reasons the cardiovascular diseases and simple and complex components of TCI and TCI are found in the range from - 0.66 to +0.44 (all values of the correlation coefficients are significant).

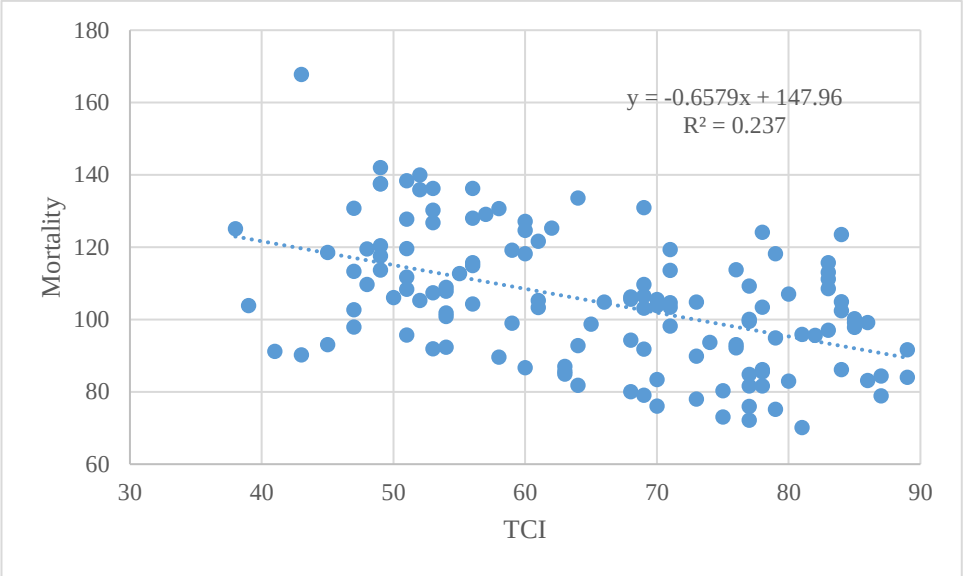

Fig. 2. Linear correlation and regression between mean monthly decade mortality by cardiovascular deceases and mean monthly values of TCI in Tbilisi.

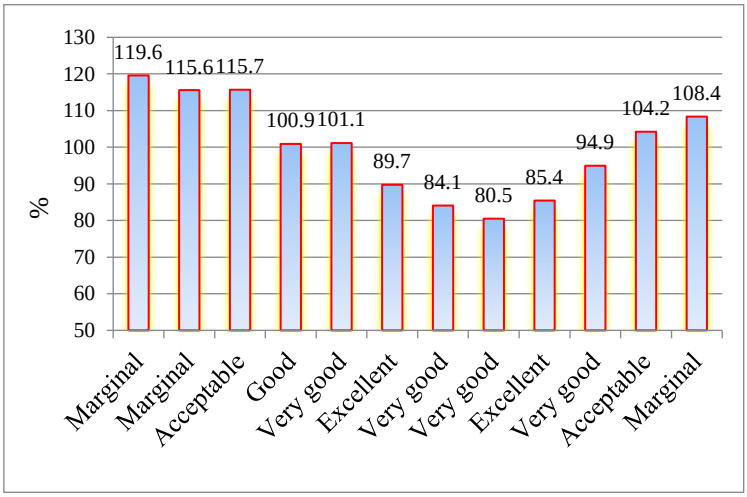

Fig. 3. Values of mean monthly decade mortality by cardiovascular deceases in Tbilisi normalize by the mean annual decade mortality under different TCI categories.

Very weak inverse correlation between the mortality and precipitation, and also wind speed is observed. Mortality noticeably correlates with average monthly maximum temperature and average monthly temperature of air, and also with values of Cla (correlation is negative). The moderate inverse correlation is noted between mortality and insolation duration, and also by the values of Cld, S and TCI. The moderate positive correlation is observed between the mortality and the average minimum and average humidity of air. Very weak positive correlation is noted between the mortality and the values of R, and weak positive correlation - between the mortality and the values of W.

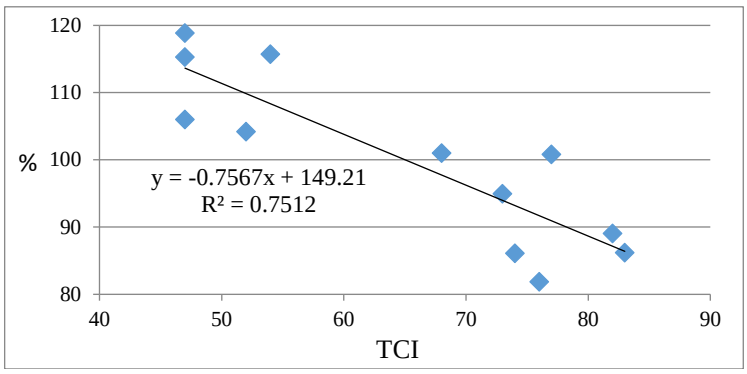

Fig. 4. Linear correlation between mean monthly decade mortality by cardiovascular deceases in Tbilisi normalize by the mean annual decade mortality and TCI according to fig. 3.

Fig. 2 for the clarity depicts the regression graph between the mortality and TCI. As it follows from this figure (as from Fig. 3,4), with an increase in the category TCI it is observed the decrease of mortality. Thus, gradations of TCI and its constituting completely adequately describe bioclimatic situation in the conditions of Tbilisi, at least for the period from 1980 through 1992. Concerning present time, similar studies it is planned to conduct in the near future.

Table 2

The statistical characteristics of TCI for 27 locations of Georgia and North Caucasus

Location	Average	Min	Max	St Dev	Distribution type
Batumi	57	36	75	14	Bimodal, May-Jun; Sept-Oct
Kobuleti	55	34	74	15	Bimodal, May-Jun; Sept-Oct
Khulo	57	31	78	19	Unimodal, plateau: May-Sept
Goderdzi	40	19	63	15	Unimodal, Aug
Anaklia	59	40	77	14	Bimodal, May-Jun; Sept-Oct
Mukhuri	55	29	70	14	Bimodal, May-Jun; Sept
Abastumani	58	34	81	18	Unimodal, plateau: Aug-Sept
Bakhmaro	41	16	67	17	Unimodal, Aug
Bakuriani	53	30	82	17	Unimodal, Aug
Gudauri	39	27	62	11	Unimodal, Aug
Sairme	53	26	81	21	Unimodal, Aug
Tskaltubo	56	36	74	15	Bimodal, May; Aug-Sept
Tbilisi	65	47	83	14	Bimodal, Jun; Sept
Telavi	62	47	79	12	Bimodal, May-Jun; Sept
Mestia	55	31	76	18	Unimodal, plateau: Jun-Sept
Zugdidi	57	33	76	15	Bimodal, May; Oct
Dedoplistskaro	63	44	81	15	Bimodal, Jun; Sept
Kvareli	61	45	75	11	Bimodal, May; Sept
Sagarejo	63	45	80	15	Unimodal, plateau: Jun-Sept
Signagi	62	46	77	11	Bimodal, May; Sept
Martvili	55	29	77	16	Bimodal, May; Sept-Oct
Kislovodsk	60	42	80	15	Unimodal, plateau: Jul-Sept
Pyatigorsk	59	38	82	18	Unimodal, plateau: Jul-Aug
Yessentuki	58	37	84	19	Unimodal, Aug
Zheleznovodsk	57	34	84	19	Unimodal, Aug
Teberda	57	35	80	18	Unimodal, plateau: Jul-Aug
Nalchik	58	35	78	17	Unimodal, plateau: Aug-Sept

Table 2 and in Fig. 5-18 clearly presents the results of the statistical analysis of annual, half year and average monthly long-standing values of TCI for 27 localities of Georgia and North Caucasus. As it follows from table 2 average annual values of TCI change from 39 (Gudauri) to 65 (Tbilisi), minimum average monthly - from 16 (Bakhmaro) to 47 (Tbilisi, Telavi), maximum average monthly - from 62 (Gudauri) to 84 (Yessentuki, Zheleznovodsk).

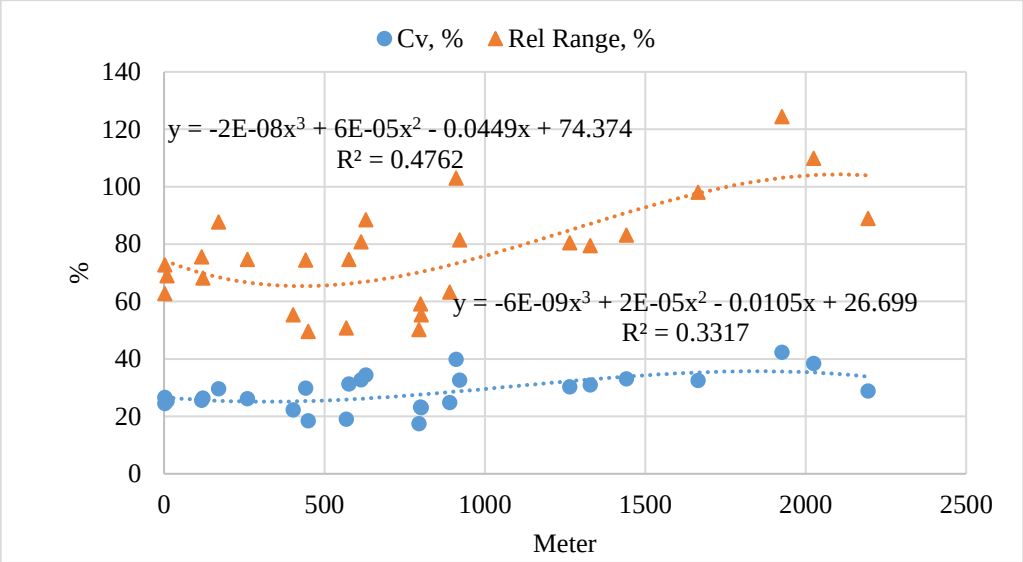

Fig. 5. Values of coefficient of variation and relative range of annual variability of TCI at the different heights.

With the height of locality, as a whole, occurs an increase in the values of the coefficient of variation and relative variation scope of intra-annual changeability of TCI (Fig. 5).

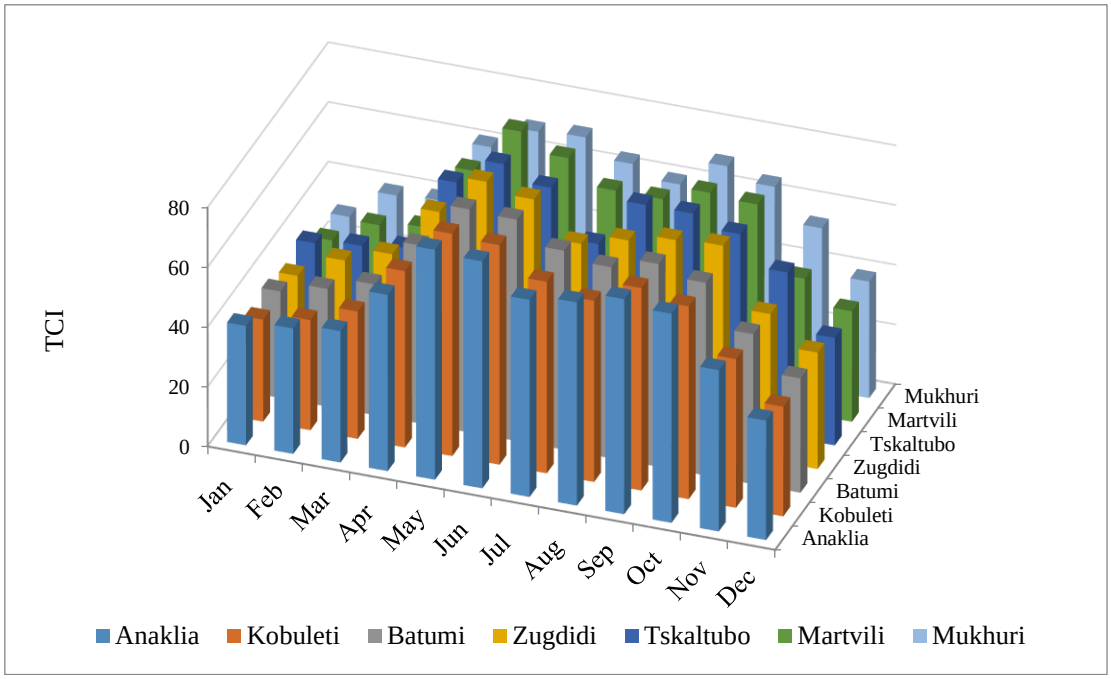

Fig. 6. Intra annual variations of TCI at the levels of terrain height from 3 m (Anaklia) to 260 m (Mukhuri).

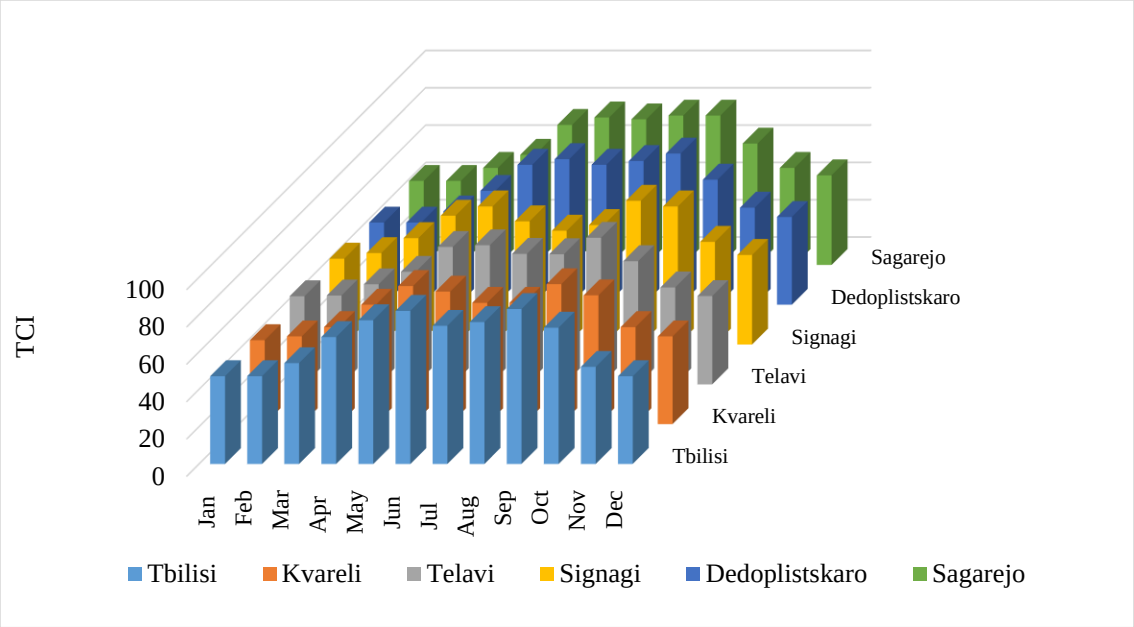

Fig. 7. Intra annual variations of TCI at the levels of terrain height from 403 m (Tbilisi) to 802 m (Sagarejo).

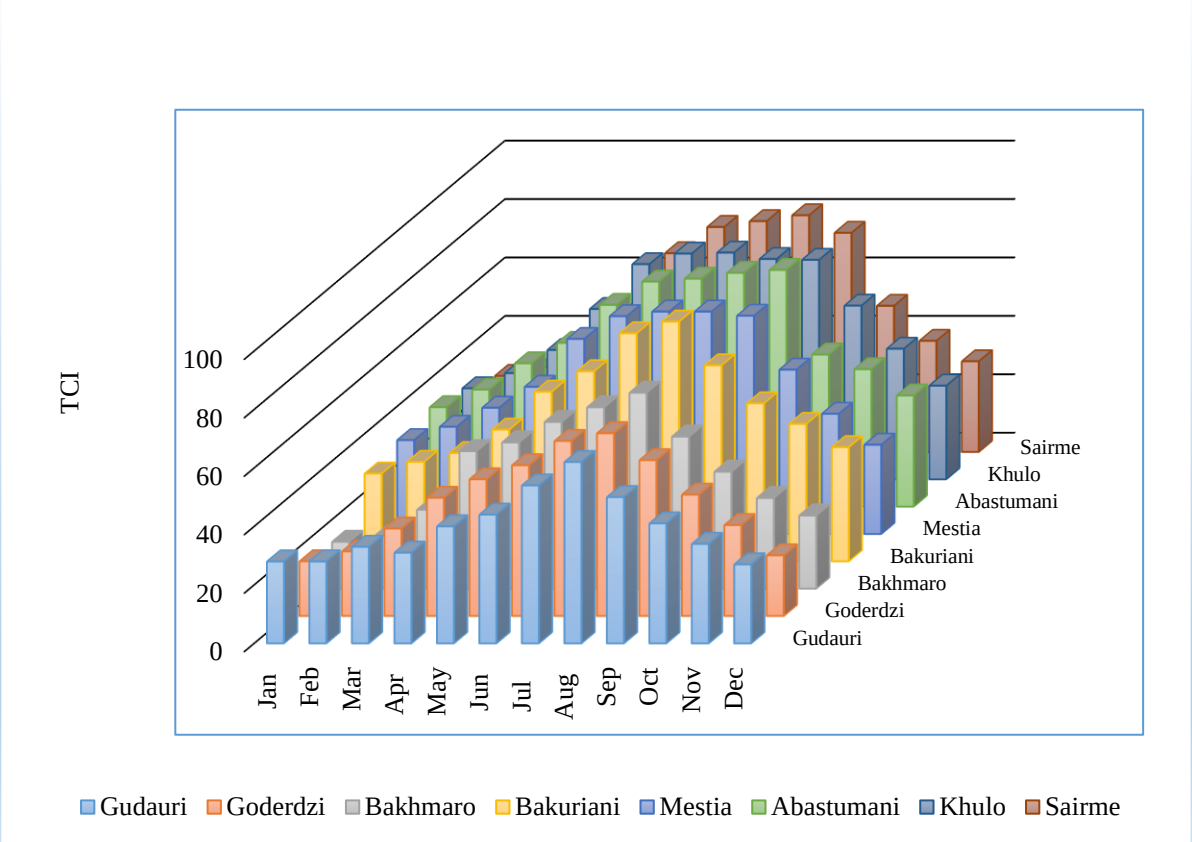

Fig. 8. Intra annual variations of TCI at the levels of terrain height from 910 m (Sairme) to 2192 m (Gudauri).

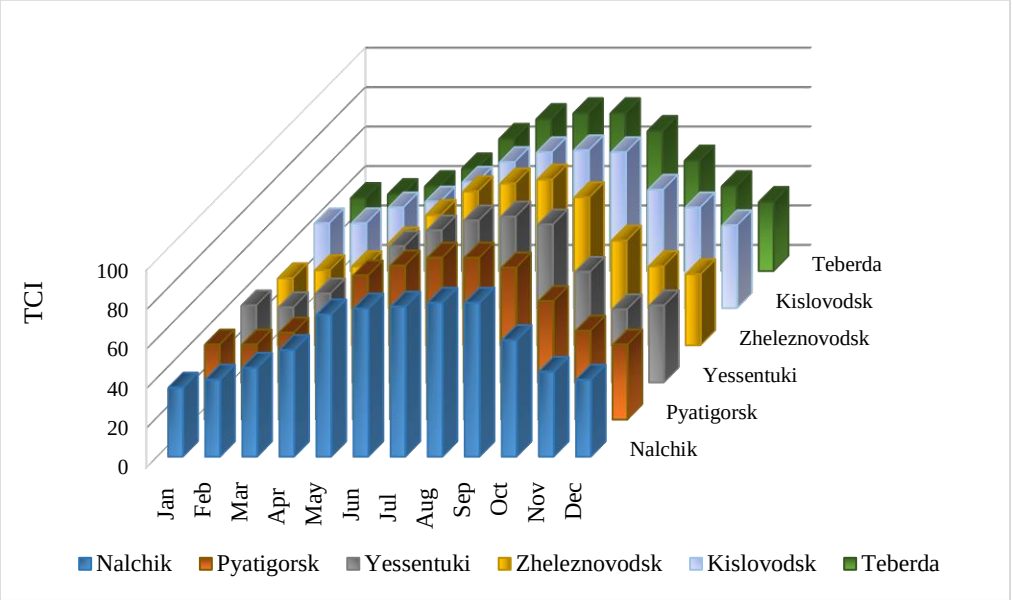

Fig. 9. Intra annual variations of TCI in six locations of the North Caucasus. Terrain height from 441 m (Nalchik) to 1328 m (Teberda).

The bimodal type of the intra-annual distribution of average monthly values of TCI in the following points are observed: Kobuleti, Anaklia, Mukhuri, Tskaltubo, Tbilisi, Telavi, Zugdidi, Dedoplistskaro, Kvareli, Signagi, Martvili; single-modal with the plateau - on the points: Khulo, Abastumani, Mestia, Sagarejo, Kislovodsk, Pyatigorsk, Teberda, Nalchik; single-modal - on the points: Goderdzi, Bakhmaro, Bakuriani, Gudauri, Sairme, Yessentuki, Zheleznovodsk (Fig. 6-9). With an increase in the height of locality, as a whole occurs the passage of bimodal intra-annual distribution of TCI to the single-modal.

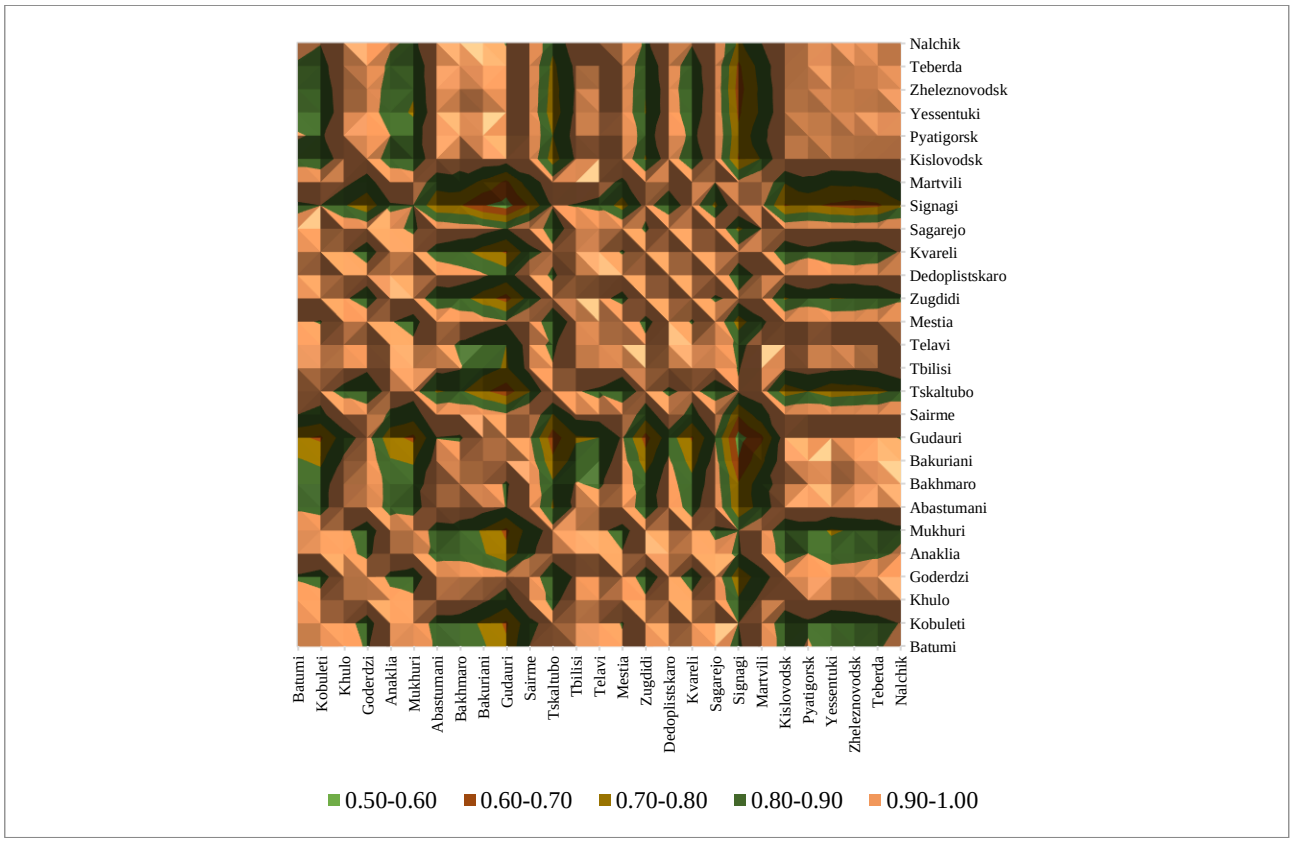

Fig. 10. Correlation field between investigation locations on values of TCI.

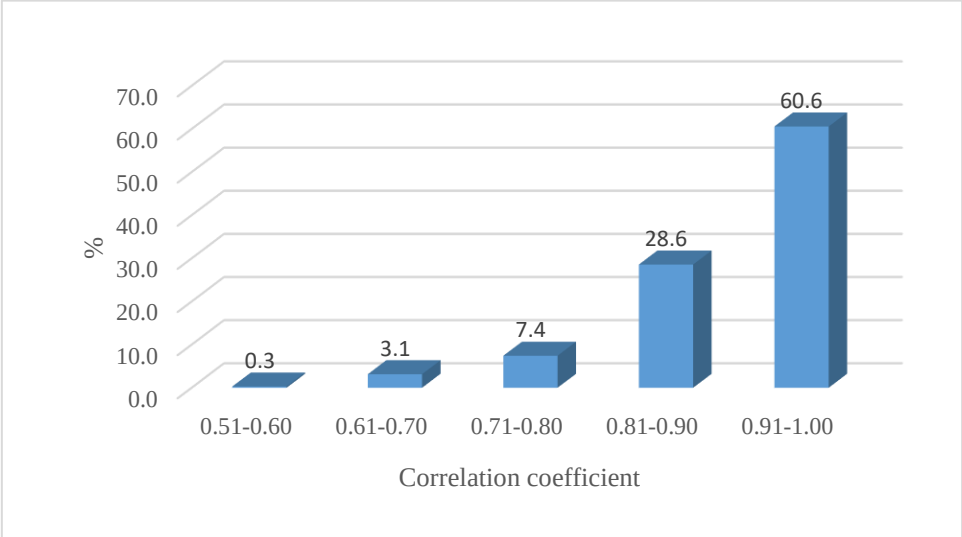

Fig. 11. Repetition of values of correlation coefficient between investigation locations on values of TCI.

Between the investigated localities in terms of the values of TCI is noted high linear correlation (Fig. 10,11). Values of Rc change from 0.56 to 1.0. Values of Rc in the range 0.91-1.0 into 60.6 % of the cases are observed. Values of Rc in the range 0.51-0.7 only in into 3.4 % of the cases are observed (Fig. 11).

Fig. 12-16 presents the data about the vertical distribution of values of TCI in the investigated region (corresponding categories of TCI are indicated together with their values on the Y-axis). As follows from Fig. 12 vertical distribution of average annual and half year values of TCI takes the form of the second power polynomial. Average annual values of TCI and values of TCI for the warm half-year with the height of locality grow (to the heights of 500-100 m), then - they diminish. In the cold half-year of value of TCI little change to the height of 1000 m, then - they diminish.

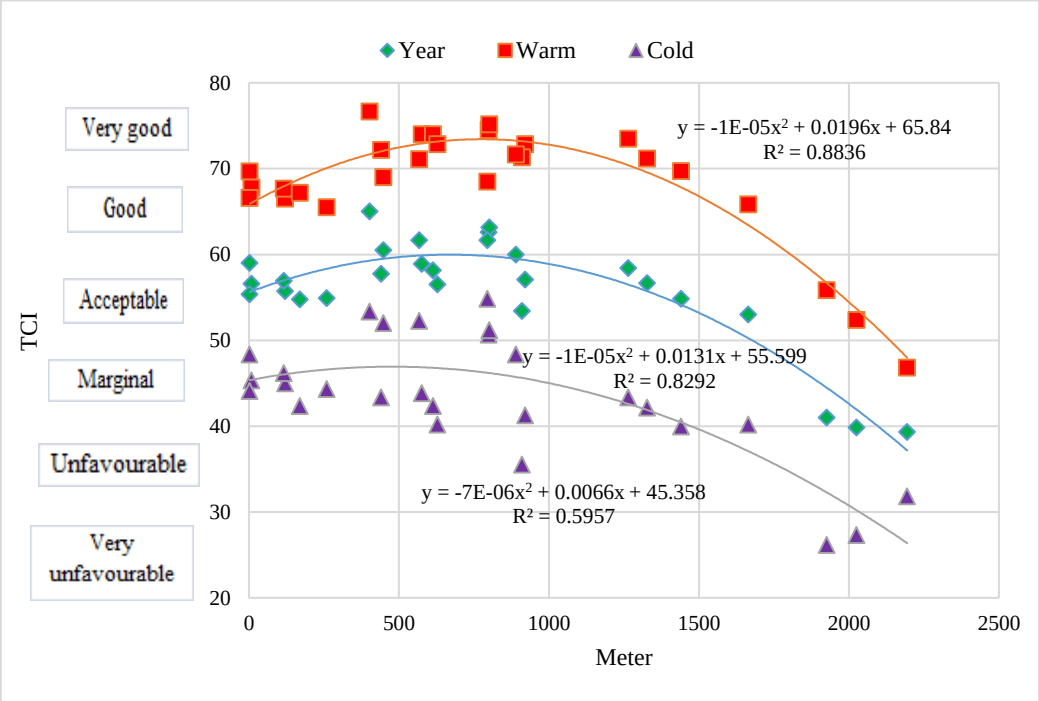

Fig. 12. Vertical distribution of TCI in three periods of Year in Georgia and North Caucasus.

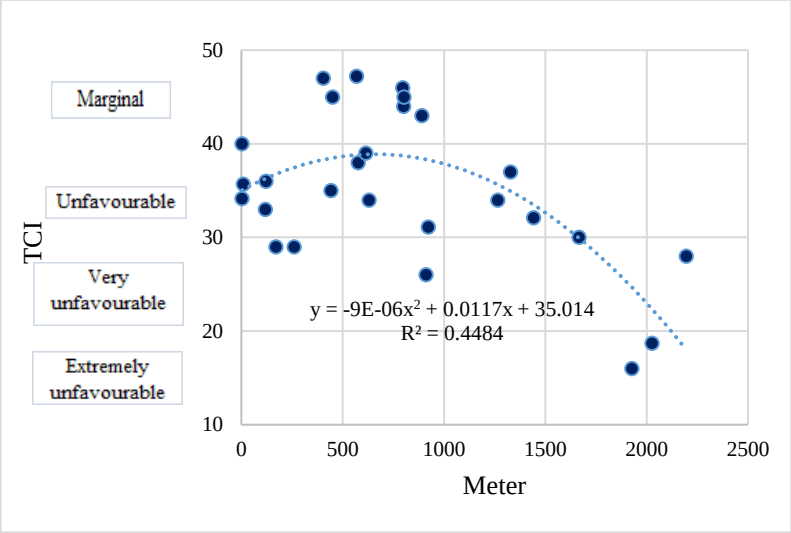

Fig. 13. Vertical distribution of TCI in January.

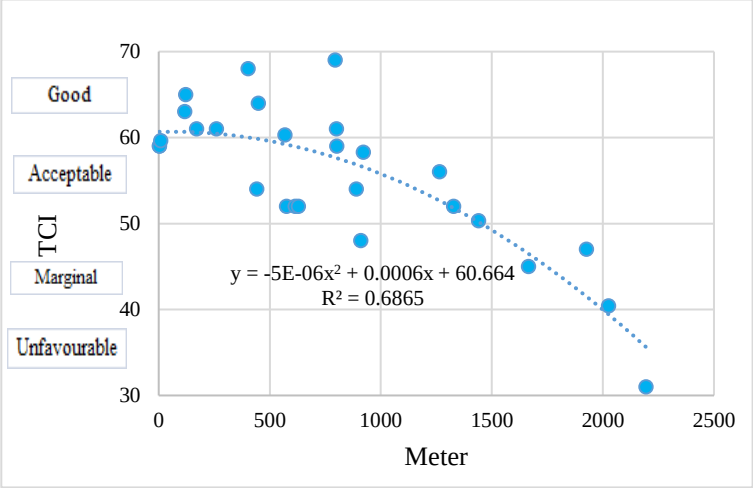

Fig. 14. Vertical distribution of TCI in April.

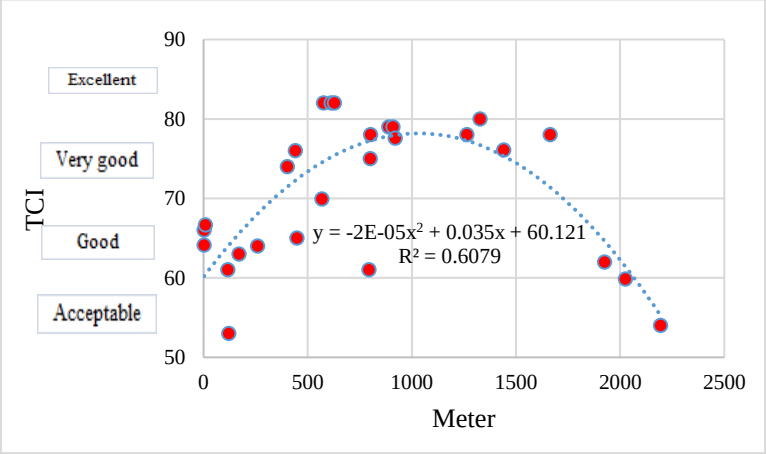

Fig. 15. Vertical distribution of TCI in July.

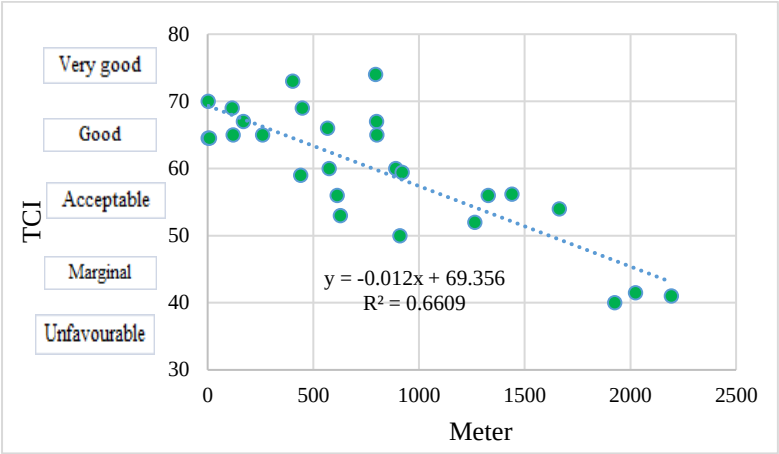

Fig. 16. Vertical distribution of TCI in October

During January, April and July vertical distribution of values of TCI takes the form of the second power polynomial (Fig. 13-15), while during October with an increase in the height the values of TCI linearly diminish (Fig. 16). Let us note, that during July an increase in the values of TCI to the height of 1000 m is clearly noticeable, then - decrease.

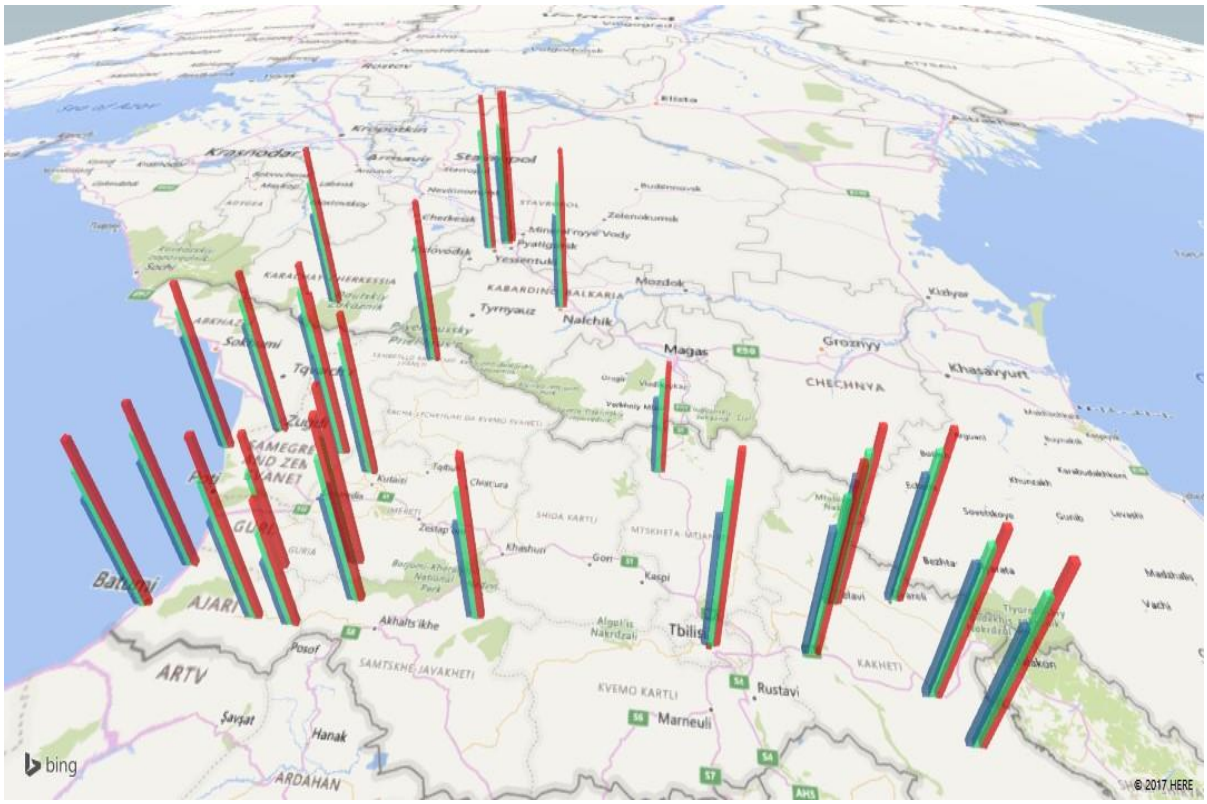

Fig. 17. Distribution of annual and half year values of TCI on the territory of Georgia and North Caucasus. April-September (red), October-March (blue), January-December (green)

Fig. 17, as the illustration, depicts the map of the distribution of average annual and half year values of TCI in Georgia and North Caucasus.

Table 3

Annual and half year average of c TCI categories for 27 locations of Georgia and North Caucasus

Location	TCI Categori		
	Year	Warm	Cold
Anaklia	Acceptable	Very Good	Marginal
Batumi	Acceptable	Good	Marginal
Kobuleti	Acceptable	Good	Marginal
Zugdidi	Acceptable	Good	Marginal
Mukhuri	Acceptable	Good	Marginal
Khulo	Acceptable	Very Good	Marginal
Bakhmaro	Marginal	Acceptable	Very Unfavorable
Martvili	Acceptable	Good	Marginal
Goderdzi	Marginal	Acceptable	Very Unfavorable
Tskaltubo	Acceptable	Good	Marginal
Sairme	Acceptable	Very Good	Unfavorable
Mestia	Acceptable	Very Good	Marginal
Abastumani	Acceptable	Very Good	Marginal
Bakuriani	Acceptable	Good	Marginal
Gudauri	Unfavorable	Marginal	Unfavorable
Tbilisi	Good	Very Good	Acceptable
Sagarejo	Good	Very Good	Acceptable
Telavi	Good	Very Good	Acceptable
Kvareli	Good	Good	Acceptable
Signagi	Good	Good	Acceptable
Dedoplistskaro	Good	Very Good	Acceptable
Kislovodsk	Good	Very Good	Marginal
Pyatigorsk	Acceptable	Very Good	Marginal
Yessentuki	Acceptable	Very Good	Marginal
Zheleznovodsk	Acceptable	Very Good	Marginal
Teberda	Acceptable	Very Good	Marginal
Nalchik	Acceptable	Very Good	Marginal

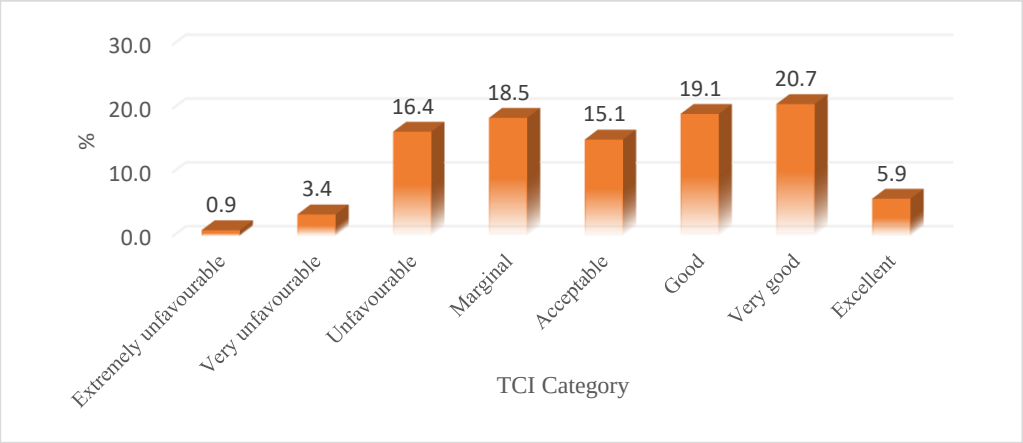

Fig. 18. Repetition of TCI categories for 27 locations of Georgia and North Caucasus from January to December

Finally, tables 3-5 present detailed information about the categories of TCI on the average during the year, the warm and cold periods (table 3), and also monthly (table 4,5). These tables, in particular, can be useful for different tourist agencies.

Fig. 18 presents the data about the repetition of monthly categories of TCI for the investigated region. As it follows from this figure, as a whole more than into 79% cases the value of TCI they are located in the range of categories from "Marginal" to "Excellent". I.e., in the overwhelming majority of the months of year the investigated localities are suitable for the so-called " average tourist ".

Table 4

TCI categories for 27 locations of Georgia and North Caucasus from October to March

Location	TCI Categori					
	Oct	Nov	Dec	Jan	Feb	Mar
Anaklia	Very Good	Acceptable	Marginal	Marginal	Marginal	Marginal
Batumi	Good	Acceptable	Unfavourable	Unfavourable	Unfavourable	Marginal
Kobuleti	Good	Acceptable	Unfavourable	Unfavourable	Unfavourable	Marginal
Zugdidi	Good	Marginal	Unfavourable	Unfavourable	Marginal	Marginal
Mukhuri	Good	Acceptable	Unfavourable	Very Unfavourable	Unfavourable	Marginal
Khulo	Acceptable	Marginal	Unfavourable	Unfavourable	Unfavourable	Marginal
Bakhmaro	Marginal	Unfavourable	Very Unfavourable	Extremely Unfavourable	Extremely Unfavourable	Very Unfavourable
Martvili	Good	Marginal	Unfavourable	Very Unfavourable	Unfavourable	Unfavourable
Goderdzi	Marginal	Unfavourable	Very Unfavourable	Extremely Unfavourable	Very Unfavourable	Unfavourable
Tskaltubo	Good	Acceptable	Unfavourable	Unfavourable	Unfavourable	Marginal
Sairme	Acceptable	Unfavourable	Unfavourable	Very Unfavourable	Very Unfavourable	Unfavourable
Mestia	Acceptable	Marginal	Unfavourable	Unfavourable	Unfavourable	Marginal
Abastumani	Acceptable	Marginal	Unfavourable	Unfavourable	Marginal	Marginal
Bakuriani	Acceptable	Marginal	Unfavourable	Unfavourable	Unfavourable	Unfavourable
Gudauri	Marginal	Unfavourable	Very Unfavourable	Very Unfavourable	Very Unfavourable	Unfavourable
Tbilisi	Very Good	Acceptable	Marginal	Marginal	Marginal	Acceptable
Sagarejo	Good	Acceptable	Marginal	Marginal	Marginal	Acceptable
Telavi	Good	Acceptable	Marginal	Marginal	Marginal	Acceptable
Kvareli	Good	Acceptable	Marginal	Marginal	Marginal	Acceptable
Signagi	Very Good	Acceptable	Marginal	Marginal	Marginal	Acceptable
Dedoplistskaro	Good	Acceptable	Marginal	Marginal	Marginal	Acceptable
Kislovodsk	Good	Acceptable	Marginal	Marginal	Marginal	Acceptable
Pyatigorsk	Good	Marginal	Unfavourable	Unfavourable	Unfavourable	Marginal
Yessentuki	Acceptable	Unfavourable	Unfavourable	Unfavourable	Unfavourable	Marginal
Zheleznovodsk	Acceptable	Marginal	Unfavourable	Unfavourable	Unfavourable	Marginal
Teberda	Acceptable	Marginal	Unfavourable	Unfavourable	Unfavourable	Marginal
Nalchik	Acceptable	Marginal	Unfavourable	Unfavourable	Unfavourable	Marginal

Table 5

TCI categories for 27 locations of Georgia and North Caucasus from April to September

Location	TCI Categori					
	Apr	May	Jun	Jul	Aug	Sep
Anaklia	Acceptable	Very Good	Very Good	Good	Good	Very Good
Batumi	Good	Very Good	Very Good	Good	Good	Good
Kobuleti	Acceptable	Very Good	Very Good	Good	Good	Good
Zugdidi	Good	Very Good	Very Good	Good	Good	Good
Mukhuri	Good	Good	Verygood	Good	Good	Good
Khulo	Acceptable	Very Good	Very Good	Very Good	Very Good	Very Good
Bakhmaro	Marginal	Acceptable	Acceptable	Good	Good	Acceptable
Martvili	Good	Very Good	Very Good	Good	Good	Good
Goderdzi	Marginal	Marginal	Acceptable	Good	Good	Acceptable
Tskaltubo	Good	Very Good	Good	Acceptable	Good	Good
Sairme	Marginal	Good	Very Good	Very Good	Excellent	Very Good
Mestia	Acceptable	Good	Very Good	Very Good	Very Good	Very Good
Abastumani	Acceptable	Good	Very Good	Very Good	Excellent	Excellent
Bakuriani	Marginal	Acceptable	Good	Very Good	Excellent	Good
Gudauri	Unfavourable	Marginal	Marginal	Acceptable	Good	Acceptable
Tbilisi	Good	Very Good	Excellent	Very Good	Very Good	Excellent
Sagarejo	Acceptable	Very Good	Very Good	Very Good	Excellent	Excellent
Telavi	Good	Very Good	Very Good	Very Good	Very Good	Very Good
Kvareli	Good	Very Good	Very Good	Good	Good	Very Good
Signagi	Good	Very Good	Good	Good	Good	Very Good
Dedoplistskaro	Good	Very Good	Very Good	Very Good	Very Good	Excellent
Kislovodsk	Acceptable	Good	Very Good	Very Good	Excellent	Very Good
Pyatigorsk	Acceptable	Very Good	Very Good	Excellent	Excellent	Very Good
Yessentuki	Acceptable	Good	Very Good	Excellent	Excellent	Excellent
Zheleznovodsk	Acceptable	Good	Very Good	Excellent	Excellent	Very Good
Teberda	Acceptable	Good	Very Good	Excellent	Excellent	Very Good
Nalchik	Acceptable	Very Good	Very Good	Very Good	Very Good	Very Good

CONCLUSIONS

In the near future is planned a study of the bioclimatic resources of Georgia and North Caucasus with the use of such bioclimatic indices as Physiologically Equivalent Temperature (PET), Standard Effective Temperature – (SET), Universal Thermal Climate Index (UTCI), etc. Wherein, both archival and modern data about the health of the population of the studied region and meteorological observations will be used.

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ტურიზმის კლიმატური ინდექსი საქართველოს და ჩრდილოეთ კავკასიის (რუსეთი) ზოგიერთ რეგიონში

ა. ამირანაშვილი, ნ.ჯაფარიძე, ლ. ქართველიშვილი,
ქ. ხაზარაძე, ა. მატზარაკისი, ნ. პოვოლოცკაია. ი. სენიკი

რეზიუმე

წარმოდგენილია ტურიზმის კლიმატური ინდექსის თვიური მნიშვნელობების კვლევის შედეგები საქართველოს ზოგიერთ რაიონსა (21 პუნქტი) და ჩრდილოეთ კავკასიაში (რუსეთი, 6 პუნქტი). პუნქტების მდებარეობა იცვლება 3 -დან 2194 მ-მდე ზღვის დონიდან.

ჩატარებულია გულსისხლძარღვთა დაავადების მიზეზით თბილისში სიკვდილიანობის ტურიზმის კლიმატურ ინდექსის მნიშვნელობებთან და მის ცალკეულ კომპონენტებთან კავშირის კორელაციური და რეგრესიული ანალიზი. ამ ანალიზმა დაადასტურა ტურიზმის კლიმატური ინდექსის შკალის, როგორც მოცემული რეგიონისათვის ბიოკლიმატური მაჩვენებლის გამოყენების რეპრეზენტატულობა (ზოგადად, ტურიზმის კლიმატური ინდექსის ზრდასთან ერთად აღინიშნება სიკვდილიანობის შემცირება).

წარმოდგენილია ტურიზმის კლიმატური ინდექსის მნიშვნელობების სტატისტიკური მახასიათებლები. კერძოდ, მიღებულია, რომ ადგილის სიმაღლის ზრდასთან ერთად მთლიანობაში ტურიზმის კლიმატური ინდექსის შიდაწლიური ბიმოდალური სვლა გადადის ერთმოდალურზე.

შესწავლილია ტურიზმის კლიმატური ინდექსის ვერტიკალური განაწილება საშუალოდ წლის, ცივი და თბილი პერიოდებისა და წლის ცენტრალური თვეებისათვის.

წარმოდგენილია დაწვრილებითი ინფორმაცია ტურიზმის კლიმატური ინდექსის კატეგორიების შესახებ ყველა გამოსაკვლევი პუნქტისათვის.

Климатический индекс туризма в некоторых районах Грузии и Северного Кавказа (Россия)

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Резюме

Представлены результаты исследования месячных значений климатического индекса туризма (КИТ) в некоторых районах Грузии (21 пунк) и Северного Кавказа (Россия, 6 пунктов). Высота расположения пунктов – от 3 до 2194 м над уровнем моря.

Проведен корреляционный и регрессионный анализ связи смертности по поводу сердечно-сосудистых заболеваний в Тбилиси со значениями КИТ и его отдельными компонентами. Этот анализ подтвердил репрезентативность использования шкалы КИТ как биоклиматического показателя для исследуемого региона (в целом, с ростом значений КИТ отмечается убывание смертности).

Представлены статистические характеристики значений КИТ. В частности получено, что с ростом высоты местности, в целом происходит переход бимодального внутригодового хода КИТ к одномодальному.

Изучено вертикальное распределение значений КИТ в среднем за год, теплый и холодный периоды, а также в центральные месяцы года.

Представлена подробная информация о категориях КИТ для всех исследуемых пунктов.