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Comparative Analysis of Mean-Daily Value of Air Equivalent-Effective Temperature in Tbilisi and Kojori

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ABSTRACT

For the confirmation of the applicability of the scale of air equivalent-effective temperature (EET) as the bioclimatic index in daily time scale, the results of studying the connection of average-daily values of EET in Tbilisi with the mortality of the population of this city from the cardiovascular diseases are represented.
It is obtained that the dependence of mortality on EET takes the classical form - the decrease of mortality from the gradation "Sharply Coldly" to "Comfortably" with further increase to the gradation "Warmly". Thus, the existing scale EET is completely acceptable for the evaluation of the severity of exposure to the health of people on a daily scale also.
The comparative analysis of mean-daily values of EET into Tbilisi (3 meteorological stations - Vashlijvari, Tbilisi state university, Tbilisi airport) and in Kojori (mountain health resort settlement in 10 km from the center of Tbilisi) is carried out. In particular it is shown that values of EET in the urbanized part of the city (Vashlijvari, State University) differ significantly from their values after the feature of city (Airport, Kojori); in Kojori are not observed negative for the health of people high values EET, which fall into the range by "Warmly".

Key Words: air equivalent-effective temperature, bioclimatology, biometeorology

Introduction

As is known, the health of people in many respects depends on different natural and anthropogenic components of the medium of its inhabiting. Bioclimate, which causes the degree of the comfort of the vital activity of man, is essential component of this medium, and therefore its studies have long ago been immediate for the scientific different specialties [1-5]. The urgency of these studies even more grew in the connection by intensive industrialization in a whole series of the countries [6], and also by the accelerated changes in the global and local climate [7-10], since both indicated factors are closely related to stability problem of different bioclimatic characteristics of environment [11-16].

The indicated problem is extremely urgent for Georgia, which, among entire other things, possesses great possibilities for realization and development of activity in the health resort-tourist sphere of the economy. Therefore, studies of the bioclimatic characteristics of different regions of Georgia, their special features and changeability, at present acquire special importance not only from a scientific point of view, but also for solving the whole series of practical questions, such, for example, as traveling papers of the health resort and tourist potential of the country [17,18].

Work on the traveling papers of the health resort-tourist potential of Georgia long ago is conducted sufficiently. Thus, work [19] presents the sufficiently detailed description of practically health resort objects all acted in Georgia in the Soviet period. In the post-Soviet period, unfortunately, the set of these objects ended its existence. However, recently in the country the health resort-tourist industry again of beginning vigorously to be developed. In connection with this, taking into account new knowledge in by world association, appeared the need for at the higher scientific level investigating the bioclimatic resources of different regions of Georgia.

In the recent two decades in Georgia are carried out sufficiently many studies in the field of bioclimatology, biometeorology and medical meteorology. In particular, was studied 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 [6,13,20-27], were studied the special features of intra-annual variations in the tourism climate index of for 21 points of Georgia [28-34], were studied the separate bioclimatic characteristics of different known and promising health resort -tourism zones [14,15,35-41]. This work is the continuation of the foregoing studies.

Below, for the confirmation of the applicability of the scale of air equivalent-effective temperature (EET) as bioclimatic index in daily time scale, are represented the results of studying the connection of average-daily values EET in Tbilisi with the mortality of the population of this city from the cardiovascular diseases. Is carried out Also the comparative analysis of values of EET in Tbilisi (3 meteorological stations - Vashlijvari, Tbilisi State University, Tbilisi airport) and in Kojori (mountain health resort settlement in 10 km from the center of Tbilisi).

Material and methods

In the work 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 agency on the environment (Vashlijvari, Tbilisi Airport) and I. Javakhishvili Tbilisi State University about the mean diurnal values of air temperature - T (°C), air relative humidity – U (%) and wind speed - V (m/sec) during the indicated period of time were used. Information about coordinates and heights of the meteorological stations in Tbilisi and Kojori in the Table 1 are presented.

The analysis of data with the aid of the standard methods of mathematical statistics [42] was conducted. All analyzed 4749 cases.

Table 1

Coordinates of the meteorological stations in Tbilisi (Vashlijvari, Tbilisi State University - TSU, Airport) and Kojori.

Location	Lat., N°	Lon., E°	Height, m, a.s.l.
Vashlijvari	41.75	44.77	518
TSU	41.71	44.78	455
Airport	41.67	44.95	472
Kojori	41.67	44.70	1338

The Air Equivalent- Effective Temperature Scale for Tbilisi [23] is: <1° - Sharply coldly, 1-8° - Coldly, 9-16° - Moderately coldly, 17-22° - Comfortably, 23-27° - Warmly, >27° - Hotly

Results and discussion

Results in Tables 2,3 and in Fig. 1,2 are represented.

Table 2

The statistical characteristics of daily mean values of T, U, V and EET in 3 locations of Tbilisi and Kojori in 1980-1992 (4749 cases of observations)

Location	Vashlijvari				TSU			
Parameter	T	U	V	EET	T	U	V	EET
Min	-6.1	31.0	0.0	-23.9	-6.0	28.9	0.0	-20.9
Max	31.0	97	10.3	25.7	30.9	98.0	5.6	25.5
Average	13.0	67.5	0.9	9.5	13.2	65.6	0.7	9.2
Location	Airport				Kojori			
Min	-8.3	30.9	0.0	-61.9	-12.5	21.4	0.0	-52.6
Max	31.0	100	23.1	24.4	25.1	100	9.9	20.1
Average	12.8	70.9	4.8	3.4	7.3	74.0	1.3	1.1

Table 2 presents the statistical data about the values of EET and its separate component for all four meteorological stations. As it follows from this table in the limits of Tbilisi of the essential difference in the average, maximum and minimum values of temperature and relative humidity of air it is not noted. What about wind speed - its smallest values are observed at the meteorological station of Tbilisi university, greatest - in the airport. Accordingly, average values of EET in Vashlijvari and TSU fall into the range of "Moderately coldly", and in the airport - into the range Coldly". Maximum values of EET at all three meteorological stations in the limits of city fall into the range of "Warmly", minimum - "Sharply coldly".

In Kojori, because of the height of locality, the average annual temperature of air is approximately on 6°C lower than in Tbilisi, relative humidity somewhat higher than at all three stations into Tbilisi, wind speed approximately such, as in Vashlijvari. Accordingly, in Kojori, in contrast to TSU and Vashlijvari, average annual value of EET falls into the range "Coldly". Maximum value of EET in Kojori, in contrast to all stations of Tbilisi, falls into the range "Comfortably".

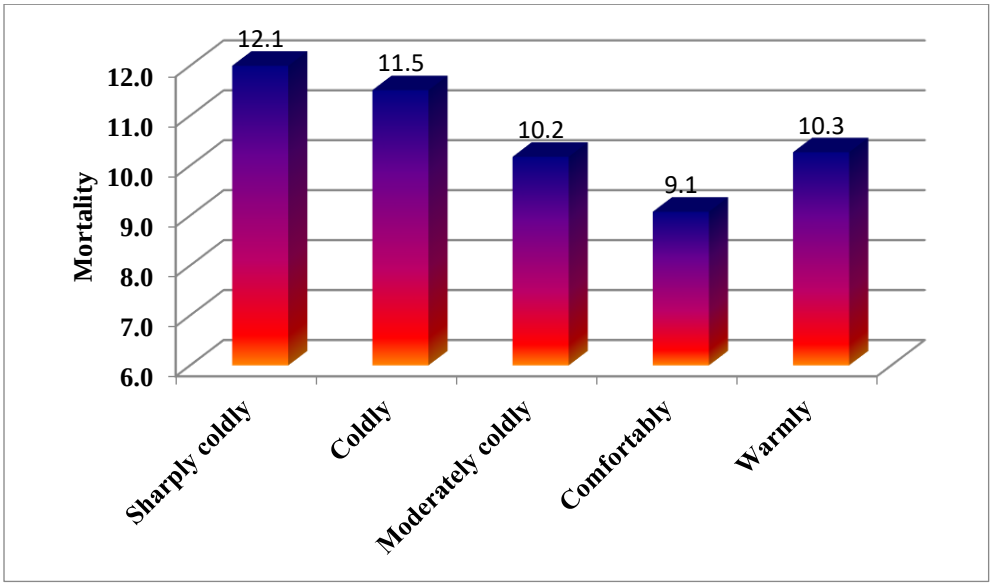

Fig. 1. Mean daily mortality from the cardiovascular diseases in Tbilisi to 1 million inhabitants with different mean daily values of air Equivalent-Effective Temperature in Vashlijvari.

Fig. 1 presents the data about the mean diurnal mortality to one million inhabitants of Tbilisi city with the different values of EET. As it follows from this figure, the smallest mortality is observed with the values of EET in the range "Comfortably" (9.1), greatest - with the values of EET in the range - Sharply coldly" (12.1). With the values of EET in the ranges "Moderately coldly" and "Warmly" the mean diurnal mortality of the population of Tbilisi is approximately identical (10.2 and 10.3 respectively).

Let us note that the dependence of mortality on EET takes the classical form - the decrease of mortality from the gradation "Sharply coldly" to "Comfortably" with further increase to the gradation " Warmly". Thus, the existing scale EET is completely acceptable for the evaluation of the degree of its action on the health of people and on a daily scale.

Table 3

Repetition of daily mean EET Category in 3 locations of Tbilisi and Kojori (%)

EET Category	Sharply Coldly	Coldly	Moderately Coldly	Comfortably	Warmly
Location/EET	<1°C	1-8 °C	9-16 °C	17-22 °C	23-27 °C
Vashlijvari	21.5	22.3	27.2	26.2	2.8
TSU	25.3	19.5	26.0	26.1	3.1
Airport	40.4	15.9	25.1	17.4	1.2
Kojori	45.0	23.0	28.4	3.6	-

Table 3 presents the data about the repetition of categories EET for all investigated points. As follows from this table, the repetition of categories EET in Vashlijvari and TSU approximately is identical. The maximum of repetition falls to the ranges "Moderately Coldly" and "Comfortably". In the airport and Kojori the maximum of the repetition of categories EET falls to the range "Sharply Coldly". It should be noted that in Kojori there are no values EET, which fall into the range of the category "Warmly", with which are observed consequences negative for the health of people.

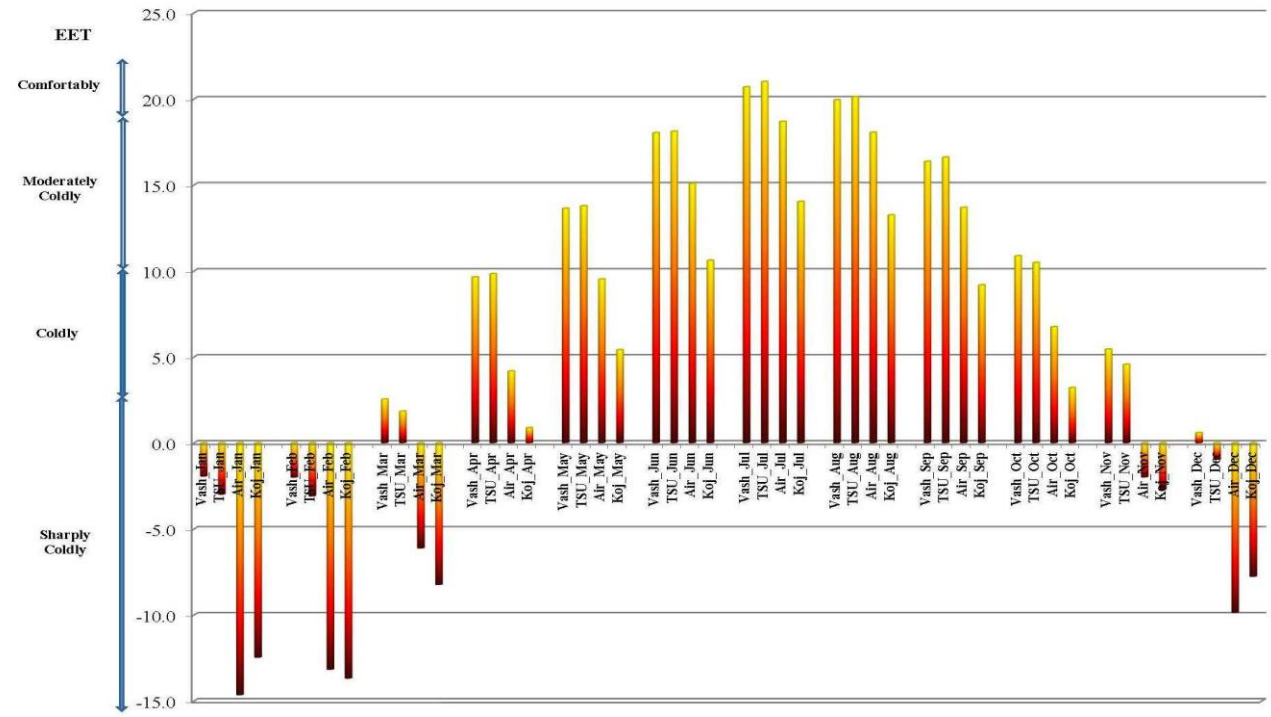

Fig. 2. Mean monthly values of air Equivalent-Effective Temperature in 3 locations of Tbilisi and Kojori.

Finally, Fig. 2 for the clarity depicts the histograms of the intra-annual distribution of average monthly values of EET for all four localities being investigated. As it follows from this figure, from February through December values of EET in Kojori is lower than at all stations in the limits of Tbilisi. Only during January values of EET in Kojori are higher than in the airport.

Conclusion

The detailed study of the bioclimatic resources of Georgia over the visible long term will make it possible to increase substantially attractiveness level of the acting and promising health resort and tourist zones and the objects both for populating of this country and its guests.

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References

[1] Sheleykhovskiy G.V. Mikroklimat yuzhnykh gorodov, M., 1948, 118 s.
[2] Rusanov V.I. Kompleksnyye meteorologicheskiye pokazateli i metody otsenki klimata dlya meditsinskikh tseley, Tomsk, izd. Tomskogo universiteta, 1981, 87 s.
[3] Landsberg H.E. The Assessment of Human Bioclimate. A Limited Review of Physical Parameters. Technical Note No 123, WMO, No 331, 1972, 37 p.

[4] Klimat Tbilisi. Pod. red. Svanidze G.G. i Papinashvili L.K., Sankt-Peterburg, Gidrometeoizdat, 1992, 230 s.
[5] Matzarakis A., Rudel E., Zygmuntowski M., Koch E. Bioclimatic maps for tourism purposes. Physics and Chemistry of the Earth, v. 35, 2010, pp. 57–62.
[6] Amiranashvili A., Bliadze T., Chikhladze V. Photochemical smog in Tbilisi. Monograph, Trans. Of Mikheil Nodia institute of Geophysics, ISSN 1512-1135, vol. 63, Tb., 2012, 160 p., (in Georgian).
[7] Budagashvili T., Karchava J., Gunia G., Intskirveli L., Kuchava T., Gurgenidze M., Amiranashvili A., Chikhladze T. Inventory of Greenhouse Gas Emissions and Sinks. Georgia's Initial National Communication on Under the United Nations Framework Convection on Climate Change, Project GEO/96/G31, Tb., 1999, 137 p.
[8] Amiranashvili A., Matcharashvili T., Chelidze T. Climate change in Georgia: Statistical and nonlinear dynamics predictions. Journ. of Georgian Geophysical Soc., Iss.(A), Physics of Solid Earth, v.15A, Tb., 2011-2012, pp. 67-87.
[9] Amiranashvili A., Chikhladze V., Kartvelishvili L. Expected Change of Average Semi-Annual and Annual Values of Air Temperature and Precipitation in Tbilisi. Journ. of Georgian Geophysical Soc,, Iss. (B), Physics of Atmosphere, Ocean and Space Plasma, ISSN 1512-1127, v. 13B, Tbilisi, 2009, pp. 50 – 54.
[10] Amiranashvili A., Kartvelishvili L., Trofimenko L., Khurodze T. Statistical Structure of Mean Annual Air Temperature in Tbilisi and St.-Petersburg in 1850-2012. Proc. of Int. Conf. "Modern Problems of Geography", Dedicated to the 80th Anniversary Since the Fondation of Vakhushti Bagrationi Institute of Geography, Collected Papers New Series, N 5(84), ISSN 2233-3347, Tbilisi, 2013, pp. 160-163.
[11] Nastos P., Matzarakis A., Nikopoulou M., Tzu-Ping Lin. Advances in Urban Biometeorology 2014. Advances in Meteorology, vol. 2015, Article ID 273831, 3, p.
[12] Mc Michael A.J., Woodruff R.E., Hales S. Climate Change and Human Health: Present and Future Risks. Lancet, 367, 2006, pp. 859-868.
[13] Amiranashvili A., Chikhladze V., Kartvelishvili L., Khazaradze K. Expected Change of the Extremal Air Temperature and its Influence on the Mortality (Based on the Example to Tbilisi City), International Cooperation Network for East European and Central Asian Countries: EECA Conference – October 7-8, 2010, Yerevan, Armenia, http://be.sci.am/.
[14] Amiranashvili A.G., Kartvelishvili L.G., Saakashvili N.M. , Chikhladze V.A. Long-Term Variations of Air Effective Temperature in Kutaisi. "Modern Problems of Using of Health Resort Resources", Collection of Scientific Works of International Conference, Sairme, Georgia, June 10-13, 2010, ISBN 978-9941-0-2529-7, Tbilisi, 2010, pp. 152-157, (in Russian).
[15] Amiranashvili A.G., Kartvelishvili L. G. Long-Term Variations of Air Effective Temperature in Tbilisi. Trans. Of the Institute of Hydrometeorology, vol. 115, ISSN 1512-0902, Tb., 2008, pp. 214–219, (in Russian).
[16] Ruuhela R., Jylha K., Lanki T., Tiittanen P., Matzarakis A. Biometeorologycal Assessment of Mortality Related to Extreme Temperatures in Helsinki Region, Finland, 1972-2014. Int. Journ. Of Environmental Research and Public Health, vol. 14, iss. 8., 2017, 19 p.
[17] Saakashvili N.M., Tabidze M.Sh., Tarkhan-Mouravi I.D., Amiranashvili A.G., Melikadze G.I., Chikhladze V.A. To a Question about the Certification of the Health Resort and Tourist Resources of Georgia. "Modern Problems of Using of Health Resort Resources", Collection of Scientific Works of International Conference, Sairme, Georgia, June 10-13, 2010, ISBN 978-9941-0-2529-7, Tbilisi, 2010, pp. 175-180, (in Russian).
[18] Amiranashvili A.G., Chikhladze V.A. Saakashvili N.M., Tabidze M.Sh., Tarkhan-Mouravi I.D. Bioclimatic Characteristics of Recreational Zones – Important Component of the Passport of the Health Resort – Tourist Potential of Georgia, Pressing Problems in Hydrometeorology and Ecology, Papers of the Int. Conf. Dedicated to the 90th Anniversary of Academician G. Svanidze, September 27-29, Tbilisi, 2011, Trans. Of the Institute of Hydrometeorology at the Georgian Technical University, vol. 117, ISSN 1512-0902, Tbilisi, 2011, pp. 89-92.
[19] Vadachkoria M.K., Ushveridze G.A., Jaliashvili V.G. Health Resorts of the Georgian SSR. Tbilisi, 1987, 383 p. (in Georgian, Russian and English).
[20] Amiranashvili A.G., Cornélissen G., Amiranashvili V., Gheonjian L., Chikhladze V.A., Gogua R.A., Matiashvili T.G., Paatashvili T., Kopytenko Yu.A., Siegelova J., Dusek J., Halberg F. Circannual and

circadecennian stages in mortality from cardiovascular causes in Tbilisi, Republic of Georgia (1980-1992). Scriptamedica (Brno), 75, 2002, pp. 255-260.
[21] Amiranashvili A.G., Gogua R.A., Matiashvili T.G., Kirkitadze D.D., Nodia A.G., Khazaradze K.R., Kharchilava J.F., Khurodze T.V., Chikhladze V.A. The Estimation of the Risk of Some Astro-Meteo-Geophysical Factors for the Health of the Population of the City of Tbilisi. Int. Conference "Near-Earth Astronomy 2007" Abstract, Terskol, Russia, 3-7 September 2007.
[22] Amiranashvili A.G., Amiranashvili V.A., Kartvelishvili L. G., Nodia Kh.A., Khurodze T.V. Influence of Air Effective Temperature and Geomagnetic Storms on the Population of Tbilisi City. Trans. Of the Institute of Hydrometeorology, vol. 115, ISSN 1512-0902, Tb., 2008, pp. 434–437, (in Russian).
[23] Amiranashvili A., Danelia R., Mirianashvli K., Nodia Kh., Khazaradze K., Khurodze T., Chikhladze V. On the Applicability of the Scale of Air Equivalent- Effective Temperature in the Conditions of Tbilisi City. Trans. Of Mikheil Nodia Institute of Geophysics, ISSN 1512-1135, vol. 62, Tbilisi, 2010, pp. 216-220, (in Russian).
[24] Amiranashvili A., Khurodze T., Shavishvili P., Beriashvili R., Iremashvili I. Dinamics of the Mortality of the Population of Tbilisi City and its Connection with the Surface Ozone Concentration. Journ. Of Georgian Geophysical Soc., Iss. (B), Physics of Atmosphere, Ocean and Space Plasma, vol.16b, Tbilisi, 2013, pp. 31-38.
[25] Amiranashvili A.G. Increasing Public Awareness of Different Types of Geophysical Catastrophes, Possibilities of Their Initiation as a Result of Terrorist Activity, Methods of Protection and Fight With Their Negative Consequences. Engaging the Public to Fight Consequences of Terrorism and Disasters.NATO Science for Peace and Security Series E: Human and Societal Dynamics, vol. 120. IOS Press, Amsterdam•Berlin•Tokyo•Washington, DC, ISSN 1874-6276, 2015, pp.155-164. http://www.nato.int/science; http://www.springer.com; http://www.iospress.nl
[26] Amiranashvili A., Chargazia Kh., Chikhladze V., Japaridze N., Khazaradze K. The monthly variations in mortality from the cardiovascular diseases in Tbilisi. Georgian Medical News, No 5 (242), 2015, pp. 53-59.
[27] AmiranashviliA.G., Bakradze T. S., Berianidze N.T., Japaridze N.D., Khazaradze K.R. Effect of Mean Annual Changeability of Air Temperature, Surface Ozone Concentration and Galactic Cosmic Rays Intensity on the Mortality of Tbilisi City Population. Journal of the Georgian Geophysical Society, Issue B. Physics of Atmosphere, Ocean and Space Plasma, v.19B, Tbilisi, 2016, pp. 135-143.
[28] Amiranashvili A., Matzarakis A., Kartvelishvili L. Tourism Climate Index in Tbilisi. Trans. Of the Institute of Hydrometeorology, vol. 115, ISSN 1512-0902, Tbilisi, 18 – 19 November, 2008, pp. 27 – 30.
[29] Amiranashvili A., Matzarakis A., Kartvelishvili L. Tourism Climate Index in Batumi. "Modern Problems of Using of Health Resort Resources", Collection of Scientific Works of International Conference, Sairme, Georgia, June 10-13, 2010, ISBN 978-9941-0-2529-7, Tbilisi, 2010, pp. 116-121.
[30] Kartvelishvili L., Matzarakis A., Amiranashvili A., Kutaladze N. Assessment of touristical-recreation potential of Georgia on background regional climate change, Proc. Of Iist International Scientific-Practical Conference "TOURISM: ECONOMICS AND BUSINESS", June 4-5, Batumi, Georgia, 2011, pp. 250-252.
[31] Amiranashvili, A., Chargazia, Kh., Matzarakis, A. Comparative Characteristics of the Tourism Climate Index in the South Caucasus Countries Capitals (Baku, Tbilisi, Yerevan). Journal of the Georgian Geophysical Society, Issue (B). Physics of Atmosphere, Ocean, and Space Plasma, v.17b, 2014, pp. 14-25.
[32] Amiranashvili A., Chargazia Kh., Matzarakis A., Kartvelishvili L. Tourism climate index in the coastal and mountain locality of Adjara, Georgia. International Scientific Conference "Sustainable Mountain Regions: Make Them Work". Proceedings, Borovets, Bulgaria, ISBN 978-954-411-220-2, 14-16 May,2015, pp.238-244, http://geography.bg/MountainRegions_Sofia2015
[33] Amiranashvili A. G., Japaridze N. D., Kartvelishvili L. G., Khazaradze R. R. Tourism Climate Index in Telavi (Eastern Georgia). The Questions of Health Resort Managing, Physioteraphy and Rehabilitation, International Collection of Scientific Articles, Vol. I, ISSN 2449-271X, Tbilisi, 2016, p. 76-81.
[34] Amiranashvili A.G., Japaridze N.D., Kartvelishvili L.G., Khazaradze K.R., Matzarakis A., Povolotskaya N.P., Senik I.A. Tourism Climate Index of in the Some Regions of Georgia And North Caucasus. Journal of the Georgian Geophysical Society, Issue B. Physics of Atmosphere, Ocean and Space Plasma, v. 20B, 2017, pp. 43–64.

[35] Tarkhan-Mouravi I., Saakashlili N., Tabidze M., Kakulia N., Kvinikadze I., Khelashvili E., Tarkhnishvili N., Amiranashvili A., Kirkitadze D., Tarkhnishvili A., Chikhladze V. Some Microclimatic Characteristic of Health Resort Tskaltubo. Trans. Of Mikheil Nodia Institute of Geophysics, ISSN 1512-1135, vol. 60, Tbilisi, 2008, pp. 314 – 318, (in Russian).
[36] Saakashvili N. M., Tabidze M.SH., Tarkhan-Mouravi I.D., Khelashvili E.I., Amiranashvili A.G., Kirkitadze D.D., Melikadze G.I., Nodia A.G., Tarkhnishvili A.G., Chikhladze V.A., Lominadze G.J., Tsikarishvili K.D., Chelidze L.T. Climatic, Aero-Ionizing and Radiological Characteristics of the Health Resort – Tourist Complex of Tskaltubo City. Trans. Of the Institute of Hydrometeorology, vol. 115, ISSN 1512-0902, Tb., 2008, pp. 31-40, (in Russian).
[37] Amiranashvili A.G., Bliadze T.G., Chikhladze V.A., Saakashvili N.M., Tarkhan-Mouravi I.D., Sikharulidze Sh.A., Lachashvili N.I. National Botanical Garden of Georgia – Recreational – Sanitation Oasis of Tbilisi City, Pressing Problems in Hydrometeorology and Ecology, Papers of the Int. Conf. Dedicated to the 90th Anniversary of Academician G. Svanidze, September 27-29, Tbilisi, 2011, Trans. Of the Institute of Hydrometeorology at the Georgian Technical University, vol. 117, ISSN 1512-0902, Tbilisi, 2011, pp. 94-96.
[38] Amiranashvili A., Mirianashvili K., Fedorova N., Levit V., Fabiana Medeiros Carnaúba, Aliton Oliveira da Silva. Comparative analysis of air equivalent – effective temperature in some cities of Georgia and Brazil, Proc. Of Int. Conf. "Environment and Global Warming", Dedicated to the 100th Birthday Anniversary of Academician F. Davitaya, Collected Papers New Series, N 3(82), ISSN 2333-3347, Tbilisi, 2011, pp. 105-110.
[39] Amiranashvili A.G, Bolashvili N.R., Chikhladze V.A., Japaridze N.D., Khazaradze K.R., Khazaradze R.R., Lezhava Z.L., Tsikarishvili K.D. Some New Data about the Bioclimatic Characteristics of the Village of Mukhuri (Western Georgia). Journal of the Georgian Geophysical Society, Issue B. Physics of Atmosphere, Ocean and Space Plasma, v.18B, Tbilisi, 2015, pp. 107-115.
[40] Bliadze T.G., Chikhladze V.A., Japaridze N.D., Khazaradze K.R., Khazaradze R.R., Melikadze G.I., Varamashvili N.D., Vepkhvadze S.G. Some Bioclimatic Indices of the Health Resort-Tourist Complex of Bazaleti Lake (Georgia). Journal of the Georgian Geophysical Society, Issue B. Physics of Atmosphere, Ocean and Space Plasma, v.18B, Tbilisi, 2015, pp. 116-123.
[41] Bolashvili N.R., Chikhladze V.A., Khazaradze K.R., Lezhava Z.I., Tsikarishvili K.D. Some Bioclimatic Characteristics of Martvili Canyon (Western Georgia). The Questions of Health Resort Managing, Physioteraphy and Rehabilitation, International Collection of Scientific Articles, Vol. I, ISSN 2449-271X, Tbilisi, 2016, p. 81-87.
[42] Kobisheva N., Narovlianski G. Climatological processing of the meteorological information, Leningrad, Gidrometeoizdat, 1978, 294 p., (in Russian).

ჰაერის ექვივალენტურ-ეფექტური ტემპერატურის საშუალოდღიური მნიშვნელობების შედარებითი ანალიზი თბილისში და კოჯორში

ქ. ხაზარაძე

რეზიუმე

ჰაერის ექვივალენტურ-ეფექტური ტემპერატურის სკალის. როგორც დროის დღეღამური მასშტაბის ბიოკლიმატური მაჩვენებლის გამოყენების შესაძლებლობის დასადასტურებლად წარმოდგენილია თბილისში ჰაერის ექვივალენტურ-ეფექტური ტემპერატურის საშუალო დღეღამური მნიშვნელობების კავშირი ამ ქალაქში მოსახლეობის გულსისხლძარღვთა დაავადების მიზეზით გამოწვეულ სიკვდილიანობასთან. მიღებულია, რომ ჰაერის ექვივალენტურ-ეფექტური ტემპერატურასთან სიკვდილიანობის კავშირს აქვს კლასიკური ხასიათი - სიკვდილიანობის შემცირება გრადაციიდან „მკვეთრად ცივი" „კომფორტული"- მდე და შემდგომი ზრდით გრადაციამდე „თბილი". ამრიგად, ჰაერის ექვივალენტურ-ეფექტური ტემპერატურის არსებული სკალა სავსებით შესაძლებელია გამოყენებულ იქნას მისი ზემოქმედების შესაფასებლად ადამიანების ჯანმრთელობაზე დღეღამურ მასშტაბში.

ჩატარებულია ექვივალენტურ-ეფექტური ტემპერატურის საშუალოდღეღამური მნიშიშვნელობების ფარდობითი ანალიზი თბილისში (3 მეტეოროლოგიური სადგური-ვაშლიჯვარი, თბილისის სახელმწიფო უნივერსიტეტი, თბილისის აეროპორტი) და კოჯორში (სამთო კურორტი თბილისიდან 10 კილომეტრზე). კერძოდ ნაჩვენებია, რომ ექვივალენტურ-ეფექტური ტემპერატურა თბილისის ურბანიზებულ რაიონებში (ვაშლიჯვარი, უნივერსიტეტი) მნიშვნელოვნად განსხვავდება მათი მნიშვნელობისაგან ქალაქის ფარგლებს გარეთ (აეროპორტი,კოჯორი). კოჯორში არ შეინიშნება ადამიანის ჯანმრთელობისათვის ნეგატიური ექვივალენტურ-ეფექტური ტემპერატურის მაღალი მნიშვნელობები, რომლებიც მოქცეულნი არიან დიაპაზონში „თბილი“.

Сравнительные анализ среднесуточных значений эквивалентно-эффективной температуры воздуха в Тбилиси и Коджори

К.Р. Хазарадзе

Резюме

Для подтверждения применимости шкалы эквивалентно-эффективной температуры воздуха (ЕЕТ) как биоклиматического показателя в суточном масштабе времени, представлены результаты изучения связи среднесуточных значений ЕЕТ в Тбилиси со смертностью населения этого города от сердечно-сосудистых заболеваний. Получено, что зависимость смертности от ЕЕТ имеет классический вид - убывание смертности от градации “резко холодно” до “комфортно” с дальнейшим ростом до градации “тепло”. Таким образом, существующая шкала ЕЕТ вполне приемлема для оценки степени ее воздействия на здоровье людей и в суточном масштабе.

Проведен сравнительный анализ среднесуточных значений ЕЕТ в Тбилиси (3 метеорологические станции – Вашлиджвари, Тбилисский государственный университет, Тбилисский аэропорт) и в Коджори (горный курортный поселок в 10 км от центра Тбилиси). В частности показано, что значения ЕЕТ в урбанизированной части города Тбилиси (Вашлиджвари, университет) существенно отличаются от их значений за пределами города (Аэропорт, Коджори); в Коджори не наблюдаются негативные для здоровья людей высокие значения ЕЕТ, попадающие в диапазон “Тепло”.