GLOBAL WARMING: 0.6 ^{o}C OR LESS? V.A.Alexeev; Vernadsky Institute of Geochemistry and Analytical Chemistry, Russian Academy of Sciences, Moscow 119991 Russia; e-mail: aval@icp.ac.ru

The global average surface temperature (the average of near surface air temperature over land, and sea surface temperature) has increased since the end of the 19th century. For the 20th century this increase was found about 0.6 ^{o}C [1]. However this value can be too high owing to the influence of so-called urban heat islands on the results of temperature measurements [2]. Such influence should become apparent especially hardly in the winter seasons and in cold regions. In this theses there are analysed the datasets of temperature anomalies compiled by Hansen et al. [3], Jones et al. [4], and Lugina et al. [5].

The temperature anomaly is the deviation of the average annual or the average monthly value of a surface temperature regarding the average value of temperature in the definite time period (1951-1980 [3], 1961-1990 [4] or 1951-1975 [5]). For example in **Fig. 1** the changes of the average annual of temperature anomalies for a land of Northern Hemisphere in an interval 1880-2005 are showed according to the data [3]. The value of the coefficient B in an equation of the regression line $y = A + Bx$ (1) determines rate of temperature change (temperature trend) in a selected time period. In the considered example (**Fig. 1**) this trend was equal to $B = 0.076 \pm 0.005$ ^{o}C /10 yrs, that corresponds to an increase of temperature over a land of Northern Hemisphere for 126 years on 0.96 ± 0.07 ^{o}C. The values of a trend for different regions of the Earth counted according to the data [3-5] are given in the **Table 1**. It follows from these data, the temperature trend in Northern Hemisphere is higher, than in Southern one, especially for a land. For all surface of the Earth, the global value of a trend was obtained of 0.050-0.062 ^{o}C /10 yrs. Such trend corresponds to the increase of a temperature for the last 126 years on 0.63-0.78 ^{o}C.

However analysis of average monthly values of temperature testifies to essential difference of a temperature trends for winter and summer months. The average value of temperature of the winter months grows with years much faster than summer ones (**Fig. 2**). So, for example, calculation according to the data [3] has shown that for a land of the Northern Hemisphere a trend of average temperature of January in an interval 1880 – 2005 was equal to 0.107 ± 0.010 ^{o}C/10 yrs, whereas for average temperature of July this trend has appeared much less: 0.050 ± 0.005 ^{o}C/10 yrs. The similar difference is seen also for Southern Hemisphere. The counted by us values of a trend for winter (TR_{win}) and summer (TR_{sum}) seasons (**Table 2**) have shown that for all reviewed data [3-5] TR_{win} = (1.5-2) TR_{sum}. For Southern Hemisphere for the data [3] and [5] the same picture is seen: TR_{win} = (1.5-2.3) TR_{sum}, but for the data [4] $TR_{win} = TR_{sum}$. Jones et al. [4] have compiled the information on temperature from large number of stations - more than 3000. The considerable part of these stations was placed in Southern Hemisphere and in winter time the amount of information from these stations is essentially decreased, especially after 1948 (**Fig. 3**). Such outcome could be conditioned by complexity of the meteorological station data receiving from region of high latitudes during winter seasons. It could underestimate the value of a trend TR_{win} for the Southern hemisphere and make TR_{win} comparable with TR_{sum}.

The difference of trends of TR_{win} and TR_{sum} is especially seen for high latitudes. So, for example, the calculation according to the data [5] for 60-90 ^{o}N shows that the values of TR_{win} and TR_{sum} are equal to 0.189 ± 0.025 and 0.054 ± 0.010 ^{o}C/10 yrs accordingly, i.e. this values differ more than three times. Whereas for low latitudes 0-30 ^{o}N, these values are identical within standard error: 0.057 ± 0.007 and 0.047 ± 0.006 ^{o}C/10 yrs.

The reviewed differences of the temperature trends can be explained by local effects of heating, the intensity of influence which on meteorological stations is increased with years both in urban and in rural areas as a result of urbanization. These local effects of heating allow also explaining the discrepancies between the surface temperature record and that of the lower troposphere, as measured by satellites and radiosondes [6].

References:

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[2] Soon W. et al. Clim. Res. 1999. V.13. P.149-164.
[3] Hansen J.E. et al. 2006. <http://cdiac.ornl.gov/trends/temp/hansen/Hansen.html>
[4] Jones P.D. et al. 2006. <http://cdiac.ornl.gov/trends/temp/jones/jones.html>
[5] Lugina K.M. et al. 2005. <http://cdiac.ornl. gov/trends/temp/lugina/lugina.html>
[6] Angell, J.K. 2005. http://cdiac.ornl.gov/trends/temp/angell/angell.html

Table 1. The average annual surface temperature trends for the last 125 yrs (in °C/10 yrs)*

Dataset source	Region	Global	NHem	SHem
Hansen et al. [2]	land	0.058 ± 4	0.076 ± 5	0.042 ± 4
Hansen et al. [2]	land + ocean	0.050 ± 3	0.056 ± 4	0.043 ± 3
Jones et al. [3]	land + ocean	0.058 ± 3	0.060 ± 4	0.056 ± 3
Lugina et al. [4]	land + ocean	0.062 ± 4	0.069 ± 5	0.055 ± 3

* The errors refer to the last significant digit of the corresponding values.

Table 2. The surface temperature trends (TR) calculated for different seasons of the last 125 yrs (in °C/10 yrs)*

Dataset source:	Hansen et al. [2]		Jones et al. [3]		Lugina et al. [4]	
Region:	land		land + ocean		land + ocean	
Hemisphere:	NHem	SHem	NHem	SHem	NHem	SHem
TR_{annual}	0.076 ± 5	0.042 ± 4	0.060 ± 4	0.056 ± 3	0.069 ± 5	0.055 ± 3
TR_{win}	0.100 ± 8	0.061 ± 5	0.071 ± 6	0.055 ± 3	0.092 ± 7	0.067 ± 4
TR_{sum}	0.057 ± 5	0.026 ± 6	0.049 ± 4	0.055 ± 4	0.046 ± 5	0.043 ± 5
TR_{win}/TR_{sum}	1.75 ± 21	2.35 ± 58	1.45 ± 17	1.00 ± 9	2.00 ± 27	1.56 ± 21

* The errors refer to the last significant digits of the corresponding values. The winter months are DJF for NHem and JJA for SHem.

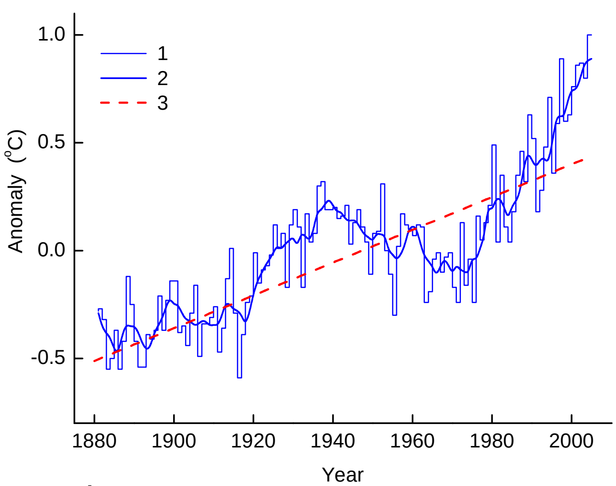

Fig. 1

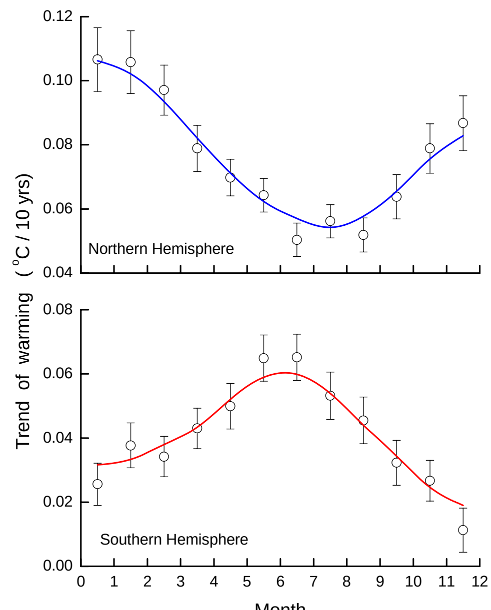

Fig. 2

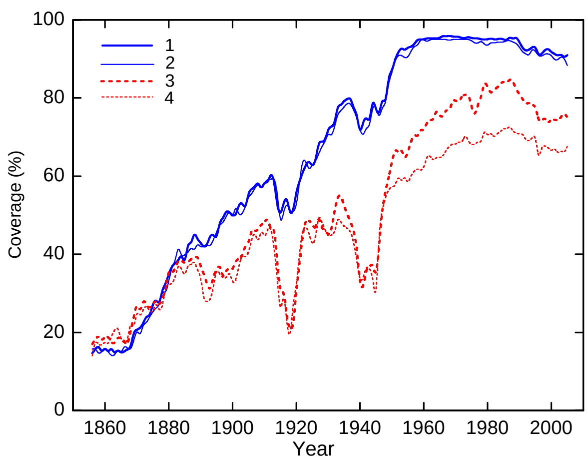

Fig. 3

Fig. 1. Annual mean land-surface temperature anomalies for Northern Hemisphere (1); 2 – 5-year mean; 3 – regression line: $y = -14.8 + 0.0076x$. (According to dataset [2].)

Fig. 2. The values of trend (the coefficient of B in the eq. (1)) on the timescale 1881-2005 in depend on the month of an year. (According to dataset [2].)

Fig. 3. The coverage of the meteorological stations through of Northern (1, 2) and Southern (3, 4) Hemispheres in summer (1, 3) and winter (2, 4). (According to dataset [3].)