

STATISTICAL CHARACTERISTICS OF DAILY MINIMUM VALUES OF HORIZONTAL METEOROLOGICAL VISIBILITY IN TELAVI (GEORGIA)

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Summary: The statistical characteristics of the minimum values of horizontal meteorological visibility (Vis) in Telavi in the period 2010, 2012-2015 are presented. The values of Vis in Telavi changes from 0.2 km (on the average - 7 ± 4 days with year) to ≥ 50 km (on the average - 246 ± 15 days with year). The mean number of days per annum with the minimum values of visibility of another intensity of Vis is follows: Vis = 20 km – 62 ± 22 ; Vis = 10 km – 11 ± 4 ; Vis = 4 km – 31 ± 5 ; Vis = 2 km – 6 ± 2 ; Vis = 1 km – 2 ± 1 ; Vis = 0.5 km – 3 ± 3 . Data about repeatability of Vis in three periods of year and in different month of year are presented.

Key words: visibility, urban climate

Introduction

Visibility presents one of the important meteorological parameters. Visibility depends on many factors, including the aerosol pollution of the atmosphere, forest and field fires, dust storms, fogs, etc. [1-10].

In the work [7] some results of the complex monitoring of the intensity of solar radiation, total cloudiness, visibility and air temperature in Tbilisi in the period from June 2009 through May 2010 are represented.

In the work [8] the statistical structure of the visibility in Tbilisi in the period from 1980 through 2008 is studied. In the period from 2004 to 2008 in comparison with period from 1980-1984 following changes in the visibility (Vis) are observed: Vis (>50 km) – 20% increase, Vis (10-20 km) – 37% decrease, Vis (2-4) – 90% decrease, Vis (1-2 km) – 68% decrease, Vis (2-10 km) – 46% decrease, Vis (1-4 km) – 88% decrease.

In the work [9] it was shown that in Tbilisi airport the horizontal visibility in the fogs on the average was 0,5 km (min - 0,1; max - 1,0 km). Most frequently fogs with the horizontal visibility 0.4-0.5 km (of 25% cases) were observed. Fogs with the visibility 0.1-0.2 km was observed in 8,3% of cases.

In this work the results of a statistical analysis of the daily minimum values of horizontal visibility for Telavi (Kakheti region of Georgia) in the period 2010, 2012-2015 are presented.

Material and methods

Data of the National Environmental Agency of Georgia about the daily minimum values of horizontal visibility (Vis) for Telavi in the period 2010, 2012-2015 [<http://www.pogodaiklimat.ru/archive.php?id=ge>]. The analysis of data is carried out with the use of the standard statistical analysis methods.

The following designations will be used below: Mean – average value; Min – minimal values; Max - maximal values; St Dev - standard deviation; St Err - standard error, (68% - confidence interval of mean values); C_v - coefficient of variation, (%); 99%(+/-) - 99% confidence interval of the average values

Results and discussion.

The results in table 1 and fig. 1,2 are given.

Table 1. Statistical characteristics of the number of days per annum with the minimum values of visibility of different intensity in Telavi in 2010, 2012-2015.

Visibility, km	0.2	0.5	1	2	4	10	20	≥50
min	5	1	1	4	27	8	35	234
max	9	5	3	8	36	15	78	264
mean	7	3	2	6	31	11	62	246
St Dev	2.1	2.1	0.8	1.6	3.6	3.1	16.9	11.8
Cv,%	28.4	62.4	40.8	26.5	11.6	27.8	27.4	4.8
St Err	1.5	1.5	0.5	0.8	1.8	1.6	8.4	5.9
99%(+/-)	4	3	1	2	5	4	22	15

As follows from table 1 the values of Vis in Telavi changes from 0.2 km (on the average - 7 ± 4 days with year) to ≥ 50 km (on the average - 246 ± 15 days with year). The mean number of days per annum with the minimum values of visibility of another intensity of Vis is follows: Vis = 20 km – 62 ± 22 ; Vis = 10 km – 11 ± 4 ; Vis = 4 km – 31 ± 5 ; Vis = 2 km – 6 ± 2 ; Vis = 1 km – 2 ± 1 ; Vis = 0.5 km – 3 ± 3 .

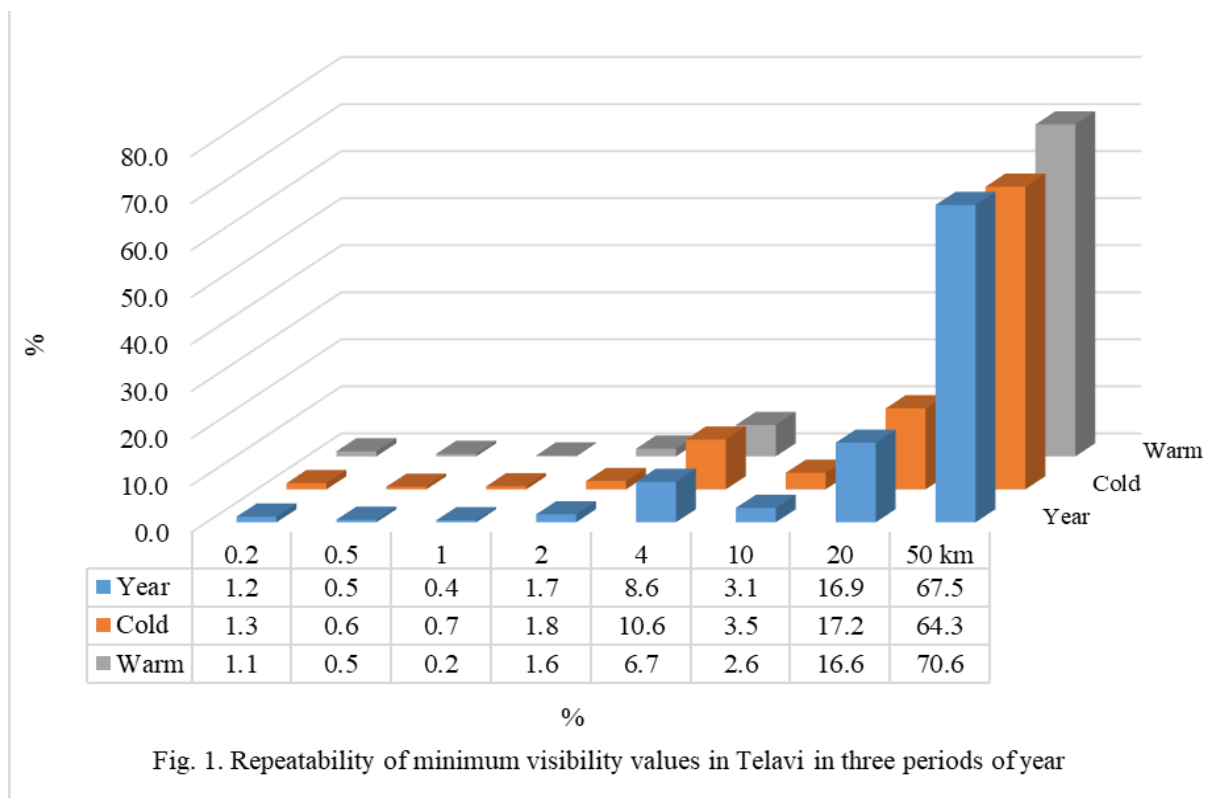


Fig. 1. Repeatability of minimum visibility values in Telavi in three periods of year

In fig. 1 data about repeatability of Vis in Telavi in three periods of year are presented. The highest repeatability of the minimum visibility values is observed for $Vis \geq 50$ km (67.5, 64.3 and 70.6% per year, cold and warm six months, respectively); the smallest - for Vis 0.5-1 km (0.5-0.4, 0.6-0.7 and 0.5-0.2 % per year, cold and warm six months, respectively).

In fig. 2 data about repeatability of Vis in Telavi in different month of year are presented. Variability of repeatability of visibility for different its values is follows (fig. 2):

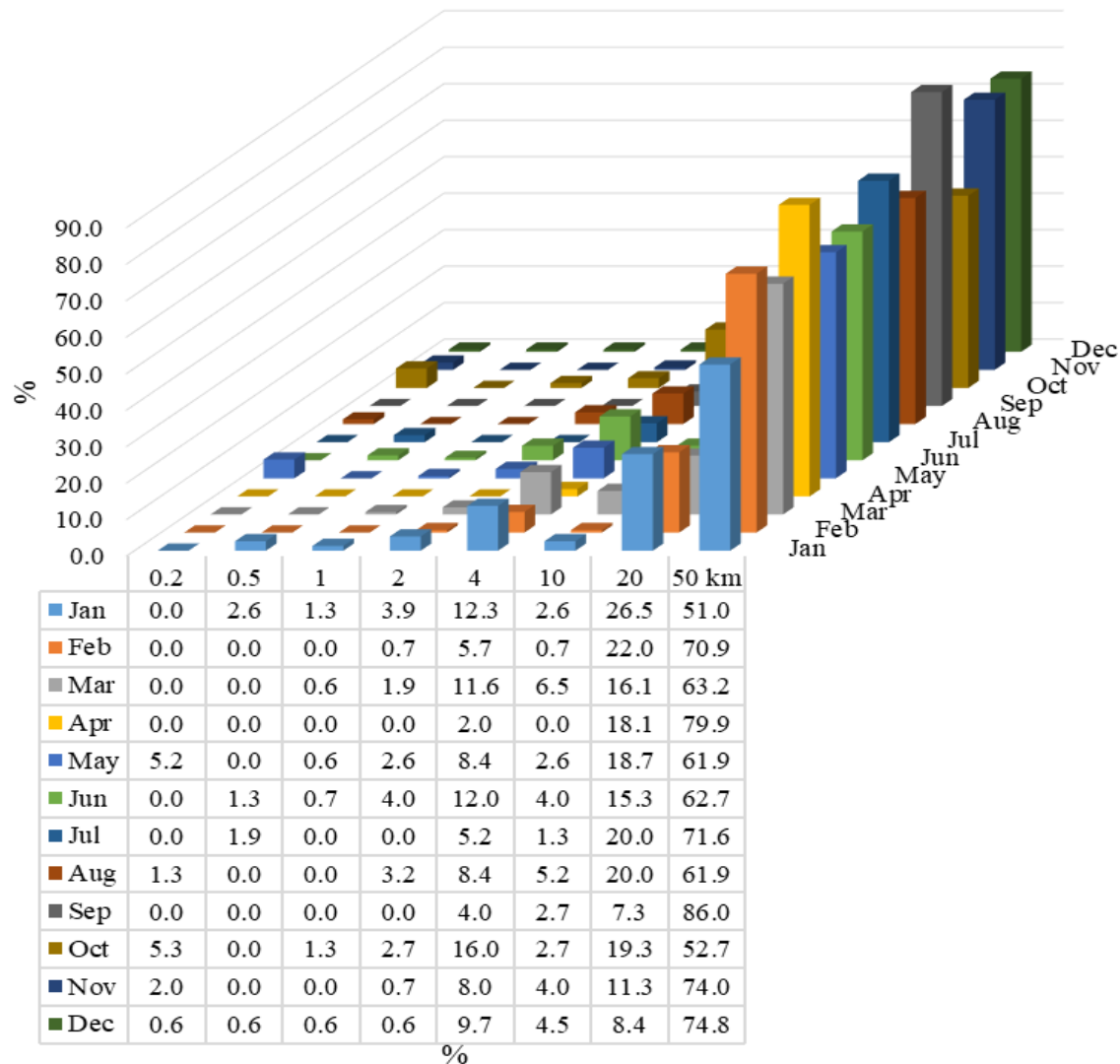


Fig. 2. Repeatability of minimum visibility values in Telavi in different months of year

$Vis \geq 50$ km – from 51.0 % (Jan) to 86.0 % (Sep); $Vis = 20$ km – from 7.3 % (Sep) to 26.5 % (Jan); $Vis = 10$ km – from 0.0 % (Apr) to 6.5 % (Mar); $Vis = 4$ km – from 2.0 % (Apr) to 16.0 % (Oct); $Vis = 2$ km – from 0.0 % (Apr, Jul, Sep) to 4.0 % (Jun); $Vis = 1$ km – from 0.0 % (Feb, Apr, Jul-Sep, Nov) to 1.3 % (Jan, Oct); $Vis = 0.5$ km – from 0.0 % (Feb-May, Aug-Nov) to 2.6 % (Jan); $Vis = 0.2$ km – from 0.0 % (Jan-Apr, Jun, Jul, Sep) to 5.3 % (Oct).

Conclusion

Over the future is planned the similar study of the visibility for other cities of Georgia.

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