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# I. Note on the mean temperature of Irkoutsk, in Siberia

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[THIRD SERIES.]

JANUARY 1833.

I. *Note on the Mean Temperature of Irkoutsk, in Siberia. By Professor M. A. KUPFFER, of the Imperial Academy of Sciences of St. Petersburg\*.*

**M. TCHOUKINE**, at Irkoutsk in Siberia, sent me some time ago an abstract of his meteorological observations, which have been continued during *ten* consecutive years; with a perseverance which is the more laudable, as the example of it is rare in the interesting country where he lives.

The months are reckoned after the Old Style, which is still generally used in Russia.

TABLE showing the Mean State of the Octogesimal, or Reaumur's Thermometer in Irkoutsk, during Ten successive Years, for 1820—1830 inclusive.

Months.	1820.				1821.			
	7 <sup>h</sup> A.M.	2 <sup>h</sup> P.M.	9 <sup>h</sup> P.M.	Mean.	7 <sup>h</sup> A.M.	2 <sup>h</sup> P.M.	9 <sup>h</sup> P.M.	Mean.
Jan.	...	...	...	...	-15.64	- 4.37	-12.63	-10.88
Feb.	...	...	...	...	11.66	- 0.53	11.00	7.73
Mar.	...	...	...	...	- 7.12	+ 3.55	- 4.14	- 2.57
April	...	...	...	...	+ 1.88	11.18	+ 3.38	+ 5.48
May	...	...	...	...	6.72	13.53	5.56	8.60
June	...	...	...	...	11.02	14.21	8.83	11.35
July	+ 9.56	+16.90	+11.20	+12.55	12.90	20.71	11.40	15.00
Aug.	7.00	14.60	9.45	10.35	10.68	13.80	9.55	12.01
Sept.	+ 1.53	11.63	+ 4.33	+ 5.83	+ 0.78	8.40	+ 0.50	+ 3.23
Oct.	- 5.71	+ 2.06	- 5.45	- 3.03	- 3.06	+ 2.16	- 2.76	- 1.22
Nov.	14.08	- 6.33	13.41	11.27	12.43	- 5.47	12.20	10.03
Dec.	-20.42	-13.58	-18.63	-17.54	-18.42	-12.42	-17.23	-16.02

\* Communicated by the Author.

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Months.	1822.				1823.			
	7 <sup>h</sup> A.M.	2 <sup>h</sup> P.M.	9 <sup>h</sup> P.M.	Mean.	7 <sup>h</sup> A.M.	2 <sup>h</sup> P.M.	9 <sup>h</sup> P.M.	Mean.
Jan.	-21.93	-12.45	-20.85	-18.41	-18.68	-11.04	-18.00	-15.91
Feb.	11.43	-4.18	9.71	-8.44	14.50	-7.10	14.32	11.97
Mar.	-2.06	+4.76	-0.66	+0.68	-7.77	+2.09	-6.30	-3.99
April	+1.45	8.93	+2.40	4.26	+0.77	8.00	+2.00	+3.59
May	6.97	15.00	6.84	9.60	6.16	13.80	6.42	8.79
June	11.20	17.33	11.50	13.34	12.40	20.60	11.16	14.72
July	12.79	20.20	13.21	15.40	13.03	19.39	12.32	14.91
Aug.	8.00	15.16	9.03	10.73	8.06	14.71	8.23	10.33
Sept.	+2.58	9.96	+3.02	+5.19	+1.52	9.01	+2.73	+4.42
Oct.	-3.06	+2.16	-2.76	-1.22	-4.70	+1.06	-4.58	-2.74
Nov.	14.13	-7.73	13.43	11.76	10.40	-4.83	9.70	8.31
Dec.	-19.03	-14.26	-18.19	-17.16	-20.18	-15.32	-20.58	-18.69
1824.								
Jan.	-16.58	-10.00	-15.24	-13.94	-18.03	-10.03	-15.80	-14.62
Feb.	13.20	-4.27	12.40	9.96	16.00	-7.67	13.71	12.46
Mar.	-6.75	+1.60	-4.47	-3.21	-8.04	+1.48	-5.19	-3.92
April	+3.70	10.86	+4.56	+6.37	+0.76	12.10	+2.06	+4.97
May	8.09	13.73	8.51	10.11	8.90	16.42	8.29	11.20
June	11.70	16.63	12.57	13.63	12.80	20.53	12.36	5.23
July	13.50	17.90	13.77	15.06	10.87	13.22	11.00	11.20
Aug.	9.45	13.77	10.11	11.11	9.16	14.16	9.95	11.09
Sept.	+3.13	8.00	+3.46	+4.86	+2.30	9.16	+2.96	+4.81
Oct.	-2.22	+1.07	-1.51	-0.89	-2.85	+1.93	-2.74	-1.22
Nov.	10.78	-6.10	10.06	8.98	10.53	-3.36	8.16	7.35
Dec.	-13.16	-8.61	-11.68	-11.15	-21.58	-13.93	-20.09	-18.53
1826.								
Jan.	-19.64	-10.39	-17.74	-15.92	-18.16	-11.32	-16.59	-15.36
Feb.	18.17	-7.60	15.32	13.70	13.14	-4.52	9.42	9.03
Mar.	-8.53	+1.83	-4.77	-3.82	-5.04	+5.00	+2.93	-0.99
April	+3.43	12.60	+3.30	+6.44	+0.70	8.40	1.36	+3.49
May	6.48	15.24	6.95	9.62	8.52	17.17	8.26	11.32
June	14.33	20.23	13.60	16.05	13.93	20.60	13.00	15.84
July	12.23	18.39	12.26	14.30	13.00	20.43	12.87	15.43
Aug.	9.00	14.20	9.50	10.90	8.42	14.68	8.87	10.66
Sept.	+1.76	10.26	+3.63	+5.22	+2.41	11.90	+3.15	+5.82
Oct.	-2.25	+3.58	-2.15	-0.27	-3.25	+3.84	-2.80	-0.74
Nov.	12.00	-6.23	10.93	9.72	10.90	-6.16	10.00	9.02
Dec.	-16.93	-9.93	-15.16	-4.01	-19.32	-12.16	-17.87	-16.45
1828.								
Jan.	-23.77	-13.55	-22.03	-19.78	-19.88	-11.77	-19.22	-16.96
Feb.	17.08	-3.24	14.15	11.49	18.12	-4.22	14.16	12.17
Mar.	7.64	+5.38	-5.45	-2.57	7.68	+3.88	-5.73	-3.18
April	-0.25	10.03	+0.35	+3.38	-1.11	8.22	+0.07	+2.39
May	+5.27	13.06	5.64	7.99	+5.31	14.76	6.40	8.82
June	11.16	19.63	11.30	14.03	10.47	17.03	11.38	12.96
July	12.72	22.22	13.59	16.18	11.93	21.25	13.47	15.55
Aug.	9.00	14.20	9.50	10.90	5.42	14.68	8.87	10.66
Sept.	+1.76	10.26	+3.63	+5.22	+2.41	11.90	+3.15	+5.82
Oct.	-2.25	+3.58	-2.25	-0.27	-3.25	+3.84	-2.80	-0.74
Nov.	12.00	-6.23	10.93	9.72	10.90	-6.16	10.00	9.02
Dec.	-16.93	-9.93	-15.16	-4.01	-19.32	-12.16	-17.87	-16.45
1829.								
Jan.	-23.77	-13.55	-22.03	-19.78	-19.88	-11.77	-19.22	-16.96
Feb.	17.08	-3.24	14.15	11.49	18.12	-4.22	14.16	12.17
Mar.	7.64	+5.38	-5.45	-2.57	7.68	+3.88	-5.73	-3.18
April	-0.25	10.03	+0.35	+3.38	-1.11	8.22	+0.07	+2.39
May	+5.27	13.06	5.64	7.99	+5.31	14.76	6.40	8.82
June	11.16	19.63	11.30	14.03	10.47	17.03	11.38	12.96
July	12.72	22.22	13.59	16.18	11.93	21.25	13.47	15.55
Aug.	9.00	14.20	9.50	10.90	5.42	14.68	8.87	10.66
Sept.	+1.76	10.26	+3.63	+5.22	+2.41	11.90	+3.15	+5.82
Oct.	-2.25	+3.58	-2.25	-0.27	-3.25	+3.84	-2.80	-0.74
Nov.	12.00	-6.23	10.93	9.72	10.90	-6.16	10.00	9.02
Dec.	-16.93	-9.93	-15.16	-4.01	-19.32	-12.16	-17.87	-16.45

Months.	1830.			
	7 <sup>h</sup> A.M.	2 <sup>h</sup> P.M.	9 <sup>h</sup> P.M.	Mean.
January.....	-16.40	- 8.07	-14.60	-13.02
February....	11.84	- 0.74	8.77	7.12
March.....	-10.00	+ 3.00	- 5.65	- 4.22
April.....	+ 0.09	10.14	+ 1.40	+ 3.88
May.....	5.83	15.46	7.47	9.59
June.....	+10.78	+21.13	+13.00	+14.97

TABLE containing the Means of Ten consecutive Years.

Months.	7 <sup>h</sup> A.M.	2 <sup>h</sup> P.M.	9 <sup>h</sup> P.M.	Mean.
January.. ...	-18.87	-10.30	-17.27	-15.48
February ...	14.51	- 4.41	12.30	10.41
March.....	- 7.06	+ 3.26	- 4.53	- 2.78
April.....	+ 1.14	10.05	+ 2.09	+ 4.43
May .. .....	6.83	14.84	7.03	9.57
June.....	11.98	18.79	11.87	14.21
July.....	12.25	19.06	12.51	14.61
August.....	8.63	15.16	9.47	11.09
September... +	1.81	9.99	+ 2.98	+ 4.93
October..... -	3.79	+ 2.51	- 3.11	- 1.46
November... +	11.50	- 5.38	10.55	9.14
December.... -	18.30	-12.00	-17.06	-15.79
Mean.....	- 2.61	+ 5.13	- 1.57	+ 0.31

*Observations on the preceding Results.*

(See this Journal, vol. i. pp. 135, 260, 428.)

It appears from the last of these tables that the mean temperature of Irkoutsk for ten years is +0°.31 of Reaumur, or 32°.7 of Fahrenheit, at the hours of 7<sup>h</sup> A.M. 2<sup>h</sup> P.M. and 9<sup>h</sup> P.M. Now it appears from the Leith hourly observations that the mean temperatures of these hours differ from the mean temperature of the day, in the following manner :

7 <sup>h</sup> A.M. . . . .	- 1°.983 Fahr.	
2 P.M. . . . .		+ 3°.203
9 P.M. . . . .	- 0°.438	
	<hr/>	<hr/>
	- 2.421	+ 3°.203
		- 2.421
		<hr/>
		+ 0.782

Hence the mean temperature obtained from the tables exceeds the true mean temperature of the twenty-four hours by 0°.782. The reason of this is obvious, from the circumstance

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that the observations made at 2<sup>h</sup> P.M. are made near the time of maximum, while no observations are made so near the time of minimum temperature. Hence we have

Observed mean temperature of Irkoutsk . . .	32°·7 Fahr.
Correction . . . . .	-0·78
Corrected mean temperature . . . . .	31·92

The mean temperature of Irkoutsk is therefore almost exactly that of the freezing point.

As I have no means of ascertaining even the approximate height of Irkoutsk above the level of the sea, it is impossible to compare the above result with that of the formula. I have not, therefore, calculated its distance from the Asiatic Pole; but taking it rudely from a globe, it is about 27° 10', which by the formula  $T = (81^{\circ}\cdot8 \sin D') + 1^{\circ}$ , gives for the temperature at the level of the sea 38°·3, leaving a difference from the observed temperature of 6°·4 as due to elevation.

Irkoutsk is situated in latitude 52° 16'·7 N., and longitude 104° 11' E., of Greenwich, according to the observations of Dr. Erman, who at the same time determined the following particulars relative to the magnetic action of the globe.

Dip of the North Pole of the needle . . . .	68° 6'·50
East declination . . . . .	2 4'·40
Magnetic intensity . . . . .	1·6324

The following are the results of M. Hansteen's observations made at the same time:

Dip of the needle . . . . .	68°12'·9
Declination . . . . .	1 37'·2
Magnetic intensity . . . . .	1·6466

II. *Observations on the Magnetic Intensity at Paris, Brussels, Göttingen, Berlin, and Stockholm. Extracted from a Letter from FREDERICK RUDBERG, Professor of Physics in the University of Upsal, to Sir D. Brewster.*

**T**HE values of the relative magnetic intensity contained in the following table were obtained, during my journey at the beginning of the present year, from experiments made at Paris, Brussels, Göttingen, Berlin, and Stockholm. The observations were made with an intensity compass, constructed by M. Gambey. To this compass belonged two needles, No. 1. and No. 2, with which I determined, by a particular investigation after my return to Stockholm, the variation which the intensity underwent by a change of temperature. The corrections which I found were,

- For No. 1.  $i' = i(1 - 0\cdot0004660 t)$ , and
- For No. 2.  $i' = i(1 - 0\cdot0005006 t)$