

VARIATION OF LATITUDE AT THE TŌKYŌ OBSERVATORY.

The values of the latitude given in the annexed tables are the result of a preliminary reduction of the 1st series of observations, extending from July 21, 1895 to June 26, 1896. It has been found desirable to publish this summary of them, though the complete report of this and of the 2nd series will appear in the "Annales de l'observatoire astronomique de Tokyo" of next year. The 2nd series was begun on September 13, 1896, and will terminate at the end of September of the present year. The interval of two months between these two series is due to my absence at that time on the expedition to Hokkaido to observe the total solar eclipse.

The site of these observations of latitude is nearly in the centre of the Observatory grounds; $\phi = 35^{\circ} 39' 17''$, $\lambda = 139^{\circ} 44' 33''$ E. of Greenwich. The instrument used is Wanschaff's zenith telescope, of 81^{mm} aperture and 100^{cm} focal length; its magnifying power is 125. It is provided with two delicate levels, $1''.135 \pm 0''.006$ and $1''.158 \pm 0''.008$, respectively. The value of one turn of the micrometer screw was determined in two ways; firstly, by the 14 series of circumpolar stars, which gave $1 \text{ turn} = 100 \text{ divisions} = 51''.631 \pm 0''.0047$; secondly, by the 18 series of the declination-differences of *Pleiades* which gave $51''.636 \pm 0''.0031$. In this reduction the mean value $= 51''.634 \pm 0''.0028$ has been adopted. For determining the inequality of the micrometer screw, I have investigated its periodic part and got a result almost coincident with that obtained by Prof. S. Hirayama, for the same instrument at Potsdam; and I have therefore adopted without verifying his value for the progressive part.

The observations were made by Talcott's method. Special care was taken to read when possible both levels before and after the star observations, but when time did not permit only one reading was taken, namely, that after them. The bisections of a star were done on the five vertical fixed threads in all cases. Electric lamps were employed for the illumination of the field and for the readings of levels and micrometer head.

The climatic conditions at the station were not always quite favourable, and generally in the winter the weather was very dry and clear, while in the summer it was misty and cloudy. This fact may be recognised in the number of observations in the monthly means (Table III).

The reduction of the 1st series was done by myself, with the kind assistance of Mr. S. Tashiro, Assistant in the Observatory. The declinations of the observed stars were taken mainly from the *Astronomisches Jahrbuch* and the *Greenwich Ten-Year Catalogue*, but a very few were taken from *Romberg's*, *1st Radcliffe's* and *Becker's Catalogues*. A, B, C, D, for deducing the apparent declinations from the mean places, were derived by interpolation from their daily values given in the *Jahrbuch*. The number of stars is 128, combined into 8 groups, each containing 8 pairs or 16 stars.

With respect to the aberration constant, I have to make the following remark. The cyclical sum of the differences of 8 groups is $-0''.183$, which must be the sum of error on the value of Struve's aberration constant $=20''.4451$, and the observation-errors. This amount, however, may be diminished to $-0''.038$ by the use of Nyren's constant $=20''.495$.* This shows to some extent the smallness of Struve's value. I have, therefore, for easy comparison tabulated two series of latitude values by the use of one or other of these two aberration constants. It will be seen that on the 28 mean values of the two series, the latter seems to be nearer to the mean curve than the former, but with regard to latitude variation its exact value is of no importance as it simply amounts to a slight displacement of the origin. The probable error of a single observation of latitude is $\pm 0''.098$, which has been found from 786 complete observations of all the groups.

Table I gives the daily means of latitude.

Table II gives 28 mean values of latitude.

Table III gives the monthly means of latitude.

(In these three tables, the adoption of Struve's or the Nyren's aberration constants is indicated by the letters S and N at the right hand side of the word 'latitude' at the head of the column.)

Table IV gives the charts drawn from Table (II N) and Table (III N).

I take this opportunity of expressing my best thanks to Prof. Terao, Director of the Observatory, for many conveniences throughout this work.

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* See A. J. No. 272.

TABLE I.

DAILY MEANS.

Date.	Latitude. (S)	(N)	No. of pairs.	Date.	Latitude. (S)	(N)	No. of pairs.
1895 July 21	35° 39' 16.53	16.54	5	1896 Jan. 12	35° 39' 16.74	16.78	6
	25	16.37	6		14	16.73	8
Aug. 7	16.63	16.65	7		20	16.73	6
	9	16.63	10		21	16.76	12
	10	16.77	1		22	16.75	13
	13	16.61	9		24	16.77	16
	14	16.48	3		28	16.70	16
	17	16.57	6		30	16.69	16
	18	16.51	15		31	16.59	8
	19	16.39	2	Feb. 2	16.72	16.76	15
	24	16.68	14		6	16.84	1
	29	16.55	14		7	16.66	8
Sept. 2	16.69	16.73	4		8	16.79	8
	4	16.68	16		10	16.74	7
	6	16.61	13		11	16.67	8
	9	16.71	16		14	16.67	16
	10	16.69	7		16	16.73	14
	18	16.75	9		17	16.64	16
	22	16.69	5		21	16.67	16
	29	16.62	16		22	16.71	8
	30	16.76	9	Mar. 2	16.65	16.68	14
Oct. 3	16.65	16.69	3		5	16.83	1
	6	16.76	15		6	16.75	15
	11	16.66	1		7	16.64	16
	12	16.48	6		8	16.75	8
	21	16.69	14		13	16.59	15
	25	16.63	8		14	16.58	14
	26	16.71	15		18	16.62	15
	28	16.80	14		25	16.54	16
	31	16.64	15		28	16.49	11
Nov. 1	16.87	16.92	5		30	16.61	7
	5	16.76	16		31	16.61	1
	7	16.74	16	Apr. 2	16.63	16.66	15
	8	16.79	16		3	16.61	16
	10	16.82	11		5	16.62	16
	14	16.66	14		8	16.57	8
	15	16.80	16		9	16.59	13
	16	16.77	8		23	16.66	5
	23	16.77	15		27	16.50	6
	26	16.82	5		28	16.41	15
	27	16.88	16	May 2	16.62	16.63	10
	29	16.78	15		5	16.52	15
	30	16.86	16		28	16.55	4
Dec. 3	16.79	16.82	8		30	16.50	10
	7	16.89	8	June 1	16.48	16.52	12
	9	16.78	16		5	16.48	24
	11	16.97	16		6	16.48	9
	12	16.77	10		11	16.41	2
	13	16.81	14		18	16.39	8
	14	16.79	8		19	16.46	24
	15	16.86	8		21	16.47	7
	18	16.72	16		25	16.49	22
	19	16.76	8		26	16.49	9
	28	16.73	16				
	29	16.70	16				

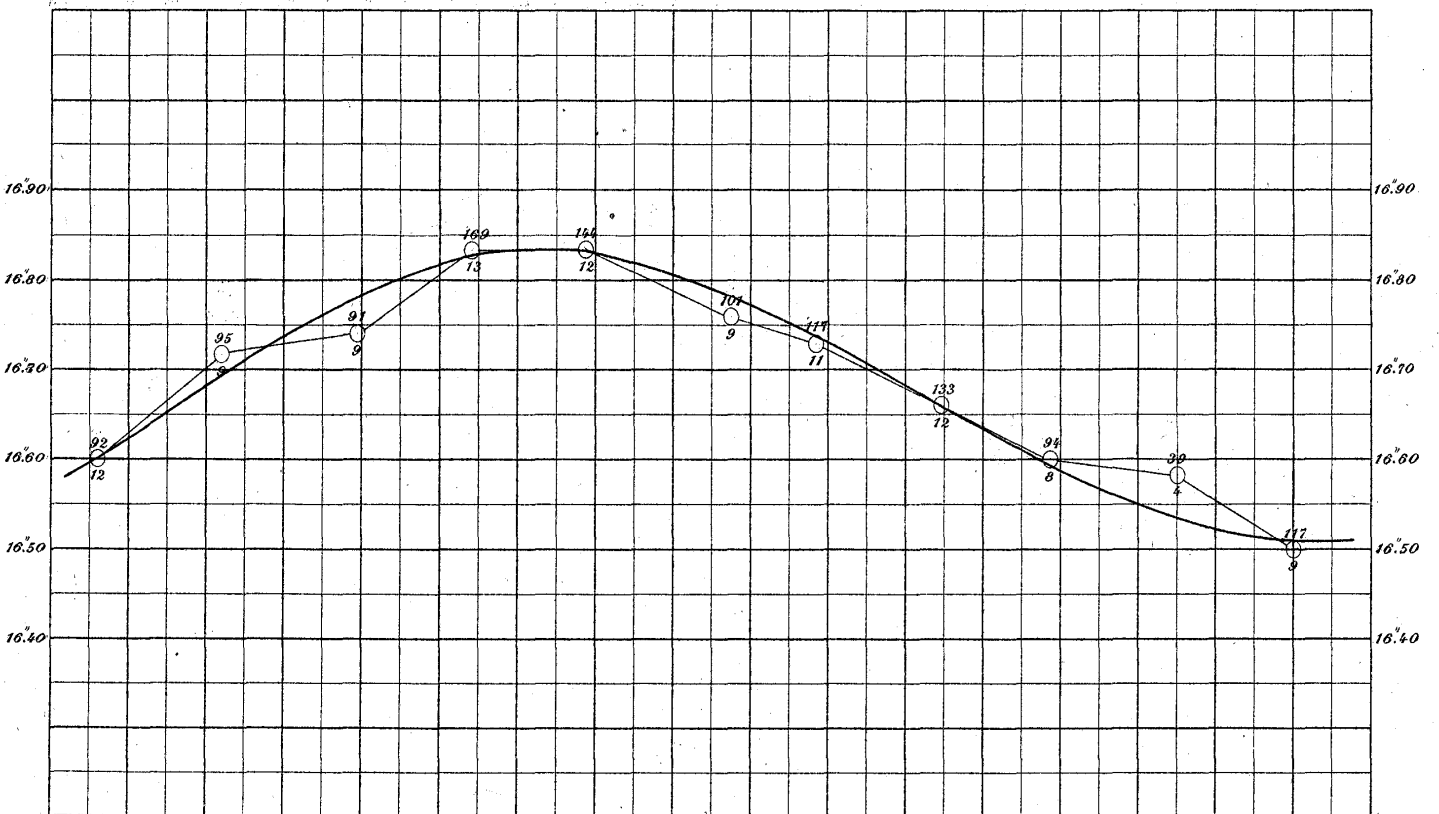
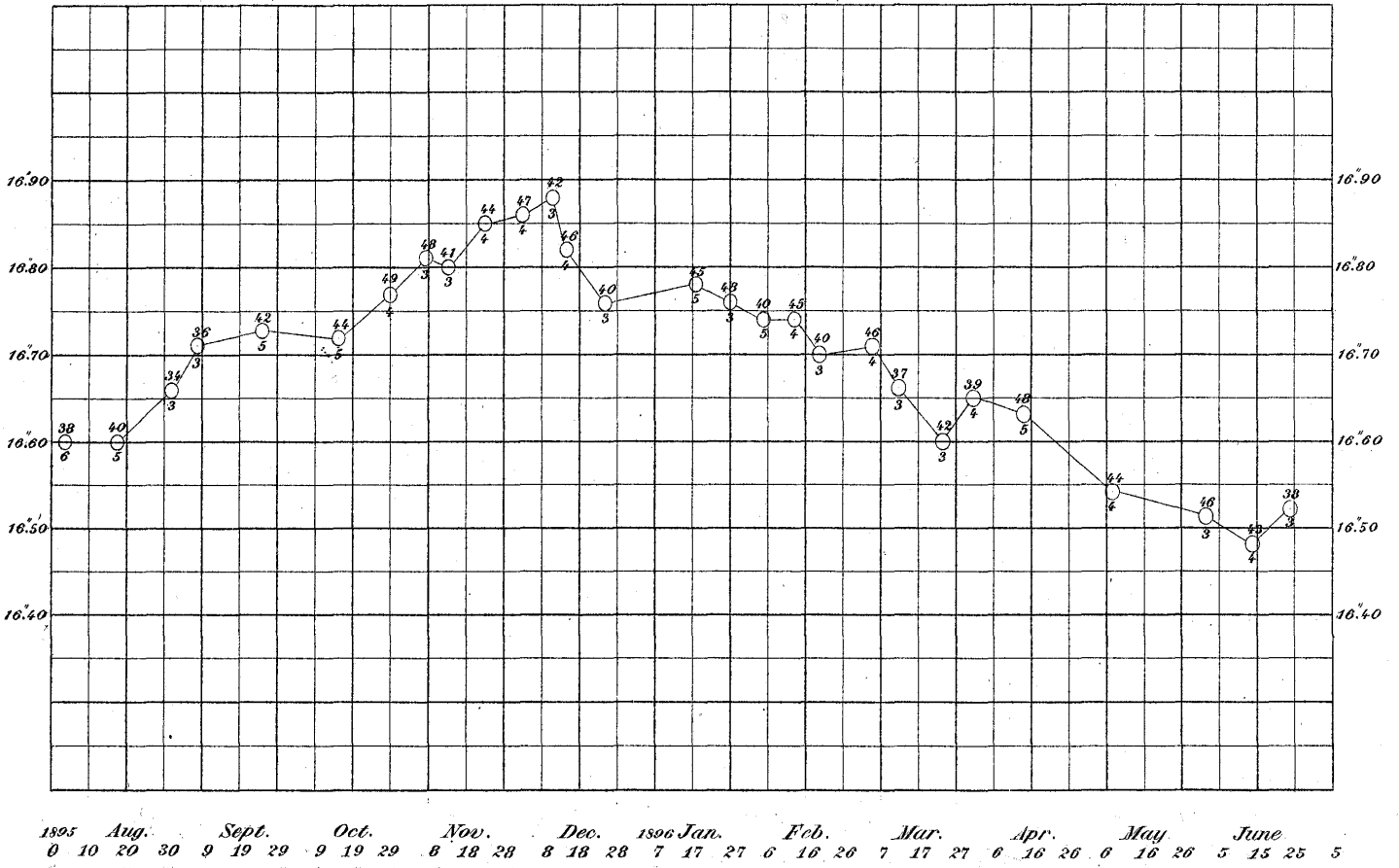
TABLE II. MEAN VALUES.

Date.	Year.	Latitude(S)	(N)	No. of pairs.	No. of nights.
1895 Aug.	4	1895.59	35° 39' 16.58"	38	6
	18	.63	16.57	40	5
Sept.	1	.67	16.63	34	3
	8	.69	16.67	36	3
	25	.73	16.69	42	5
Oct.	15	.79	16.67	44	5
	29	.83	16.73	49	4
	Nov.	7	.85	16.76	48
Nov.	13	.87	16.76	41	3
	23	.90	16.82	44	4
	Dec.	3	.92	16.83	47
Dec.	11	.94	16.85	42	3
	15	.96	16.78	46	4
	25	.98	16.72	40	3
1896 Jan.	18	1896.05	16.75	45	5
	27	.07	16.72	48	3
Feb.	5	.10	16.70	40	5
	13	.12	16.70	45	4
	20	.14	16.66	40	3
Mar.	5	.18	16.68	46	4
	12	.20	16.62	37	3
	24	.23	16.56	42	3
Apr.	1	.25	16.62	39	4
	14	.29	16.59	48	5
May	8	.35	16.51	44	4
	June	2	.42	16.48	46
June	14	.45	16.45	43	4
	24	.48	16.49	38	3

TABLE III. MONTHLY MEANS.

Date.	Year.	Latitude (S)	(N)	No. of pairs.	No. of nights.		
1895	Aug.	12	1895.61	35° 39' 16.57"	16.60	92	12
	Sept.	14	.70	16.68	16.72	95	9
	Oct.	18	.80	16.69	16.74	91	9
	Nov.	16	.88	16.79	16.83	169	13
	Dec.	15	.96	16.79	16.83	144	12
1896	Jan.	22	1896.06	16.72	16.76	101	9
	Feb.	12	.12	16.69	16.73	117	11
	Mar.	16	.21	16.62	16.66	133	12
	Apr.	13	.28	16.57	16.60	94	8
	May	16	.37	16.54	16.58	39	4
	June	15	.46	16.47	16.50	117	9
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TABLE IV.



The upper numbers denote the number of pairs.
 The lower numbers denote the number of nights.