56. *Provisional Result of the Work of the International Latitude Service in the North Parallel +39° 8' during the Year 1933.*

By Hisashi KIMURA, M.I.A.

International Latitude Observatory, Mizusawa.

(Comm. April 12, 1934.)

The Number of the International Stations is now complete namely 5.

Change of Observers has not been made at old four stations. At a new station, Gaithersburg, Mr. E. L. Williams has been engaged from the beginning.

Observing Programme is the same as in the preceding years.

Weather Conditions:—During the year the weather conditions in all stations were usually good throughout except the winter season.

Repairs of the Instruments:—At Mizusawa on Sept. 5, 1933 a micrometer wire was accidently broken, and after renewing it the micrometer case was again put back on Sept. 10.

Values of One Revolution of the Micrometer, their Temperature-Coefficients and Inequalities of the Screw:—The adopted values for the former two values are:—

for Mizusawa	39''.956	—''.00056 (T-7°.9)
„ Kitab	39''.765	—''.00120 (T-11°.5)
„ Carloforte	39''.753	—''.00126 (T-16°.1)
„ Gaithersburg	39''.620	—''.00120 (T-9°.7)
„ Ukiah	39''.754	—''.00120 (T-9°.4)

Besides them, slow variations of the values of the micrometers were applied.

The inequalities of the screw at Mizusawa, Kitab and Ukiah are the same as in the year 1932, but at Carloforte new one determined in the year 1933 was applied. At Gaithersburg also inequalities of the screw were applied.

The Mean of the Group:—The method of taking the mean of the group is the same as in the previous years.

TABLE 1. Mean of the Group.

EVENING GROUP.

Group	Mizusawa $\phi_0 = 3''.37$			Kitab $\phi_0 = 1''.65$			Carloforte $\phi_0 = 8''.86$			Gaithersburg $\phi_0 = 13''.16$			Ukiah $\phi_0 = 12''.00$		
	Date 1932 -33	No. Obs.	ϕ	Date 1932 -33	No. Obs.	ϕ	Date 1932 -33	No. Obs.	ϕ	Date 1932 -33	No. Obs.	ϕ	Date 1932 -33	No. Obs.	ϕ
III	.98	80	3.53	.98	48	1.76	.99	63	8.93	.97	36	13.31	.99	71	11.98
IV	.07	71	3.81	.06	52	2.08	.06	68	9.07	.07	37	13.33	.06	64	12.30
V	.13	58	3.88	.14	55	2.02	.13	72	9.11	.14	79	13.46	.14	77	12.40
VI	.22	85	2.86	.21	29	1.06	.23	62	8.12	.24	41	12.55	.24	59	11.47
VII	.31	92	3.53	.31	70	1.70	.32	46	8.83	.31	98	13.29	.30	64	12.28
VIII	.39	127	3.07	.39	51	1.22	.40	98	8.42	.39	63	12.91	.40	79	11.88
IX	.46	68	3.23	.48	78	1.49	.48	141	8.66	.47	120	13.21	.48	118	12.11
X	.55	75	3.60	.56	55	1.86	.56	151	9.09	.56	109	13.57	.56	120	12.49
XI	.64	62	3.21	.65	76	1.56	.64	163	8.84	.64	71	13.19	.64	120	12.06
XII	.73	94	2.98	.72	64	1.32	.72	120	8.62	.72	116	12.90	.72	112	11.79
I	.81	67	3.57	.81	67	1.88	.80	85	9.21	.80	133	13.45	.81	104	12.32
II	.89	83	3.26	.88	53	1.60	.89	55	8.86	.90	84	13.07	.88	88	12.00
III	.96	60	3.43	.97	48	1.71	.96	53	8.96	.97	75	13.13	.99	63	12.03

MORNING GROUP.

Group	Mizusawa $\phi_0 = 3''.37$			Kitab $\phi_0 = 1''.65$			Carloforte $\phi_0 = 8''.86$			Gaithersburg $\phi_0 = 13''.16$			Ukiah $\phi_0 = 12''.00$		
	Date 1932 -33	No. Obs.	ϕ	Date 1932 -33	No. Obs.	ϕ	Date 1932 -33	No. Obs.	ϕ	Date 1932 -33	No. Obs.	ϕ	Date 1932 -33	No. Obs.	ϕ
IV	.97	71	3.76	.98	46	2.07	.99	59	9.21	.97	34	13.60	.99	60	12.28
V	.07	63	3.88	.06	44	2.08	.07	37	9.13	.08	18	13.56	.06	64	12.34
VI	.14	59	2.90	.14	48	1.11	.14	56	8.19	.15	74	12.56	.14	72	11.51
VII	.23	73	3.65	.18	8	1.90	.23	59	8.86	.23	42	13.30	.25	52	12.31
VIII	.30	86	3.22	.31	71	1.31	.32	27	8.39	.31	79	12.97	.30	62	11.93
IX	.39	110	3.36	.39	48	1.49	.40	83	8.72	.40	86	13.19	.40	75	12.18
X	.45	68	3.67	.48	63	1.80	.48	122	9.04	.48	105	13.61	.48	120	12.50
XI	.55	40	3.25	.56	48	1.49	.56	135	8.76	.56	87	13.14	.56	119	12.10
XII	.65	48	2.96	.65	74	1.32	.64	151	8.59	.64	61	12.94	.64	120	11.82
I	.73	79	3.55	.72	55	1.83	.72	110	9.19	.72	94	13.52	.73	112	12.32
II	.81	75	3.28	.81	58	1.57	.80	74	8.88	.81	113	13.14	.81	102	12.01
III	.88	63	3.44	.87	40	1.73	.88	36	8.97	.90	69	13.20	.88	88	12.06
IV	.97	54	3.75	.97	45	1.98	.96	42	9.17	.97	58	13.45	.99	48	12.30

*The Values of x , y and $\Delta\delta'$:—*The process of the calculations is the same as in the former reports, but the formula used should be changed due to the addition of a new station Gaithersburg. The formula is as follows :

$$\begin{aligned}x &= -.436\Delta\varphi_m + .123\Delta\varphi_k + .448\Delta\varphi_c + .123\Delta\varphi_g - .258\Delta\varphi_u \\y &= -.264\Delta\varphi_m - .313\Delta\varphi_k + .017\Delta\varphi_c + .338\Delta\varphi_g + .256\Delta\varphi_u \\ \Delta\delta' &= +.231\Delta\varphi_m + .201\Delta\varphi_k + .176\Delta\varphi_c + .185\Delta\varphi_g + .208\Delta\varphi_u\end{aligned}$$

where $\Delta\varphi_m$ $\Delta\varphi_k$ $\Delta\varphi_c$ $\Delta\varphi_g$ and $\Delta\varphi_u$ denote latitude variations of Mizusawa, Kitab, Carloforte, Gaithersburg and Ukiah respectively. As it is shown in the coefficients of $\Delta\delta'$, they become nearly equal to each other owing to the favourable distribution of the stations in their longitudes. It is noted that $\Delta\delta'$ should be the declination errors with the mean values of non-polar variations in the five stations.

TABLE 2.

Date	x_e	x_m	Mean	y_e	y_m	Mean	$\Delta\delta'_e$	$\Delta\delta'_m$	Diff. of the same Group $e-m$	Combination
1932.97	''	''	''	''	''	''	''	''	''	III IV
1933.06	+.007	+.025	+.016	-.032	-.019	-.026	+.099	+.376	-.004	IV V
.14	-.091	-.083	-.087	-.107	-.043	-.075	+.328	+.403	-.048	V VI
.22	-.130	-.109	-.120	-.052	-.024	-.038	+.375	-.549	-.028	VI VII
.30	-.125	-.162	-.144	-.003	-.011	-.007	-.590	+.200	-.041	VII VIII
.39	-.133	-.193	-.163	+.059	+.072	+.066	+.124	-.236	-.076	VIII IX
.47	-.122	-.119	-.121	+.108	+.114	+.111	-.301	-.011	-.065	IX X
.55	-.062	-.101	-.082	+.140	+.153	+.147	-.072	+.316	-.061	X XI
.64	-.048	-.042	-.045	+.136	+.106	+.121	+.311	-.063	-.005	XI XII
.72	+.038	+.036	+.037	+.098	+.096	+.097	-.043	-.287	+.020	XII I
.80	+.043	+.053	+.048	+.068	+.094	+.081	-.290	+.270	-.003	I II
.89	+.051	+.033	+.042	+.049	+.045	+.047	+.275	-.035	+.005	II III
.97	+.032	+.019	+.026	+.018	-.013	+.003	-.050	+.072	-.015	III IV
	+.014	-.027	-.007	-.039	-.033	-.036	+.044	+.325	-.028	

The values of x and y given below for each tenth of the year are deduced graphically from the adopted smoothed curves by using the above mean values.

TABLE 3.

Date	x	y	Date	x	y
1932.9	''	''	1933.5	''	''
3.0	+.04	.00	6	-.07	+.14
1	-.03	-.05	7	.00	+.11
2	-.10	-.07	8	+.05	+.08
3	-.15	-.01	9	+.04	+.04
4	-.16	+.06		+.02	.00
	-.13	+.12			

The Separation of $\Delta\delta'$ into $\Delta\delta$ and z :—For the purpose we have first to determine z for each station. The first principal term of z of the form $-r_1 \cos(\odot - \alpha + A_1)$ is always constant for each evening and morning observations, because, in the present programme, the both series of observations are just symmetrically distributed with respect to midnight throughout the year. And only the difference of those two constants may be determined from the “closing sum,” giving the following results for all stations:

	Mizusawa	Kitab	Carloforte	Gaithersburg	Ukiah
$e-m$	$-''040$	$-''009$	$-''009$	$-''043$	$-''021$

The results of another principal term of z of the form $+r_2 \sin(2\odot - \alpha + A_2)$ for all stations are as follows:

Station	Mizusawa	Kitab	Carloforte	Gaithersburg	Ukiah
r_2	$+''016$	$+''073$	$-''005$	$+''056$	$+''065$
A_2	$+18^\circ$	$+32^\circ$	0°	$+28^\circ$	-10°

The above values r_2 and A_2 were found from the materials of the last three years, except that for Gaithersburg which has only one and half years' duration.

After correcting all values of latitudes given in the table 1 by the respective z for all stations, the values of x , y and $\Delta\delta$ were again calculated by the formula (1) giving following results.

TABLE 4.

Date	$\frac{x_e + x_m}{2}$	$\frac{y_e + y_m}{2}$	Group	$\Delta\delta_e$	$\Delta\delta_m$	$\Delta\delta_e - \Delta\delta_m$
	''	''		''	''	''
1932.97	+024	-040	IV	+320	+324	-004
1933.06	-076	-087	V	+387	+355	+032
.14	-108	-048	VI	-555	-582	+027
.22	-136	-014	VII	+171	+186	-015
.30	-161	+066	VIII	-246	-226	-020
.39	-124	+117	IX	-025	+009	-034
.47	-091	+157	X	+344	+345	-001
.55	-058	+134	XI	-029	-041	+012
.64	+025	+109	XII	-299	-279	-020
.72	+041	+088	I	+253	+257	-004
.80	+041	+047	II	-079	-069	-010
.89	+032	-002	III	+024	+024	.000
.97	+001	-049				

In comparing the corresponding values in the tables 2 and 4 we see that the values of x and y are practically the same, but that $\Delta\delta_e - \Delta\delta_m$ in the table 4 does not contain such considerable systematic errors as those in the table 2.