XV. *On the Lunar-diurnal Variation of the Magnetic Declination, with special regard to the Moon's Declination.* By G. Neumayer. *Communicated by the President.*

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The hourly records of the magnetic declination, systematically kept at the Flagstaff Observatory at Melbourne, Victoria, during the period from the 1st of May 1858 to the 28th of February 1863, have been discussed with a view to determine the lunar-diurnal variation to which this magnetic element is subjected. The results arrived at in the course of this discussion, eliciting, as I believe, facts hitherto unnoticed, induced me to think it important to have them brought before the Royal Society, with no other object in view but to direct the attention of scientific men to a subject of such vast import for the development of the science of terrestrial magnetism.

The process adopted in reducing the observations, in order to eliminate the solar-diurnal variation of the magnetic declination, is identical with the one generally adopted in such cases. The limit of disturbance was taken to be 3·61 minutes of arc, and all hourly directions which differed from their final normals by this value, or more, were consequently omitted from the record. This elimination of the larger disturbances having been effected, from every remaining reading (R) of the magnet's direction the respective final normal (N) was subtracted, thus causing the residuals (R—N) to be devoid of the influence of the solar-diurnal variation. When the remainders are negative, *i. e.* when the normal exceeds the reading, the north end of the needle is to the west of its mean direction, and when positive the needle deviates with its north end towards the east of its normal mean. The magnetic declination being east at Melbourne, we perceive that the negative values denote a decrease, and the positive ones an increase, with respect to the normal value of this magnetic element. The total number of observations at command amounts to 38,194, of which 4,178 single readings were excluded from the discussion, on account of their being beyond the above-mentioned limit, and there remained only 34,016 readings for the purpose of determining the lunar-diurnal variation. Of this number 15,735 were observed in the months from April to September, and 18,281 during the time from October to March.

The treatment of the residuals, with a view to classify them according to lunar hours, presents no particularly new features; so much may, however, be mentioned that, prior to entering upon any general discussion, every month's result was calculated separately and expressed in minutes. Subsequently the values for the various months were arranged, irrespective of the year, in two groups, viz., the sun's declination being South (October to March), and the sun's declination being North (April to September). Thus

we received a mean lunar-diurnal variation curve for each half of the year, from which again was derived the annual curve. A more rigid examination of the results obtained in this way showed forthwith that irregularities in the lunar-diurnal variation manifested themselves, for which it was hardly possible to account otherwise, than that they were depending to some degree on the moon's position with reference to the equator, whether her declination was South or North.

After having been once convinced of the truth of this, there could not exist a doubt as to the mode in which the observations had to be treated. The whole series was arranged in groups, "Declination of the Moon South" and "Declination of the Moon North," rejecting all days on which the moon was close to the equator, so as to cause her declination to be divided between the hours of the day. The 118 groups of lunar-diurnal variation thus formed were subsequently classified according to whether the sun's declination was South or North, which was easily accomplished, as of each group only the sums expressed in minutes of arc had been taken. The mean values for each period were derived by allowing due weight to the number of readings from which it had been derived, a practice which was made a rule in the course of these discussions. The only exception to this in the subsequent Tables occurs in those values of the lunar-diurnal variation for the winter and summer half-year in the single years, they being derived from the monthly tables by simply taking the means. This must be borne in mind when comparing the various values, as in some instances there are considerable discrepancies caused by this difference of treatment, which are, however, quite irrelevant for the purpose required. It ought to be mentioned that the mean values were subsequently reduced to seconds of arc.

Originally, as I have already described, I obtained yearly and half-yearly curves of the lunar-diurnal variation from the monthly tables; and it is evident that the results, obtained by the method just described, afforded a means of checking those of the inquiry primarily instituted, so far as both could reasonably be expected to tally with one another, the principles of classification being somewhat different in the two cases. Taking this into consideration, the agreement between the results was such as to cause us to receive the subsequent mean values with great confidence.

The values of the first Table are to be considered as derived irrespectively of the years during which the observations were made, and to represent mean values for the period from May 1858 to February 1863. We shall presently see that this point is of some moment, the single years differing widely in their results with regard to the lunar-diurnal variation of the magnetic declination.

The values of the following Table have been thrown into curves which may be readily studied by the aid of Plate XIX.; it was considered advisable to retain the plan adopted in the above Table, and exhibit the nine curves in three different groups, namely:—

TABLE I.—Lunar-diurnal Variation of the Magnetic Declination (1858–1863).

1st. From the superior to the inferior passage.

Declination of the		Lunar hours.											
Sun.	Moon.	0.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
S. and N.	S. and N.	+6″·38	+7″·84	+5″·13	−0″·89	−5″·86	−9″·23	−11″·74	−12″·10	−9″·04	−2″·06	+6″·16	+10″·31
S.	„	+13·18	+16·33	+10·20	+1·15	−10·04	−15·96	−20·64	−15·55	−10·32	−0·90	+10·61	+12·67
N.	„	−1·79	−1·98	−0·82	−3·30	−1·00	−1·43	−1·61	−8·12	−7·60	−3·39	+1·05	+7·54
S. and N.	S.	+9·08	+9·35	+7·48	−0·29	−8·23	−8·62	−12·87	−7·35	−6·31	+4·36	+9·09	+9·74
S.	„	+17·73	+18·01	+13·64	+1·91	−14·39	−18·08	−24·18	−13·14	−7·97	+8·85	+15·94	+12·27
N.	„	−1·68	−0·93	+0·02	−3·08	−0·77	+3·05	+0·67	−0·33	−4·29	−1·00	+1·02	+6·71
S. and N.	N.	+3·72	+6·33	+2·78	−1·50	−3·44	−9·83	−10·62	−16·76	−11·83	−8·46	+3·24	+10·88
S.	„	+8·56	+14·62	+6·67	+0·33	−5·43	−13·64	−16·96	−18·02	−12·87	−10·96	+5·17	+13·07
N.	„	−1·90	−3·01	−1·64	−3·50	−1·22	−5·72	−3·76	−15·36	−10·74	−5·68	+1·09	+8·36

2nd. From the inferior to the superior passage.

Declination of the		Lunar hours.											
Sun.	Moon.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.
S. and N.	S. and N.	+11″·38	+10″·38	+7″·01	+2″·43	−4″·33	−7″·42	−6″·69	−7″·83	−8″·03	−5″·15	+3″·13	+6″·25
S.	„	+17·45	+16·55	+10·25	+2·29	−4·06	−12·82	−12·86	−17·18	−12·25	−4·23	+5·12	+10·71
N.	„	+4·33	+3·24	+3·30	+2·60	−4·64	−1·26	+0·37	+3·07	−3·01	−6·27	+0·80	+1·04
S. and N.	S.	+8·67	+4·33	+4·84	+1·92	−3·28	−4·54	−7·01	−8·46	−7·53	−5·80	+1·73	+7·65
S.	„	+15·19	+9·42	+5·83	+1·62	+0·97	−5·58	−13·03	−21·11	−13·29	−5·25	+4·28	+13·14
N.	„	+1·20	−1·68	+3·69	+2·27	−8·20	−3·33	0·00	+6·24	−0·56	−6·48	−1·39	+0·96
S. and N.	N.	+14·10	+16·64	+9·20	+2·96	−5·42	−10·36	−6·35	−7·19	−8·55	−4·51	+4·51	+4·84
S.	„	+19·73	+24·06	+14·81	+2·99	−9·28	−20·35	−12·68	−13·27	−11·18	−3·20	+5·98	+8·17
N.	„	+7·52	+8·22	+2·98	+2·92	−0·96	+0·83	+0·75	−0·09	−5·45	−6·06	+2·86	+1·12

Group I. :—Declination of the moon *south* and *north*, *i. e.* no distinction being made with reference to the moon's declination.

1. No distinction with reference to the sun's declination (this may be called the mean yearly curve).
2. The sun's declination south (summer half-yearly curve).
3. The sun's declination north (winter half-yearly curve).

Group II. :—Declination of the moon *south.*

1. No distinction with reference to the sun's declination (yearly south curve).
2. The sun's declination south (the summer half-yearly south curve).
3. The sun's declination north (winter half-yearly south curve).

Group III. :—Declination of the moon *north.*

1. No distinction with reference to the sun's declination (yearly north curve).
2. The sun's declination south (summer half-yearly north curve).
3. The sun's declination north (winter half-yearly north curve).

A glance at the curves of Plate I. shows that the lunar-diurnal variation must be regarded as being influenced by both the sun and the moon, for we perceive that, in case the declinations of both heavenly bodies are of the same name, both north or both south, the curves show greater regularity than they exhibit otherwise. For instance: the summer half-yearly south curve is far less irregular than the summer half-yearly

north curve; the winter half-yearly south curve scarcely deserves the name of such, while the winter half-yearly north curve exhibits the oscillations in a far higher degree, although they are still somewhat irregular.

The doubt so often raised, whether during the winter season any lunar-diurnal variation was traceable at all, can, I think, not be entertained any longer, if we pay due attention to the facts which may be gleaned from our Table. Indeed we shall presently see, when speaking of the lunar-diurnal variation in the various years of observation, that in some cases the variation manifests itself in a very distinct manner even during those months when the sun's declination is north.

The principal features of the curves just enumerated may be delineated as follows:—

Ad I. 1. The maximum value of the easterly deviation of the needle takes place at the time of the moon's lower transit, and the minimum between 6^h and 7^h. A secondary maximum occurs at 1^h, and a corresponding minimum between 19^h and 20^h. The range of oscillation amounts to $24''\cdot 0$.

Ad I. 2. In this case the maximum seems to occur a little after the moon's lower transit, and the minimum at 6^h, while a secondary maximum takes place at 1^h and a secondary minimum at 19^h, the greatest range amounting to $38''\cdot 69$.

Ad I. 3. I consider it most likely that in this instance two influences, counteracting each other in some measure, make themselves manifest, and it is therefore rather difficult to determine the extreme deviations so well as in the former cases; but it appears that 11^h and the hour between 7^h and 8^h are marked as extremes, in the first instance the easterly deviation reaching its greatest value, and in the latter the same occurring with respect to the westerly deviation of the needle. The greatest range amounts to $15''\cdot 66$.

The nodes, where the three curves intersect each other, are at the hours 15^h–16^h, $20^h\,45^m$, $3^h\,20^m$, and $8^h\,40^m$.

Ad II. 1. The maximum of the east magnetic declination occurs at 11^h, the minimum at 6^h, the greatest range amounting in this case to $22''\cdot 61$. A secondary maximum takes place at 1^h, and a secondary minimum at 19^h.

Ad II. 2. Primary maximum about 30^m past the superior passage of the moon, and the corresponding minimum at 6^h, with a range of $42''\cdot 17$. Secondary maximum at 10^h, and minimum at 19^h.

Ad II. 3. There is in this case scarcely any regularity in the oscillations of the needle observable, the extreme values differing by $14''\cdot 91$.

On account of the irregularity of the winter curve the nodes for this group are not well defined; they seem, however, to be between $14^h\,30^m$ and $16^h\,50^m$, $20^h\,50^m$, $3^h\,15^m$, and $8^h\,30^m$.

Ad III. 1. Maximum at 13^h and minimum at 7^h, giving a range of $33''\cdot 40$; secondary extremes are noticeable at 1^h and 17^h.

Ad III. 2. Maximum at 13^h, minimum at 17^h, greatest range $44''\cdot 41$; secondary maximum and minimum respectively at 1^h and 7^h. It is yet to be decided whether the deviation from the rule, that the minimum between the inferior and the superior pas-

sage exceeds the one between the superior and the inferior, is rather due to an accidental irregularity than to an actual change; but the latter is undoubtedly the case with reference to the maximum, comparing it with the summer semiannual curve obtained irrespectively of the moon's declination.

Ad III. 3. This curve shows but one distinctly expressed maximum and minimum, viz. at 11^h (or perhaps near the inferior transit) and at 7^h, the range of oscillation amounting to $23''\cdot72$.

The intersecting points are in this group of curves more distinctly determined than in either of the two preceding ones; they are at 15^h, $20^h\ 40^m$, $3^h\ 30^m$, and $9^h\ 50^m$.

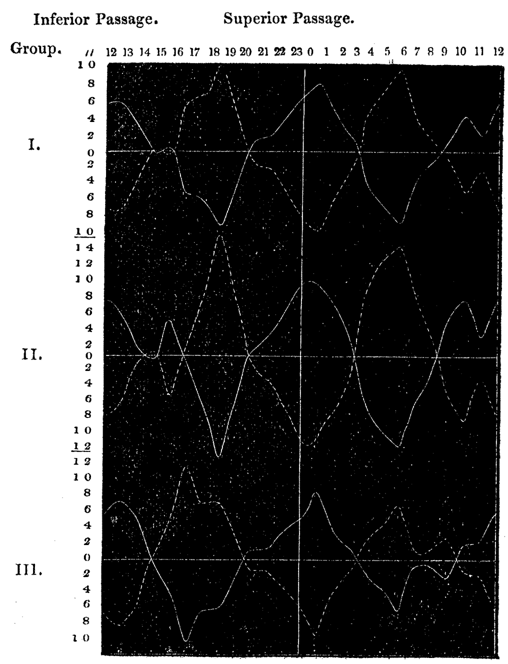
Prior to entering on the examination of the lunar-diurnal variation in various years, I may be permitted to add a few words on the semiannual inequality for the several groups of curves, taking in every one of the annexed diagrams the annual curve for the axis of projection.

Diagram I. in the annexed woodcut illustrates in the usual manner the semiannual inequality of the lunar-diurnal variation, no distinction being made respecting the name of the moon's declination.

Diagram II. shows the semiannual inequality of the lunar-diurnal variation only for declinations of the moon south of the equator.

Diagram III. represents the semiannual inequality of the lunar-diurnal variation for declinations of the moon north of the equator.

Semiannual Inequality of the Lunar-diurnal Variation.



In every one of these cases the summer branch (October to March) bears the character of the lunar-diurnal variation, even as far as the turning hours are concerned. We

notice also a marked difference between the curve when the moon is south of the equator (II.) and the one when her declination is north (III.). A glance at the diagrams will convince us of this; we need only to point out that the range of oscillation in the first instance, taking both branches into consideration, is 27″·35, in the last but 21″·18, and that the extremes occur in the latter case two hours earlier than in the former. Besides these differences there are others of minor import which also contribute towards drawing a distinction between the curves for north and south declinations of the moon; for instance, the secondary extremes differ in the south curve by 24″·85, whilst the corresponding deviation in the north curve is but 13″·20.

On examining the results of this inquiry for the several years of observation somewhat closer, we are struck by the differences which they exhibit among themselves. It was the year 1861 which first called my attention to this fact by manifesting considerable abnormities with respect to every one of the curves of the lunar-diurnal variation for the various seasons and positions of the moon. These irregularities are the more striking, as the year 1860 does not exhibit any such extraordinary deviations from the mean values for the several years, although also in this case the curve for the winter half-year shows some peculiarly interesting features (Plate XIX.).

The subjoined Table gives the lunar-diurnal variation for the years 1860 and 1861, and Plate XIX. shows the respective curves.

TABLE II.—Lunar-diurnal Variation of the Magnetic Declination for the years 1860 and 1861.

1st. From the superior to the inferior passage.

Declination of the		Years.	Lunar hours.											
Sun.	Moon.		0.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
S. and N.	S. and N.	1860	+ 7″·28	+ 6″·80	+ 6″·03	+ 2″·77	− 3″·90	− 9″·65	− 8″·09	−14″·91	−14″·45	− 6″·73	+ 2″·86	+12″·92
		1861	− 5·87	− 8·76	− 6·82	−13·38	− 9·69	− 8·96	−12·88	−10·92	− 6·10	− 1·09	+ 6·84	+17·21
”	S.	1860	+11·54	+ 8·60	+10·37	+ 3·50	− 5·39	−11·70	−27·16	−21·65	−24·92	− 7·52	+ 2·04	+ 6·50
		1861	+ 4·18	− 2·47	− 1·96	− 5·34	−10·59	− 6·69	−11·71	+ 5·10	+ 4·33	+14·86	+17·14	+23·76
”	N.	1860	+ 3·56	+ 5·21	+ 2·14	+ 2·08	− 2·60	− 7·79	− 9·73	− 8·47	− 4·46	− 5·98	+ 3·67	+18·92
		1861	−15·61	−14·78	−11·57	−21·13	− 8·72	−11·37	−14·03	−25·98	−15·98	−15·91	− 2·66	+10·79
S.	S. and N.	1860	+13·97	+13·91	+ 9·88	− 0·24	−11·62	−20·48	−19·91	−23·07	−16·05	− 4·06	+ 9·47	+17·84
		1861	+ 3·64	+ 1·74	+ 5·61	− 1·40	−12·78	−18·36	−22·62	−13·65	− 3·32	− 1·59	+ 8·12	+12·78
N.	”	1860	+ 2·08	− 0·65	+ 2·76	+ 4·76	+ 1·37	+ 0·97	− 3·97	− 6·56	−11·30	−10·56	− 2·68	+ 5·63
		1861	−17·98	+19·65	−19·96	−25·84	− 7·32	+ 2·30	− 1·07	− 5·67	− 5·95	+ 0·12	+ 4·50	+17·76

2nd. From the inferior to the superior passage.

Declination of the		Years.	Lunar hours.											
Sun.	Moon.		12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.
S. and N.	S. and N.	1860	+ 4″·75	+ 1″·66	+ 2″·38	− 0″·85	− 1″·42	− 8″·02	+ 6″·20	− 5″·07	− 2″·48	+ 4″·82	+13″·51	+14″·30
		1861	+25·07	+21·33	+19·80	+15·81	+ 7·60	+ 3·85	− 5·35	− 4·32	−10·47	−10·01	− 3·01	− 2·68
”	S.	1860	− 1·04	− 9·18	− 6·99	− 6·31	− 9·43	−14·45	+ 1·42	−12·17	− 6·04	− 0·31	+12·47	+19·40
		1861	+27·28	+21·70	+17·03	+11·34	+ 7·91	+ 8·37	− 3·19	− 2·25	− 6·35	− 3·24	− 1·30	+ 2·22
”	N.	1860	+10·20	+12·13	+11·32	+ 4·27	+ 6·34	− 2·01	+11·08	+ 1·79	+ 0·82	+ 9·53	+14·43	+ 9·48
		1861	+22·79	+20·96	+22·53	+20·30	+ 7·26	− 0·79	− 7·52	− 6·21	−14·56	−16·38	− 4·66	− 7·49
S.	S. and N.	1860	+14·93	+12·92	+12·34	+ 1·98	+ 5·91	−14·15	+ 1·45	−17·46	−12·16	− 2·34	+12·43	+16·25
		1861	+24·34	+20·26	+17·67	+12·90	+ 1·49	− 0·89	−11·25	−12·61	−15·87	− 5·68	+ 3·17	+ 8·53
N.	”	1860	− 4·06	− 9·39	− 8·19	− 4·62	− 8·51	− 2·50	+ 8·90	+ 7·07	+ 8·44	+12·33	+16·99	+13·91
		1861	+20·96	+18·10	+20·26	+16·84	+12·41	+ 5·93	+ 1·02	+ 7·71	− 6·64	−16·16	−10·53	−14·84

One glance at this Table informs us of the great difference between the several curves for the two years. The yearly curve for 1860 shows a maximum easterly declination at 23^h and a minimum at 6^h, with a secondary maximum at 11^h and a range of $32''\cdot39$; whilst the same curve for 1861 shows a maximum at the moon's lower transit, and a rather indistinctly expressed minimum at 3^h, the greatest range being $38''\cdot45$. Differences, similar to those just pointed out, will be found on examining the various curves, but it may suffice for the present to single out one of the most striking anomalies, if we are allowed to speak of such, our knowledge on this point being still very indistinct. I refer to the winter half-yearly curve when the moon's declination is indiscriminately north and south. In 1860 we notice in this case a distinct maximum at 22^h and a minimum at 8^h, secondary extremes occurring at 11^h and 13^h. The greatest range is $28''\cdot23$. But on examining the same curve for 1861 we find a vast difference; a maximum deviation towards the east at the moon's inferior passage and at 3^h, whereas it is scarcely possible to speak of secondary extremes, all other undulations appearing as accidental irregularities when compared with the main oscillation, with a range amounting to $43''\cdot82$. It can hardly escape our observation that both curves show a clear sweep, but in a very different sense; and we understand now the reason of the irregularity of the mean winter curve for the five years, which scarcely deserves the name of a curve. This fact frequently induced those more especially engaged in these pursuits to doubt the existence of a lunar-diurnal variation-curve during the absence of the sun from the hemisphere of observation, a notion which, after the above explanations, may safely be pronounced to be erroneous. We feel, however, also inclined to recognize in the facts above pointed out the excuse for such a conclusion.

The summer semiannual curve for 1861 exhibits a secondary maximum and minimum, respectively, at 23^h and 20^h, the primary extremes occurring at the moon's lower passage and at 6^h. As all curves for this year exhibit similar anomalies, when compared with what we adopted for the rule, the idea suggested itself that some error might have crept into the discussion; but this was soon proved to be an erroneous supposition by a perfectly independent and fresh discussion which gave in the main points results identical with those arrived at on the first occasion.

In course of the year 1861, the instruments hitherto in use at the Flagstaff Observatory, were replaced by new ones just received from Munich, and in the month of May the necessary adjustments were so far advanced as to allow of the registration of the new instruments being commenced with the beginning of the month of June. It need scarcely to be mentioned that the greatest care was taken to ensure uniformity of registration in every respect, and it is not likely that the new arrangements would have influenced the observation in any undue manner. Not satisfied, however, with such guarantees for an exact observation and discussion, I resolved to examine the anomalies of this year still further. For this purpose the lunar-diurnal variation for the period from May 1860 to April 1861 was derived with special regard to the moon's declination, as likewise for the same months in 1858 and 1859, and in comparing the respective results

we must remember that during both periods the same instruments were used; but still we perceive that towards the end of the latter period the abnormities above pointed out make themselves clearly manifest, even in the yearly curve with the moon's declination north and south (see Plate XIX.). This seems to speak strongly in favour of a progressive change rather than of an accidental irregularity. It would be premature to enter upon an explanation of these facts at present, as it is evident that for such a purpose we are in need of similar discussions from other localities; suffice it to call attention to so important a class of phenomena. The subjoined Table shows the results of this last-mentioned inquiry, and on Plate XIX. are found the lunar-diurnal variation curves for the periods above delineated.

TABLE III.—Lunar-diurnal Variation of the Magnetic Declination for the periods May 1858 to April 1859, and May 1860 to April 1861.

1st. From the superior to the inferior passage.

Declination of the		May to April.	Lunar hours.											
Sun.	Moon.		0.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
S. and N.	S. and N.	$18\frac{58}{59}$	+12″·18	+13″·37	+ 9″·61	− 0″·31	− 4″·98	− 0″·14	− 8″·48	−12″·63	− 2″·15	+ 3″·82	+ 5″·84	+ 3″·29
		$18\frac{60}{61}$	+ 4·16	+ 4·57	+ 8·85	+ 4·48	− 1·35	− 2·89	−10·30	− 2·38	− 5·98	− 5·24	+ 3·45	+13·55
”	S.	$18\frac{58}{59}$	+ 5·47	+ 9·00	+ 9·24	− 6·95	−12·02	− 2·29	−11·75	−16·39	− 7·90	+ 0·55	− 1·39	− 4·52
		$18\frac{60}{61}$	+ 7·43	+ 5·44	+10·96	+ 8·48	− 1·85	+ 2·05	− 9·56	+ 2·35	− 7·87	+ 0·20	+ 4·49	+11·63
”	N.	$18\frac{58}{59}$	+20·35	+18·73	+10·05	+ 7·52	+ 3·64	+ 2·46	− 4·78	− 8·42	+ 5·20	+ 7·96	+14·83	+12·41
		$18\frac{60}{61}$	+ 0·96	+ 3·73	+ 6·73	+ 0·28	− 0·82	− 8·21	−11·08	− 7·40	− 3·95	−11·05	+ 2·30	+15·63

2nd. From the inferior to the superior passage.

Declination of the		May to April.	Lunar hours.											
Sun.	Moon.		12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.
S. and N.	S. and N.	$18\frac{58}{59}$	+ 7″·96	+ 1″·91	− 6″·94	− 4″·36	−12″·90	− 6″·81	− 5″·44	− 2″·93	− 5″·27	− 1″·07	+ 7″·85	+10″·89
		$18\frac{60}{61}$	+ 9·72	+ 4·22	+ 2·26	+ 3·65	− 2·41	− 8·83	− 4·73	− 6·67	− 6·09	− 4·66	+ 7·06	+ 5·79
”	S.	$18\frac{58}{59}$	+ 0·93	− 9·60	− 3·69	+ 1·29	− 9·57	− 4·46	− 2·78	+ 1·66	− 9·53	− 7·30	− 2·03	+ 4·00
		$18\frac{60}{61}$	+ 6·55	− 2·03	− 7·21	− 2·51	− 3·69	−13·38	−10·58	−10·36	−11·12	− 6·87	+ 7·21	+ 6·96
”	N.	$18\frac{58}{59}$	+16·43	+16·40	−10·75	−10·83	−16·88	− 9·55	− 8·41	− 8·24	− 0·32	+ 6·08	+19·60	+19·51
		$18\frac{60}{61}$	+13·13	+11·11	+12·43	+10·38	− 0·98	− 4·04	+ 1·64	− 2·89	− 0·91	− 2·42	+ 6·91	+ 4·60

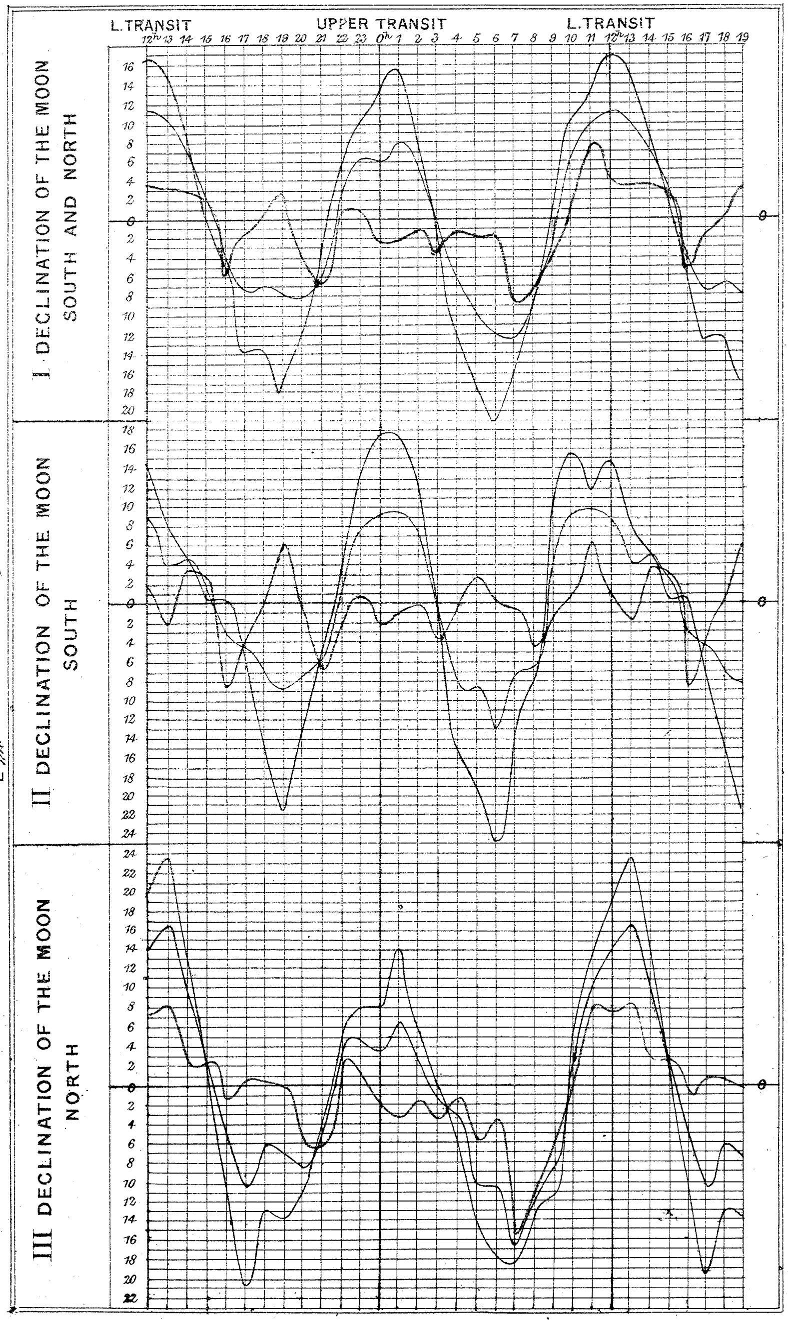
On Plate XIX. we represent furthermore the two annual curves of the same periods without reference to the moon's declination, and we perceive that there is a depression in the curve for 1860–61 near the moon's upper transit, as likewise an increase of easterly declination near her inferior passage, while the curve for 1858–59 bears more the character of the mean curves for five years.

These few facts may for the present suffice to induce those who are engaged in similar pursuits to enter upon such a laborious task as is the classification of magnetic observations for the purpose of examining into the law and nature of the lunar-diurnal variation, according to the moon's position north or south of the equator. We may, however, rest assured that such inquiries will ultimately prove to be conducive of the greatest

benefit for the advancement of the science of terrestrial magnetism; and I hope I have been successful in showing that for such a purpose it is not enough to inquire into the nature of the lunar-diurnal curve variations only for the time of the moon's farthest deviation from the equator, as has in several instances been the practice. It is indeed indispensable for the exact investigation of the moon's influence on the magnetism of our earth, to extend the method of inquiry, which I have just explained in the example of the magnetic declination, to the other magnetic elements, for the lunar-diurnal variation of the horizontal force also shows great differences according as the moon is to the north or the south of the equator. As far as my researches have as yet gone, I feel inclined to believe that the results in this latter case are at least equally decisive with those which I have made the immediate subject of this short paper. As soon as the respective discussions are brought to a close, I shall not fail to communicate the results of my labours in this direction to the Royal Society.

CURVES SHEWING THE LUNAR DIURNAL VARIATION OF THE MAGNETIC DECLINATION 1858–1863.

TABLE I.



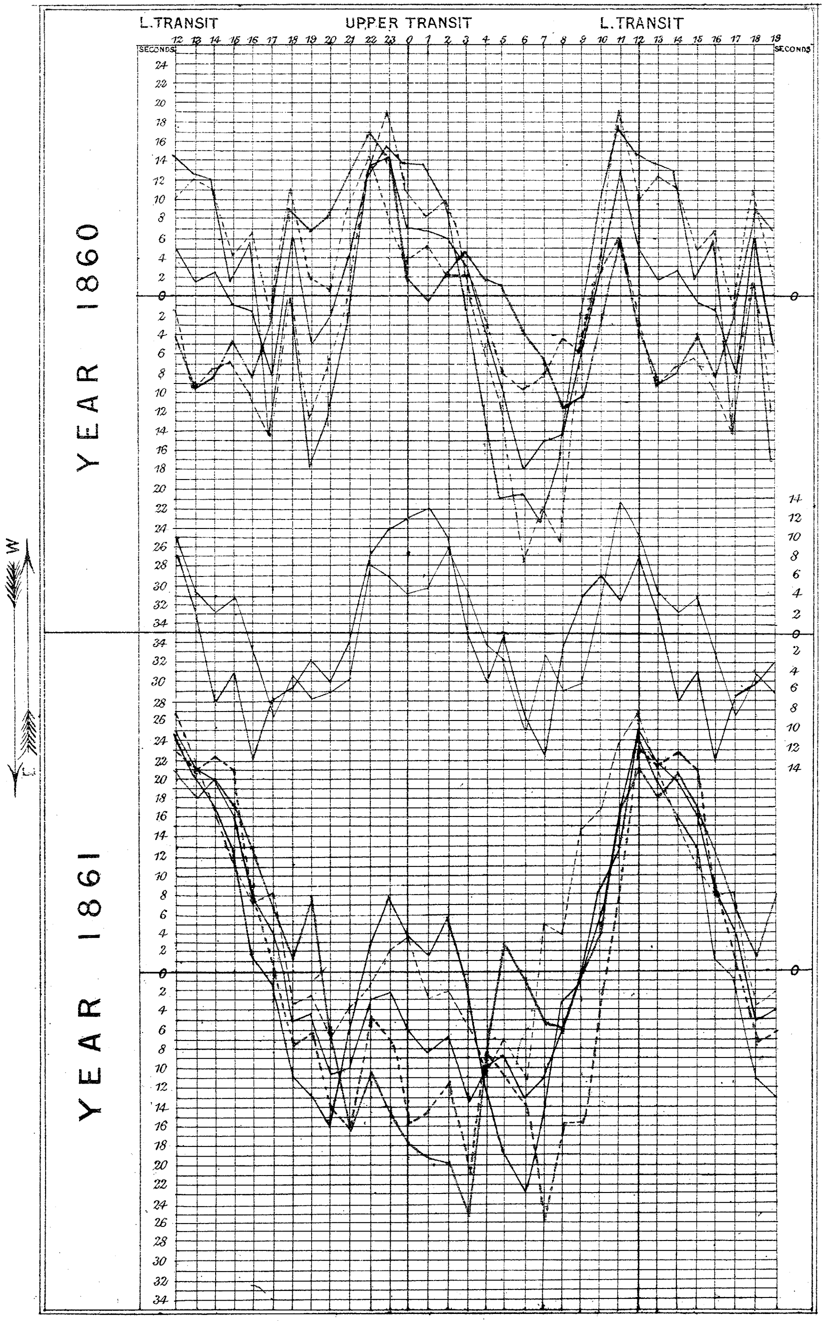
DECLINATION OF THE SUN:

- SOUTH AND NORTH (YEAR)
- SOUTH (OCTOBER TO MARCH)
- NORTH (APRIL TO SEPTEMBER)

J. Basire, lith.

CURVES SHEWING THE LUNAR DIURNAL VARIATION OF THE MAGNETIC DECLINATION 1858–1863.

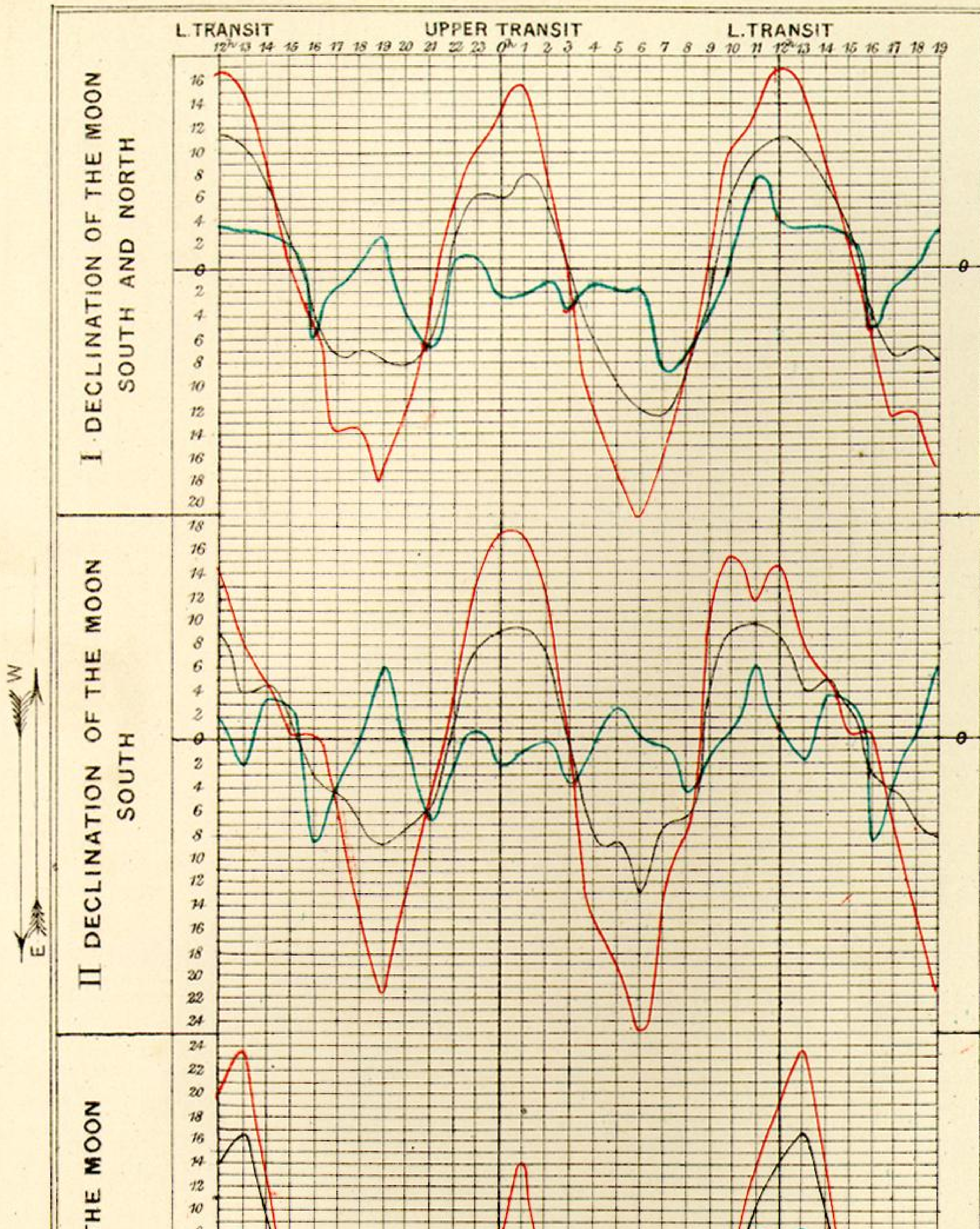
TABLES II & III.



- SUN'S DECLINATION SOUTH (MOON'S DECLINATION SOUTH AND NORTH)
- MOON'S DECLINATION SOUTH (SUN'S " " " " ")
- SUN'S DECLINATION NORTH (MOON'S " " " " ")
- MOON'S DECLINATION NORTH (SUN'S " " " " ")
- MEAN FOR THE YEAR 1858–59 (MAY TO APRIL) AND FOR THE YEARS 1860 AND 1861.
- MEAN FOR THE YEAR 1860–61 (MAY TO APRIL). } (in black)

CURVES SHEWING THE
LUNAR DIURNAL VARIATION OF THE MAGNETIC DECLINATION
1858–1863.

TABLE I.



DECLINATION OF THE SUN:

SOUTH AND NORTH (YEAR)

SOUTH (OCTOBER TO MARCH)

NORTH (APRIL TO SEPTEMBER)

CURVES SHEWING THE
LUNAR DIURNAL VARIATION OF THE MAGNETIC DECLINATION
1858–1863.

TABLES II & III.