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APPENDIX B - THE STANDARDIZED INDEX, K_s , AND THE PLANETARY INDEX, K_p

By J. BARTELS

1. Preservation of the standard of K .

The collaboration of an observatory in the K - scheme is completed with the communication of the monthly tables for K , and the data on sudden commencements and solar flare-effects. The conversion of K into K_s does not involve any additional labor for the observatory, since it will be done at a central office. It may even be advisable that those observers who have to scale K regularly, might better refrain from taking cognizance of the conversion-tables for their own stations, in order to avoid all danger of unconscious influences on their scaling practice, especially with regard to the lower grades of K , from 0 to about 3.

A change in the scaling practice, even if it were an improvement in the direction of the original conception of K , should never be made without an urgent reason, and, before all, without a definite announcement. For the 11 K_p - observatories, in particular, a change would mean that their K - indices could no longer be used for K_p . In order to safeguard the standard of scaling, every observer scaling K should have a proxy who is fully informed and able to scale K in exactly the same manner.

2. The diurnal variation of K .

At every station, there is a characteristic diurnal variation of magnetic activity, changing somewhat with the season. In Europe, for instance, the evening hours are more frequently and more intensely disturbed than the morning hours. This is the first (natural) cause for a corresponding diurnal variation in the frequencies of K , affecting all grades from $K = 0$ to $K = 9$.

In addition, the practical difficulty of eliminating the non- K -variations (Sq and L) provides a possibility for a second (personal) cause of diurnal variation in K -frequencies, most marked in the lower degrees of K ($= 0, 1, \text{ or } 2$), stronger in day-time, and most suppressed in the indices scaled by skilled and experienced observers.

Both causes combine to determine the observed diurnal variation in the frequencies and averages of K as expressed in averages from long series.

3. Meaning of K_s .

If stations scaling K -indices were densely and evenly distributed over the globe, it would be easy to derive a significant world-wide average for K . The well-known deficiencies in the net of observatories, with respect both to latitude as with longitude, prohibit such a simple course; every ordinary average for existing stations would be biased.

Therefore, a standardizing process was developed, to assign, to each K , a standardized index K_s . While K is one of the integers 0 to 9, K_s is given in thirds, as follows: If, at the outset, K_s is conceived as a continuous variable between 0.0 and 9.0, the interval (say) 1.5 to 2.5 is divided equally into thirds, designated by 2^- , 2_0 , and 2^+ ; use of such thirds was made by J.M.Stegg, for auroral intensity figures, in "British Polar Year Expedition, Fort Rae, Vol. I", pp.252 f. (London, Royal Society, 1937). The symbols 0_0

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and 90 comprise only $\frac{1}{6}$ of a full interval, namely, from 0.0 to $\frac{1}{6}$, and from $(9 - \frac{1}{6})$ to 9.0. For convenience, working tables give 3Ks, ranging between 0 and 27 .

4. Description of the conversion-tables.

For each station, the conversion-tables give a set of three tables, for every one of the ordinary groups of four months, northern winter JFND , equinoxes MASO , and northern summer MJJA . The average 3Ks for $K = 0$ is always 0, and, for $K = 9$, always 27. Furthermore, no value of 3Ks is the same for different values of K , so that a table giving K s , or 3Ks , can be uniquely reconverted into a table for K .

Each table has 8 columns, for the eight intervals of the Greenwich day, called Eighths E1 to E8 , assigning values of 3Ks to every $K = 0$ to 9.

The standardization process yields, for each K , two limits for 3Ks . Example: Wingst JFND, Eighth E2 (= 03...06 GMT): a $K = 1$ corresponds to 3Ks between 2 and 6 (or K s between 1- and 20). Usually, the conversion table lists nothing but the central value 3Ks = 4 (or K s = 1+). If, however, the interval between the limits for 3Ks is big, exceeding 4 (for $K = 1$) or 5 (for $K = 2, 3, 4$, and 9), the central value for 3Ks is enclosed in a circle, and the limits for 3Ks are entered at the right, immediately above and below the central value for 3Ks . Thus, in the conversion-table for Lerwick, MJJA, E3, $K = 2$ may be 3Ks = 4 to 9, central value 7 ; etc. The limits for 3Ks are the wider, the more frequently that value of K occurs at that station; for instance, Witteveen MJJA E3 gives $K = 1$ relatively often, with limits 3Ks = 1 to 7. - For $K = 5$ to 8, it was not considered necessary to give more than the central values for 3Ks .

5. The derivation of the conversion-tables.

The principle of the standardization process, using the assimilation of frequencies, has been introduced elsewhere (Trans.Washington Assembly IATME, Bull.Nr.11, 184 ff., Edinburgh 1940; and Terr. Magn. 45, 335 ff., 1940). Details for the procedure used here will be described for JFND:

From the material available at the time (K -indices for the 11 observatories, years 1943 to 1947 complete, and second half of 1948), a number of days had to be selected as standardization basis, with emphasis on more recent data, in order to conform to the present practice of scaling. That basis was chosen as : all months JFND for 1946 and 1947, months November and December 1945 and 1948, totalling 362 days; finally, in order to get more data for the rarer, higher degrees of K , a group of 62 days was added, namely, all days with international character-figures $C = 1.2, 1.3, \dots, 2.0$, from the remaining months JFND of 1943 to 1945, supplemented always by one day before and one day after each disturbed day, in order to avoid a systematic influence of the statistical "curvature-effect", described, for K , in Terr. Magn. 44, 467 ff., 1939. So, the basis for JFND comprises 424 days in all.

For each observatory, the frequencies of K -indices for each of the 8 intervals E1 to E8 of the Greenwich day were counted. Example: Lerwick JFND, for two eighths:

TABLE 9 - CONVERSION TABLES FOR CHANGING K INTO 3K.

Lerwick JFND									
K = 0	0	0	0	0	0	0	0	0	0
K = 1	4	5	7	9	10	11	12	13	14
K = 2	7	8	9	9	9	9	9	9	9
K = 3	10	12	13	13	13	13	13	13	13
K = 4	13	15	17	17	17	17	17	17	17
K = 5	16	18	20	20	20	20	20	20	20
K = 6	18	21	22	22	22	22	22	22	22
K = 7	21	23	24	24	24	24	24	24	24
K = 8	24	25	26	26	26	26	26	26	26
K = 9	27	27	27	27	27	27	27	27	27

Wingat JFND									
K = 0	0	0	0	0	0	0	0	0	0
K = 1	3	4	5	6	7	8	9	10	11
K = 2	6	8	9	9	9	9	9	9	9
K = 3	9	11	12	12	12	12	12	12	12
K = 4	13	15	16	16	16	16	16	16	16
K = 5	17	19	20	20	20	20	20	20	20
K = 6	21	22	23	23	23	23	23	23	23
K = 7	23	24	25	25	25	25	25	25	25
K = 8	25	26	26	26	26	26	26	26	26
K = 9	27	27	27	27	27	27	27	27	27

Meanook JFND									
K = 0	0	0	0	0	0	0	0	0	0
K = 1	7	5	3	3	3	3	3	3	3
K = 2	10	8	5	5	5	5	5	5	5
K = 3	12	10	7	7	7	7	7	7	7
K = 4	15	13	9	9	9	9	9	9	9
K = 5	18	16	12	11	11	11	11	11	11
K = 6	21	19	15	13	13	13	13	13	13
K = 7	24	22	19	18	18	18	18	18	18
K = 8	26	25	23	23	23	23	23	23	23
K = 9	27	27	27	27	27	27	27	27	27

Witteveen JFND									
K = 0	0	0	0	0	0	0	0	0	0
K = 1	4	5	6	7	8	9	10	11	12
K = 2	7	9	10	10	10	10	10	10	10
K = 3	10	13	13	13	13	13	13	13	13
K = 4	13	16	17	16	16	16	16	16	16
K = 5	18	19	20	19	19	19	19	19	19
K = 6	21	22	24	22	22	22	22	22	22
K = 7	24	25	25	25	25	25	25	25	25
K = 8	26	26	26	26	26	26	26	26	26
K = 9	27	27	27	27	27	27	27	27	27

Sitka JFND									
K = 0	0	0	0	0	0	0	0	0	0
K = 1	7	6	3	3	3	3	3	3	3
K = 2	10	9	6	5	5	5	5	5	5
K = 3	13	11	8	7	7	7	7	7	7
K = 4	16	13	11	10	10	10	10	10	10
K = 5	19	16	14	12	12	12	12	12	12
K = 6	22	19	17	14	14	14	14	14	14
K = 7	24	22	19	16	16	16	16	16	16
K = 8	26	25	22	19	19	19	19	19	19
K = 9	27	27	27	27	27	27	27	27	27

Abinger JFND									
K = 0	0	0	0	0	0	0	0	0	0
K = 1	3	4	5	6	7	8	9	10	11
K = 2	7	8	9	9	9	9	9	9	9
K = 3	10	11	11	11	11	11	11	11	11
K = 4	13	15	15	15	15	15	15	15	15
K = 5	18	18	19	18	18	18	18	18	18
K = 6	22	22	23	21	21	21	21	21	21
K = 7	24	24	25	24	24	24	24	24	24
K = 8	26	26	26	26	26	26	26	26	26
K = 9	27	27	27	27	27	27	27	27	27

Bskdalemuir JFND									
K = 0	0	0	0	0	0	0	0	0	0
K = 1	4	5	7	8	9	10	11	12	13
K = 2	7	8	10	11	11	11	11	11	11
K = 3	11	12	13	13	13	13	13	13	13
K = 4	15	16	17	16	16	16	16	16	16
K = 5	18	19	21	20	20	20	20	20	20
K = 6	21	22	24	22	22	22	22	22	22
K = 7	24	24	25	24	24	24	24	24	24
K = 8	26	26	26	26	26	26	26	26	26
K = 9	27	27	27	27	27	27	27	27	27

Cheltenham JFND									
K = 0	0	0	0	0	0	0	0	0	0
K = 1	4	5	6	7	8	9	10	11	12
K = 2	7	7	7	7	7	7	7	7	7
K = 3	10	10	10	10	10	10	10	10	10
K = 4	13	13	13	13	13	13	13	13	13
K = 5	16	16	17	16	16	16	16	16	16
K = 6	19	20	21	19	19	19	19	19	19
K = 7	23	24	24	22	22	22	22	22	22
K = 8	25	26	26	25	25	25	25	25	25
K = 9	27	27	27	27	27	27	27	27	27

Rude Skov JFND									
K = 0	0	0	0	0	0	0	0	0	0
K = 1	4	5	7	8	9	10	11	12	13
K = 2	7	9	10	10	10	10	10	10	10
K = 3	10	12	13	13	13	13	13	13	13
K = 4	14	16	16	16	16	16	16	16	16
K = 5	18	19	20	20	20	20	20	20	20
K = 6	21	22	24	22	22	22	22	22	22
K = 7	23	25	25	24	24	24	24	24	24
K = 8	25	26	26	26	26	26	26	26	26
K = 9	27	27	27	27	27	27	27	27	27

Amberley JFND									
K = 0	0	0	0	0	0	0	0	0	0
K = 1	0	0	1	2	2	3	4	5	6
K = 2	2	3	4	5	6	7	8	9	10
K = 3	5	6	7	8	9	10	11	12	13
K = 4	8	9	10	11	12	13	14	15	16
K = 5	11	12	13	13	13	13	13	13	13
K = 6	14	15	16	15	15	15	15	15	15
K = 7	18	19	20	18	18	18	18	18	18
K = 8	21	22	23	21	21	21	21	21	21
K = 9	24	24	24	24	24	24	24	24	24

Agincoourt JFND									
K = 0	0	0	0	0	0	0	0	0	0
K = 1	4	5	7	8	9	10	11	12	13
K = 2	7	7	7	7	7	7	7	7	7
K = 3	10	9	9	9	9	9	9	9	9
K = 4	12	12	12	12	12	12	12	12	12
K = 5	15	15	15	15	15	15	15	15	15
K = 6	18	18	18	18	18	18	18	18	18
K = 7	21	21	21	21	21	21	21	21	21
K = 8	24	24	24	24	24	24	24	24	24
K = 9	27	27	27	27	27	27	27	27	27

TABLE 9 - CONVERSION TABLES FOR CHANGING K INTO 3K, - continued

Lerwick MASO								
K = 0	0	0	0	0	0	0	0	0
K = 1	3	4	3	3	2	2	3	2
K = 2	7	8	8	(8) ⁵ ₁₁	(6) ³ ₉	6	6	5
K = 3	10	11	13	(13) ¹⁶	11	10	9	9
K = 4	12	14	17	17	15	13	12	12
K = 5	14	16	20	21	18	16	15	14
K = 6	16	19	22	24	22	19	18	17
K = 7	19	22	25	25	23	22	21	20
K = 8	23	25	26	26	25	25	24	22
K = 9	27	27	27	27	27	27	27	27

Winget MASO								
K = 0	0	0	0	0	0	0	0	0
K = 1	(3) ¹ ₅	(4) ¹ ₆	(3) ¹ ₅	2	2	2	2	2
K = 2	7	8	(8) ¹⁰	(6) ⁴ ₉	6	6	5	5
K = 3	10	11	11	(11) ¹⁴	10	9	8	8
K = 4	13	(15) ¹³	16	(16) ¹⁹	13	12	11	12
K = 5	16	19	20	20	18	16	15	15
K = 6	20	22	23	24	21	19	19	19
K = 7	24	25	25	25	24	22	22	22
K = 8	26	26	26	26	25	25	25	25
K = 9	27	27	27	27	27	27	27	27

Meanook MASO								
K = 0	0	0	0	0	0	0	0	0
K = 1	5	5	3	3	(3) ¹ ₅	(3) ¹ ₆	(3) ¹ ₅	(3) ¹ ₅
K = 2	8	8	5	5	6	7	(8) ¹¹	8
K = 3	11	10	7	7	9	11	13	12
K = 4	14	12	9	9	11	14	17	16
K = 5	16	14	11	11	13	17	21	20
K = 6	20	18	14	14	15	20	24	23
K = 7	25	22	18	18	19	22	25	25
K = 8	26	26	25	24	25	25	26	26
K = 9	27	27	27	27	27	27	27	27

Witteveen MASO								
K = 0	0	0	0	0	0	0	0	0
K = 1	4	(6) ³ ₈	(5) ² ₈	(3) ⁰ ₆	2	(3) ¹ ₅	(3) ¹ ₅	(3) ¹ ₅
K = 2	8	10	10	8	(7) ⁴ ₉	7	6	6
K = 3	11	13	14	(13) ¹⁰	11	10	9	9
K = 4	15	16	18	17	15	13	12	13
K = 5	19	21	21	21	19	17	16	17
K = 6	22	24	24	24	24	21	20	21
K = 7	25	25	25	25	25	24	24	24
K = 8	26	26	26	26	26	26	26	26
K = 9	27	27	27	27	27	27	27	27

Sitka MASO								
K = 0	0	0	0	0	0	0	0	0
K = 1	5	5	4	3	3	3	3	5
K = 2	9	8	5	5	6	7	8	9
K = 3	12	11	8	8	8	10	12	13
K = 4	15	13	11	10	10	13	16	18
K = 5	18	16	13	11	12	16	20	21
K = 6	21	19	15	13	15	18	22	23
K = 7	23	22	18	16	18	21	25	25
K = 8	26	26	21	20	21	22	26	26
K = 9	27	27	(27) ²² ₂₇	(27) ²¹ ₂₇	(27) ²² ₂₇	27	27	27

Abinger MASO								
K = 0	0	0	0	0	0	0	0	0
K = 1	(3) ¹ ₅	(4) ¹ ₆	2	1	1	1	2	2
K = 2	6	7	6	5	4	4	5	5
K = 3	10	11	10	(10) ⁷ ₁₃	(9) ⁶ ₁₃	(8) ⁶ ₁₃	8	8
K = 4	13	(15) ¹³	15	(15) ¹⁸	13	13	12	12
K = 5	17	19	19	19	18	17	16	16
K = 6	22	23	23	23	22	21	20	21
K = 7	25	25	25	25	24	24	24	24
K = 8	26	26	26	26	25	25	26	26
K = 9	27	27	27	27	27	27	27	27

Eskdalemuir MASO								
K = 0	0	0	0	0	0	0	0	0
K = 1	3	(5) ² ₇	(3) ¹ ₂	2	1	1	2	2
K = 2	7	8	(7) ¹⁰	(6) ³ ₉	(5) ² ₈	5	(6) ³ ₈	6
K = 3	11	12	(12) ¹⁵	(12) ¹⁵	(10) ⁷ ₁₂	10	9	9
K = 4	14	16	16	16	15	14	13	13
K = 5	18	19	20	21	19	18	17	17
K = 6	21	22	23	23	22	21	21	21
K = 7	23	25	25	25	24	22	22	22
K = 8	25	26	26	26	25	24	24	24
K = 9	27	27	27	27	27	27	27	27

Cheltenham MASO								
K = 0	0	0	0	0	0	0	0	0
K = 1	3	3	3	4	4	4	2	2
K = 2	6	7	6	7	8	8	6	5
K = 3	9	10	10	10	11	12	10	9
K = 4	12	13	13	13	15	16	15	13
K = 5	16	16	16	17	19	20	20	17
K = 6	20	21	20	21	22	23	23	21
K = 7	24	25	24	24	25	25	25	24
K = 8	25	26	26	26	26	26	26	25
K = 9	27	27	27	27	27	27	27	27

Rude Skov MASO								
K = 0	0	0	0	0	0	0	0	0
K = 1	4	(4) ² ₆	3	3	3	3	3	3
K = 2	7	8	(8) ¹⁰	(7) ⁴ ₉	7	6	6	6
K = 3	10	12	12	(11) ¹⁵	10	10	9	9
K = 4	14	(14) ¹⁴	(14) ¹⁴	16	14	13	12	12
K = 5	18	20	20	21	18	16	15	16
K = 6	21	23	24	24	22	20	20	20
K = 7	23	25	25	25	24	23	23	22
K = 8	26	26	26	26	25	25	25	24
K = 9	27	27	27	27	27	27	27	27

Amberley MASO								
K = 0	0	0	0	0	0	0	0	0
K = 1	1	2	2	3	(3) ¹ ₅	(4) ² ₇	2	1
K = 2	(5) ⁷	(6) ³ ₈	6	6	7	9	(7) ³ ₉	(5) ² ₈
K = 3	(10) ¹⁴	(10) ¹³	10	9	10	(12) ¹⁰	(12) ¹⁶	(11) ¹⁵
K = 4	(16) ²⁰	(15) ¹⁸	13	13	14	(17) ²⁰	18	(17) ²¹
K = 5	21	20	18	17	19	21	21	22
K = 6	24	24	22	23	23	24	24	24
K = 7	25	25	25	25	25	25	25	25
K = 8	26	26	26	26	26	26	26	26
K = 9	27	27	27	27	27	27	27	27

Agincoourt MASO								
K = 0	0	0	0	0	0	0	0	0
K = 1	3	3	2	2	1	1	1	1
K = 2	6	6	5	5	(4) ¹ ₆	(4) ² ₇	(4) ² ₇	(5) ² ₇
K = 3	9	9	8	9	(9) ¹¹	(10) ¹³	(9) ¹²	9
K = 4	12	11	11	12	(13) ¹⁶	15	(14) ¹⁷	13
K = 5	14	14	14	15	17	18	18	16
K = 6	17	17	17	18	21	21	22	20
K = 7	20	20	20	21	24	23	24	22
K = 8	24	23	22	22	25	26	26	25
K = 9	27	27	27	27	27	27	27	27

TABLE 9 - CONVERSION TABLES FOR CHANGING K INTO 3K₁ - continued

Lorwick MJJA								
K = 0	0	0	0	0	0	0	0	0
K = 1	3	2	2	1	1	1	1	3
K = 2	6	6	7 ⁴ ₉	6 ³ ₉	5	4	5 ³ ₈	6
K = 3	9	10	11	11	9 ⁷ ₁₂	9	10	9
K = 4	12	13	15	16	13 ¹⁷ ₁₇	13	13	12
K = 5	15	16	19	20	18	16	17	15
K = 6	17	19	22	23	21	19	20	18
K = 7	19	21	25	25	25	23	23	21
K = 8	22	24	26	26	26	26	26	24
K = 9	27	27	27	27	27	27	27	27

Wingat MJJA								
K = 0	0	0	0	0	0	0	0	0
K = 1	2	2	3	2	2	1	2	2
K = 2	6	6	7	6	5	4	5	6
K = 3	9	9	10	10	8	8	9	9
K = 4	13	13	14	14	12	12	13	13
K = 5	16	17	18	18	17	16	17	17
K = 6	21	21	21	22	22	21	21	21
K = 7	24	25	25	25	25	25	24	25
K = 8	25	26	26	26	26	26	26	26
K = 9	27	27	27	27	27	27	27	27

Meanook MJJA								
K = 0	0	0	0	0	0	0	0	0
K = 1	2	3	3	3	3	2	2	2
K = 2	6	6	5	5	6	6	7 ⁴ ₁₀	6
K = 3	9	8	7	7	8	10	12 ¹⁶ ₁₆	10
K = 4	12	11	9	9	10	14	17	14
K = 5	15	13	10	10	13	17	21	18
K = 6	19	16	13	13	16	20	24	22
K = 7	25	19	18	18	20	25	25	25
K = 8	26	25	25	24	25	26	26	26
K = 9	27	27	27	27	27	27	27	27

Witteveen MJJA								
K = 0	0	0	0	0	0	0	0	0
K = 1	4 ¹ ₆	4 ¹ ₆	4 ¹ ₇	2	1	1	2	4
K = 2	7	8	9	6 ⁴ ₉	5 ² ₇	5	6	7
K = 3	11	11	13 ¹¹ ₁₆	11 ¹⁴ ₁₄	9 ¹³ ₁₃	9	10	10
K = 4	15	16	17	19 ²¹ ₂₁	15	13	13	15
K = 5	19	21	21	22	19	17	17	19
K = 6	23	23	23	24	24	22	21	22
K = 7	25	25	25	25	25	25	25	25
K = 8	26	26	26	26	26	26	26	26
K = 9	27	27	27	27	27	27	27	27

Sitka MJJA								
K = 0	0	0	0	0	0	0	0	0
K = 1	2	3	3	3	3	3	3	3
K = 2	6	6	6	6	6	7	7 ⁵ ₁₀	7
K = 3	9	9	8	8	9	10	13 ¹⁵ ₁₅	11
K = 4	13	11	10	10	11	13	16	13 ¹⁴ ₁₉
K = 5	18	14	13	12	13	16	19	20
K = 6	20	18	15	14	16	19	20	23
K = 7	22	21	18	17	19	22	25	25
K = 8	25	24	21	20	22	25	26	26
K = 9	27	27	27	27 ²² ₂₇	27	27	27	27

Abinger MJJA								
K = 0	0	0	0	0	0	0	0	0
K = 1	3	2	1	1	1	1	1	2
K = 2	6	5	5	4	3	2	4	6
K = 3	9	9 ⁷ ₁₂	9 ⁷ ₁₂	9 ⁶ ₁₁	7 ⁴ ₁₀	6	8 ⁶ ₁₁	9
K = 4	13	14	14 ¹⁷ ₁₇	13 ¹⁸ ₁₈	12 ¹⁵ ₁₅	11	13	13
K = 5	18	18	18	19	17	16	16	17
K = 6	23	23	22	24	23	21	20	22
K = 7	25	25	25	25	25	25	25	25
K = 8	26	26	26	26	26	26	26	26
K = 9	27	27	27	27	27	27	27	27

Eskdalemuir MJJA								
K = 0	0	0	0	0	0	0	0	0
K = 1	3 ¹ ₅	3 ¹ ₅	3 ¹ ₅	2	1	1	1	3
K = 2	7	7	7 ⁴ ₉	5 ² ₈	4 ¹ ₆	3 ¹ ₆	5 ² ₇	6
K = 3	10	10	11	10 ¹³ ₁₃	8 ¹¹ ₁₁	8	9 ¹² ₁₂	10
K = 4	14	15	15	15 ¹⁹ ₁₉	13 ¹⁶ ₁₆	12	14	14
K = 5	19	19	19	20	18	17	18	19
K = 6	22	22	22	24	22	21	21	21
K = 7	25	25	24	25	25	24	24	24
K = 8	24	26	25	26	26	26	25	25
K = 9	27	27	27	27	27	27	27	27

Cheltenham MJJA								
K = 0	0	0	0	0	0	0	0	0
K = 1	2	2	3	3	3	3	1	1
K = 2	5	5	6	6	7	7	5	5
K = 3	9	8	9	10	11	11	9	8
K = 4	12	12	12	13	16	16	14	12
K = 5	15	15	16	17	20	20	19	16
K = 6	19	19	20	21	24	24	23	20
K = 7	23	23	24	24	25	25	25	23
K = 8	25	25	26	26	26	26	26	25
K = 9	27	27	27	27	27	27	27	27

Rude Skov MJJA								
K = 0	0	0	0	0	0	0	0	0
K = 1	3	3	3	2	2	2	3	3
K = 2	6	6	7	6	5	5	6	7
K = 3	10	10	10	10	9	8	10	10
K = 4	13	14	15	15	12	12	13	13
K = 5	18	19	19	19	17	16	17	18
K = 6	22	22	22	24	21	21	22	21
K = 7	25	25	25	25	25	25	24	24
K = 8	26	26	26	26	26	26	25	26
K = 9	27	27	27	27	27	27	27	27

Amberley MJJA								
K = 0	0	0	0	0	0	0	0	0
K = 1	1	2	3 ¹ ₅	3	4	5	4 ¹ ₆	2
K = 2	5 ² ₈	6 ³ ₈	6 ³ ₈	6	8	9	8 ¹ ₁₁	7 ⁴ ₁₀
K = 3	10 ¹³ ₁₃	10 ¹³ ₁₃	9	9	11	13	13 ¹⁶ ₁₆	13 ¹⁶ ₁₆
K = 4	15 ²⁰ ₂₀	15 ¹⁸ ₁₈	13	13	15	16	18	18
K = 5	21	20	16	17	19	21	22	23
K = 6	24	24	21	21	24	24	24	24
K = 7	25	25	25	25	25	25	25	25
K = 8	26	26	26	26	26	26	26	26
K = 9	27	27	27	27	27	27	27	27

Agincoourt MJJA								
K = 0	0	0	0	0	0	0	0	0
K = 1	2	2	2	2	1	1	1	1
K = 2	5	4	5	5	4 ¹ ₆	3 ¹ ₅	3 ¹ ₅	4 ¹ ₆
K = 3	8	7	8	8	8 ¹¹ ₁₁	8 ¹¹ ₁₁	8 ¹¹ ₁₁	8
K = 4	11	10	10	11	13 ¹⁶ ₁₆	13 ¹⁶ ₁₆	13	12
K = 5	14	13	13	14	18	18	17	16
K = 6	17	16	16	19	22	22	21	19
K = 7	21	19	19	22	25	25	24	22
K = 8	24	22	22	25	26	26	25	25
K = 9	27	27	27	27	27	27	27	27

K =	0	1	2	3	4	5	6	7	8	9	Total
E5 = 12...15 GMT	32	150	140	66	22	6	2	6	.	.	424
E8 = 21...24 GMT	53	74	83	120	52	22	12	6	1	1	424

For the standardizing distribution, the two Eighths nearest to local midnight were selected for each observatory. This gave a total of 2 times 11 times 424 = 9328 indices, distributed as indicated by the following numbers n ; these, by multiplication with $424/9328$, have been expressed in relative numbers s , and these, finally, have been summed consecutively to give S .

K =	0	1	2	3	4	5	6	7	8	9	Total
$n =$	1328	1893	1813	2129	1245	576	232	84	19	9	9328
$s =$	60.4	86.0	82.4	96.8	56.6	26.2	10.5	3.8	0.9	0.4	424.0
$S =$	60.4	146.4	228.8	325.6	382.2	408.4	418.9	422.7	423.6	424.0	

6. The standardization-process.

The last line, S , provides the standardization basis for the group JFND. Again, we regard K as a continuous variable, and the 424 K -indices are considered as ranked, from low to high activity. The upper limits for the half units, i.e. for $K_s = 0+, 1+, \dots$ are given by the numbers S . We derive the upper limits for the other thirds by linear interpolation. Thus, the upper limit for $K_s = 0_0$ would be at $S = 60.4/3 = 20.1$, for $0+$ at $S = 60.4$, for $1-$ at $S = 60.4 + (86.0/3) = 89.0$, for 1_0 at $S = 117.7$, for $1+$ at $S = 146.4$, for $2-$ at $S = 173.9$, etc. These are the standard rank limits for K_s .

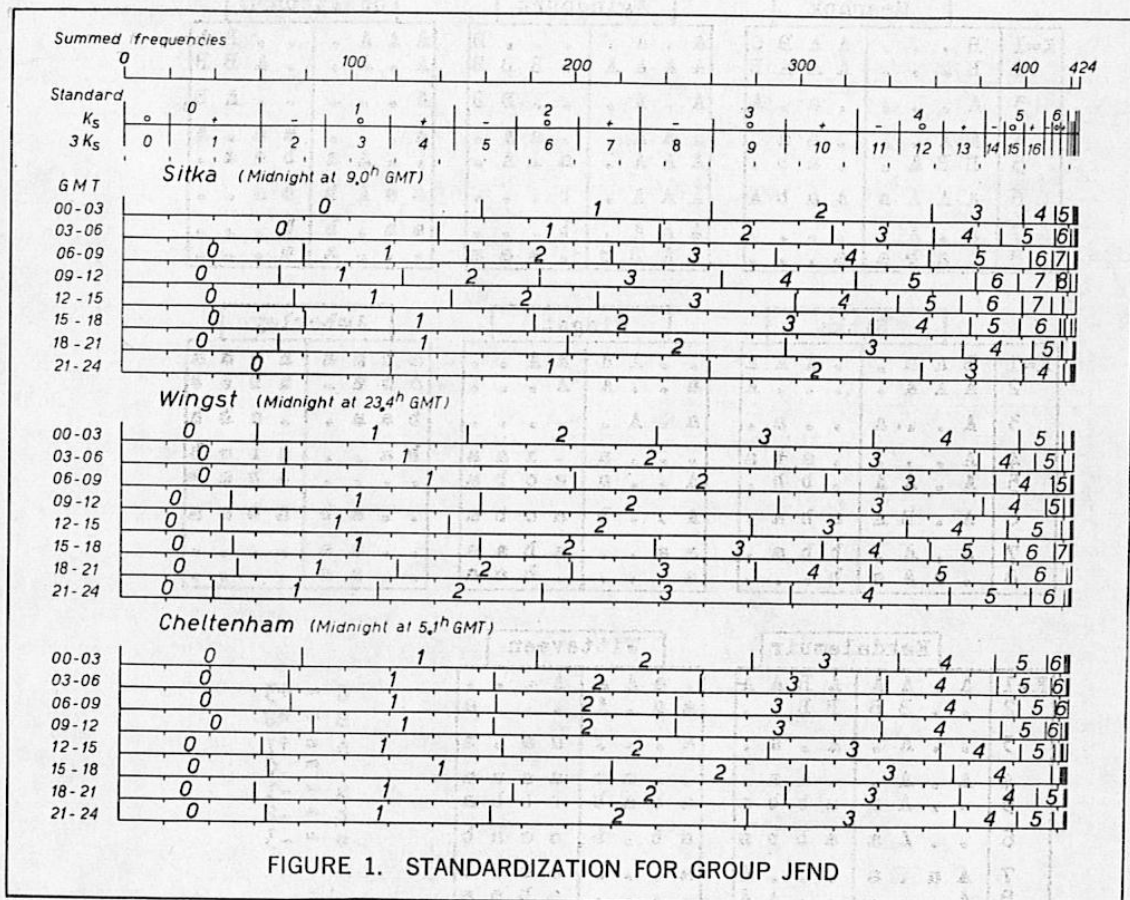
As example, we describe the standardization of K for Lerwick JFND, Eighth E5 = 12-15 GMT. The 424 three-hour-intervals are marked, by the observatory, with one of the indices $K = 0$ to 9. This is equivalent to a ranking in which the transition from $K = 0$ to 1, according to the frequency distribution given in section 5, lies between 32 and 33, say, at the rank $R = 32.5$; and from $K = 1$ to 2, at $R = 32.5 + 150 = 182.5$, etc. The center of all ranks with $K = 1$ is $R = (32.5 + 182.5)/2 = 107.5$. Comparing this rank with S , it is realized that it falls into the limits $S = 89.0$ and 117.7 of the standard ranks for $K_s = 1_0$; similarly, it is found that the (lower and upper) limits of the ranks for $K = 1$ fall into those for the standard ranks $0+$ and 2_0 . These limits are more than 4 units in $3K_s$ apart, they must therefore be indicated in the conversion-table; that table lists, accordingly, for $K = 1$, in addition to the center $3K_s = 3$, the limits $3K_s = 1$ and 6.

For Lerwick JFND E8, $K = 1$, the frequency distribution (given also in section 5) indicates the lower limit, central value, and upper limit, as $R = 53.5, 90.5$, and 137.5 , falling into the standard rank limits for $0+, 1_0$, and $1+$. Here, the lower and upper limits of $3K_s$ are only 3 units apart, so that it is sufficient to list, in the conversion-table, nothing but the central value $3K_s = 3$.

7. Assimilation of summer and winter.

Groups MASO and MJJA were treated in the same way, with one slight adjustment: In summer, $K = 0$ is, even around midnight, rarer than in winter. Since 10 of the 11 observatories are in the northern hemisphere, the standard ranks for MJJA and JFND would express the difference between northern summer and winter

almost fully. The K_s - indices, and, with them, K_p , would, so-to-say, show remnants of the egg-shells of their origin, not in keeping with the conception of K_p as a planetary index. In order to eliminate that effect as far as possible, its magnitude was studied in the intervals around local midnight, for quiet days, with international character-figures 0.0 and 0.1; the selection was restricted to such days that are surrounded by other quiet days, in order to avoid the curvature effect mentioned in section 5. The evidence suggested that, in order to reduce the group MJJA to the standard of JFND, it was sufficient to increase the numbers of zeros in the standard for MJJA by 15 per cent of its value, and to subtract that amount, in equal parts, from the numbers for $K = 1$ and 2.



8. Graphical illustration of the standardization.

The principle of the standardization is illustrated in Fig.1: The top line gives an even scale from 0 to 424, which applies to all scales given below. The second scale gives the limits for the standard ranks, S , and their division into thirds. The next scales give the frequencies of K at Sitka, Wingst, and Cheltenham, for the eight intervals E of the Greenwich day. The numbers for the indices K are placed in the centers of their respective frequency intervals. By simply going straight upwards in the diagram, it is seen that, in Sitka, for 00-03 GMT, the central value for $K = 1$ gives $K_s = 2+$, also lower and upper limits for $K = 1$ at $K_s = 2-$ and $3-$, etc.

The great diurnal variation of K at Sitka is shown, for instance, by the great diurnal change of K_s for $K = 4$: for 09-12 GMT, it yields hardly $K_s = 3+$, while, for 21-24 GMT, it is equivalent to $K_s = 6-$. For Wingst, $K = 4$ changes

TABLE 10 - TRANSITION TABLE
(To be used with Table 9)

$x = \text{JFND minus MASO}$

Lerwick		Rude Skov		Abinger		
K=1	A A B A	A A . A	. A A A	A A . .	. . A A	. A . .
2	. . A A	B A . A	. A . A	A A . .	A A A A	B A . .
3	. A . .	A . . .	. . . A	A a a .	. . A .	A A . .
4	A A . .	. . a .	. . . .	a b b .	. . . .	. a a .
5	B B . a	a a a A	. a . a	b o b .	A a . a	a a b a
6	B B . b	b b a .	. a . b	b o b a	. a . b	b b a b
7	B A a a	a a a .	. . . a	a b a .	a a . a	. a b a
8	A . . .	. a b .	a . . .	. a . A	. . . .	A A a a

Meanook		Aginocourt		Cheltenham		
K=1	B . . .	A A B C	. A . .	. . . B	A A A .	. . B A
2	B . . .	A A A B	A A A A	A B B B	A . A .	. A B B
3	A . . .	. a . A	A . A .	. . B B	A . . .	. . A B
4	A A . .	. a a .	. A A .	. a A .	A . . .	a a . A
5	B B A .	. a b .	A A A .	a . A .	. . A a	b a a .
6	A A A a	A a b A	A A A .	b . . .	a a A b	b a . .
7	a . A .	. . . .	A A A .	b . . .	a a . b	b . . .
8	. a b a	a . . .	. A B B	. a a a	. . . a	a . . .

Sitka		Wingst		Amberley		
K=1	B A a .	. A A A	. . A A	A A . .	a b a a	a a a a
2	A A A .	. . . A	a . . A	A . . .	c c a .	a b b b
3	A . . a	. . a .	a . A .	. . . .	b a a .	. a b b
4	A . . .	. a b a	. . . a	. a a a	b a . .	a b e b
5	A . A A	. b b .	A . . a	a o b a	. . . .	a b a b
6	A . B A	a b a .	A . . b	a o b a	. . a b	a b a a
7	A . A .	b b a .	a a . .	a b a a	. . a a	. . . .
8	. a A a	b . . .	a . . .	. b a a	. . a a	. . . .

Eskdalemuir		Witteveen		
K=1	A . A A	A B A A	. a A A	A . . .
2	. . B B	B B . .	a a . A	. . . a
3	. . A .	A . a .	a . . .	a a . a
4	A . A .	. a a .	. . a a	a a a a
5	. . A a	a b b a	a b a b	b b b a
6	. . A a	a b b a	a b . b	c o a b
7	A a . a	. . . A	a . . .	a b b b
8	A . . .	. . A A	. . . .	a b a a

C = +3
B = +2
A = +1
. = 0
a = -1
b = -2
o = -3

between $K_s = 3+$ (for 18-21 GMT), and $K_s = 5+$ (for 06-09 GMT). This, of course, expresses the local diurnal variation of K at Wingst: A solar particle stream of general intensity $K_s = 3+$ is, in the eighth 18 to 21 GMT, concentrated towards Wingst to produce a $K = 4$, while, in the eighth 06 to 09 GMT, when the solar particle stream is deflected away from Wingst, a $K = 4$ at Wingst needs a general intensity $K_s = 5+$

9. Physical meaning of the conversion-tables.

The conversion-tables and the frequencies of K on which they are based provide good material for a discussion of the local diurnal variation of activity, which may be given elsewhere. But the fact, made evident by Fig.1, may be mentioned that the situation of Cheltenham is favored by a surprisingly small diurnal variation of magnetic activity.

TABLE 10 - TRANSITION TABLE - continued

y = MASO minus MJJA

Lerwick		Rude Skov		Abinger		
K=1	. B A B	A A B a	A A . A	A A . .	. B A .	. . A .
2	A B A B	A B A a	A B A A	B A . a	. B A .	A B A a
3	A A B B	B A a .	. B B A	A B a a	A B A A	B B . a
4	. A B A	B . a .	A B A A	B A a a	. A A B	A B a a
5	a . A A	. . b a	. A A B	A . b b	a A A .	A A . a
6	a . . A	A . b a	a A B .	A a b a	a . A a	a . . a
7	. A . .	b a b a	b . . .	a b a b	. . . .	a a a a
8	A A . .	a a b b	. . . .	a a . b	. . . .	a a . .

Meanook		Aginocourt		Cheltenham		
K=1	C B . .	. A A A	A A . .	. . . .	A A . A	A A A A
2	B B . .	. A A B	A B . .	. A A A	A B . A	A A A .
3	B B . .	A A A B	A B . A	A B A A	. B A .	. A A A
4	B A . .	A . . B	A A A A	. B A A	. A A .	a . A A
5	A A A A	. . . B	. A A A	a . A .	A A . .	a . A A
6	A B A A	a . . A	. A A a	a a A A	A B . .	b a . A
7	. C . .	a c . .	a A A a	a b . .	A B . .	. . . A
8	. A . .	. a . .	. A . c	a . A .	. A . .	. . . .

Sitka		Wingst		Amberley		
K=1	C B A .	. . . B	A B . .	. A . .	. . a .	a a b a
2	C B a a	. . A B	A B A .	A B . a	. . . .	a . a b
3	C B . .	a . . B	A B A A	B A a a	. . A .	a a a a
4	B B A .	a . . B	. B B B	A . b a	A . . .	a A . a
5	. B . a	a . A A	. B B B	A . b b	. . B .	. . a a
6	A A . a	a a B .	a A B B	a b b b	. . A B	a . . .
7	A A . a	a a . .	. . . .	a c b c	. . . .	. . . .
8	A B . .	a c . .	A . . .	a a a a	. . . .	. . . .

Eskdalemuir		Witteveen		
K=1	. B A A	. . A a	. B A A	A B A a
2	. A . A	A B A .	A B A B	B B . a
3	A B A B	B B A a	. B A B	B A a a
4	. A A A	B B a a	. . A A	. . a b
5	a . A A	A A a b	. . . a	. . a b
6	a . A a	. . . .	a A A .	. a a a
7	. . A .	a b b b	. . . .	. a a a
8	A . A .	a b a a	. . . .	. . . .

C = +3
B = +2
A = +1
. = 0
a = -1
b = -2
c = -3

10. Transition-tables.

Proceeding, in the routine reduction of K into Ks, from February to March, the conversion-tables to be applied change from JFND to MASO, etc. In order to smooth those changes, "transition-tables" are provided expressing the changes of 3Ks from JFND to MASO, and from MASO to MJJA. For shortness, +1 has been denoted by A, +2 by B, etc., and -1 by a, -2 by b, etc. A +sign always means that 3Ks, for the same K, is higher in the months lying towards the beginning or end of the year.

11. Planetary index Kp.

The planetary index Kp is derived as follows: For each interval, the K for the 11 observatories are converted into 3Ks, by application of the conversion-tables. The simple average is 3Kp.

1944 MAY

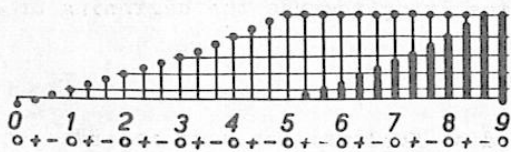
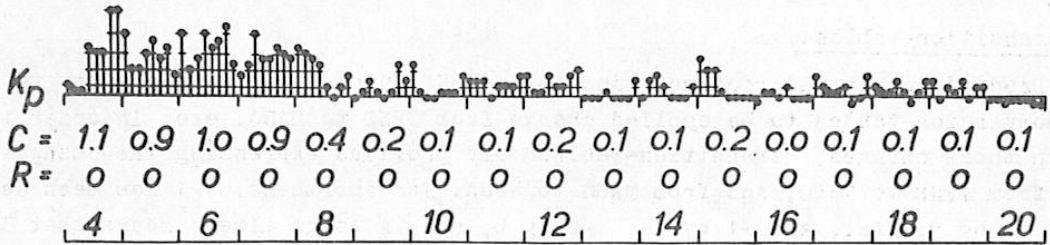
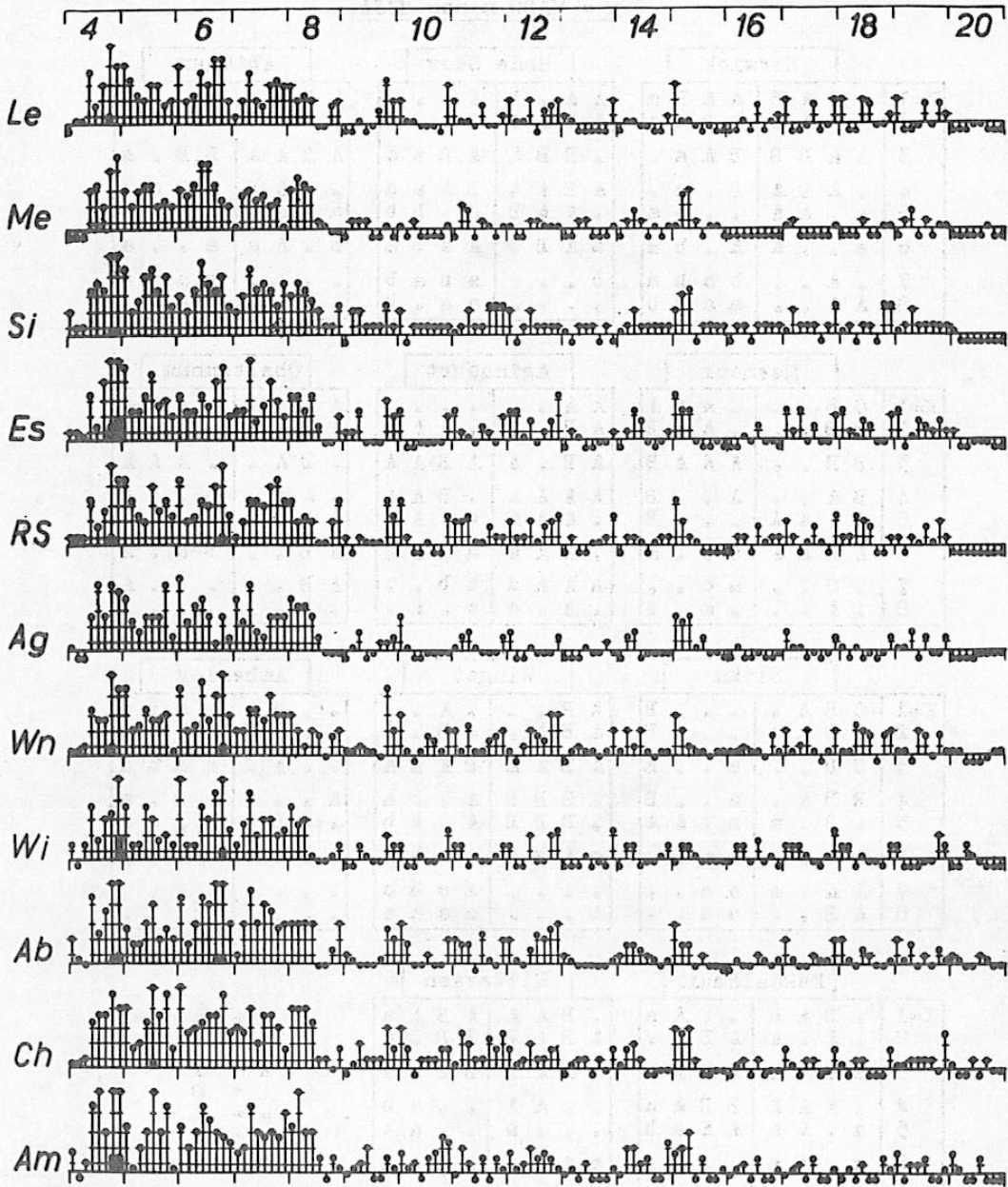


FIGURE 2. PROPOSED NOTE-SCRIPT FOR A MAGNETICALLY QUIET PERIOD

If the K_s for one observatory deviates considerably from the K_s for the other ten stations, the limits given in the conversion-tables are used occasionally to change that K_s by one or two thirds in the direction of the value for the other stations. This provides a welcome lee-way in rounding off, particularly for $K_p = 00, 0+,$ and for $9-, 90.$

Table 11 shows K_p for 1945-48. Figures 7 and 8 show note-script of K_p for 1947 and 1948.

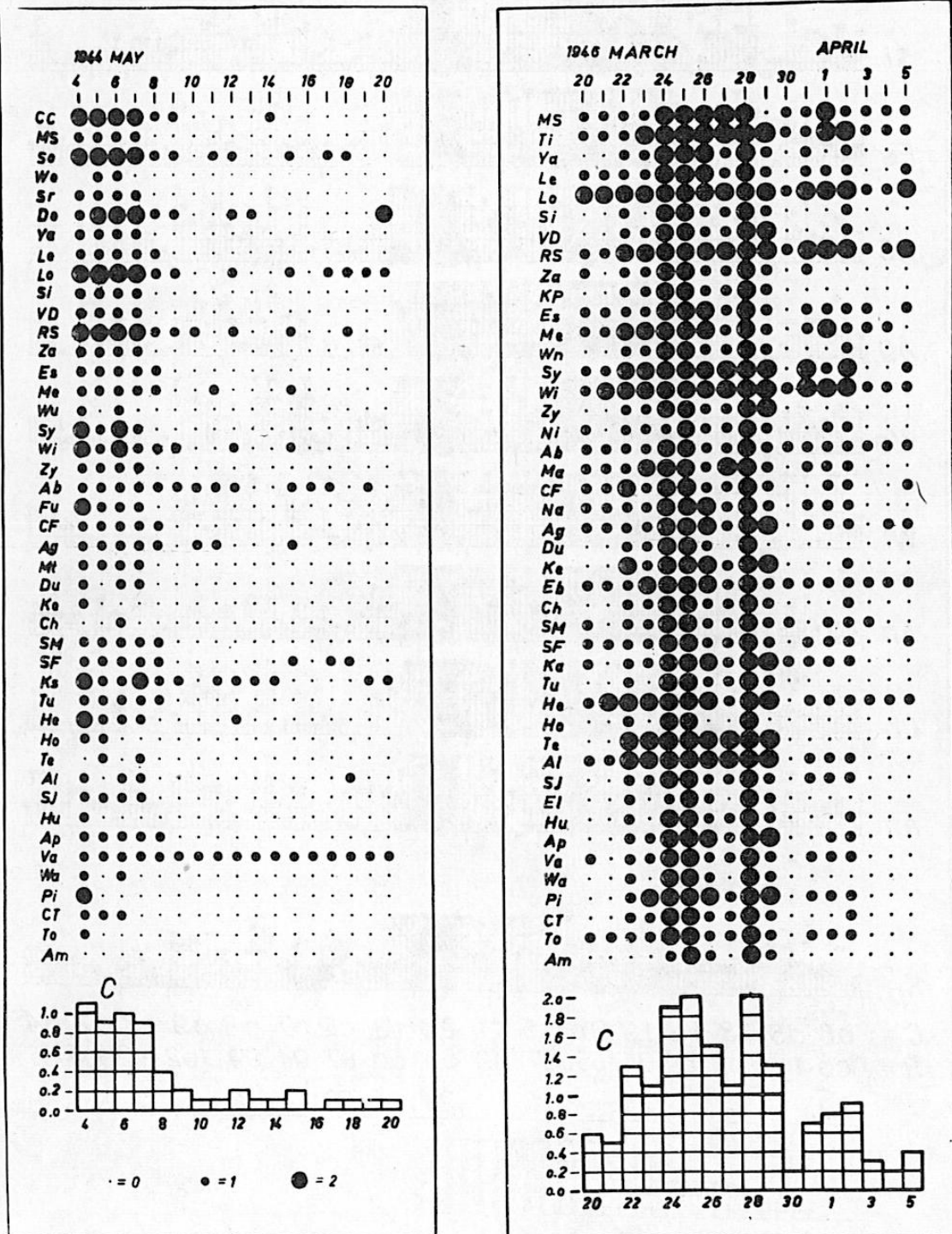


FIGURE 4. C FROM INDIVIDUAL OBSERVATORIES FOR DAYS SHOWN IN FIGURES 2 AND 3

12. Use of transition-tables.

For the 30 days around March 1, May 1, Sept.1, and Nov.1, the symbols from the transition-tables are entered too on the working sheets, and added up. For the 10 days centered at these transition dates, half of the summed differences JFND minus MASO etc. is applied; for the first and the last 10 days of the transition intervals, only $\frac{1}{4}$ of the summed differences are applied.

This, of course, is nothing but the practical equivalent to the following procedure: From Febr.14 to March 15, all K-indices are standardized twice, namely, first with the conversion-table JFND, and then with the conversion-table MASO. The two resulting values of K_p for each eighth are then combined as follows: The JFND-result gets relative weights $\frac{3}{4}$, $\frac{1}{2}$, and $\frac{1}{4}$, in the days Febr.14 to 23, Febr.24 to March 5, and March 6 to 15; while the MASO-result gets weights $\frac{1}{4}$, $\frac{1}{2}$, and $\frac{3}{4}$, for the same groups of 10 days each.



FIGURE 5. RELATION OF K_p AND C - Part I

K_p for days of equal C: a, days of smallest maximum K_p ;
b, smallest range of K_p ; c, largest range of K_p .

Actually, that process smoothing the transition is introduced mainly to satisfy a desire for exactness; it is of little practical consequence, because the differences indicated in the transition-tables are so small that an influence on the final K_p is noticeable only in rounding off where K_p lies just between two successive thirds.

13. Scale for note-script.

For the usual note-script illustrating K , the following scale (see also Figs. 2 and 3) is recommended for use with K_s and K_p : If the symbols are placed 2 millimeters apart (so that one day takes 16 mm abscissa), the note-heads will be circles of 2 mm diameter, to be placed with their centers at the following heights given in half millimeters:

00 0+ 1- 1o 1+ 2- 2o 2+ 3- 3o 3+ 4- 4o 4+ 5- 5o
 - 4 - 1 + 2 + 5 + 8 + 11 + 14 + 17 + 20 + 23 + 26 + 30 + 34 + 38 + 42 + 46 ,

and, for K_s or K_p over 50, the additional circles are to be centered at

5+ 6- 6o 6+ 7- 7o 7+ 8- 8o 8+ 9- 9o
 + 2 + 5 + 6 + 12 + 16 + 20 + 24 + 29 + 34 + 40 + 46 + 46 and -2

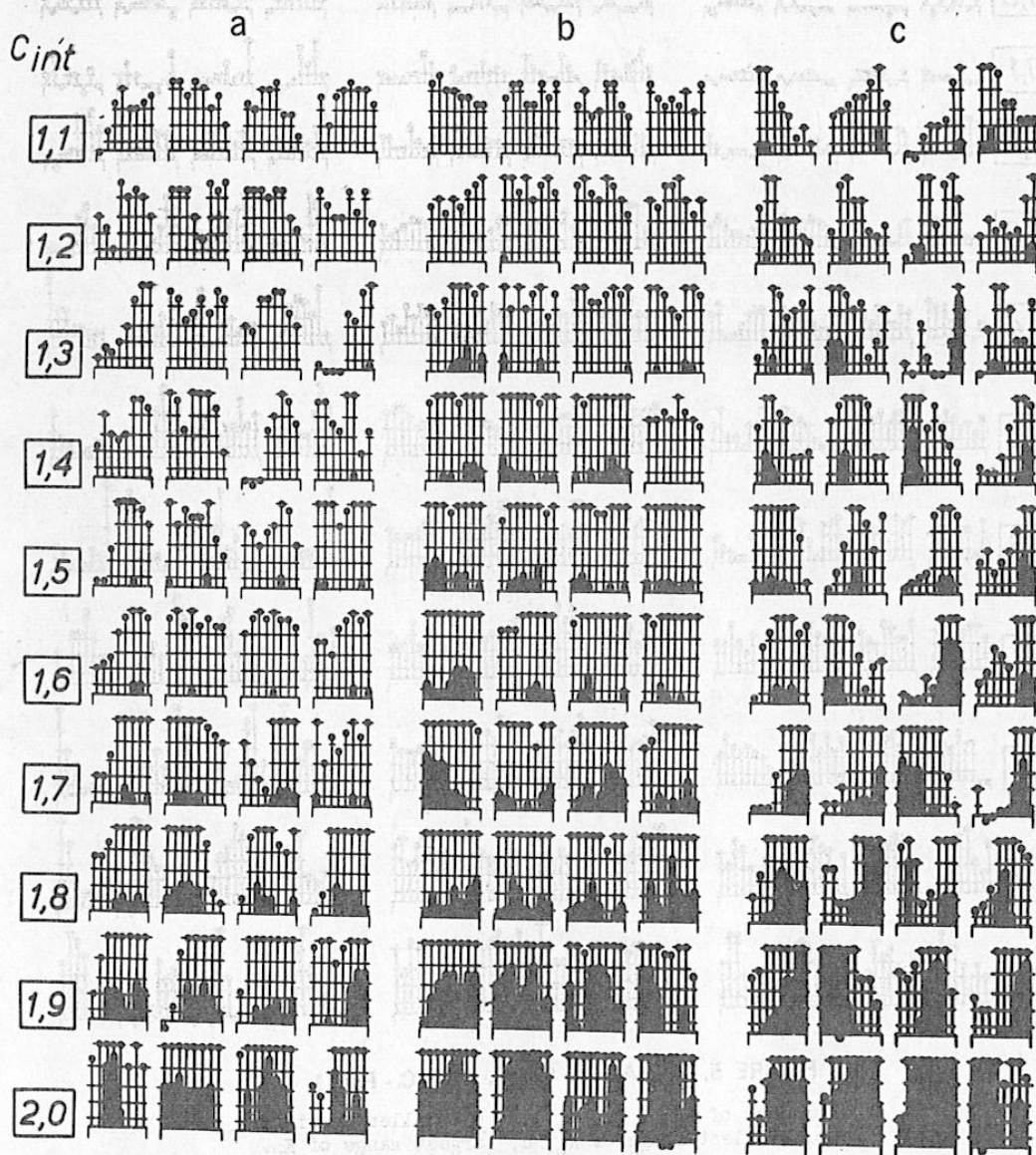


FIGURE 6. RELATION OF K_p AND C - Part 2

Figs. 2 and 3 illustrate K_s and K_p for two epochs of 16 days each. They also give the international character-figures C (sometimes denoted by C_{int}), and the Zürich relative sunspot-numbers R . In addition, Fig. 4 illustrates how C is made up by the characters of the individual observatories. Fortunately for the success of C , the tempers of the various observers, by good fortune, mixed so happily that the average C has been so useful. In K , and even more so in K_s , those individual differences of the observatories are much less apparent. The good response of K to the slightest intensity changes of solar particle radiation is well brought out in the days 1944 May 4 to 20, when the Sun was free of spots.

14. Note on the relation between K_p and C .

Finally, Figs. 5 and 6 provide a first illustration for the relation between K_p and C . From all days of the standardization basis with equal $C = 0.0, 0.1$, etc., three groups of 4 days each were selected: In group a, the highest of the 8 values of K_p for the day was to be small; in group b, the K_p should be

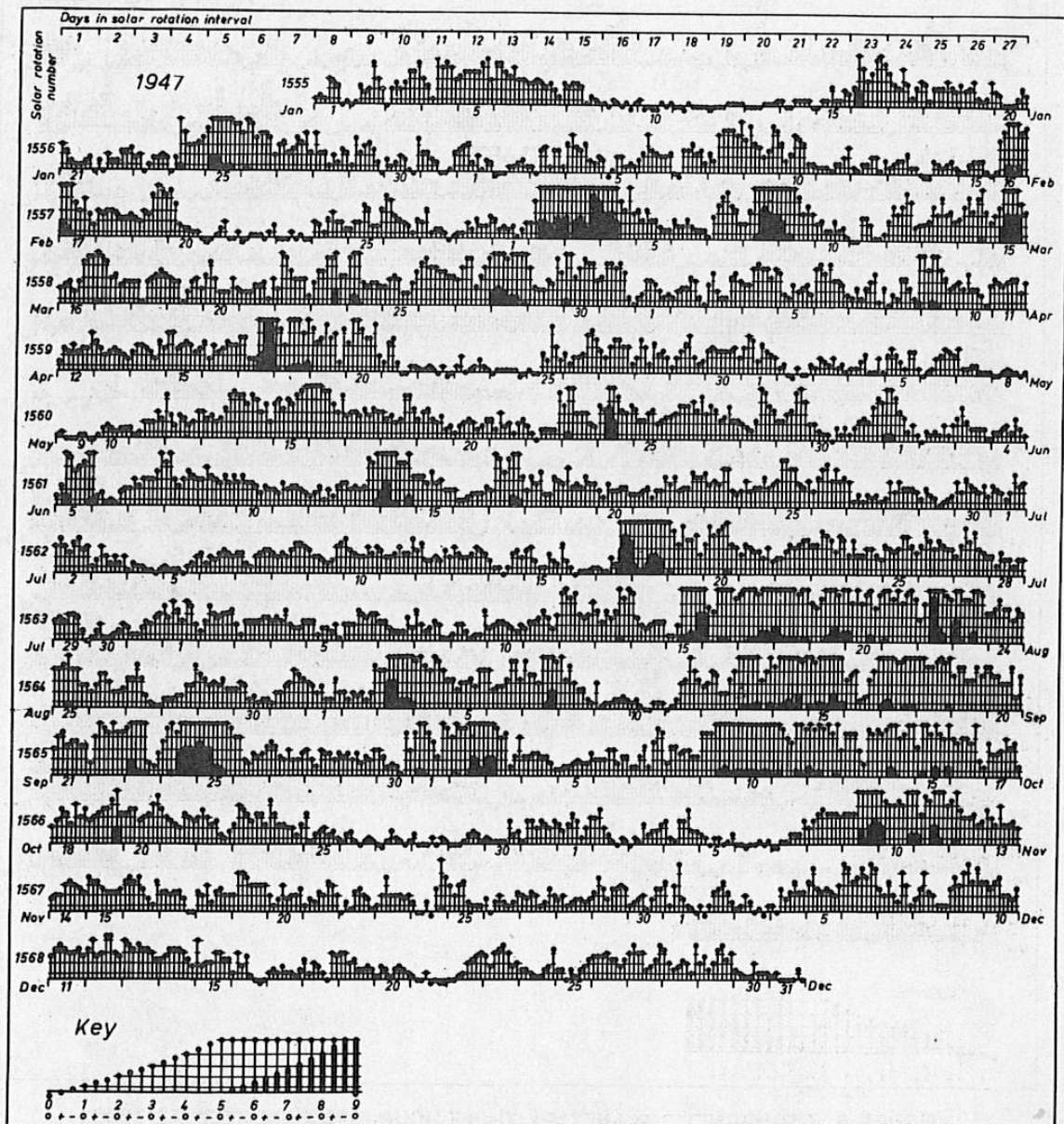


FIGURE 7 - GEOMAGNETIC PLANETARY THREE-HOUR-RANGE INDICES, K_p , 1947

as much alike as possible, that is, the highest and the lowest Kp for the day should differ little; in group c, on the contrary, the difference between the highest and the lowest Kp was to be large. This sample selection will be of interest in connection with the question - to be discussed later - whether C can be derived from Kp.

It is rather disquieting for those who have used C, for instance, for the elimination of disturbed days in work on lunar diurnal variations, - to note, namely, that, with rather low values of C like 0.9, there may occur rather highly disturbed eighths with Kp = 50 and more. This, of course, is the consequence of the compromise to be made for days which are partly quiet, partly disturbed, if whole days shall be characterized by C; for three-hour-intervals, with K, that difficulty hardly ever occurs.

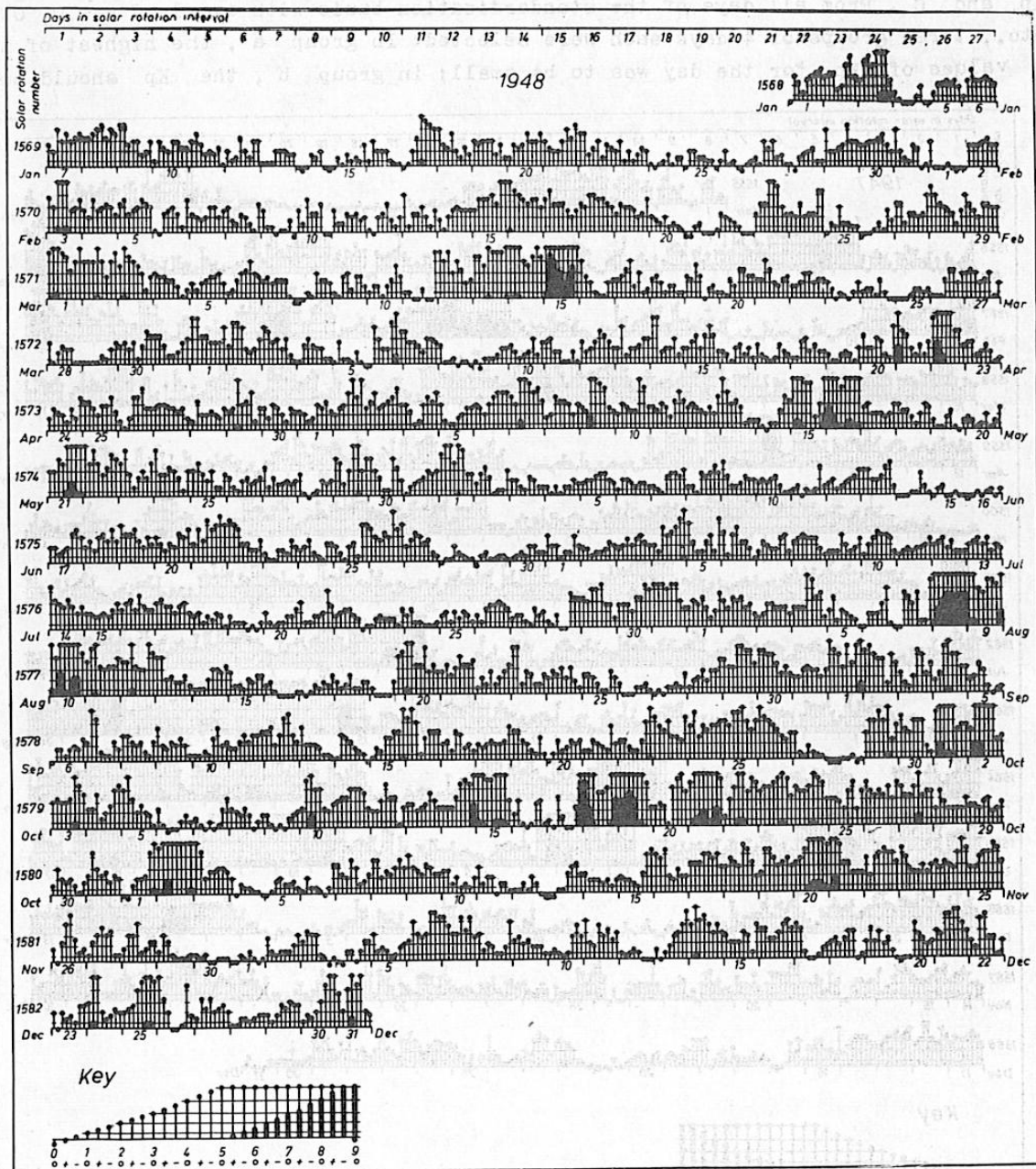


FIGURE 8 - GEOMAGNETIC PLANETARY THREE-HOUR-RANGE INDICES: Kp, 1948

TABLE 11 - GEOMAGNETIC PLANETARY THREE-HOUR-RANGE INDICES, K_p

E	January 1945								February 1945								March 1945									
	1	2	3	4	5	6	7	8	Sum	1	2	3	4	5	6	7	8	Sum	1	2	3	4	5	6	7	8	Sum
1	2o2-2-3-	2+2o4-3-						19-	2o3-1-0+	1-1o1+1-							9+	2o2-1o3-	1+1+0+0+						11-	
2	4-2+3o1+	2o3-2-2-						18+	1-1o2-2o	3+3+3o2+							17+	0o0+0+1o	2o3+1-1o						9-	
3	1o1+2-3+	2o2+3+1o						16o	3o3+1-1+	1o2o0+1-							12+	3+3o3+3o	2-2+2o0+						19o	
4	0+0o0+1o	2-3-4-4-						13+	0+3-1+1-	1-2-1o1+							10-	1o1-1-1+	1+1o1+2+						10-	
5	2o2o2-2-	1+1o2-0+						12-	2+5-5-3+	2+2o3-2-							24-	2o2o1+2-	2+4+5+5-						24-	
6	3o1+1+2+	2o0+1o2-						13o	4-2+2+4o	2o1o2+1+							19o	3-2-3-3-	3o4-4o3o						23+	
7	1+2+1-2o	2-1-1o2o						12-	1o1o2o3-	1+2-3-1+							14-	3-2+3-3o	2-3-2-1-						17+	
8	2-0+1-1-	2o1+1-1o						8+	3o3o3o3+	3+3+1+3+							24-	2+5-3o4+	4o5-1+0+						25-	
9	1o0+1+1+	1o3-2-5o						14+	3+3-3+3+	3+3-3-3-							24o	0+1o1o1+	0+1o2+3+						11-	
10	6-4+5-3+	4-2+3o0o						27o	2o3-2o4-	0+1-2-2-							15-	2o1o1-1o	1o1o1-3-						10o	
11	1-0o0+0o	0+0+1o1o						4-	3-3+3o2+	1o3o1+1o							18-	5o5-3+5o	5o5o4+2o						34+	
12	0+0o1o0o	2o2-3o2o						10o	2o3o3+1o	1-2-0o1+							13o	3o3+3+5+	6-5+6+6o						38+	
13	3+4-2+1+	0+0+0o0o						11+	0+1-0+2-	1+0+0o0+							5o	4-2o2o3+	3o1+1o1-						17o	
14	1-1-0+1-	1+1o1-2-						7o	0o0o0+1o	2-2-2o3o							10-	0+2+3o2o	2-3-3+4-						19o	
15	2o4+4o4o	4+6-6o3o						33+	4o4-3o4+	4+2+4o4-							29+	7-5o5o3+	4-6-4+7-						40+	
16	4o3+3+3-	2-1+2+4-						22+	5-3o3-3-	4-3+4+3o							27+	4o3+3-4o	3+5-3+4-						29o	
17	4-4-2o4-	2+2+4-2-						23o	2o2o2+2o	2o3o4o3o							20+	3+2o2o1+	1o2-2+3o						17-	
18	1-0+0+0+	1-2-2+3+						10-	3o2o2+1o	2+2o1-2+							16-	2o3-2-2+	3-2+3-3-						19o	
19	3-3o2-1+	2-3-3+2-						18o	2+2-2-1+	1+1-1-1o							11-	3-2-0+1o	1+1-1o1o						10-	
20	2o3+2+3+	3-2o2-1+						19-	1+0+1-1o	2-2o1-1o							9-	3o1+2-1+	1o1-6o6-						21-	
21	2o2o1+1-	1+1+1o2o						12-	1-1-1-0+	0+0+1-1-							4+	2o2+1+2+	1+2-4o1+						16+	
22	1+1o1o1-	1+1+1o1o						9-	1o0+1+2o	3-2-2-3-							13+	1+2+1-1o	0o0o0+0+						6o	
23	1-2-1-1-	1-0o1o1o						6+	1+0+0+3-	3-2o1+2o							13-	1o2-1-1o	0+0+1-1-						6+	
24	0o0o0o0+	0+0o0+0o						1o	2-2o1o2-	1o2-3-2o							14-	0+1o1o3o	2+3o2+2o						15o	
25	0o0o0+0+	0+0+0o0+						2-	4+3+2+3-	1+1o4o2+							21+	3-1+0+1+	2+4-2-4o						17+	
26	0+0+1-2o	2+3o3o2o						14-	1+3o1+1+	2o5+5+4+							24o	5o5-6o5+	5o5+5o5o						41+	
27	2o1o1o1+	2o1+2-1o						11+	3o3-3+2o	3+3o5-3-							25-	4-3+2+4o	3+4-5-5o						30o	
28	2+1+1-0+	1+2+4+5-						17+	3-3-1o1-	1o2+3-1o							14o	4-4o6-7+	7-4-3-2o						36-	
29	6o7o5-3o	3+5-5o4+						38o										1+3o4-3+	3+2+2-3-						21+	
30	3+5-3-3-	3-3o1+1+						22-										1-2o1o1-	1o1+1-0+						8-	
31	1-1+1-1o	1-1-1-2+						8o										1o0o0o0o	0+1o1+3-						6+	

E	April 1945								May 1945								June 1945									
	1	2	3	4	5	6	7	8	Sum	1	2	3	4	5	6	7	8	Sum	1	2	3	4	5	6	7	8	Sum
1	2+4+6o7o	6-5+4+4o						39o	4-3o2o2+	2o2-3o1o							19-	1-1+1o1-	1-1o1+0+						7o	
2	5o4-3-1+	2o3o3-1-						21o	3+4o3o3-	3o2o1+1o							20+	0o0+1-1-	0+1-1+2-						6-	
3	2-3o1o0o	1-0+0+0+						7+	4o2+2+3-	2+3+3-3+							23o	1+2o2-1-	1+0+0+0+						8o	
4	0+0+1-1-	4-3o1o1-						10+	1+2o2+1o	0+1-2o3-							12+	0o0+0+0+	2-1-1-1+						5+	
5	0+0o1-3o	2-3o6o4+						19o	1+1o2+1o	2o2o1o2-							12+	1-1+1o1o	1-1+2o2o						10o	
6	2o3o4o4+	3+5-3+3+						28o	0+1-1o1o	2o3-2+1o							11o	2-3-4+5-	4+4-3o4-						28o	
7	4o4o4+2-	2-2-2-5-						24-	0o0+0+1-	1-1-1+2+							6+	3o3o3+2-	2+2+4-3o						22+	
8	4o3+4-4-	3o3o1o2-						23+	1+2-2o1-	1+1o1o1-							10-	4-4o4-3-	3o4-3-3o						26+	
9	2-2o1-0o	0o0+1-0o						5+	0+1+2-1o	3-4-3+3+							17+	2o2o3o2o	2-3o3o3-						19+	
10	1o1+0o0+	3-1-0+1o						7+	1+2-2o2-	2+2+3o4-							18o	3o3+3o3o	2o3o2o2+						22-	
11	1-2-3+5+	6+4+3o5-						29+	2o4+4-4-	3+4o4+3o							28+	3o2+2o1+	2+1+3-1+						16+	
12	5o5o4-3o	2o4o5-4o						31+	4-3+2+2-	1+2-4-3+							21o	1-1+2-1+	1+1-1+1+						10-	
13	3+3+4-3-	2o2-3-3o						22+	2-2-2o1o	2-3-3-3+							17-	1-2-2o2-	2-2-1-1o						11o	
14	5o4o2+3o	3o3+4o4o						29-	2-1o1o1+	3o4-1+3-							16-	2-1+1o1o	0+1o1+1o						9-	
15	3+3o4-4o	2+2o1+2-						21+	2-1+1o0+	0+1-1-2o							8o	1+1o1o1o	1+0+1-1-						7+	
16	1+1o2o1o	1o1+2-2o						11+	2o2+1-1-	1o2-2-3+							13+	1-0+1-1o	1-1+2-2-						8o	
17	2o2-1-1-	0+1+0+0+						7+	2+2-2-1+	2o2-2o2-							14+	2-2-2-2o	2+3+1-1-						14o	
18	1-2o2o1+	1-0+0+2-						9o	1+1+2o1+	3-3+2+3+							18-	1-2o2-0+	1-1o2o1+						10-	
19	3-2o2+2+	3o1o3o3+						20-	2o2-1-2-	3-3o3-3o							17+	1-1o1o1-	1o1o2o2+						10-	
20	4-3-3o4-	4-3o2o0+						22o	2o3o3+2o	1-2+1o1-							15o	2+2-1+2o	2-1o1+1+						13-	
21	1+0o0+0+	1o1-1-2+						7-	1o1o1+2-	3o3+2-1+							14+	1+2-1-1-	1-1o0+1-						7o	
22	2o0+1-2-	1o2+4-2+						14o	1o1-1o2o	1+1+1o1o							9+	0+0o0+0o	1-1o0+0+						3o	
23	2-2+2o3o	3o4o3-4-						22+	2o2+3+2+	1+2o2-1-							16-	0+1o2o2o	1+1o0+0+						8+	
24	4o3+4-3o	2-3-4-2+						24+	3-3o3-2-	2o2o3-1-							17+	1-1+1o1-	1o0+1o1+						7+	
25	3o3-2+2+	2-1+0+1+						15o	2o4+3o2o	2+3-4o3-							23o	3o3-1o1o	0+0+2-1+						11+	
26	0o0+0+0+	2-1+0+0+						5-	2o1-1o1-	1o2-3+2o							12+	1o1-0+0+	1o0+1o2o						7-	
27	2o2o3o0+	0o0+1-1-						9o	2-1-1-1o	2+3-3+2o							14+	2o3+4-4-	2+2+1+1o						20-	
28	0+0+0o1-	1o1+0+1o						5o	0+1-0+2o	1+3-2o2o							11+	2o1+2-2-	1+1+0+2-						11+	
29	1o1-0o1+	2+2-2o1+						10+	4-2o2-1+	1-2-2+2+							16-	1o2-1-1-	1-0+0+0+						6-	
30	1o2o3-4-	2-4-3o3-						20+	2o2o2o2+	3o4o3+4+							23o	0+2+2o1+	3o4+2o3+						19-	
31									3-2o3-3o	3-2+1+1-							17+									

TABLE 11 - GEOMAGNETIC PLANETARY THREE-HOUR-RANGE INDICES, K_p - continued.

E	July 1945								August 1945								September 1945									
	1	2	3	4	5	6	7	8	Sum	1	2	3	4	5	6	7	8	Sum	1	2	3	4	5	6	7	8	Sum
1	605-505-	505-4+30						37+	1-1-1+10	10103-2+							11-	1-000+1-	10103-3-							90
2	5-2+1+2-	2+201+2+						180	5-502020	3-203-2+							23+	3-202+20	2-10102-							14+
3	303-2-1+	101-1-1+						12+	3-201+10	2-101+1+							12+	1+0+1-1+	1+1-1-2-							80
4	1-2-3+4-	404-2030						220	2-10101+	101-0+20							90	303-5-4+	4-203+2+							260
5	3+30404+	2-102+3+						230	2-2-2-20	2+3-2+0+							15-	2+1+2+20	2-30201+							160
6	3+4+6-50	3-4-2020						29-	20302020	202+1+20							17-	20201+2+	2-1-1+2+							14-
7	1+201+10	2+2-2+40						160	101-2020	1+1+202+							13-	1+2-2-1+	2-101-1+							11-
8	304+3-3-	2+2+3-3-						23-	2-1-0+10	102+2-2-							10+	10100+1-	1-1-2+2+							90
9	3-1+2-10	202-101+						13-	2-1-100+	10101-1-							70	2+1-2-1-	2-2-0+20							110
10	1-1-000+	1+1+1+10						7-	0+0+101-	1-0+0+1-							4+	1+001-1+	10102-1-							8-
11	10101+0+	1-1+1010						8-	201-0+10	101+2-3-							11-	1+101+2-	2-2+404+							18-
12	1+2+1+10	1+1-1-1-						9+	202-2-1+	101+101+							11+	5-4-3-3-	301+2-1-							20+
13	1+10101+	101-0+10						8-	202-3030	302+1-0+							160	101-2-20	30204-2-							16-
14	1-2-1-20	2-100+0+						8+	303+3+3+	3-3+4-2-							24+	201+0+0+	1-1-1000							6+
15	1-1-0+1-	1-10101-						6-	2+2-203-	2-202+4-							18+	1-0+1+2-	1-0+1-0+							60
16	1+2-0010	303-3-30						15+	4-1+1+10	2-10101+							12+	10101+2-	2-2+1+30							13+
17	2010202+	1+4+5-30						21-	1-101+1+	2-201+0+							10-	5-504+5+	4+5-4+4+							370
18	3-3-2+2+	201-1+2-						16-	0+001-10	101-1-0+							5-	5-4+5-4+	5-6+4+5-							380
19	302+2-20	100+102+						14-	0+0+101-	0+0+1-1-							4+	5+2-202+	10102+20							18-
20	0+0+1-1-	1+1-0+1-						50	1-0+01-	1-0+000+							3+	2+302+4-	1+201+0+							16+
21	1-1-1-10	102-0+0+						6+	1-10103-	3+2+200+							13+	0+0+0+2-	303-2030							13+
22	10101-1-	101-2-0+						70	001-1+10	1+4-403-							15-	2+3-1-1-	101+101-							10+
23	0+100+0+	20303+5+						16-	4+402-20	2-1+0+10							16+	1+1-101-	0+0+000+							5-
24	4-2-2-20	2-1+1+0+						14-	102+1000	0+0+0+00							5+	0+0+0+1-	0+1-1010							5-
25	2-1+1-1+	1-1-101+						9-	0010201-	1-1-0+00							5+	0+2-1+2+	2+2-2+2+							14+
26	1-10102-	1+1+1+10						9+	001-101-	1+1+1-10							7-	201-1-10	1+3-2+10							12-
27	100+0+0+	1-100+0+						4+	1+1+1-1-	103-3-3-							130	10301+5-	4-102-1+							18-
28	1+20304-	4-2-2030						20+	606+3-2+	203-4-20							28-	20301+2-	101-2-1-							120
29	3+101-2-	2-20204-						160	2+203-2+	1+10101+							140	1-2-2-0+	002+202-							10+
30	4+503-20	30202-2+						230	1-0+0+1+	1-101010							6+	3+2+4+3+	3-2-3+30							240
31	3+1+1-0+	0+000010						70	1-1+1-0+	0+0+1+20							70									

E	October 1945								November 1945								December 1945										
	1	2	3	4	5	6	7	8	Sum	1	2	3	4	5	6	7	8	Sum	1	2	3	4	5	6	7	8	Sum
1	3-2-1-10	0+2-3+2+						14-	100+1-0+	1-1-0+1+							5+	0+1+000+	0+1-0+1-							40	
2	002-2020	30200+0+						11+	1+0+0+1-	1-0+1+00							50	0+2-1-0+	1-1-0+30							8-	
3	100+1-1-	101-0+00						5-	001-1010	1-0+0020							6-	2-000+00	1-0+0+1-							4+	
4	0+001-0+	000+1010						4-	1+000+0+	3-2-203-							110	100+0000	00000000							1+	
5	2-2+2020	2+2+302+						180	403+103-	201+0+0+							150	001-101-	0+1+303-							10-	
6	10000+1-	10102-2+						80	00001-10	0+1-0+00							3-	2+202-2-	3+3-3030							20-	
7	2-0+1-0+	100+3+5-						12+	0+0+1-0+	0+101010							50	302+2+1+	0+0+1+3+							14+	
8	3-1+2030	3-3+1010						170	00000+10	2-4-403+							140	4-40303-	4-2+2-2-							23-	
9	1+303-2-	101+0+00						11+	4+5-6+5+	40504+4-							38-	4-2+3-2+	2+302-20							20+	
10	0000001-	100+0000						20	404-4-2+	201-1-20							190	2-301+2-	1+100+0+							11-	
11	00000000	0+00001-						10	3-4-4+3-	40303+10							25-	100+101+	100+0+0+							6-	
12	1-1-3-50	505+5-40						280	404+4-3+	102-4020							240	0+0+000+	2-0+1+10							5+	
13	4-3-402+	101-1+3-						18+	20303+2-	2-2+2+20							18+	1-0+0+0+	4-3+5-5+							19-	
14	2+103-10	20303030						180	201+2020	102-201+							13+	6+7-7-7-	6+4+2-10							40-	
15	1+202-20	2020101+						13+	2-2+3+20	2-3-3-20							18+	1-2+302-	3-202-4-							18-	
16	1+303020	404-301-						21-	2020203-	303-3+4+							220	2+100+0+	000+2+20							9-	
17	00103-30	103-302-						150	3+20203+	3+1-1-0+							16-	404-2+3-	3+3+202-							230	
18	2+2+2+2+	2-1+202-						160	001+1-1+	100+1-0+							6-	200+1010	2-1+2-1+							10+	
19	201-101+	2+2-3+4+						17-	1-0+000+	1010100+							5-	1+1-1+2-	1-2+3+60							17+	
20	4-2+1-1-	2-10303-						16-	0+2-0+0+	1-1-0+10							5+	5-4-5-2+	203+4+4+							29+	
21	10001-1+	1-2-203-						100	1-0+0+0+	1-1-2-2+							70	506-3+30	2010101+							22+	
22	1-00002-	303+2+2+						13+	2+2+0+00	000+1-1-							7-	100+0+0+	000+0+1-							3+	
23	2-001-1-	1-10102+						80	0+1-0+0+	1-2-2-0+							60	1+0+0+0+	1-3+404+							15-	
24	4-4-4+6-	605+605+						400	0+100+1+	0+000+1-							4+	3+2+304-	4-401+1-							220	
25	60603+5+	5+4+302-						350	1-0+001-	1+1+3-1+							8+	0+003-3+	40505-4-							24-	
26	20100+1-	1-1-0+10						7-	00000+0+	0+1-001-							2+	5-5-4040	4-303+2+							30-	
27	101-1+10	2-3-305+						17-	0+1+1000	0000101+							50	3+40303+	5-4-5+3+							31-	
28	6+6-2030	30405-40						33-	001-1+0+	0+0+1+20							6+	4-404-30	5-4+3-40							300	
29	3-201+20	203-2+30						180	2-2+302+	2+1+4-2+							190	2-4-3-3-	2+3-2+3-							21-	
30	200+1-10	3+2+1010						12-	1+10001-	0+0+1-10							5+	3-2+2-20	2-0+1+1-							13-	
31	2-1+001-	10101+20						90										2+203-1+	2+101020								15-

TABLE 11 - GEOMAGNETIC PLANETARY THREE-HOUR-RANGE INDICES, K_p - continued.

E	January 1946								February 1946								March 1946									
	1	2	3	4	5	6	7	8	Sum	1	2	3	4	5	6	7	8	Sum	1	2	3	4	5	6	7	8	Sum
1	1+202+3-	2+3-3+2+						190	0+1-0+10	101+101+							70	4+6-5+4+	1+202-30							28-
2	3+2-101+	2-302+0+						15-	3030302+	20101+1+							170	5-403+4-	2+101-2-							21+
3	001+4+70	6+706+6-						380	100+0+10	4-30303+							16-	1+102-0+	101-202-							10-
4	60606-4+	3+50505-						400	3-0+2-2+	4-3+1+30							18+	3+304-4-	3+3+405+							30-
5	30303-2-	2+2-203-						190	3+4-2010	2+3+3-30							21+	5-3+305-	4+403030							300
6	3+2-2+2-	1+4-3+20						19+	4+10202-	4-1+303+							20+	303+3+3+	4-303-30							25+
7	001+1-10	20203020						120	4-20408+	8-807080							49-	2+202+30	30202020							19-
8	1+2+1+10	1-10201-						10+	9-8-7+70	6-6-4030							490	101-1-0+	101+3-2-							9+
9	0+0+1-10	1+1+1010						70	1+1-4-4+	3+3-3-3+							220	0+10101-	2+4+4+30							170
10	002-1+20	2-2+1+10						11+	2-3+5+3+	404-2+2-							25+	606-5+50	5+40606+							44-
11	205+5-40	3-2-304-						270	2+3-201+	301+2+1-							16-	6+404-4-	4-3+4-40							32+
12	203-203+	2-1+3-2-						17+	0+20101+	2+3-3-3+							16-	1+2-2-10	101-0+0+							80
13	0+1+0010	100+2+10						7+	3-2+4-4+	403-100+							210	0+2-1020	1+2-2+10							11+
14	00201-10	1-1-0+1-						60	1-1+6050	3-5-5040							29+	101+0+20	2-1+3-1-							110
15	1-0+1-1-	1-1+1+2+						80	4-5+4020	30202010							230	1+1-3-3+	3020202-							17-
16	3+302010	2010102-						150	10101010	202-3-30							13+	0+0+1+1-	1+10102-							8-
17	1+2+4-2+	1-3-3-3+						190	3+303-1+	1-1-0+0+							12+	404+3+3-	404-4+3+							30-
18	1-1+2-2+	30304-3+						190	201+1+10	102+3-10							13-	2+202+3-	202-2+0+							150
19	403+2-2-	101-203-						170	3-4-4+3+	2+405050							30+	1-2-2-10	101-2-3-							110
20	2+2+0+0+	0+000000						6-	20302+3-	202+4060							24+	3-2-1+4-	4-2+3-20							200
21	00000000	1-101+2+						5+	6-5+605+	6-5+4-10							380	2+403-3+	4-2-1-0+							19-
22	3+4-4-20	2+1-0+2+						18+	404+403+	303-3-2+							26+	0+306-5+	402+2+4+							27+
23	3-303-3-	3-1+2+50						22+	3+4-5-40	4-3+3+1+							27+	3+3-2+10	20304-6+							24+
24	40404+40	504+404-						33+	2+102-3-	2-2-4-4-							18+	808-506-	7+803+5+							50+
25	3+202-10	4-30301+						190	304-3-3+	2+2+203-							220	8-7+7+8-	8+9-8-8-							62+
26	3-4-403+	2+404-10						25-	302-1+2+	101+2+20							150	6+606050	3+3+5+30							38+
27	203-2-10	1-0+1+1+						110	0+101-10	001-0+0+							4+	505-203+	4-5-3050							31+
28	10000+2-	101-102+						80	1+1-1010	1-1-2-10							80	50608+9-	9-9-8+80							62-
29	103-2020	302-2-10						150										6-505050	4+302+30							33+
30	1+2-102-	2-102+20						13-										2+2+102-	101+202+							140
31	1+102010	2+3-1+2+						140										10204-3+	2+2-204+							20+

E	April 1946								May 1946								June 1946										
	1	2	3	4	5	6	7	8	Sum	1	2	3	4	5	6	7	8	Sum	1	2	3	4	5	6	7	8	Sum
1	50304+30	202-3030						250	0+2+3-1+	1+203-3-							15+	1+202+1+	2-1+202-							14-	
2	40403-4-	4-3+3+40						29-	402-2+2-	1+2-1+20							160	3-1+2-1+	1+1+2-1-							120	
3	101-2-2-	2+30202-						140	202+1+1+	1-103020							14-	0+0+1-10	1-0+0+0+							40	
4	2+2+102-	2-2-102+						140	3020203+	2-202010							170	0+2-2+20	302+0+0+							12+	
5	201+1+20	3-30302+						18-	102-1-0+	101+3-4+							130	000+1-10	101-4+40							120	
6	2+2+2-2+	202-2+3-						17+	4-506040	3-3+3-7-							340	303-3-4-	4-2-1+1+							200	
7	3-4-303-	3+3+2-10						21+	4-7-604+	4020202+							310	3-103-6-	7+604+30							33-	
8	1-103+30	3-1+3-2+						170	3-5+6+4-	5-3-4-3+							32+	5-4-3+4+	505+4-4+							34+	
9	30203050	6-60305-						32+	4+5-5-4+	606-6-5-							400	4+4+4-3-	4-4-2+2+							270	
10	401+1+3+	20101-2-						15+	303+4-30	3-3-3-3+							24+	1+10101+	2+4-3-1+							15-	
11	1010202-	1+1+1010						10+	405-7-50	505-2020							340	203-304-	302+2+2-							21+	
12	2+2+1-3-	30303-4+						210	2+20203-	2+2-3-2-							17+	10303-3+	505-405-							28+	
13	40404+3+	3-30404-						290	3+3+201-	1-1-1+30							150	3+403+40	403-2-10							240	
14	3+202+5-	604-3040						290	3-2-1-0+	10101+1-							9+	2-204-20	2-2-3+10							170	
15	50506+6-	7-506-2-						410	10101020	2-102-20							11+	0+2-3-20	2+202+10							14+	
16	2+3-1+10	2-1+3-3+						16+	1+2-1+20	3+103-20							15+	101+2+4-	3+3-406-							240	
17	3+2-1010	2+1-1-1-						11+	3040202-	3+4-3-1+							22-	606-4+2-	2+1+2-3+							26+	
18	1+2-203-	2+20201-						15-	4-304-30	303+2-1+							23-	4-3-3030	2040404+							27-	
19	0+0+1+1-	102+1+2+						10-	0+1-1-1+	1-1+1-10							7-	505-5-5-	5-4+403+							35+	
20	20100+10	20201+1-						10+	0+1+101-	1-2+3050							14+	4-3-3-2+	303-3-2-							21+	
21	001-101-	1+1+1010						70	5-3+4+4-	404+5040							33+	2+4-403-	2-2+4-3+							24-	
22	1-104-4+	3-304+20						22-	30606+5-	505-504+							390	3+201+20	30304-1+							20-	
23	4-405+60	6+8-8-9-						49+	5+4-3+4-	4+506-5-							36-	1010302-	101-1-0+							9+	
24	8+7+7-6+	4+7-5-3+						48-	4-4-304-	404+3-40							290	0+1-1010	0+0+2+3-							9-	
25	5-4-3-10	100+0+1-						14+	403+302+	2+303030							240	203-3030	2-302+1+							190	
26	2+2-202-	102-304-						170	3+3+2-20	3-2-102-							17+	2-202-2+	4-4-2+3-							200	
27	4+2-1-1-	0+0+1010						100	1+102-1-	1+101-2+							100	2-2-3+40	3-305-4+							25+	
28	2-1+1020	20304+30						18+	2+2+2+2-	2+2+3-1+							17+	2+40302-	302+3+30							23-	
29	1+104030	2-2+2-2+						17+	202+3-2-	2-2-3-2-							16+	3-4-403+	5-7-6+50							36+	
30	3-1+1-10	20102-1-						110	201-1-1+	202-202+							13-	1+202-2-	2+20201-							14-	
31									3+4-5-2+	3-202+2-							23-										

TABLE 11 - GEOMAGNETIC PLANETARY THREE-HOUR-RANGE INDICES, K_p - continued.

E	July 1946								August 1946								September 1946									
	1	2	3	4	5	6	7	8	Sum	1	2	3	4	5	6	7	8	Sum	1	2	3	4	5	6	7	8	Sum
1	1-1-0+1-	2-2-1+0+						7+	2+2-201+	2+202-10							14+	1-0+1-2-	2020101-						90	
2	1+3-3020	3-2-1+1+						160	1+1+1+2-	2-1-2-1+							110	20204-1+	10103-20						16-	
3	2+3+5-5-	302+1+10						23-	102-202-	10101-1-							10-	201+1-1+	2-3-2030						15-	
4	101-002-	301+1-0+						9-	1-1-1-1-	10101+1-							7-	2+2+4-4+	3+303-4-						25+	
5	1-1-0+0+	2-101-1-						60	1-1-1+20	2-1+2-1+							11-	301+3030	3+3-2-2+						20+	
6	2-1-1010	202-2-2-						11+	1+1-1020	4-1+1+2-							130	3-4-1+1-	1-000+0+						10-	
7	2-505-50	4-5-5+5-						35-	304-3-2+	504+5-2+							280	0+1+404+	40304-30						24-	
8	4+3-2+30	404-2-2-						23+	201+100+	0+2+3-20							120	2+2-3+30	202-2+30						19+	
9	5-303-4-	3-3+3+20						25+	3-1-1-1+	1+102010							11-	2+2+202-	3-3+402+						21-	
10	2+202-30	2-3+3-30						20-	0+0+0+1+	1+2-3-30							110	2+105-50	3+20104+						24-	
11	3+3+2+2+	3-304-20						23-	3+4+4+30	50404-40							32-	3-2-2030	2+30302+						200	
12	1+202+20	2010101-						12+	402+4-1+	1-202-5-							20+	2-2-4-3+	3-202+30						20+	
13	0+0+1-20	202-1-2-						90	3-2+2+2-	1013-2-							16-	2-302+10	2+1+2-2+						16-	
14	1-1+2+2+	5-50303-						220	20305050	60306+60							36+	301-202+	101+202+						15-	
15	2+4+2+2-	20202-10						17+	5-402+3+	3-404040							290	1+1+2+1+	1+3-1+1+						130	
16	100+1+5-	3-403030						200	3+3-3030	3-3-505-							270	1+101020	4-5+705-						260	
17	3+303+3-	3-2+2-3-						22-	3-4-4+4+	4+3+2+4-							29-	6-5-3-3-	2-30405+						30-	
18	202-2-4-	506+5+50						31-	1+1-2-1+	10102-2+							110	7+7+8-70	70707+50						56-	
19	5-5-404-	5+202+3-						29+	3+2-1+1+	2-1+202-							14+	6-7-4-5-	7-603-4-						40-	
20	3-2-0+00	1-101+20						10-	2-2+1+1+	1+102-1-							11+	4-2+403-	1+3-3020						22-	
21	203-2-1+	2+3+2+3+						190	1010101+	0+0+0+2-							70	4-2-1030	3-5+4+4+						260	
22	203+2+2-	3-3-3-3+						21-	101+000+	0+1-1-1-							50	4-8+8-9-	908+7060						59-	
23	3+202+50	403+3-30						26-	1-0+0+10	1-0+1+10							6-	7+8-806+	7080607-						570	
24	1-10101+	20101010						90	202-3-10	1+1+2-2-							13+	5+4+4-4-	30302-0+						250	
25	203-3-3+	2-5-4040						250	3-2+201+	101+100+							120	1+102-2-	10102-10						10+	
26	4-40304-	3+3+9-80						38-	100+1010	0+101+0+							6+	102-203-	20201+20						15-	
27	9-9-907-	5+4-4-2+						480	0+2+202+	201-1+2+							13+	303-5-40	3060605-						340	
28	202+202+	4+4-4+4+						25+	2-201-0+	101+200+							9+	4+6-6+5+	607+707-						49-	
29	50606-5-	4+705+40						420	1-1-1-1-	00101-10							5+	7-4+3-2+	405-4+40						330	
30	505-4040	505-3-20						320	0000000+	0+1-3-4+							8+	5-5+5-4+	4-405030						35-	
31	3+1+1+20	1+2+2-20						15+	5+8-604-	5-4-3-2-							35+									

E	October 1946								November 1946								December 1946									
	1	2	3	4	5	6	7	8	Sum	1	2	3	4	5	6	7	8	Sum	1	2	3	4	5	6	7	8	Sum
1	4-305-40	3+4-4-2-						28-	4-4-405-	404+3+5-							32+	101-0+00	1-302+3-						11-	
2	2-3+4-2-	3+2+2-2-						19+	1+2-402+	2+10202+							170	30102-1+	3-2+2-30						17-	
3	30404-1+	3-3+1-1-						19+	2+1+3-0+	101-0+1+							100	4+302+3-	1+1+100+						16+	
4	303+3-3-	20302+1+						20+	2-0+103-	20101020							12-	1-2+201-	102-2+1+						120	
5	103+2+2+	404+401-						220	0+203-4+	4-303020							210	1+2+2+30	303+3-3-						21-	
6	3-4-4-3+	2-20404-						25-	3-303+5-	5-4+2+4-							29-	2+302-10	2-1+203-						16-	
7	3-3-304-	3+4-2010						220	4-4-2-10	1+1+100+							140	3+4-3010	2-302+20						200	
8	1+201-0+	0+1-2-2-						9-	100+1-2-	2+1-1+3-							11-	30401+3-	101-101-						14+	
9	3+5-5+5-	3+2+3+50						320	30202-30	3-202+3+							19+	2-1+1+10	1-1+3-10						110	
10	3+1+2+30	3-104-4-						210	3+201+1+	202+403+							20-	201+1+30	3-402+3+						200	
11	3-301+1+	2+2+3-20						18-	4+5-303+	202-3-30							25-	2010102+	30304040						20+	
12	3+4-401-	1-10103-						170	405+4-2+	2030301+							25-	3+201040	4-4-2+3-						23-	
13	3+102-10	0+0+1-2-						100	101+2-1+	1+2-2+3+							140	3-2-302-	3-2+2-10						17-	
14	2-103-2-	1+1+2-1+						13-	1-101010	201+1+2-							100	0+1-1-0+	0+100+00						4-	
15	001-203-	2-2-1+2+						12+	0+0+4+3+	3+3+4-4-							22+	0+000+1+	1+1-1-0+						50	
16	1+103-30	2-10202+						150	40404-2+	3-2-3-40							250	100+1+1-	101-2-3-						9+	
17	1-10201-	0+0+101-						7-	2-301-1-	102-1+3-							13-	3-2+302+	2+101+20						170	
18	1+10000+	0+0+1-2-						6-	3-2-1+2-	1+100+2+							12+	3-202+10	2-102-1-						130	
19	1-1+1-1+	1-2-3-40						130	4-304-30	2+3-305-							260	3-304+40	505+4-10						290	
20	4050403+	30304030						29+	304-203-	4-3+3+3-							24+	2-301+10	1-1-0+1-						9+	
21	2+1+1010	1-2-3-2+						130	4-304-50	5-30304-							30-	1-2-305-	303-1-20						18+	
22	1+102+1+	201-1010						11-	4-40403-	20402-20							240	304-4-3-	3-3-1+1-						20+	
23	2+3-3-20	2+201-1+						160	3+3-3-2+	2+101-1-							16-	003-303-	3+2-1+1+						160	
24	1+0+1020	3-2-1+2-						120	104+4040	603+201+							260	2+3-2-1-	1+10001-						10+	
25	302-302+	1+202-2+						17+	2-3+3-3+	4-5-4030							26+	2-2-1+1-	1+0+4-5-						15+	
26	4-4+5-4-	30304-6+						32+	4-4-2-1-	2-3-100+							15+	20203-4-	3+3+202-						21-	
27	7-6+5+5-	505-404+						410	1+0+1-0+	001-0+0+							40	2+403+2+	20103+30						21+	
28	3+3-303-	203-2-2-						20-	1-102+10	100+1010							8+	4-2+2+2-	3-1+101+						16+	
29	3+302+3-	201+2+3-						20-	1-0+0+0+	0+000+10							3+	2-2-3-1+	2+2+1-10						14-	
30	101+3-1+	1-2-0+0+						9+	100+0+1-	200+0+2-							7-	0+1+0+1-	0+0+0+00						4-	
31	000+303+	4+4+4-30						220										201+1+10	2-1+1+2-						12-	

TABLE 11 - GEOMAGNETIC PLANETARY THREE-HOUR-RANGE INDICES, K_p - continued.

E	January 1947								February 1947								March 1947									
	1	2	3	4	5	6	7	8	Sum	1	2	3	4	5	6	7	8	Sum	1	2	3	4	5	6	7	8	Sum
1	101+1030	3-2+0+1-	12+	3-303+1+	201-2-1+	160	2+1+2-1+	2-1-1+20	12+																	
2	0+1-2+2-	204+3020	16+	000+0+10	101+2-10	7-	20407-7-	6+5+707-	45-																	
3	0+203-20	3-4-4-4+	21+	100+3-30	103-3-10	14+	70507-70	6+6-8+80	540																	
4	302+105-	404+4030	26+	3+40303-	3+2-1+20	21+	7+707+7-	403+5030	44-																	
5	3+4-4-4-	4-4+5-30	300	2-001-20	20101+10	10-	3+2+3+2+	2+2-1+1+	180																	
6	4+4+4-3+	4030303-	28+	2-2+403-	2+20202+	19+	2+2-2-2+	2-1+1+1+	14-																	
7	3-303-2+	3-201+3-	19+	0+003-3-	3+2+3-1+	15+	1-3-4-4+	5-4-3+20	250																	
8	2+3-3-2+	1-1+101-	14-	2+2-404+	4+4+4050	300	203+5+6-	8-7+7-70	450																	
9	1-0+101-	0+1-001-	4+	4-5-3+30	203-5-4+	28+	7-5+6-50	4+304-30	37-																	
10	1000+00	001-0+1-	30	3+2-2+40	4-3+1+1+	210	202+1+1+	2+1+2-1-	130																	
11	0+0+001-	0+0+0+0+	3-	1010101-	1+1+2030	11+	0+0+3-3-	201-1-10	10+																	
12	000+0+0+	1-1-1-1-	4-	101-1+1+	20201-2-	11-	2+4-304-	5-402-20	250																	
13	0+0+0+0+	1-1-1-10	4+	101+2-2-	2+10100+	10+	202+4-30	4+303+2+	240																	
14	100+0+10	1010100+	60	00002-1+	101+2-10	80	3-4-4+3+	4+5+3+2+	29+																	
15	0+10102+	1010202-	10+	1-1-1+2-	2-2-1-0+	9-	304-6+7+	7-7+403+	42-																	
16	2+6+4030	4-5-504+	33+	1-4-4+60	6-604+5-	35+	202+3-2-	3-4+5-5-	250																	
17	4-3-2+40	3-1+2+30	220	6+605+4-	30403-2-	33-	5+5-4+30	3+2+3-3-	28+																	
18	3-102+2+	2+302+20	180	303-3030	3-2+2+3-	22-	3-3-1-3-	303+4-3+	220																	
19	3-202+30	1+101+30	17-	2+20303-	4+505-4+	28+	303-301-	2-3-3020	18+																	
20	202-1-1-	1-1+2+2-	110	5-4-2-1+	1+10100+	150	3+4+302-	2-2-3020	21-																	
21	302+1+10	101+2-0+	120	000+1-1+	200+0+10	60	2-2-2-2+	2+3-1030	16+																	
22	1+0+201+	1+2+2+3-	14-	000+1-1-	1-0+102-	5+	20505-4-	3030301+	26-																	
23	2-200+10	2-2-202-	120	0+0+0+10	0+1-0+0+	4-	3-4-4-5-	5-6+3+3+	32+																	
24	0+2-6-40	30303+4-	25-	202-102+	3020201+	15+	5-605+30	2+3-3-2+	29-																	
25	4+6+6+6-	5+6-5-5-	430	1+20204-	3+2-2-3+	190	2+303+30	2-2-3-4-	21+																	
26	405+5-4-	40404-20	31+	4+403-2+	202-102+	20+	4+5-4040	4-4-3+3+	310																	
27	303+2+3-	4-3+402+	25-	203+101+	1+100+1-	110	30405-5-	2+3+405-	31-																	
28	402+2+10	201+3-2+	180	1010201+	2+2-2-3-	14-	6+7-6+5-	6060505+	46+																	
29	104-2+30	3+3-1+0+	18-				402+2020	303-5-4-	24+																	
30	2-101+20	2-1-0+4-	12+				6-503+40	5-4+4+30	34+																	
31	2+2+2-1+	0+0+1-2+	11+				3+4+4+40	4+4-1+1-	260																	

E	April 1947								May 1947								June 1947									
	1	2	3	4	5	6	7	8	Sum	1	2	3	4	5	6	7	8	Sum	1	2	3	4	5	6	7	8	Sum
1	1+2-3030	3-201+2-	17-	30404-2-	3+3-2+20	23-	6-6-4+3+	3-1+2010	260																	
2	1+202+2+	3+301+1-	16+	101+0+00	100+0+1+	6-	0+1+101+	10201020	100																	
3	3-4-201+	1+3+4-30	210	10202-1+	20101+1-	110	3-4-2+2-	2-2-2-1-	160																	
4	3-3-40+4	40403+40	290	10102-2+	1-1-201-	100	1+1+2-20	1+3-2-10	130																	
5	4-2-1+3-	202+3-2-	180	2+302+2-	103-3-10	17-	1+2+605-	4-404+5+	32-																	
6	404+4-4+	30303-2-	27-	0+1-1020	2+303-2+	14+	6-1+2-1-	101-2-20	15-																	
7	1+2+1+2+	304-102+	17+	3010101+	1+1-1-1-	10-	20302+30	30304-50	250																	
8	1-2-1+3+	3+2+1+6-	20-	0+0+1-10	1-1-0+1-	5-	4+50302+	304-3+30	28-																	
9	50406-5+	403+2+3-	32+	1-100+0+	0+1-1-0+	4+	30403+30	3-3+3-3+	25+																	
10	302+4-2+	2+2-1-3-	19-	0+1-1+2-	1+101+1+	90	3-3+3-3-	2+2-2+20	20-																	
11	3+303-30	3+3+2030	24-	1+1-1020	2020302+	14+	202-3-20	2+2+202-	17-																	
12	1+3-2+30	2+3-3-40	210	4+3-2-3-	2+2-2030	20+	1+2-2+10	201+2+3-	15-																	
13	3+3-202+	3-2+202-	190	302+3-20	2+3+4+5-	25-	3-202+20	2+5-4+6-	260																	
14	2+30303-	2+2-3+3-	210	4+4+4-4+	40304-20	29+	6+705+5+	4+4+603+	420																	
15	40403-30	3+302+3-	250	4-403+40	4-4+5-50	33-	3+3+3-4-	3-302020	23-																	
16	3+2-302+	3-3+3030	22+	5050505-	5-4-304+	35+	2010101+	2-2-2-2+	13-																	
17	4-4-2-2-	6+7-9-8+	41-	3-30303-	3+3-3+30	24-	20505-4-	5-606-3+	350																	
18	5+4+305+	6-6-4060	39+	302+3-20	2+4+4+3+	24+	203+3-4-	2-2-3+30	21+																	
19	4+3+4-5-	4-401+4+	29+	2+303+2+	203-1+2-	19-	3-402+3-	2+3+3-3-	23-																	
20	3+50504+	4-4-5-20	32-	102-202+	201+2-2+	14+	201+3-20	202+2+2-	16+																	
21	1+3+4-1+	0+0+1010	12+	2+1+302-	2010202+	16-	2-2-202+	1+20203+	16+																	
22	1-1-101-	0+1000+	5-	2-100+1+	1+1+1+5-	130	3-3+202+	2+4-5+3+	230																	
23	10200+1-	102-101-	8+	4-6-5030	3030202-	270	4-3-303-	4040202-	24-																	
24	0+1-1-1-	1-1-000+	40	4-3+8-7-	4+3+304-	36-	2030202+	2+3+2+3-	200																	
25	1-0+0+2+	2-5-302-	15-	3+2+2+30	3+202+3-	21+	305-5-40	403-2+30	28+																	
26	2+1+2020	2+404+4-	220	3-304-4-	4-403+4+	28+	203+404+	3040303+	270																	
27	3-20304-	4-30301+	22+	304-3+2+	3-4-2+2+	23+	30102-10	2-1+2-10	12+																	
28	204-301+	3+2+3-20	20+	202-1+2+	505-4-3+	240	1+302030	2+2+2+20	18+																	
29	10203-3+	40201+2-	180	2+2+303+	5-504020	27-	1+2+2-1+	1-101+2-	11+																	
30	3-303-3-	3-3-3020	21+	201+1010	0+2-102-	100	30203+3-	2+203-2-	20-																	
31				102-2+3-	2+4-4+40	220																				

TABLE 11 - GEOMAGNETIC PLANETARY THREE-HOUR-RANGE INDICES, K_p - continued.

E	July 1947								August 1947								September 1947									
	1	2	3	4	5	6	7	8	Sum	1	2	3	4	5	6	7	8	Sum	1	2	3	4	5	6	7	8	Sum
1	3-2+201+	204-3-30						20-	4-3-403+	2+404-20							26-	303-203-	1+1+3+20						18+	
2	304-302+	3+4-3-30						25-	1+2+4-30	3-30303+							22+	201+202-	201+204+						17-	
3	102-3020	1+201+20						14+	20102+2+	2+2+3-3-							18-	40407+7+	6060606-						46+	
4	1-1+1010	1-1-0+1-						6+	2+3-2+3+	202-2-2+							18+	5-504+40	505-403+						350	
5	101-1-1-	0+101+20						8-	2+2+102-	2-1+201-							130	3+2+3030	3+3-4040						26-	
6	2+1+202-	2+3-2+20						17-	2020203+	303-3030							210	402+3-3-	3+5-5-3+						28-	
7	2+2+1+10	202+3-3-						17-	2+2+2-1+	1+1+3-2-							15-	5-4-4-30	506-7-5-						370	
8	2+202+20	3-3+3+30						210	3+201+2-	2+201-1-							140	503+4+30	2+2+1+10						23-	
9	3-20202-	1+2-303+						18-	1020201+	1-10103+							12+	301-1010	1+1+2-1+						11+	
10	4-3-2+20	20302+30						210	2-202+2+	202-1+20							15+	101+1-0+	0+101010						7-	
11	3-20202+	302+2+4-						20+	2-2+2+3-	3+3-2-30							20-	0+1-1+30	3+50403+						210	
12	3-3+2-2-	202-3-20						18-	5-504+5-	303-3040							31+	3-30404-	20203+40						25-	
13	302+2020	2+303-2+						20-	3+2+3+3-	3+5+4+50							30-	505+5+50	6-3+406-						39+	
14	2-10100+	102+3-20						120	5-3-202-	202+2+2+							200	4+5+6-60	5+6+5-50						43-	
15	3-302-10	102+2-1+						15-	1010206-	6-605+7+							340	5+5-6-50	5+6+6-6-						44-	
16	3+2-10+0	1-1-1-10						9+	7+4-3+50	5+5+504+							39+	3+4-401+	2-3+4050						26+	
17	101-1-20	1+70308-						28+	5-505+5+	5-60606-							43-	6-605+5-	5-5+505+						420	
18	605+5+60	7-7-6+50						47+	6+6-5+5+	5+5-5+5+							43+	50504+4+	5-505-5+						38+	
19	5+4+3+5-	4-4-402+						31+	404-4+5+	6-6+5-60							400	4-4+4+3+	3+4+4-4+						31+	
20	3+5-404+	5-5+3+30						33-	60405040	5-6-4-5-							38-	4+4-4-30	304+2-4-						27+	
21	2+3+303-	3-20302-						21-	5+504+50	405-504+							38-	30404+3+	4-4-3+3+						29-	
22	20203-3+	303+4-4-						24-	3-40508+	6+605-4+							41+	2-40505-	4+504+4+						33+	
23	3+3+4+40	4-3-404-						290	705+4+4+	60505-3+							400	5-6+6-5+	5+2-1+3-						330	
24	2+4-2+2+	30302+20						210	3+4-4+4-	4-3-4-3+							28+	4-5-5+4+	707+7+70						47-	
25	3+303-30	40403+3-						260	40404+5+	40403-3-							310	8-7+7+60	606-505-						50-	
26	3+4+4-30	4-3+3030						27+	203-4-4-	3020202+							21+	4040202-	3-2+3-3+						23-	
27	2+3+5-4-	4+303-20						26+	3+3+4+3+	2-101-1-							18+	4-3+2+20	3020203-						210	
28	2+1+3-20	201+2020						16-	1+1+1+2-	2-3-3-4+							170	30201+30	3-3-203-						19+	
29	2+3-2+30	303-1+0+						18-	4-3+3-30	3-3+2+2+							23+	2+3-203-	2-2+2030						19-	
30	1-1+201-	1-101+20						10-	2+303-1+	2-101+1+							15-	302+1+2-	1+1-4+30						18-	
31	2-10102-	2+203-30						15+	1020203-	30404-3+							22-									

E	October 1947								November 1947								December 1947									
	1	2	3	4	5	6	7	8	Sum	1	2	3	4	5	6	7	8	Sum	1	2	3	4	5	6	7	8	Sum
1	4+6-5+4+	4-2+505-						35+	2+2-2+3+	3-102030							18+	3+10305-	2-101-0+						16-	
2	405+5-5-	6-7-606-						43-	304-201+	1-0+101-							13-	1000102+	3-3+2+1+						140	
3	7-7-5-40	4+1+2+40						340	0+101-2+	1+2-2-2+							11+	1-10201+	0+1-0010						70	
4	2+2+3-3-	2+2+2-10						17+	3-101-3-	3-4-2-2-							17-	100+3-2-	2+3+2+2+						160	
5	101+1+2-	202-2-3-						13+	1+100+10	100+1-1+							70	3+4+3-2+	3-2+2030						23-	
6	20202030	302-2+2+						18+	0+0+00+0	0+1-0+1-							30	5-4+3+4-	4+4-5-4+						330	
7	1+1+2+3+	1+4-5-4+						22+	00001-1-	1+1+1+3-							80	3-203+20	1+403010						19+	
8	2-3+3+3-	30302+2+						22-	203-3+4-	3+3+3+30							25-	2-3-402+	20101010						16-	
9	4+4+4+50	6-605+5+						40+	3+3+3+50	6+5+7-70							40+	3-4-3040	5-3+4+3+						290	
10	6-506-6-	5+5+6-5+						44-	7-4+4040	4+405060							38+	3+3-3+4-	20202-3-						21+	
11	505+5-40	4-6-5+5-						38+	603+5-4+	7-6-5040							40-	3-3+4-3+	30303+3-						250	
12	605-6-5-	504+5+30						39-	4+5+4-30	303+2+3-							28-	3+403-30	4+4+303-						27+	
13	4+4+4+30	2-5-4+5-						31+	4-302+40	2+2+3-20							22+	404-3+4-	3+3+302+						27-	
14	4+5-605+	404+5050						39-	2-202030	3+303-2+							200	2+3-3+3+	3+302+2-						220	
15	3+5+504+	604+4060						38+	4-3+3+3-	2+2+2+3-							23-	402-2020	30302+2+						20+	
16	404-4040	4-50201+						28-	3+4-3+4-	3-2-103+							23-	10302-3-	1-0+000+						10-	
17	4-3-3-30	403+4-1+						24+	2+2+202+	2+2-0+0+							14-	101+102-	10101-1+						90	
18	203-4-3+	2+40304-						25-	2+20301+	2+3-2020							18-	2+10202-	100+303-						140	
19	3-303+4-	4-4+6+3+						30+	2040404-	30303030							26-	3030202+	1+1+2-1+						160	
20	3+4-4-3-	303+405-						28+	20102-30	2-20203-							160	1-2-1+1-	1+2-1+10						10-	
21	4-303-2+	203+303-						23-	102-1+2+	203+3020							17-	1-0+0+10	000+0000						3-	
22	304-302+	3-1+102-						19-	0+1+1-2-	3-202-1-							12-	0+0+1-10	202+3-30						12+	
23	2+404-3+	3-3+3+2+						250	10204-20	20202-20							16+	3-2-303+	4-302-20						210	
24	4+3+2+2+	20201+2+						200	1+0+0+1+	003-5+4-							150	1+1+101-	1-1+2-3+						11+	
25	3+1-1+2-	201+2-10						130	3020303+	1+101010							16-	1+1+0+1+	1-1+2-2+						10+	
26	1-1+2-1-	0+1-101-						70	2-0+1+20	1+101+2+							11+	3-3-3-30	2+2+2-2+						20-	
27	0+001-2-	101-0+1-						5+	202-2+20	101+3-20							150	304-3030	1+2-2+4-						22-	
28	1+0+0+0+	100+101-						5+	2-20101+	2-2-1+2-							12+	3+201+2-	2+20104-						17+	
29	0+0+0+1-	1+2-1+1-						7-	2+4-3-2-	3-3-303-							21+	203-1+20	3+4-2+30						20+	
30	101-1-1-	1-3-1+2-						9+	101+2-20	1-2-3-3-							14-	1+101-1-	20101010						9-	
31	1-3-3-20	3-2+203-						18-										1-100+0+	0+0+1+0+						5-	

TABLE 11 - GEOMAGNETIC PLANETARY THREE-HOUR-RANGE INDICES, K_p - continued.

E	January 1948								February 1948								March 1948									
	1	2	3	4	5	6	7	8	Sum	1	2	3	4	5	6	7	8	Sum	1	2	3	4	5	6	7	8	Sum
1	0+3o2+1+	3-3o3+4-						20-	3o0+0+0+	1-0+0o0+							5+	5-5+6-5-	4+3+4o5o						37o	
2	3o3+3+2-	2o4o5-3o						25o	0+3-3-3-	3o3+3-3-							20o	4o4o4o5+	4o3-4o5-						33-	
3	3-4+5-4o	5o6o6o3-						35+	4-3o6-5o	6-3-3o4-							32+	4-5+4+4o	4-3o1+3-						28o	
4	1+1-0+0+	0+1o2o0+						6+	3-2o4-3-	3o3+3o2+							23-	3o3-3-2+	2+2-1-1+						17-	
5	0+1+2+2+	3-2+3-2o						16o	3+4-2+3-	3o4-3+3o							25o	2o1+2o2+	3-3-3o2o						18o	
6	1o3-4-3-	3-3o3-2+						21-	1-0+2+3-	3o2+1o4-							16o	1o1+2+3o	3+4o3o3-						21-	
7	3-2o4o3o	4-3o3+4-						25+	2+2o2-2o	3o3o2o3-							19-	2+3-2o2+	2+2+1-0o						15-	
8	3+3+4-4o	4+3+4o4-						30-	3o2-1+2+	2o1+1-3+							16-	0o0+1o1-	3o2+2+2o						12-	
9	4+4+3-3o	3o2-2o3o						24o	3-1o1o0+	1-1-2-0o							8o	1o1-3-3o	1+3-3-2-						16-	
10	1o3o2+2o	3o3o2+2+						19o	3-1+4-2+	2+3+0+0+							16+	1o2-2-1-	2-2+4-3-						15+	
11	3o4-3-2-	2o2-2+1-						18-	3-1+1+2+	2o2+2-2o							16-	1o1o0+0+	1+0+0+5-						9+	
12	2o1o1+3+	2o1+3o3o						17o	1-0+2o2+	3+2-1o2o							13+	5-4o5-3o	4o3+2o2+						28o	
13	1-1-1-2o	2o2o2-2-						11+	4o1o2+2+	3o2o1o3-							18+	4+4+4-5+	5-5-5-5+						37o	
14	0+0o0+2-	1+2o0+0o						6o	2-1-2o3-	3o3-3-3-							18o	5o5+5+4o	4-4+5o4+						37o	
15	0+1+1-2-	1o1+1o3-						10o	3-4-4-4-	4o3+5o5o							31o	6-8+8o7+	6+7o8-5o						55+	
16	1o3o2o2o	2o1o1-1-						12+	5+4+4o4-	3+4-4-3o							31o	4o3-2o1o	1-1-2o2+						15+	
17	0+1-2o3+	6-5-4+4o						25o	4-4+3+3+	3+3-2o3-							25+	2+3-3+4o	2-3o1o1+						19+	
18	4o3-2+4-	2o1+2+2-						20o	3+3o4o4o	4-4-3+3o							28o	2+3-2o1o	2-2-1o1o						13+	
19	3o3-3o3o	3o2-3-1+						20+	2+3+3o3o	3-2o2+4-							22+	3-2+4-3-	0+1+2-1o						16-	
20	1+3-2+3-	4-3o3o4-						22+	2o2-1+2o	1o1+1o1-							11o	1o1-2+2-	3+3+3-3-						18-	
21	3o2+2o2o	3o4o3+4+						24o	0o0o1o1+	0+0+0+1-							4o	2+2+4o3+	2o2-2+3-						21-	
22	4-4-2-2+	3o1+3-2+						21-	2+2o2-1+	1o0+0+0+							9+	2-2-2o3o	3o2o2+2+						18o	
23	2o3o1o2o	1o2-2+2o						15o	2+3+3+5o	5o5-3o2+							29o	2o1+0+1o	1-0+1o2o						9-	
24	1-0+1-1o	2-1-1+1+						8-	2+2o3+2o	2+2+4+4+							23o	1o1+1+1-	2+1o0+0+						8+	
25	0+2o2o1+	1+1o1o0+						9+	0+1+1o3o	1+1+1o1o							10+	0+0+0+1-	1+1+1o1+						7-	
26	1o2o1-1o	0+0o1-1o						7-	0o0+0+1-	1+1-3-2-							8-	1-1-1-2+	3+3+2o3o						16o	
27	1+1-3o2+	3o1+2-1-						14o	3+3+1+2+	2+2o2+4o							21o	3o3+3o2o	2+3o1-2o						19+	
28	1-0o1+2-	2o2+1o1o						10o	5-4o3+3o	3-2+1+3-							24o	3-1-2-2+	2o2o1-1-						13-	
29	4o2o2o2+	3-4+3o3o						23+	4o3+3-2o	3+3+3o3o							25-	1-1-1-1-	1+1o2o3-						10-	
30	3-3-3o3o	3+4-3-2o						23o										2+3-2o3-	1o2+4-3+						20o	
31	4o2o1+1o	3-2+0+1-						14+										3+3+2+1+	1+2-3-3o						19o	

E	April 1948								May 1948								June 1948									
	1	2	3	4	5	6	7	8	Sum	1	2	3	4	5	6	7	8	Sum	1	2	3	4	5	6	7	8	Sum
1	5-5-3+3+	3-3-3-4o						28o	2+2o1+2-	3o3-3+2+							19-	4+5o5o4-	5+5-3-3-						33+	
2	2+4+4+4o	2o2-2o3o						24-	2o3-3o4o	5o4-5o3-							28o	2-3-3+2+	1-1o1o3o						16-	
3	4o4-3-3o	2o3o1+1-						20+	3+4o3-3o	3+4-4+3o							27+	2o2o1+1o	2+2o1+1+						13+	
4	1-2+3o2+	2o2o1o1o						14+	3o2+1o1+	3o4-3+4o							22-	1+1-1+1-	1+1+2o2-						10+	
5	1-3-1o1o	1-2-1-0+						9-	3o1+1o1o	2-2o3-3-							15+	2-2o2o2+	3-3-2o2-						17o	
6	0+4o3o2o	2o4+6o4-						25+	3o3-2o3o	4-4o4o4o							26+	1o2o2o2-	1+2-2-1+						13-	
7	4-3-3-2+	2-3o3o3-						22-	4-3o6o5o	5-4o4+3+							34o	1+1o1-2+	3-3-2+3o						16o	
8	2+1-1-1o	0+1-1-0+						7-	2-2o4-3+	3+3o2o3o							22o	1+1+1-3-	2+3-3+3-						17o	
9	1-0o1o1o	1o1+2o2o						9o	3-2+6+5o	5-4+3-2+							30+	4-2+1+1+	2-2+2o2o						17-	
10	2+2-1o1+	2-3o1+3-						15o	2o3o3-2+	2+5o4+3-							24+	2-2o2-2o	2+1+1-1-						12+	
11	3-3o2-2-	1-1-2-1-						13-	3-2+3o3-	2-3+4o3+							23o	1o1+0+1o	1-1o3+1+						10o	
12	3-2-2o3-	4-3+3-2o						21-	3-3o3-2+	2o3-2o4-							21o	2-2o1o1+	2-2o2+3o						15o	
13	2o4o1+2o	2o2+3o3o						20-	5o4o3o3+	3-1o1+1+							22-	3o3o2o2o	2+3+4-1+						21-	
14	5-5-2-2o	2o3o1+2o						21+	1+1-0+1o	1o2+4-3+							14-	0+0+0+1-	1-3-1+1-						7o	
15	2o3-3+2o	3+4o3+2-						22+	5o6o5+5-	5-2-3o6+							37-	0+1o1+0+	0+1-0+0+						5-	
16	2-1+1-2o	2+1+2o1o						12+	7o6+6-4+	5+6o5o6-							45+	0o0+1-0+	1-1o0+1o						4+	
17	2+1+1o1-	1o2+2-1+						12-	3-3o2o2o	2o2-2o3o							18+	2o2o1+2-	2o3+4-3o						19o	
18	1o1o3-3o	2-2+2-2-						15o	3o2+2+2-	1o2o3o3-							18o	2o3-2-3o	3+3-4-3-						22-	
19	1+1-1-1+	2-1+1-2o						10-	1+1-1-2-	2+1-0+1+							9o	4o3+3+4-	3-2o3o2+						24+	
20	3+2o2o3o	3-1+1o4o						19+	2-1+1-1o	2o1-1+3-							11+	3o2+2-2o	2o3+3o4-						21+	
21	7-4-3+2o	1+2+1+3-						23+	3o3o4o4-	6-6+6-5+							37-	2+4-3-4+	4-4o5-4o						29+	
22	5-7o6o5o	5o4-4-2+						37+	5o4-5-4-	3-3+4+4o							31+	4+4o4-2+	2+2-2-3-						23-	
23	3-3-1+2-	2+2-1-1o						14o	4-5-3-1+	2+3o2+4-							24-	1+1-1-2-	2-1+3-2o						12o	
24	2-3-2+2o	1+3-2-4-						18o	5-3-3-3+	3o2+1o3o							23-	2-2o3-1+	1o1-2+2+						14o	
25	3+3+3-2o	3o3o4-2+						23+	3o4-3-2o	3o1+1+3-							20-	2o1+1-2o	2+1o4o4o						17+	
26	1+1-2-4-	4-4+3-3-						21-	2+1+1o2o	2+2-2o2+							15o	4-3o3-3+	3o5o4-4o						28+	
27	3-3o3o3-	3-2+3-2-						21-	3+1+2+2-	2-2o2-2o							16o	2o3-3+3o	2+3-1+1o						18+	
28	1+3+2o2o	2+2o2-3-						17+	3-1-0+1-	1o2o2-2o							11o	0+1-1-2o	1+1o1-1-						7+	
29	2+3-5+3o	3+4o1+3-						25-	4o4-2-3o	5o5+3o4o							30-	0o1o1+1-	1-1o1o1-						6+	
30	3-2-3o3-	2o1+3-2+						18+	4o3o2+1o	1o4o3+2o							21-	1-1o1+1o	2o2o1+1+						11-	
31									1-1+2-2o	2+3o3-3o							17-									

TABLE 11 - GEOMAGNETIC PLANETARY THREE-HOUR-RANGE INDICES, K_p - continued.

E	July 1948								August 1948								September 1948									
	1	2	3	4	5	6	7	8	Sum	1	2	3	4	5	6	7	8	Sum	1	2	3	4	5	6	7	8	Sum
1	3o2o2o1-	1+1+3o2o						15+	2+3o3-3+	2+1+2o4-							21-	5o4+4o3o	5-3+5-6o						35o	
2	2-2-1o1+	1+2-2+2o						13o	3o2+3+3o	3+2+3-2-							22-	4+5-4o4-	4-1+4o3+						29o	
3	2-2o3-2o	3-3o2+2o						18+	1+2-3-3-	2+2+2+2-							17o	2+1+1o2o	4+4o2+3+						21-	
4	2o1+4-3o	3+4-4+5+						27-	2+2+2+5o	5-3+4-1+							25o	2-2+5-5+	4o4o3o3o						28o	
5	4o2+1+1+	2+3o1+4+						20o	2o3+1o2o	2-1+1o0+							13-	2-2o3+3-	1o0+1-1o						13-	
6	3+1o3o4-	2+2+2-1-						18o	0+2-2-2-	3-4o1-0+							13o	0+2-2-1o	2-2o2-3-						13-	
7	1+2+2o2-	2-3-3o1+						16o	0+4-3+3-	4-1o1o5-							20+	2+5o4+1+	1o1o2+2-						19o	
8	2+3-3o3-	3-3-2-1o						19-	5+7-7+8-	8-7o8-8-							57o	3o3o2+2o	2+1+1o2+						17+	
9	1+1+1+3o	2o1+2-3-						15-	6-6-4o4-	5-5-4+6+							39o	4-2o2-2+	2o3-2o1o						17+	
10	1o2o3-3+	3o3o3-1+						19o	6-4o7o5+	5+7-7-4+							45o	1o1o1+1o	3-4-2o2+						15o	
11	1o1+2-1+	2-2-2o3-						13+	4-5-5+3+	3o3+3+4o							31-	2-2-2+3o	2+3o3o3+						20+	
12	2o2+3-2-	2+1+1+1+						15o	4-4-6-3+	3o3o5o4+							32-	3+4-2o3o	4+5-3o2+						26+	
13	2o2+3-2o	3-1+2o2-						17-	4o4o2o2+	2-2-2+1+							19+	4-2o2o2o	2-1o1o1-						14o	
14	4+3+3o3-	3+3-2o3-						24o	1o1o1o2o	3o3o3-3+							17o	1-3o3-2+	2-1+1o0+						13o	
15	2o2o2-2-	2o2-2+3o						16+	3-1+1+1o	2o2-2+2+							15-	1-2-1+3-	3-3+3+5+						21o	
16	2+3o3+2+	4-3-2+2+						22o	1+2-1-0+	0+0+0+1-							6-	4+5o4o1o	3-3+3+3+						27o	
17	3o3+3-3-	2o3-3o2o						21+	1-0+1-1+	1o2-1+2+							9+	2o2+1+3+	3o2-2o1+						17o	
18	2-2o1o2-	1+2o2-1-						12o	2-1o1+2+	1o1o2-2-							12-	2o2-2o2+	2o2o2+4-						18o	
19	2-1o1o1o	0+1-0+1o						7o	1o0+0+0+	0+2-4o4+							12+	3+3+2+2o	1+1o3-1o						17o	
20	2o1o1-1o	1o2-2-2+						11+	6-5o3+3+	5-3-3+3-							31-	0+1o2+1+	2-2+2o2+						13+	
21	3o1o1o2-	2-2o4o3-						17o	3-3+2+3o	4o3+3+4-							26-	1+1+2+2o	2-1+4-2o						16-	
22	2-2o2+2+	2-1+0+1-						12+	1o2o1+3-	1+2o3-3+							16+	2+2+2-1+	1+2+4o5+						21-	
23	1-1+2-1+	1+1+1-2+						11-	5-5-1+3-	2+1+1+2+							21-	4+4-3+4o	3-3-2+4+						27+	
24	2-2+1o1o	1-1-1-1o						9o	2o3-2+3o	2o3o2-1o							18-	4-5-3-4-	3+4-4-4o						29+	
25	2-2o1o2o	1+2o2-1o						13-	2+2+2o1+	1-1-3-2o							14o	4o4-5-5-	5o4o3+4o						33+	
26	2-1o2+3-	3-3o3-2+						18+	1+0+0+0+	1o1o1+1-							6+	5o4+4o4-	3+3-2+3o						28+	
27	1+2-2-1o	1-2+2-2o						12+	0+1-0+1o	1o1+1o2+							8o	3o1o1-2-	1o1-1-0+						9o	
28	1o1-2-0+	0+4-3+3+						14+	1o2-2o3-	2-3-3-4-							18o	0o0o0o0+	0+1-0o0+						2-	
29	3+3o4o4o	4+3-3-1+						25+	4-3o3o5-	5-4+4+3+							31o	3o4o4o5-	4o5+2+4-						31o	
30	3-3-3-2o	3+3+4+4o						25o	4+4+4o4o	3+2+3o2+							28-	4+3+3o4o	4o4o2-1o						25+	
31	4+4+4+4o	4+4+3o2+						31o	2o2o3-3o	3-3-2o3-							20-									

E	October 1948								November 1948								December 1948									
	1	2	3	4	5	6	7	8	Sum	1	2	3	4	5	6	7	8	Sum	1	2	3	4	5	6	7	8	Sum
1	5-6+5o6-	5+3+4-4-						38-	0+0o1+2o	2o2+4+6-							18o	0+0+1o1-	1+1-0+1-						5+	
2	3+6+6+5o	5o5o2+3-						36o	5-5+6+5o	5o5o5o6-							42o	3-1+1o1+	1+1+2o3o						14o	
3	3o3+3o3o	3+6-4+4-						29+	5o4+2o3-	3-3o3o3-							25+	2+3+3o3o	1o1-0o1-						14o	
4	2+2+4-1+	2o3-4o4+						23-	2o0+1+1o	1o1-1-0+							7+	0+0o1+1+	0+1+2+2+						9+	
5	4o5o3+2o	3o2o2-1-						21+	0+1-2-2o	1+1+2-1o							10o	3o1+2-1+	1-1o2-2o						13-	
6	2+1-0o0+	0+1o2-1o						7+	1-2o1o1o	1-0+1o3+							10o	2+4o3o3-	3o5-5-4+						29-	
7	1+1-0+1o	0+1-2+3+						10o	3+2+2o4-	3o1+2-2+							20-	4+4-3o3o	4+3+4+3-						29-	
8	2+2o2-2+	2-0+1o2-						13o	4-4-2o3-	2+3o4-3o							24o	3o1+2o2-	1o1o2-4o						16-	
9	2-1-0+1-	0+1+2-2o						9-	4o3o3-2+	3+3o2+2+							23o	2+3-2o2+	2-2-2-1o						15+	
10	2+5-6+4o	4o2+2o3-						28+	3-3-1+2o	1o1+1o2o							14o	1o1+1o1-	1o3-4-3-						14o	
11	3o3+3+4o	4o4o4-2+						28-	3o1+2o2o	0+1+1+1-							12o	4o2o2-4-	3-3+2+3o						23-	
12	2o2o3o4+	3+3+1-2+						21o	1-1-1+1-	2o1+0+0o							7o	1o1-1o1+	1o0+0+0+						6o	
13	3-3-2o2+	3-4-3o2+						21+	0o0o1-1-	2+3o3+2+							12+	1+0+1o2-	3-3o4-5-						18+	
14	2+2+2+3+	4+5-4+7o						31-	2+2-2-2-	1+2-1o2-							13o	4-5+4o4+	4-3o4-3o						31-	
15	6-5+5-5-	6-6-5+3o						40o	2o2-2-1+	1o2+4o4+							18+	3-2o2o2o	3o3-1o4-						19o	
16	2-3o1-0+	1-3-3o1-						13-	4o4-4+2o	2-3-2o2o							22+	3+3+2+2+	3o4-4o3+						25+	
17	1o0+3+1+	0+0+2+8+						17+	3+3+3+4o	4o4-4o3o							29-	4-3+1o0+	0+1-1+2-						12+	
18	8+7-5+4-	4-4o5+7+						44+	3o4-3+3o	5-4+3+2o							27+	2o2+2-2+	3o3o0+1-						15+	
19	7-7+8-7+	5+5+4+2+						46+	2+4+4+4-	3o3+4-3o							28-	2o3+2o3o	2-2+1o0+						16-	
20	2+3-2+1-	4o5-5o4-						25+	3+4-4+5+	6o6o6-5-							39o	0o0+0+4-	3-2+2-2o						13o	
21	4+6-6o6+	5o6-7-5-						44+	5+6+5-3+	3+2+2+2+							30o	3o3-4+4+	5-5-4-3o						30+	
22	1+3o4o6-	6-4-5-4+						32+	4-2o4-4o	4+4o4o3+							29o	2o1+4o4+	2+2+1-2o						19o	
23	4-4o4o4+	5-5+5-3+						34o	4+4-3-2+	2+3o2+3o							24-	2o0+2o1+	2-1o3-3-						14-	
24	4o4-4-4o	5+5-4+3o						33-	3+3-3+3o	3-4o5o4+							28+	3o6-5o2o	1+2-2+2o						23o	
25	3o3o3-2o	4-4+2o4-						24+	3-3-4-4o	4o5-4+3+							29+	2o2+3-4o	5-6-6-5-						32-	
26	4+4-3+4-	3+4o3o4+						30-	2-0+2+4o	5-3-1+2-							19-	5o3+2o0+	0+1-4+2-						18-	
27	4o3+3+4o	6o3+4-4-						31+	1o2+3o4-	3o3+1o1o							18+	1+3+2+3+	2o2+3-2o						19+	
28	2o4-3-2o	2o2o2o3o						19+	2-3o3o4o	1+2-2+2+							19+	1-1-1+1+	1o1+2-2-						10-	
29	2+2+2o3-	3o2-2o3-						19-	1+3o2+1o	1-1-1-1o							11-	2-1o2-3-	2+3o3-3-						18-	
30	1+3o2o2-	2o1+1-2-						14-	1o1-1o0+	0+1-1-1-							5+	1o2-1+2o	3o4+5o5o						23+	
31	2+4+3o2+	3-2-2+2o						21-											4-2o4o6o	4+5o2o2-						29-