PART B

SOLAR - GEOPHYSICAL DATA

ISSUED
July 1956

U. S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS
CENTRAL RADIO PROPAGATION LABORATORY
BOULDER, COLORADO

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PART B

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INTRODUCTION

This monthly report series is intended to keep research workers abreast of the major particulars of solar activity and the associated ionospheric, radio propagation and other geophysical effects. It is made possible through the cooperation of many observatories, laboratories and agencies as recorded in the detailed description of the tables and graphs which follows. The Editor is Miss J. V. Lincoln.

I RELATIVE SUNSPOT NUMBERS

American and Zürich Daily Numbers -- The table lists (1) the daily American relative sunspot numbers, R_A', as compiled by the Solar Division of the American Association of Variable Star Observers, and (2) the provisional daily Zürich relative sunspot numbers, R_Z, as communicated by the Swiss Federal Observatory. Because of the time required to collect and reduce the observations, R_A' will normally appear one month later than R_Z.

The relative sunspot number is an index of the activity of the entire visible disk. It is determined each day without reference to preceding days. Each isolated cluster of sunspots is termed a sunspot group and it may consist of one or a large number of distinct spots whose size can range from 10 or more square degrees of the solar surface down to the limit of resolution (e.g. 1/8 square degrees). The relative sunspot number is defined as $R=K(10g+s)$, where g is the number of sunspot groups and s is the total number of distinct spots. The scale factor K (usually less than unity) depends on the observer and is intended to effect the conversion to the scale originated by Wolf. The observations for sunspot numbers are made by a rather small group of extraordinarily faithful observers, many of them amateurs, each with many years of experience. The counts are made visually with small, suitably protected telescopes.

Final values of R_Z appear in the IAU Quarterly Bulletin on Solar Activity, the Journal of Geophysical Research and elsewhere. They usually differ slightly from the provisional values. The American numbers, R_A', are not revised.

Graph of Sunspot Cycle -- The graph illustrates the recent trend of Cycle 19 of the 11-year sunspot cycle and some predictions of the future level of activity. The customary "12-month" smoothed index, $\overline{R}$, is used throughout, the data being final R_Z numbers except for the current year. Predictions shown are those made for one year after the latest available datum by the method of A. G. McNish and J. V. Lincoln (Trans. Am. Geophys. Union, 30, 673-685, 1949) modified by the use of regression coefficients and mean cycle values recomputed for Cycles 8 through 18. Cycle 19 began April 1954, when the minimum $\overline{R}$ of 3.4 was reached.

II SOLAR CENTERS OF ACTIVITY

Calcium Plage and Sunspot Regions -- The table gives particulars of the centers of activity visible on the solar disk during the preceding month. These are based on estimates made and reported on the day of observation and are therefore of limited reliability.

The table gives the heliographic coordinates of each center (taken as the calcium plage unless two or more significantly and individually active sunspot groups are included in an extended plage) in terms of the Greenwich date of passage of the sun's central meridian (CMP) and the latitude; the serial number of the plage as assigned by McMath-Hulbert Observatory with age of plage in number of rotations given in parentheses; the serial number of the center in the previous solar rotation, if it is a persisting region; particulars of the plage at three times during its transit of the visible disk (first appearance, maximum development, last appearance): the date, the area, the central intensity; particulars of the associated sunspot group, if any, at analogous times: the date, the area, the spot count. The unit of area is a millionth of the area of a solar hemisphere with measurements corrected for foreshortening; the central intensity of calcium plages is roughly estimated on a scale of 1=faint to 5=very bright.

Calcium plage data are available through the cooperation of the McMath-Hulbert Observatory of the University of Michigan and the Mt. Wilson Observatory. The sunspot data are compiled from reports from the U. S. Naval Observatory (preliminary data), Mt. Wilson Observatory, and from reports from Europe and Japan received through the daily Ursigram messages.

Coronal Line Emission Indices -- In the table are summarized solar coronal emission intensity indices for the green (Fe XIV at λ5303) and red (Fe X at λ6374) coronal lines. The indices are based on measurements made at 5° intervals around the periphery of the solar disk by the High Altitude Observatory at Climax, Colorado, and by Harvard University observers at Sacramento Peak (The USAF Upper Air Research Observatory at Sunspot, New Mexico, under contract AF 19(604)-146). The measurements are expressed as the number of millionths of an Angstrom of the continuum of the center of the solar disk (at the same wavelength as the line) that would contain the same energy as the observed coronal line. The indices have the following meanings:

G_6 = mean of six highest line intensities in quadrant for $\lambda 5303$.

R_6 = same for $\lambda 6374$.

G_1 = highest value of intensity in quadrant, for $\lambda 5303$.

R_1 = same for $\lambda 6374$.

The dates given in the table correspond to the approximate time of CMP of the longitude zone represented by the indices. The actual observations were made for the North East and South East quadrants 7 days before; for the South West and North West quadrants 7 days after the CMP date given.

To obtain rough measures of the integrated emission of the entire solar disk in either of the lines, assuming the coronal changes to be small in a half solar rotation, it is satisfactory to perform the following type of summation given in example for 15 October:

$$\left(\begin{matrix}\text{MEAN DISK EMISSION}\\ \text{IN } \lambda 5303\end{matrix}\right)_{15\text{ OCT}} = \frac{1}{N}\left[\sum_{15\text{ OCT}}^{22\text{ OCT}}\left\{(G_6)_{NE}+(G_6)_{SE}\right\}+\sum_{8\text{ OCT}}^{14\text{ OCT}}\left\{(G_6)_{SW}+(G_6)_{NW}\right\}\right]$$

where N is the number of indices entering the summation.

Such integrated disk indices as well as integrated whole-sun indices are computed for each day and are published quarterly in the "Solar Activity Summary" issued by the High Altitude Observatory at Boulder, Colorado. In the same reports are given maps of the intensity distribution of coronal emission derived from all available Climax and Sacramento Peak observations, as well as other information on solar activity, such as maps made from daily limb prominence surveys in Hα and notes regarding the history of active regions on the solar disk.

Preliminary summaries of solar activity, prepared on a fast schedule, are issued Friday of each week from High Altitude Observatory in conjunction with CRPL and include solar activity through the preceding day. These are useful to groups needing information on the current status of activity on the visible solar disk, but are not recommended for research uses unless such a prompt schedule of reporting is essential. The same information is included in the subsequent quarterly reports, with extensive additions, corrections and evaluations.

III SOLAR FLARES

Optical Observations -- The table presents the preliminary record of solar flares as reported to the CRPL on a rapid schedule at the sacrifice of detailed accuracy. Definitive and complete data are published later in the Quarterly Bulletin of Solar Activity, I.A.U., in various observatory publications and elsewhere. The present listing serves to identify and roughly describe the phenomena observed.

Reporting directly to the CRPL are the following observatories: Mt. Wilson, McMath-Hulbert, U. S. Naval, Wendelstein, Sacramento Peak, and Swedish Astrophysical Station on Capri. The remainder report through the URSIgram centers in Europe and Japan. Observations are in the light of the center of the H-alpha line unless noted otherwise. The reports from Sacramento Peak, New Mexico (communicated to CRPL by the High Altitude Observatory at Boulder) are from observations at the USAF Upper Air Research Observatory at Sunspot, New Mexico, by Harvard University observers, under contract AF 19(604)-146.

For each flare are listed the reporting observatory, date, times of beginning and ending of observing period (b or a preceding the number denotes true start or end of flare unknown), duration of flare (when known), total area in millionths of visible disk (Sacramento Peak uncorrected for foreshortening; Swedish Astrophysical Station corrected for foreshortening), the McMath serial number of the region with which the flare is associated, the heliographic coordinates in degrees, the time of maximum phase, maximum intensity of flare, fractional area having nearly maximum brightness, and finally the flare importance on the IAU scale of 1- to 3+. A final column lists provisionally the occurrence of simultaneous ionospheric effects as observed on selected field strength recordings of distant high-frequency radio transmissions; a more nearly definitive list of these ionospheric effects, including particulars, appears in these reports after the lapse of a month (see below). All times are Universal Time (UT or GCT). Subflares (importance 1-) are listed by date, time of beginning and number of McMath region with which associated.

Ionospheric Effects -- SID (and GID--gradual ionospheric disturbances) may be detected in a number of ways: short wave fadeouts, enhancement of low frequency atmospherics, increases in cosmic absorption, and so forth. The table lists events that have been recognized on field strength recordings of distant high-frequency radio transmissions. Under a coordinated program, the staffs at the following ionospheric sounding stations contribute reports that are screened and synthesized at CRPL-Boulder: Puerto Rico, Ft. Belvoir, Va., and Anchorage, Alaska (CRPL Stations: PR, BE, AN); Huancayo, Peru, and College, Alaska (CRPL-Associated Laboratories: HU, CO); and White Sands, N. Mex., Adak, Alaska, and Okinawa (U. S. Signal Corps Stations: WS, AD, OK). McMath-Hulbert Observatory (MC) also contributes such reports. In addition, reports are volunteered by RCA Communications Inc., Marconi Wireless, Netherlands Postal and Telecommunications Services, Swedish Telecommunications, and others; these usually specify times of SID and the radio paths involved.

In the coordinated program, the abnormal fades of field strength not obviously ascribable to other causes, are described as short wave fadeouts with the following further classification:

S-SWF: sudden drop-out and gradual recovery
Slow S-SWF: drop-out taking 5 to 15 minutes and gradual recovery
G-SWF: gradual disturbance; fade irregular in both drop-out and recovery.

When there is agreement among the various reporting stations on the time (UT) of an event, it is accepted as a widespread phenomenon and listed in the table.

The degree of confidence in identifying the event, a subjective estimate, is reported by the stations and this is summarized in an index of certainty that the event is widespread, ranging from 1 (possible) to 5 (definite). The times given in the table for the event are from the report of a station (underlined in table) that identified it with high confidence. The criteria for the subjective importance rating assigned by each station on a scale of 1- to 3+ include amplitude of the fade, duration and confidence; greater consideration is given to reports on paths near the subsolar point in arriving at the summary importance rating given in the table.
Note: The tables of SID observed at Washington included in CRPL F-reports prior to F-135 were restricted to events classed here as S-SWF.

IV SOLAR RADIO WAVES

The data on solar radio waves are from observations at 167 Mc and 460 Mc made at the Gunbarrel Hill (Boulder) station of the National Bureau of Standards. The half-width of the antenna lobe is appreciably greater than the solar disk. Polarization has not been determined. All times are in Universal Time (UT or GCT); when the observing period extends slightly into the next Greenwich day, the time scale is extended beyond 24 hours.

3-hourly and Daily Flux -- Flux is given in power units. These units are approximately 10^{-22} watt meter^{-2}(c/s)$^{-1}$ for both polarizations together. They will be subject to a correction factor when gain measurements of the antenna have been made. The median flux is measured for every one-hour period that contains a usable calibration and at least thirty minutes of usable record. A three-hour value of flux is obtained by averaging the available one-hour medians (at least two required). A daily value of flux is obtained by averaging all available one-hour medians (at least 4 required). A dash indicates that insufficient measurements were made to meet the above requirements or that the records were not of usable quality. Parentheses indicate that the value is somewhat doubtful because of atmospheric noise or local interference.

The variability index, given for each three-hour interval, is on a scale 0 to 3 defined as follows:

0 - The instantaneous flux did not drop below one-half the median level or exceed twice the median level at any time.

1 - The instantaneous flux made from one to ten excursions outside the range described above.

2 - The instantaneous flux made from ten to one hundred excursions outside the range described above.

3 - The instantaneous flux made more than one hundred excursions outside the range described above.

For the purpose of the variability index, an excursion whose maximum intensity is M times the median level is counted as M excursions. A dash is used to indicate that measurements were made for less than one hour during the period. Parentheses surround variability indices which are in doubt because of atmospheric noise or local interference.

Outstanding Events -- A separate table lists the occurrences that are not adequately described by the three-hourly values of median flux and variability. These are classified in general accordance with the system described and illustrated by Dodson, Hedeman, and Owren (Ap. J. 118, 169, 1953). The categories of events are identified in the table by numbers, which do not necessarily indicate the magnitude of the event:

0 - Rise in base level -- A temporary increase in the continuum with duration of the order of tens of minutes to an hour.

1 - Series of bursts -- Bursts or groups of bursts, occurring intermittently over an interval of time of the order of minutes or hours. Such series of bursts are assigned as distinctive events only when they occur on a smooth record or show as a distinct change in the activity.

2 - Groups of bursts -- A cluster of bursts occurring in an interval of time of the order of minutes.

3 - Minor burst -- A burst of moderate or small amplitude, and duration of the order of one or two minutes.

4 - Minor burst and second part -- A double rise in flux in which the early rise is a minor burst.

5 - Noise storm ends -- A noise storm (see 6) which ceases at some time during the observing period.

6 - Noise storm -- A temporary increase in radiation characterized by numerous closely spaced bursts, by an increase in the continuum, or by both. Duration is of the order of hours or days.

7 - Noise storm begins -- The onset of a noise storm occurs at some time during the observing period.

8 - Major burst -- An outburst, or other burst of large amplitude and more than average duration. A major burst is usually complex, with a duration of the order of one to ten minutes.

9 - Major burst and second part -- A double rise in flux, the first part of which is a major burst. The second part may consist of a rise in base level, a group or series of bursts, or the onset of a noise storm.

Starting times and durations are enclosed in parentheses when they are limited by the period of observation. The maximum instantaneous flux (Inst. Flux) is measured from the sky level as are the hourly medians. The maximum smoothed flux (Smd. Flux) is that obtained by taking the difference of the maximum value of a smooth curve drawn through the outstanding occurrence with a smoothing period of 20 percent to 50 percent of the total duration, and the value of the interpolated hourly median at that same time had the event not occurred, both measured from the sky level.

V GEOMAGNETIC ACTIVITY INDICES

C, Kp, Ap, and Selected Quiet and Disturbed Days -- The data in the table are: (1) preliminary international character figures, C; (2) geomagnetic planetary three-hour range indices, Kp; (3) daily "equivalent amplitude," Ap; (4) magnetically selected quiet and disturbed days.

This table is made available by the Committee on Characterization of Magnetic Disturbance of IAGA, IUGG. The Meteorological Office, De Bilt, Holland collects the data from magnetic observatories distributed throughout the world, and compiles C and selected days. The Chairman of the Committee computes the planetary and equivalent amplitude indices. The same data are also published quarterly in the Journal of Geophysical Research along with data on sudden commencements (sc) and solar flare effects (sfe).

The C-figure is the arithmetic mean of the subjective classification by all observatories of each day's magnetic activity on a scale of 0 (quiet) to 2 (storm).

Kp is the mean standardized K-index from 12 observatories between geomagnetic latitudes 47 and 63 degrees. The scale is 0 (very quiet) to 9 (extremely disturbed), expressed in thirds of a unit, e.g. 5- is 4 2/3, 5o is 5 0/3, and 5+ is 5 1/3. This planetary index is designed to measure solar particle-radiation by its magnetic effects, specifically to meet the needs of research workers in the ionospheric field. A complete description of Kp has appeared in Bulletin 12b, "Geomagnetic Indices C and K, 1948" of the Association of Terrestrial Magnetism and Electricity (IATME), International Union of Geodesy and Geophysics.

Ap is a daily index of magnetic activity on a linear scale rather than on the quasi-logarithmic scale of the K-indices. It is the average of the eight values of an intermediate 3-hourly index "ap," defined as one-half the average gamma range of the most disturbed of the three force components, in the three-hour interval at standard stations; in practice, ap is computed from the Kp for the 3-hour interval. The extreme range of the scale of Ap is 0 to 400. The method is described in IATME Bulletin No. 12h (for 1953) p. viii f. Values of Ap (like Kp and Cp) have been published for the Polar Year 1932/33 and for the years 1937 onwards.

The magnetically quiet and disturbed days are selected in accordance with the general outline in Terr. Mag. (predecessor to J. Geophys. Res.) 48, pp 219-227, December 1943. The method in current use calls for ranking the days of a month by their geomagnetic activity as determined from the following three criteria with equal weight: (1) the sum of the eight Kp's; (2) the sum of the squares of the eight Kp's; and (3) the greatest Kp.

Chart of Kp by Solar Rotations -- The graph of Kp by solar rotations is furnished through the courtesy of Dr. J. Bartels, Geophysikalisches Institute, Göttingen.

VI RADIO PROPAGATION QUALITY INDICES

One can take as the definition of a radio propagation quality index: the measure of the efficiency of a medium-powered radio circuit operated under ideal conditions in all respects, except for the variable effect of the ionosphere on the propagation of the transmitted signal. The indices given here are derived from monitoring and circuit performance reports, and are the nearest practical approximation to the ideal index of propagation quality.

Quality indices are usually expressed on a scale that ranges from one to nine. Indices of four or less are generally taken to represent significant disturbance. (Note that for geomagnetic K-indices, disturbance is represented by higher numbers.) The adjectival equivalents of the integral quality indices are as follows:

1 = useless	4 = poor-to-fair	7 = good
2 = very poor	5 = fair	8 = very good
3 = poor	6 = fair-to-good	9 = excellent

CRPL forecasts are expressed on the same scale. The tables summarizing the outcome of forecasts include categories P-Perfect; S-Satisfactory; U-Unsatisfactory; F-Failure. The following conventions apply:

P - forecast quality equal to observed

S - forecast quality one grade different from observed

U - forecast quality two or more grades different from observed when <u>both</u> forecast and observed were $\geqslant 5$, or both $\leqslant 5$

F - other times when forecast quality two or more grades different from observed

Full discussion of the reliability of forecasts requires consideration of many factors besides the over-simplified summary given.

The quality figures represent a consensus of experience with radio propagation conditions. Since they are based entirely on monitoring or traffic reports, the reasons for low quality are not necessarily known and may not be limited to ionospheric storminess. For instance, low quality may result from improper frequency usage for the path and time of day. Although, wherever it is reported, frequency usage is included in the rating of reports, it must often be an assumption that the reports refer to optimum working frequencies. It is more difficult to eliminate from the indices conditions of low quality for reasons such as multipath or interference. These considerations should be taken into account in interpreting research correlations between the Q-figures and solar, auroral, geomagnetic or similar indices.

North Atlantic Radio Path -- The CRPL quality figures, Qa, are compiled by the North Atlantic Radio Warning Service (NARWS), the CRPL forecasting center at Ft. Belvoir, Virginia, from radio traffic data for North Atlantic transmission paths closely approximating New York-to-London. These are reported to CRPL by the Canadian Defense Research Board, Canadian Broadcasting Company, and the following agencies of the U. S. Government:--Coast Guard, Navy, Army Signal Corps, U. S. Information Agency. Supplementing these data are CRPL monitoring, direction-finding observations and field strength measurements of North Atlantic transmissions made at Belvoir.

The original reports are submitted on various scales and for various time intervals. The observations for each 6-hour interval are averaged on the original scale. These 6-hour indices are then adjusted to the 1 to 9 quality-figure scale by a conversion table prepared by comparing the distribution of these indices for at least four months, usually a year, with a master distribution determined from analysis of the reports originally made on the 1 to 9 quality-figure scale. A report whose distribution is the same as the master is thereby converted linearly to the Q-figure scale. The 6-hourly quality figure is the mean of the reports available for that period.

The 6-hourly quality figures are given in this table to the nearest one-third of a unit, e.g. 5o is 5 and 0/3; 5- is 4 and 2/3; 5+ is 5 and 1/3. Other data included are:

(a) Whole-day radio quality indices, which are weighted averages of the four 6-hourly indices, with half weight given to quality grades 5 and 6. This procedure tends to give whole-day indices suitable for comparison with whole-day advance forecasts which seek to designate the days of significant disturbance or unusually quiet conditions.

(b) Short-term forecasts, issued every six hours by the North Atlantic Radio Warning Service. These are issued one hour before 00^h, 06^h, 12^h, 18^h, UT and are applicable to the period 1 to 7 hours ahead.

(c) Advance forecasts, issued twice weekly by the NARWS (CRPL-J reports) and applicable 1 to 3 or 4 days ahead, 4 or 5 to 7 days ahead, and 8 to 25 days ahead. These forecasts are scored against the whole-day quality indices.

(d) Half-day averages of the geomagnetic K indices measured by the Cheltenham Magnetic Observatory of the U. S. Coast and Geodetic Survey.

A chart compares the short-term forecasts with Qa-figures. A second chart compares the outcome of advance forecasts (1 to 3 or 4 days ahead) with a type of "blind" forecast. For the latter, the frequency for each quality grade, as determined from the distribution of quality grades in the four most recent months of the current season, is partitioned among the grades observed in the current month in proportion to the frequencies observed in the current month.

Ranges of useful frequencies on the North Atlantic radio path are shown in a series of diagrams, one for each day. Time is the angular coordinate and radio frequency in Mc is the radius vector. The shaded area indicates the range of frequencies for which transmissions of quality 5 or greater were observed. The blacker the diagram, the quieter the day has been; a narrow strip indicates either high LUHF, low MUF or both. These diagrams are based on data reported to CRPL by the German Post Office through the Fernmeldetechnischen Zentralamtes, Darmstadt, Germany, being observations every one and a half hours of selected transmitters located in the eastern portion of North America.

Note: Beginning with data for September 1955, Qa has been determined from reports that are available within a few hours or at most within a few days, including for the first time, the CRPL observations. Therefore these are the indices by which the forecasters assess every day the conditions in the recent past. Over a period of several years, they have closely paralleled the former Qa indices which included CRPL observations and included three additional reports received after a considerable lag. Qa was first published to the nearest one-third of a unit at the same time.

North Pacific Radio Path -- The CRPL quality figures, Qp, are compiled by the North Pacific Radio Warning Service (NPRWS), the CRPL forecasting center at Anchorage, Alaska, from radio traffic data for moderately long transmission paths in the North Pacific equivalent to Seattle-to-Anchorage or Anchorage-to-Tokyo. These include reports to CRPL by the Alaskan Communications Service, Aeronautical Radio, Inc., U. S. Air Force and Civil Aeronautical Administration. In addition, there are CRPL monitoring, direction-finder observations and field strength measurements of suitable transmissions.

The original reports are on various scales and for various time intervals. The observations for each 9 hours or 24 hour period are averaged on the original scale. This average is compared with reports for the same period in the preceding two months and expressed as a deviation from the 3-month mean. The deviations are put on the 1 to 9 scale of quality which is assumed to have a standard deviation of 1.25 and a mean for the various periods as follows:

03-12 hours UT	5.33
09-18	5.33
18-03	6.00
00-24	5.67

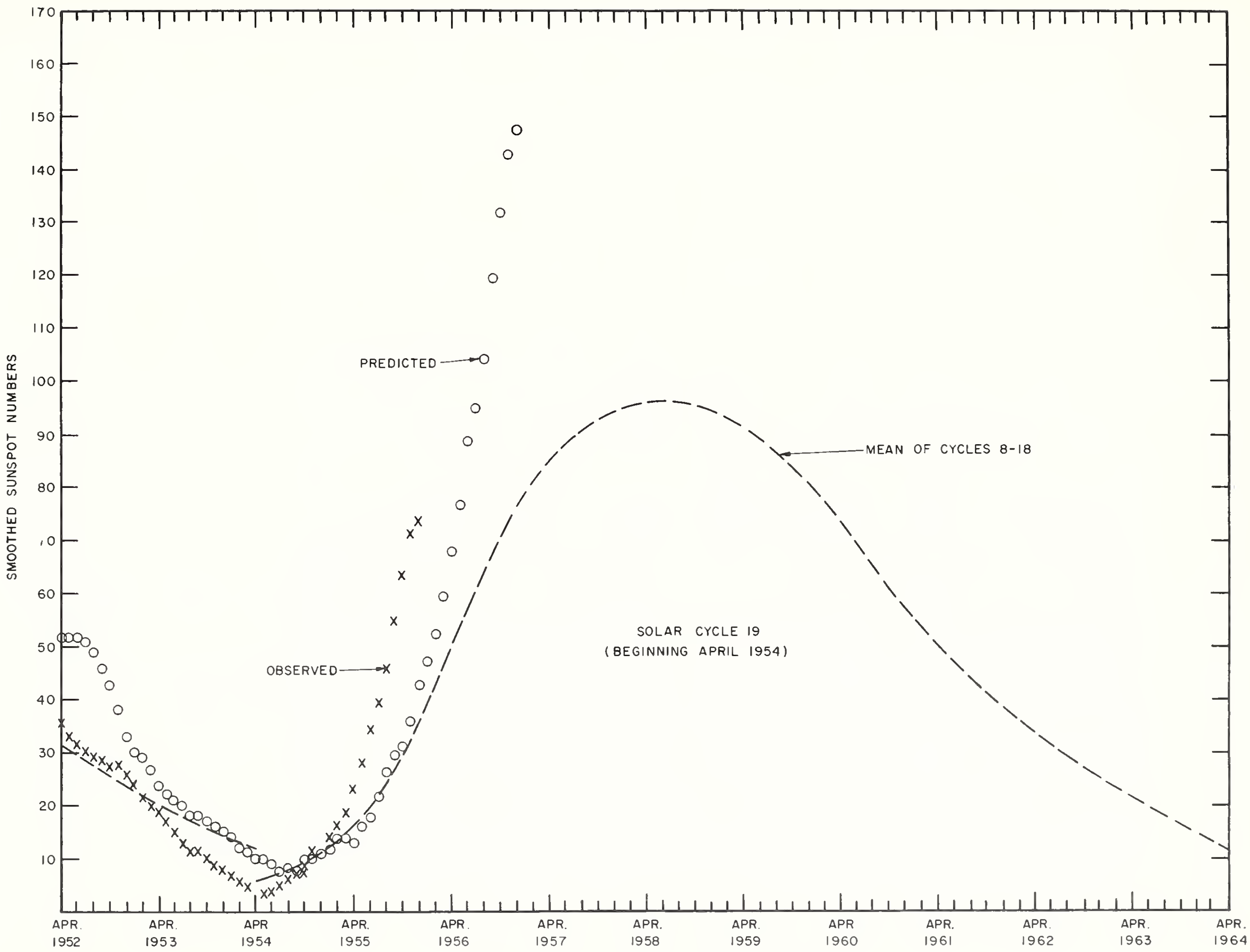
The 9-hour and 24-hour indices Qp are determined separately. Each index is a weighted mean where the CRPL observations have unit weight and the others are weighted by the correlation coefficient with the CRPL observations.

The table, analagous to that for Qa, includes the 9-hourly quality figures; whole day quality figures; short term forecasts issued by NPRWS three times dailv at 02^h, 09^h, and 18^h UT, applicable to the stated 9-hour periods; advance forecasts issued twice weekly by NPRWS (CRPL-Jp report); and half-day averages of geomagnetic K indices from Sitka.

The chart compares the outcome of advance forecasts, on the same basis as the similar chart for the North Atlantic Radio Path.

American Relative Sunspot Numbers May 1956	
Date	$R_{A'}$
1	101
2	96
3	107
4	134
5	138
6	118
7	155
8	166
9	154
10	146
11	143
12	130
13	118
14	110
15	95
16	86
17	107
18	131
19	119
20	131
21	117
22	108
23	75
24	80
25	95
26	94
27	105
28	119
29	125
30	121
31	111
Mean:	117.3

Zürich Provisional Relative Sunspot Numbers June 1956	
Date	R_Z
1	98
2	107
3	117
4	106
5	117
6	118
7	111
8	90
9	85
10	89
11	87
12	94
13	98
14	108
15	114
16	132
17	120
18	130
19	171
20	166
21	162
22	150
23	139
24	125
25	106
26	70
27	71
28	122
29	135
30	162
Mean:	116.7



PREDICTED AND OBSERVED SUNSPOT NUMBERS

CALCIUM PLAGE AND SUNSPOT REGIONS

JUNE 1956

CMP June 1956	Lat.	McMath Plage Number	Return of Region	Calcium Plage Data Date-Area-Intensity First seen	Maximum	Last seen	Sunspot Data Date-Area-Count First seen	Maximum	Last seen
01.0	N32	3517	New	27- 700-2.5	04- 2000-2	06-1500-1.5	28- 130 -7	28- 130 -7	30- 20 -1
01.4	S16	3514	New	26-2000-4	06- 8000-3	07-6000-2	26- 390 -1	29- 860 -16	07-150a-x
03.3	N32	3521 (4)	3480	30-1600-2	04- 3000-1.5	08-2000-1.5			
04.0	N21	3518 (2)	3481	27-2000-2	03-11400-4	09-5000-3	28-1311 -8	29-1980 -9	09-190 -1
04.7	S12	3520	New	29- 800-2	30- 800-2.5	04- 500-1			
04.9	N23	3522 (6)	3485	30-2500-3	05- 2500-2	10-1500-2	31- 220 -1	----------	--------*
05.3	S23	3519	New	29-1500-2	30- 1500-2.5	04- 700-2.5			
06.1	S20	3523	New	30-1000-2	06- 2000-3.5	11-1500-3	05- 70 -4	07- 280 -15	11- 50 -1
06.3	N25	3530 (6)	3485	06-1500-1.5	06- 1500-1.5	12- 500-1	*---------	-----------	12-100 -1
07.0	S17	3528 (3)	3497	05-1800-2	05- 1800-2	13-1000-2			
08.2	S20	3525 (3)	3488	02-4000-1	05- 5000-3	14-2000-2	02- xx -1	04- 150 -9	13- 30 -2
10.2	N35	3526 (2)	3493	04-3000-1.5	04- 3000-1.5	13-1500-1			
10.4	N21	3527 (4)	3491	04-6000-4	04- 6000-4	14-1500-1	04- 50a-x	----------	11- 50a-x
10.5	S29	3529 (3)	3492	05-4000-1.5	05- 4000-1.5	13-1000-1			
12.4	N29	3532 (2)	3494	06-2000-2	11- 2000-3	16- 800-1.5			
13.2	S28	3531 (3)	3497	06-3000-2.5	10- 6500-3.5	19-4000-2	06- 150 -1	08- 540 -12	17- 10 -2
13.4	N26	3533 (2)	3494	07-2000-1.5	11- 1500-2.5	16-1000-2.5	14- 10 -1	-----------	14- 10 -1
15.5	N15	3534	New	09-3000-3.5	09- 3000-3.5	20-1000-2	09- 50a-x	10- 50 -2	16- 50a-x
15.9	N30	3536 (5)	3499	10-1500-2.5	13- 2000-2.5	19-1500-1	10- 30 -1	11- 70 -2	18- xx -3
16.5	N37	3537	New	10-1000-2	13- 1500-2	18- 500-1			
16.9	S25	3538 (5)	3500	11-1000-1.5	13- 1300-2.5	22- 500-1.5	13- 100 -3	14- 170 -1	15- 20 -3
17.3	N27	3535 (5)	3501	10-1500-2	21- 9000-4	23-4000-2.5	10- 150 -1	22-1390 -6	23- xx -5
19.4	S26	3539 (2)	3503	12-1000-1.5	18- 3000-2	24-2500-1.5	13- 240 -1	13- 240 -1	23- 70 -1
19.7	N21	3540	New	13-1000-2.5	18- 3000-3	25-1800-3	14- 200 -5	16- 920 -8	25-390 -3
19.5	N36	3542 (2)	3504	13-1000-1.5	14- 1200-1	16-1000-1.5			
20.1	N13	3541	New	13- 700-2	24- 3000-3.5	26-2500-3.5	21- 570 -8	25-1450 -12	26-780 -2
21.2	S20	3543 (3)	3506	14-1600-2.5	18-11000-4	27-4500-3.5	14- 10 -1	21- 810 -19	27-290 -1
23.3	S16	3548 (2)	3511	21- 300-3	24- 600-1	25- 500-1	21- 50a-x	-----------	22- 20 -1
23.3	N21	3555	New	25- 400-3	27- 800-3	28- 800-2.5	25- 110 -3	25- 110 -3	26- 20 -1
24.1	N27	3547	New	21-1000-2	21- 1000-2	29- 600-1			
26.1	N33	3545	New	19-2000-2	20- 4000-2.5	01-1500-1	19- 190 -2	19- 190 -2	20- 10 -x
26.3	N20	3546	New	20- 700-2	25- 2000-2.5	01-1500-1	21- 50a-x	27- 30 -2	28- 10 -3
28.5	S17	3550 (2)	3514	22-2000-2.5	25- 4000-2	03-2000-1.5	22- 390 -1	22- 390 -1	03-100 -1
29.4	S30	3551	New	23-2500-4	26- 3200-4	03-2300-3	23- 100 -1	27- 540 -11	04-120 -1
30.4	N24	3552 (3)	3518	24-2500-2	02- 3100-2.5	03-2900-2.5			
30.5	N27	3553 (3)	3518	24-2000-2	26- 2500-3	28-2300-2.5			
July 01.3	N25	3554 (3)	3518	25-1000-2.5	26- 2000-3	28-1600-2.5			

* Plage 3522 breaks into 3522 and 3530; spot originally assigned to 3522 later assigned to 3530.

CORONAL LINE EMISSION INDICES

JUNE 1956

CMP Date 1956	North East Quadrant (observed 7 days earlier)				South East Quadrant (observed 7 days earlier)				South West Quadrant (observed 7 days later)				North West Quadrant (observed 7 days later)			
	G_6	G_1	R_6	R_1	G_6	G_1	R_6	R_1	G_6	G_1	R_6	R_1	G_6	G_1	R_6	R_1
June																
1	38	55	X	X	X	X	X	X	X	X	X	X	X	X	X	X
2	55	87	X	X	90	109	X	X	39[a]	55[a]	X	X	62[a]	100[a]	X	X
3	90	119	21	31	48	66	18	23	27[a]	38[a]	18[a]	20[a]	73[a]	138[a]	32[a]	50[a]
4	94*	152	32	52	49	67	14	22	43	60	25[a]	54[a]	70	115	28[a]	89[a]
5	57	85	20	38	29	40	6	7	43	64	43	94	67	98	27	61
6	66	85	16	21	57	116	37	94	32[a]	72[a]	X	X	65[a]	95[a]	X	X
7	58	74	16	23	44	83	47	87	X	X	X	X	X	X	X	X
8	X	X	X	X	X	X	X	X	22[a]	34[a]	19[a]	32[a]	26[a]	34[a]	14[a]	16[a]
9	96	115	26	49	69	119	43	59	X	X	X	X	X	X	X	X
10	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
11	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
12	125	185	X	X	X	X	X	X	61	91	X	X	59	100	X	X
13	65	92	37	85	76	94	46	79	X	X	X	X	45	63	X	X
14	51	68	46	93	64	96	38	44	52	81	44	54	52	70	25	40
15	93	107	X	X	58	81	X	X	75	100	26	31	95	143	45	69
16	120[a]	150[a]	26	45	59[a]	63[a]	16	18	74	105	41[a]	65[a]	105	157	40[a]	65[a]
17	130[a]	160[a]	39[a]	45[a]	70[a]	82[a]	25[a]	30[a]	61	74	X	X	89*	170	X	X
18	108	132	40[a]	53[a]	76	119	26[a]	49[a]	126[a]	170[a]	X	X	103[a]	160[a]	X	X
19	82	127	38	62	95	148	37	58	82	131	34[a]	89[a]	77	104	23[a]	33[a]
20	57[a]	70[a]	X	X	97*	147	X	X	91[a]	129[a]	49[a]	66[a]	72[a]	104[a]	18[a]	30[a]
21	X	X	X	X	X	X	X	X	136	172	39	83	70	80	13	22
22	24[a]	34[a]	12[a]	16[a]	49[a]	87[a]	23[a]	36[a]	94	143	20[a]	30[a]	52	79	7[a]	20[a]
23	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
24	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
25	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
26	44	99	X	X	33	43	X	X	45	50	X	X	50	69	X	X
27	49[a]	66[a]	X	X	113[a]	165[a]	X	X	66*	96	14	20	40	68	12	25
28	26	31	18	21	61	78	28	35	92	154	X	X	31	33	X	X
29	29	48	22	31	102	164	20	33	72	132	14[a]	25[a]	43	57	21[a]	25[a]
30	58	108	43	55	65	100	X	X	60	113	17	24	70	131	28	40

a = index computed from low weight data.

* = yellow line observed.

SOLAR FLARES

JUNE 1956

Observatory	Date June 1956	Time Observed Start UT	Time Observed End UT	Duration Min.	Total Area Mill.	McMath Plage Region Number	Approx. Position Lat.	Approx. Position Mer. Dist.	Time Max. Phase UT	Max. Int. Arb.	Rel. Area of Max. Tenths	Importance	Provis. Ionospheric Effect
S. Peak	01	2010	2050	40	120	3518	N22	E26	2031	18	3	1	
S. Peak	02	2230	~2340	~70	305	3518	N23	E03	2254	25	1	2	Slow S-SWF
S. Peak	02	2340	a2406	>26	~510	3518	N22	E11	2356	28	1		
Capri-S	03	1103	1111	8	150	3518	N24	W01				1	
Capri-S	03	1126	1153	27	240	3518	N24	E04				1+	
Schaus.	03	b1145				3518	N23	E05				1	
S. Peak	03	b1845	~1955	>70	245	3527	N23	E85	1853	22	2	1	G-SWF
Tokyo	04	b0340				3518	N25	W05				1	
Capri-S	04	0959	1022	23	200	3527	N20	E85				1+	
Schaus.	05	b1225				3523	S16	E03				1+	
Capri-S	05	1209	1229	20	150	3523	S19	E10				1	
S. Peak	06	b2010	b2055	~45	142	3527	N21	E47	~2015	16	8	1	
Capri-S	07	1113	1155	42	150	3518	N25	W50				1	
McMath	07	1730	1800	30		3518	N20	W55				1	Slow S-SWF
S. Peak	07	b1729	~1800	>31	54	3518	N22	W56	1740	14	6	1-	
McMath	07	1837	2115	158		3518	N20	W60				2-	Slow S-SWF
S. Peak	07	1840	a1858	>18	157	3518	N23	W57	1856	22	2	1	
Tokyo	08	0101		~30		3532	N25	E55				1	
Tokyo	08	0135		~10		3532	N35	E55				1	
Capri-S	08	1048	1130	42	200	3525	S18	W10				1+	
Capri-S	09	1237	1312	35	150	3534	N20	E85				1	
McMath	09	b1332	1350	>18		3531	S29	E50				1	
Capri-S	09	1327	1344	17	200	3531	S29	E47				1+*	
Capri-S	09	1343	1425	42	100	3534	N20	E85				1	
Capri-S	09	1501	1514	13	200	3531	S29	E46				1	
Wendel.	09	1630	1650	20		3529	S25	E15				1	
Capri-S	10	1604	1618	14	100	3525	S16	W37				1	
Capri-S	11	0736	0805	29	100	3532	N28	E12				1	
McMath	11	b1935	1940	>5		3525	S21	W54				1+	
Capri-S	13	0658	0719	21	150	3536	N28	E36				1	
McMath	13	b1525	1623	>58		3539	S25	E80				1+	Slow S-SWF
Capri-S	13	1526	1625	59	290	3539	S29	E80				1+	
McMath	14	1230	1325	55		3531	S25	W35				2-	
Capri-S	14	1220	1333	73	480	3531	S25	W18				2+	G-SWF
S. Peak	14	b1314	1350	>36	175	3531	S28	W18	~1316	17	2	1	

*Sac. Peak lists as importance 1-.

SOLAR FLARES
JUNE 1956

Observatory	Date June 1956	Time Observed Start UT	End UT	Duration Min.	Total Area Mill.	McMath Plage Region Number	Approx. Position Lat.	Mer. Dist.	Time Max. Phase UT	Max. Int. Arb.	Rel. Area of Max. Tenths	Importance	Provis. Ionospheric Effect
Capri-S	14	1230	1322	52	150	3540	N20	E69				1*	
McMath	14	1811	1825	14		3543	S20	E90				1	Slow S-SWF
Tokyo	15	0048		~50			S25	W65				1	
Tokyo	15	0329		~20			N15	W65				1	
Capri-S	15	0835	0848	13	150	3543	S22	E90				1	
Capri-S	16	0853	0901	8	150	3543	S22	E74				1	
Capri-S	16	0948	1012	24	150	3543	S22	E74				1	
Capri-S	17	1138	1240	62	200	3543	S24	E56				1+	
Capri-S	17	1423	1438	15	100	3543	S22	E52				1	
S. Peak	18	1530	1605	35	110	3543	S18	E20	1533	20	4	1	
{ McMath	18	1850	2000	70		3543	S20	E42				1+ }	
{ S. Peak	18	b1857	a1903	>6	98	3543	S21	E35	1901	18	2	1- }	
Capri-S	19	1310	1322	12	150	3543	S21	E26				1	
McMath	19	1850	1905	15		3543	S20	E24				1+	G-SWF
Capri-S	20	1415	1424	9	150	3535	N31	W57				1*	
{ Mt.Wilson	20	1955		>100		3535	N35	W55				2 }	Slow S-SWF
{ McMath	20	b2005				3535	N30	W50				2 }	
McMath	20	2115				3535	N30	W50				2	G-SWF
Tokyo	22	0304		~30		3541	N10	W25				1	
{ Meudon	22	0711		~40		3543	S15	W15				1 }	
{ Capri-S	22	0722	0741	19	200	3543	S20	W11				1 }	S-SWF
Capri-S	22	1242	1253	11	200	3535	N26	W80				1	
{ S. Peak	22	1525	1820	175	365	3543	S20	W15	1612	30	3	2 }	
{ McMath	22	1550	1650	60		3543	S20	W15				2 }	Slow S-SWF
{ Capri-S	22	1550	1655	65	680	3543	S19	W16				3 }	
Capri-S	23	0656			100	3541	N17	W40				1	
Capri-S	23	1331	1342	11	100	3551	S27	E87				1	
Capri-S	23	1445	1505	20	200	3541	N13	W46				1+*	
Capri-S	24	0929	0949	20	240	3541	N17	W61				1+	
Capri-S	24	1109	1159	50	150	3543	S17	W60				1	
Capri-S	24	1445	1514	29	200	3541	N16	W62				1	
Capri-S	25	1419	1439	20	200	3543	S18	W74				1	G-SWF
Capri-S	25	1607	1618	11	240	3543	S17	W58				1	
Neder.	26	1135	1200	25		3543	S20	W90				1	
{ Neder.	26	1400	1407	07		3551	S29	E37				1 }	
{ Capri-S	26	1359	1409	10	200	3551	S33	E29				1* }	

*Sac. Peak lists as importance 1-.

SOLAR FLARES

JUNE 1956

Observatory	Date June 1956	Time Observed Start UT	Time Observed End UT	Duration Min.	Total Area Mill.	McMath Plage Region Number	Approx. Position Lat.	Approx. Position Mer. Dist.	Time Max. Phase UT	Max. Int. Arb.	Rel. Area of Max. Tenths	Importance	Provis. Ionospheric Effect
{ S. Peak	26	1705	1720	15	133	3551	S30	E34	1710	18	7	1 }	
{ Capri-S	26	1705	1716	11	150	3551	S31	E27				1 }	
Capri-S	27	1220	1248	28	240	3551	S32	E31				1	
Capri-S	28	0917	0933	16	150	3551	S32	E13				1	
{ Neder.	30	1033	1103	30		3563	S24	E68				2 }	S-SWF
{ Capri-S	30	1033	1137	64	390	3563	S22	E70				2 }	
Capri-S	30	1055	1133	38	100	3558	N22	E28				1	
Capri-S	30	1138	1154	16	100	3550	S11	W28				1	
Capri-S	30	1424	1453	29	200	3558	N22	E25				1+	
Capri-S	30	1433	1453	20	150	3551	S29	W14				1	

Subflares noted as follows (Date, time (UT), region):

June 1, 2250 (3514)
2, 2230 (3523)
4, b1710 (3514)
b1710 (3513)
5, 1459 (3527)+
b1608 (3514)+
1708 (3518)+
b2115 (3518)+
6, 1340 (3518)++
1415 (3518)+
b1522 (3518)++
1542 (3518)+
1725 (3518)++
7, 1717 (3518)+
9, 1625 (3529)
b2334 (3531)
11, b1510 (3535)+
1518 (3535)+
12, b1441 (3535)+
13, 1315 (3535)+

June 13, b2325 (3534)
b2325 (3535)
14, 1235 (3540)+
1335 (3543)
1344 (3535)
1355 (3543)
2045 (3535)
15, 1445 (3541)
1705 (3532)
1725 (3543)
2235 (3543)
2315 (3535)
16, 1300 (3543)
1650 (3540)
18, 1320 (3540)
1510 (3540)
2013 (3543)+
20, b1952 (3535)
21, b1806 (3541)
b1806 (3535)
22, b1253 (3543)

June 22, 1540 (3541)
1910 (3543)
1930 (3541)
2045 (3551)
23, 1255 (3539)
1655 (3551)
b2255 (3541)
24, 1300 (3535)
1440 (3541)
25, ~2215 (3540)
26, 1405 (3551)+
2027 (3551)+
27, 1845 (3558)
1940 (3558)
28, 1350 (3558)
29, 1355 (3551)
1440 (3563)
1515 (3558)
1550 (3558)
30, 1435 (3558)+
1610 (3550)

+ McMath. Otherwise observations are Sac. Peak.

++ McMath and Sac. Peak.

IONOSPHERIC EFFECTS OF SOLAR FLARES

MAY 1956

May 1956	Start UT	End UT	Type	Wide-spread Index	Impor-tance	Observation stations
3	2000	2015	Slow S-SWF	5	1	BE, HU, MC, PR, WS
4	1035	1200	Slow S-SWF	3	2	MC, NE
	1900	1938	S-SWF	4	2-	BE, HU, PR, NE
5	0600	0618	S-SWF	1	1	NE
8	1308	1420	S-SWF	5	3-	BE,HU,MC,PR,WS,NE,SW,RCA*
10	0005	0055	Slow S-SWF	5	3-	AN, CO, OK, WS
	0505	0555	Slow S-SWF	1	2-	OK
	0939	1007	S-SWF	1	1	NE
	2100	2130	G-SWF	3	1+	MC, PR, WS
11	1813	1840	S-SWF	5	2+	AN,BE,HU,MC,PR,WS,NE,RCA+
	2235	2305	S-SWF	4	1-	OK, WS, TO
12	1030	1105	S-SWF	4	1	DA, NE
13	0309	0350	S-SWF	4	2+	OK, TO
15	1818	1846	G-SWF	2	1	BE, HU
16	0434	0457	S-SWF	1	1+	OK
	1248	1308	Slow S-SWF	1	1	DA
17	0830	0914	S-SWF	4	2-	OK, DA, NE
	1053	1130	Slow S-SWF	1	1	NE
18	0655	0707	G-SWF	4	1-	OK, NE
	0807	0824	S-SWF	2	2-	DA, NE
	0838	0850	S-SWF	2	2-	DA, NE
	1605	1620	S-SWF	5	1	BE, HU, MC, PR, NE
21	0300	0330	Slow S-SWF	1	2	OK
	1139	1155	S-SWF	4	1-	PR, DA, NE
22	1515	1525	G-SWF	2	1	MC, PR
	1827	1840	Slow S-SWF	5	2	AN, HU, MC, PR, WS
25	0430	0453	Slow S-SWF	4	1	OK, RCA+
	0842	0908	S-SWF	2	1	DA, NE
	1459	1528	Slow S-SWF	5	1+	BE, HU, MC, PR, NE
	1806	1900	Slow S-SWF	5	2	AN,BE,HU,MC,OK,PR,NE
26	0328	0404	S-SWF	4	2-	AN, OK
	0835	0900	S-SWF	1	-	SW
	1335	1350	Slow S-SWF	4	1-	HU, MC, WS, NE
	1455	1510	G-SWF	4	1-	BE, MC, PR, WS
	2047	2157	Slow S-SWF	3	2	BE, MC, WS
28	1610	1620	Slow S-SWF	3	1	BE, MC, PR
	1630	1700	Slow S-SWF	5	1+	BE,HU,MC,PR,WS,NE
29	0015	0132	G-SWF	4	3-	AN, OK
	0833	0853	G-SWF	1	1	DA
	1109	1139	Slow S-SWF	1	2-	DA
	1407	1453	G-SWF	5	1+	BE, HU, MC, PR, WS
30	0230	0405	S-SWF	5	3+	CO, OK, RCA+, TO
	0930	1003	S-SWF	5	2+	OK, DA, RCA*, NE, SW
	1447	1455	S-SWF	5	1	BE, HU, MC, PR, DA
	2130	2207	G-SWF	4	1	BE, HU, MC, WS
31	0747	0908	S-SWF	5	3+	OK, NE, SW, RCA*
	0936	0956	Slow S-SWF	1	1	DA

DA Darmstadt, Germany.
NE Nederhorst den Berg, Netherlands.
RCA* RCA Communications Inc., Riverhead, N.Y.
RCA+ RCA Communications Inc., Point Reyes, California.
SW Enköping, Sweden.
TO Hiraiso Radio Wave Observatory, Japan.

SOLAR RADIO WAVES (BOULDER) -- 167 MC

3-HOURLY AND DAILY FLUX

JUNE 1956

June 1956	Flux Hours UT 12-15	15-18	18-21	21-24	Daily	Variability Hours UT 12-15	15-18	18-21	21-24	Daily	Observed Periods Hours UT
1	--	10	10	10	10	--	(0)	(0)	(0)	(0)	1553-2606
2	8	8	7	9	8	(0)	1	1	3	3	1133-2607
3	7	8	7	7	7	(0)	(0)	(2)	(1)	(2)	1132-2608
4	8	8	8	8	8	1	(0)	(0)	(0)	1	1132-2608
5	9	8	9	12	10	1	(2)	(1)	(2)	(2)	1132-2609
6	19	20	23	17	20	1	2	(2)	(2)	2	1131-2609
7	26	21	67	23	35	2	2	(2)	2	2	1131-2610
8	8	8	8	8	8	1	1	(0)	(0)	1	1131-1846, 1900-2611
9	--	--	--	--	--	--	--	--	--	--	---- ----
10	--	--	--	--	--	--	--	--	--	--	---- ----
11	--	8	8	8	8	--	(0)	(0)	(0)	(0)	1533-2315
12	--	8	8	8	8	(0)	(0)	(0)	1	1	1430-2614
13	8	8	8	--	8	2	1	(1)	2	2	1130-2208, 2313-2614
14	8	7	--	--	8	(0)	(0)	--	--	(0)	1130-2615
15	--	8	8	--	8	(0)	(0)	(0)	(0)	(0)	1130-2326, 2339-2615
16	9	8	10	9	9	(0)	(1)	(1)	(1)	(1)	1131-2616
17	9	9	10	10	9	(1)	(0)	(1)	(0)	(1)	1131-2616
18	11	11	18	15	14	3	(1)	2	(2)	3	1131-2617
19	8	9	9	9	9	(2)	(2)	(2)	(2)	(2)	1131-2201, 2251-2617
20	8	--	25	16	15	2	--	(2)	(2)	(2)	1131-1530, 1833-2617
21	12	11	9	11	11	(1)	(0)	1	(1)	1	1131-2618
22	--	15	12	10	13	2	3	2	(2)	3	1131-2618
23	--	10	10	11	10	(1)	(0)	(2)	(2)	(2)	1132-2618
24	--	26	21	27	25	2	3	(2)	(3)	3	1132-2618
25	--	19	14	20	19	3	2	(1)	(2)	3	1132-2618
26	--	12	11	--	12	(1)	2	(2)	--	2	1133-2000
27	--	--	--	--	--	--	--	--	--	--	---- ----
28	--	10	10	10	10	--	(2)	(2)	(2)	(2)	1601-2618
29	--	9	9	9	9	(0)	(0)	(0)	(0)	(0)	1216-2617
30	--	8	8	--	8	(0)	(0)	(0)	(0)	(0)	1134-2617

SOLAR RADIO WAVES (BOULDER) -- 460 MC

3-HOURLY AND DAILY FLUX

JUNE 1956

	Flux					Variability					Observed Periods
	Hours UT					Hours UT					
1956	12 15	15 18	18 21	21 24	Daily	12 15	15 18	18 21	21 24	Daily	Hours UT
May,	cont'd.										
29	49	50	49	49	49	1	2	2	2	2	1135-1645 , 1717-2604
30	45	44	46	45	45	0	0	1	0	1	1134-2603
31	44	44	44	--	44	2	2	2	0	2	1134-2530
June											
1	--	44	44	43	44	0	0	0	1	1	1553-2606
2	41	40	42	42	41	0	0	0	1	1	1133-2607
3	40	41	41	40	41	0	0	0	1	1	1132-2608
4	39	39	40	42	40	2	1	0	(1)	2	1132-2608
5	40	40	42	42	41	1	2	2	2	2	1132-2609
6	39	41	41	42	41	0	2	0	1	2	1131-2609
7	40	40	41	40	40	0	0	0	0	0	1131-2610
8	38	40	41	42	40	0	0	0	0	0	1131-1657 , 1900-2611
9	--	--	--	--	--	--	--	--	--	--	---- ----
10	--	--	--	--	--	--	--	--	--	--	---- ----
11	--	41	41	42	41	--	0	0	0	0	1546-2315
12	--	41	41	42	41	0	0	0	0	0	1433-2614
13	42	42	43	41	42	0	0	0	1	1	1130-2614
14	42	42	42	43	42	0	0	0	0	0	1130-2615
15	44	45	46	46	45	0	0	(0)	(0)	(0)	1130-2326 , 2339-2615
16	45	45	46	44	45	0	0	0	0	0	1131-2616
17	42	44	45	46	44	0	0	0	0	0	1131-2616
18	50	53	63	58	57	0	0	1	0	1	1131-2617
19	45	48	48	46	47	1	0	1	1	1	1131-2617
20	45	46	59	51	51	1	1	2	1	2	1131-2617
21	44	44	44	45	44	0	0	0	0	0	1131-2618
22	47	48	47	48	47	0	1	1	0	1	1131-2618
23	48	46	50	47	48	0	0	0	0	0	1132-2618
24	46	50	49	46	48	0	0	0	0	0	1132-2618
25	48	45	46	48	47	0	0	0	0	0	1132-2618
26	43	42	41	42	42	0	0	(1)	0	(1)	1133-2618
27	40	40	40	40	40	0	0	0	0	0	1133-2618
28	--	40	40	40	40	--	0	0	0	0	1133-1200 , 1541-2147*
29	38	39	39	40	39	0	0	0	0	0	1134-2617
30	39	40	40	40	40	0	0	0	0	0	1134-2617

*Additional observed period 2253-2618.

SOLAR RADIO WAVES (BOULDER) -- 167 MC

OUTSTANDING EVENTS

JUNE 1956

June 1956	(Note 1) Type	Start UT	Duration Hrs:Mins	Maximum Time UT	Maximum Inst. Flux.	Maximum Smd. Flux.	Remarks
2	1	(1133)	(12:22)	2254.3	220	--	
2	9	2355	00:29	2402	830	230	
3	3	1800.6	00:02.1	1802.2	>2500	--	Off scale
3	1	2050	03:12	2352	190	--	
5	6	(1132)	(12:19)	2117.6	> 2500	5	Off scale (Note 2)
5	9	2351	(02:18)	2352	>2100	--	Off scale
				2355.8	>2100	--	Off scale
6	6	(1131)	(14:38)	~2315	590	16	
7	6	(1131)	(07:09)	~1820.8	380	18	
7	9	1840	(07:30)	~1900	530	34	
8	1	(1131)	(14:40)	~1445	120	--	
12	3	2150.8	00:01.2	2150.8	110	--	
13	1	1300	03:30	1338.5	530	--	
13	3	2346.5	00:00.6	2346.6	>3100	--	Off scale
18	6	(1131)	(10:29)	~ 1200	> 2600	14	Off scale (Note 3)
19	1	(1131)	(14:46)	2305.9	>3100	--	Off scale
19	2	2157.2	00:02.3	2158.2	> 2600	--	Off scale (Note 2)
20	1	(1131)	(03:59)	1215.1	> 2700	--	Off scale
20	6	1930	(06:47)	2057	~1500	26	Large
22	6	(1131)	(14:47)	1945	920	8	
22	2	1748.9	00:03.2	~1750.4	> 3700	--	Off scale (Note 2)
24	6	(1132)	(14:46)	1340	600	20	
25	6	(1132)	(14:46)	2252	>3200	17	Off scale
26	6	(1133)	(08:27)	1815.7	460	5	

Notes: 1. Severe sferics and man-made interference may sometimes obscure or be mistaken for solar events.

2. Off scale bursts also occurred at: June 5 - 2243, 2355.8; June 19 - 1833.8, 2039.1, 2101.7, ~2358, ~2429, ~2443; June 22 - 1800.2.

3. Many large bursts from (1131) to 1330 and from 1900 to 2130.

SOLAR RADIO WAVES (BOULDER) -- 460 MC

OUTSTANDING EVENTS

JUNE 1956

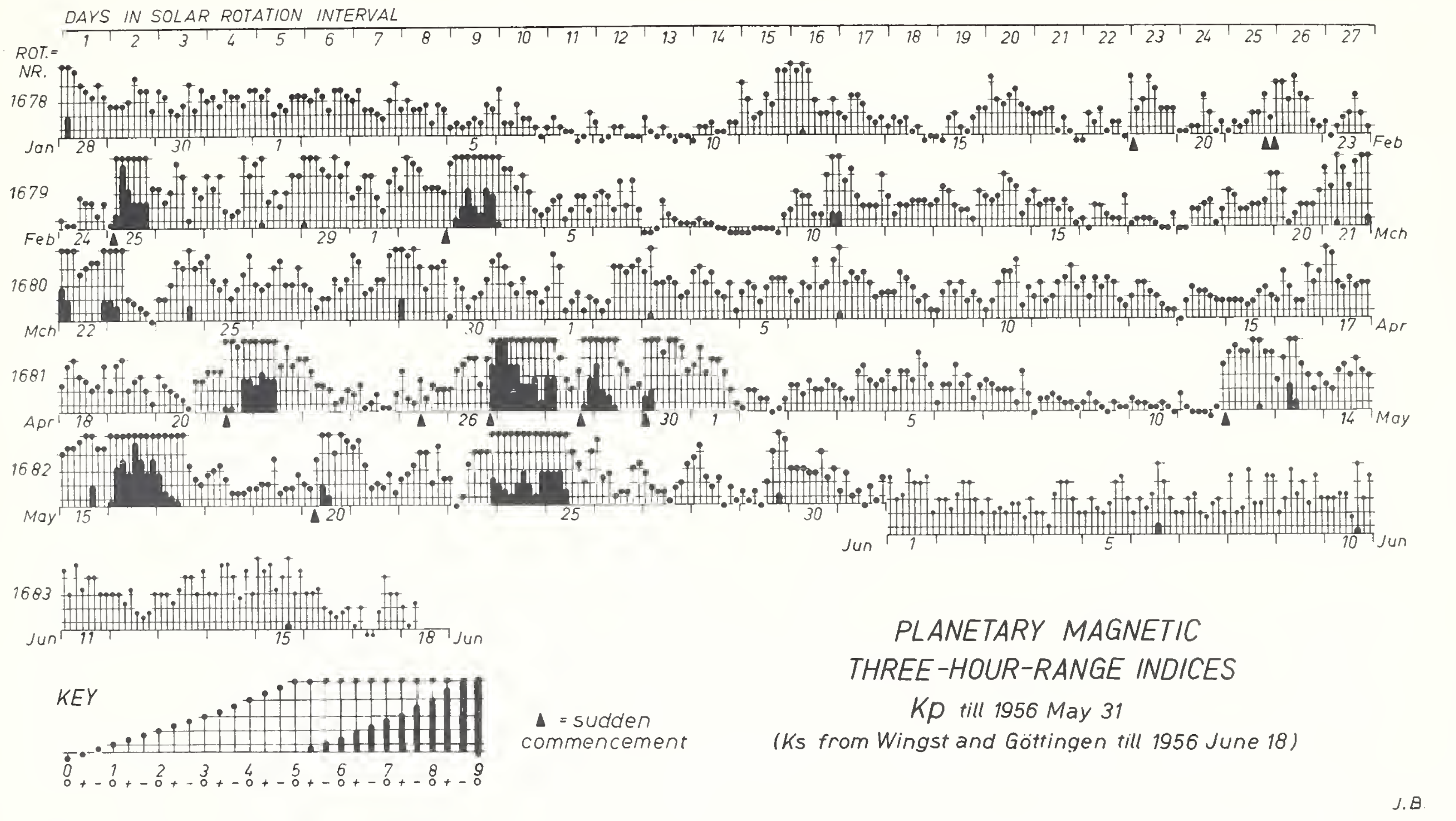
1956	Type	Start UT	Duration Hrs:Mins	Maximum Time UT	Maximum Inst. Flux.	Maximum Smd. Flux.	Remarks
May,	cont'd.						
29	1	1211	(13:53)	Note 2	>1300	--	Off scale
				Note 3	~ 900	--	Large
30	3	1929.0	00:00.2	1929.1	220	--	
30	3	2050.9	00:00.2	2051.0	110	--	
31	1	1150	07:58	Note 2	>1400	--	Off scale
				Note 3	~ 900	--	Large
June							
1	2	2402.7	00:03.3	2405.8	400	16	
2	6	2251	(03:16)	2400.8	100	5	
3	1	1802	07:30	2353.8	110	--	
4	8	1249.1	00:24.3	1307.2	340	180	
4	1	1509	08:25	1546.3	190	--	
4	3	2555.8	00:00.6	2556.1	>1400	--	Off scale
5	1	1325	11:25	Note 2	>1500	--	Off scale
				Note 3	~ 600	--	Large
6	1	1404	09:13	2252.1	150	--	
13	3	2325.7	00:00.2	2325.8	170	--	
18	6	(1131)	(14:46)	~2100	--	30	
18	3	2047.8	00:00.1	2047.8	440	--	
19	1	(1131)	(14:46)	1834.5	550	--	
20	1	1215	05:53	1454.7	120	--	
20	9	1933.3	(06:34)	1939.0	470	23	
22	6	(1131)	(14:47)	(1748.9)	360	8	
23	6	(1132)	(14.46)	~1800	--	10	
24	6	(1132)	(14:46)	~1700	--	11	
25	6	(1132)	(14:46)	~1300	--	9	
29	3	1211.4	00:00.7	1211.7	65	--	
30	1	1137	05:49	1725.0	76	--	

Notes:
1. Some relatively small 460 mc/s events are unreported or may have been obscured by interference.
2. Off scale bursts at May 29-1535.2, 1538.0, 1703.6, 1721.4; May 31-1326.5, 1809.4; June 5-2045.7, 2313.1.
3. Large bursts at May 29 - 1503.9, 1924.0, 2149.0; May 31 - 1150.9, 1322.1, 1325.3, 1639.5, 1849.9, 1851.8; June 5 - 1711.8, 1927.8, 2445.7.

GEOMAGNETIC ACTIVITY INDICES

May 1956

May 1956	C	Values Kp — Three hour Gr. interval 1	2	3	4	5	6	7	8	Sum	Ap	Final Selected Days
1	1.0	4-	5-	3+	4o	4o	3+	2o	1o	26o	20	Five
2	0.1	1-	2o	2o	1+	1+	0+	1-	1+	10-	5	Quiet
3	0.6	2+	2+	2-	3-	2o	2o	3-	2+	18o	9	
4	0.8	2o	1+	1+	3+	4-	3-	2+	3-	19+	11	2
5	0.8	3+	2o	3+	3+	3-	4+	4-	2+	25o	17	8
												9
6	0.5	1o	2+	2+	4-	2+	3o	1+	2+	18+	10	10
7	0.4	3-	2+	2o	2o	2o	1o	3+	2-	17o	9	11
8	0.1	0+	1+	1+	2-	1+	1o	1o	1-	9-	4	
9	0.0	1o	2-	1o	1-	0+	1o	1-	1-	7o	4	
10	0.1	1+	1o	1o	1-	1-	1o	1-	0+	7-	4	
11	0.3	2-	1-	0+	0+	0+	0o	1-	4-	8-	5	Five
12	1.4	4+	5-	4+	4+	5o	5+	4+	4+	37-	38	Disturbed
13	1.4	3-	4o	7-	6-	4-	3o	2o	3o	31-	34	
14	0.9	2+	2o	3+	4-	3o	4o	3+	3o	25-	16	15
15	1.4	4o	4+	4+	5-	5o	6+	4+	4+	37+	42	16
												17
16	2.0	5+	7+	8-	7o	8+	8-	7o	8-	58o	156	24
17	1.5	7o	6o	6-	5+	5o	3+	2+	2o	37-	52	25
18	0.6	3-	3o	3+	2+	1+	1+	1+	2-	17o	9	
19	0.4	2-	2o	2o	4-	1+	2-	2-	3-	17-	9	
20	1.4	2o	2-	4-	6+	6-	4o	5o	5-	33o	39	
21	0.9	4+	5-	3+	2-	2o	2-	3-	1+	22-	16	Ten
22	0.9	2+	3-	3+	4o	4o	2o	4+	2+	25o	18	Quiet
23	1.1	2+	0+	1o	3+	4o	4o	4o	7-	26-	28	
24	1.9	6+	6o	6-	6+	7o	6+	6-	7o	50+	95	2
25	1.6	7o	7o	7o	6o	4o	3+	2o	4o	40+	69	7
												8
26	0.8	5-	2+	3-	1o	1+	1+	3o	3+	20-	14	9
27	0.4	3-	2-	1+	1+	1-	2-	2o	3+	15-	8	10
28	0.7	4-	4+	2+	2-	2+	0+	2-	1-	17o	11	11
29	0.9	1+	1-	1+	0+	2o	4o	6-	5-	20o	19	18
30	0.8	3o	3o	3o	3-	3-	4o	2+	3o	24-	15	19
31	0.3	1+	3-	1o	1+	0+	2-	1-	2+	11+	6	27
Mean:	0.89									Mean:	26	31



PLANETARY MAGNETIC
THREE-HOUR-RANGE INDICES
Kp till 1956 May 31
(Ks from Wingst and Göttingen till 1956 June 18)

NORTH ATLANTIC

May 1956

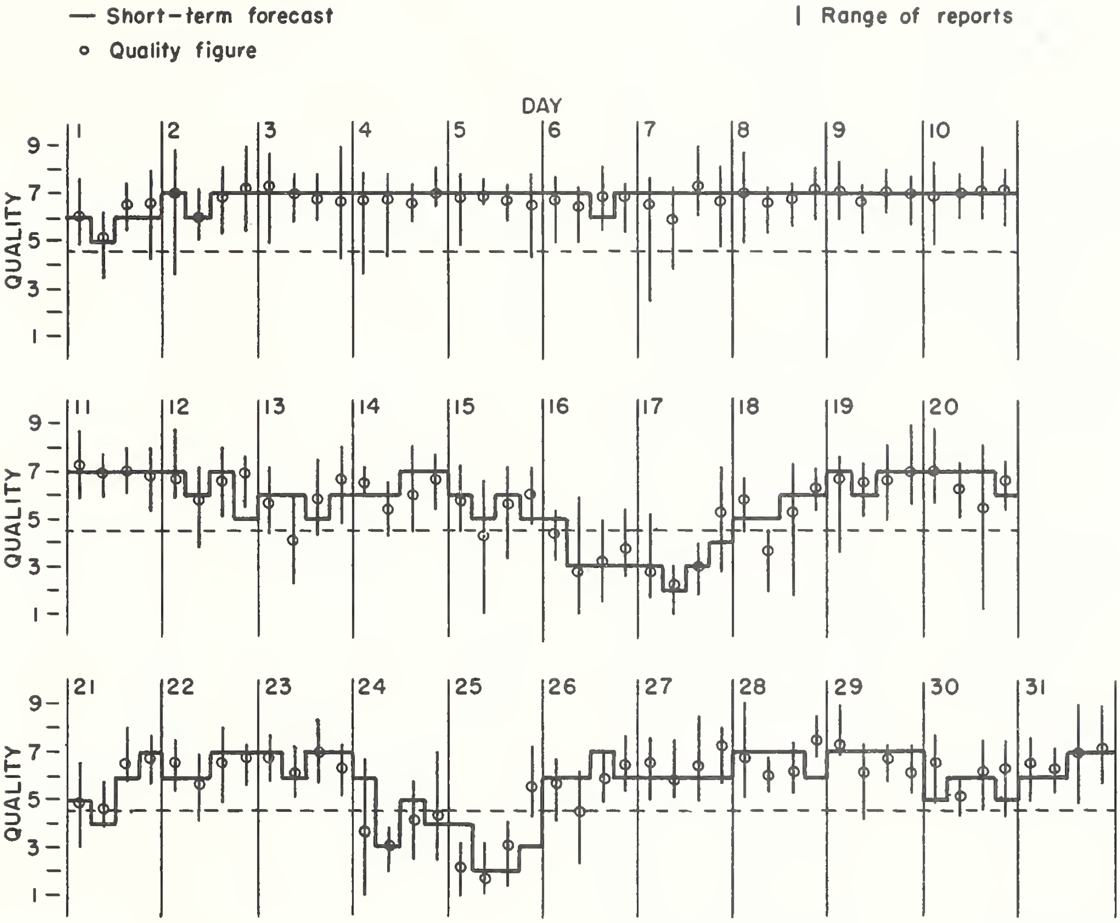
May 1956	North Atlantic 6-hourly quality figures				Short-term forecasts issued about one hour in advance of:				Whole day index	Advance forecasts (J-reports) for whole day; issued in advance by:			Geomagnetic K_{Ch}	
	00 to 06	06 to 12	12 to 18	18 to 24	00	06	12	18		1-4 days	4-7 days	8-25 days	Half (1)	Day (2)
1	6o	5+	7-	7-	6	5	6	6	6+	5	7		(4)	2
2	7o	6o	7o	7+	7	6	7	7	7o	6	7		2	1
3	7+	7o	7-	7-	7	7	7	7	7o	6	7		2	2
4	7-	7-	7-	7o	7	7	7	7	7-	7	6		2	3
5	7o	7o	7-	7-	7	7	7	7	7-	7	6		3	3
6	7-	6+	7o	7o	7	7	6	7	7-	7	7		3	2
7	7-	6o	7+	7-	7	7	7	7	7-	7	7		3	2
8	7o	7-	7-	7o	7	7	7	7	7-	6	7		2	2
9	7o	7-	7o	7o	7	7	7	7	7o	6	7		2	1
10	7o	7o	7o	7o	7	7	7	7	7o	7	7		1	1
11	7+	7o	7o	7o	7	7	7	7	7o	4	7		1	1
12	7-	6-	7-	7o	7	6	7	5	7-	4	7		(4)	(5)
13	6-	4o	6o	7-	6	6	5	6	6-	5	7		(5)	3
14	7-	5+	6o	7-	6	6	7	7	6+	7	7		3	3
15	6-	4+	6-	6o	6	5	6	5	5+	6	7		(4)	(4)
16	4+	3-	3+	4-	5	3	3	3	(3+)	6	7		(7)	(6)
17	3-	2+	3o	5+	3	2	3	4	(3o)	4	7		(5)	3
18	6-	4-	5+	6+	5	5	6	6	5o	4	4		3	2
19	7-	7-	7-	7o	7	6	7	7	7-	6	6		2	2
20	7o	6+	5+	7-	7	7	7	6	7-	6	7		3	(5)
21	5o	5-	7-	7o	5	4	6	7	6o	6	7		(4)	2
22	7-	6-	7-	7o	6	6	7	7	7-	6	6		3	3
23	7-	6+	7o	6+	7	6	7	7	7-	6	6		2	(4)
24	4-	3o	4+	4+	6	3	5	4	(4-)	6	6		(6)	(6)
25	2o	2-	3o	6-	4	2	2	3	(3-)	4	7		(6)	3
26	6-	4+	6o	7-	6	6	7	6	6-	6	7		2	2
27	7-	6o	6+	7+	6	6	6	6	7-	7	7		2	2
28	7-	6o	6+	7+	7	7	7	6	7-	7	7		2	2
29	7+	6+	7-	6+	7	7	7	7	7-	7	7		2	(4)
30	7-	5+	6+	6+	5	6	6	5	6+	7	7		3	3
31	7-	6+	7o	7o	6	6	7	7	7-	7	7		2	2
Score: Quiet Periods				P	21	14	18	16		11	14			
				S	5	9	8	11		14	12			
				U	1	0	1	1		0	1			
				F	0	0	0	1		2	0			
Disturbed Periods				P	1	4	2	1		0	0			
				S	1	2	2	1		2	0			
				U	1	0	0	0		0	0			
				F	1	2	0	0		2	4			

( ) represent disturbed values.

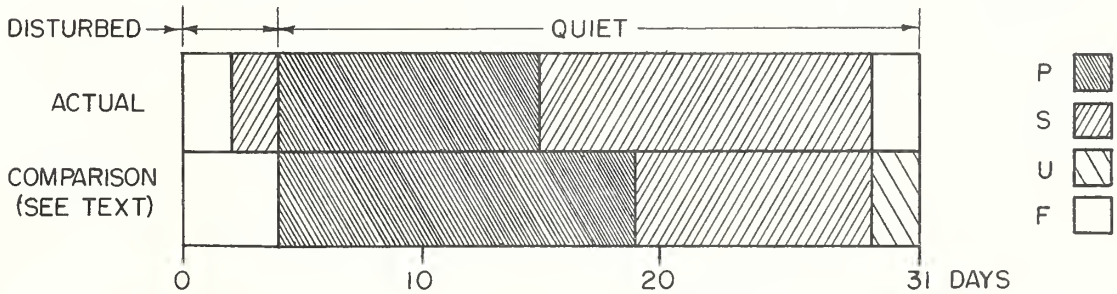
CRPL RADIO PROPAGATION QUALITY FIGURES AND FORECASTS

NORTH ATLANTIC

MAY 1956

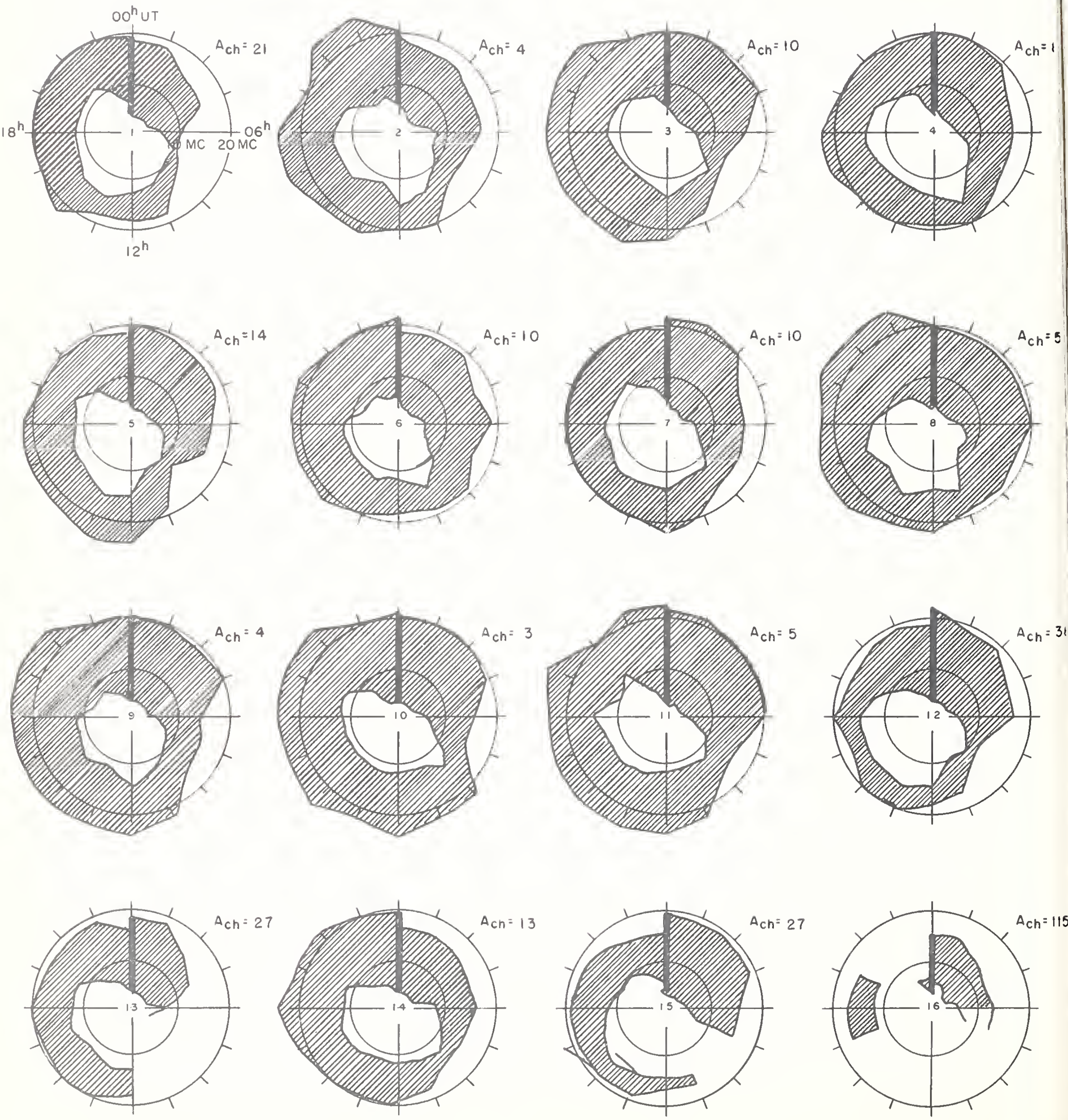


OUTCOME OF ADVANCE FORECASTS (1 TO 4 DAYS AHEAD)

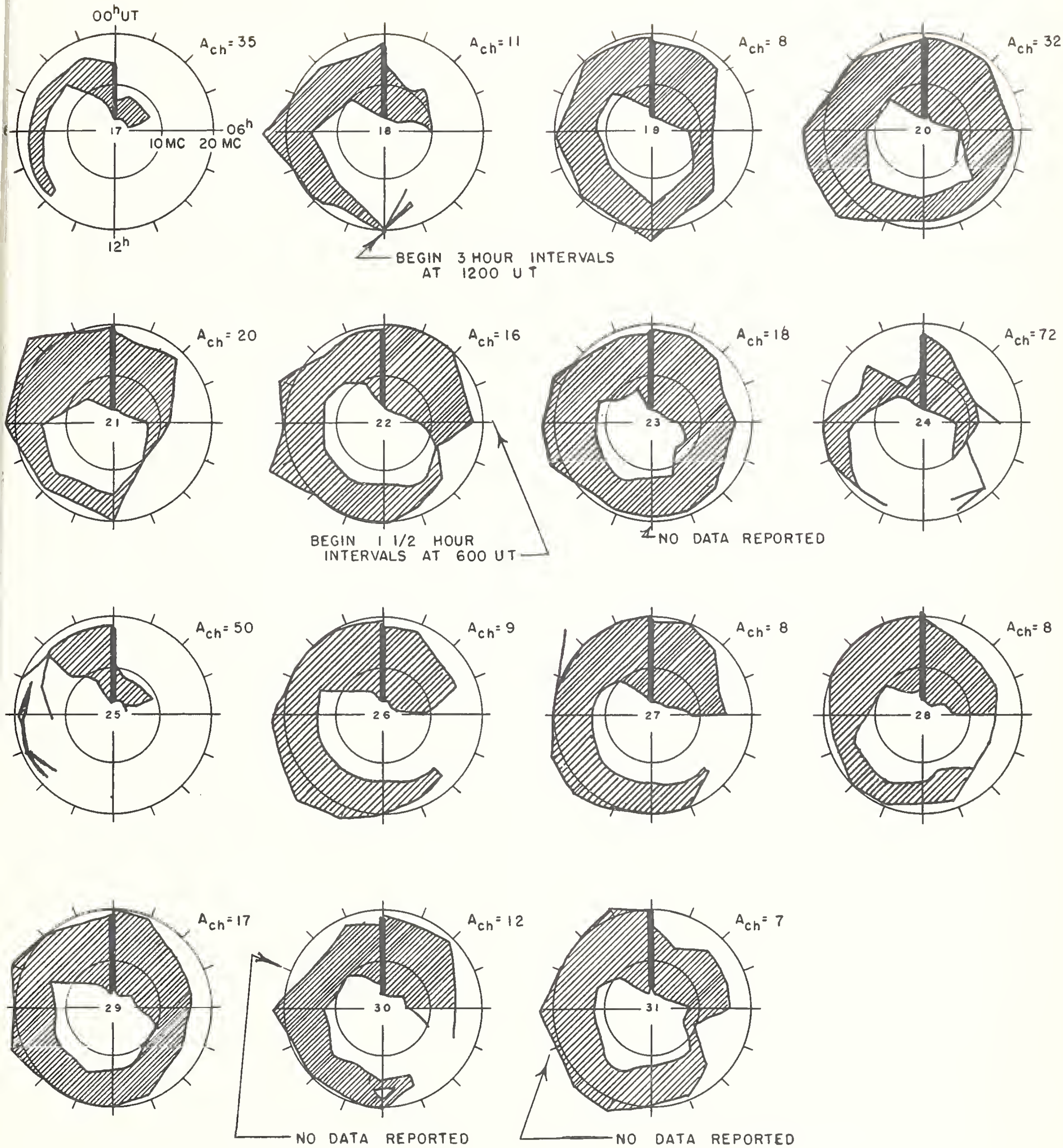


USEFUL FREQUENCY RANGES -- NORTH ATLANTIC PATH

MAY 1956



MAY 1956



Adapted from Observations by Deutschen Bundespost

CRPL RADIO PROPAGATION QUALITY FIGURES AND FORECASTS

NORTH PACIFIC

MAY 1956

May 1956	North Pacific 9-hourly quality figures			Short-term fore-casts issued at			Whole day index	Advance forecasts (Jp reports) for whole day; issued in advance by;			Geomag-netic K_{Si}	
	03 to 12	09 to 18	18 to 03	02	09	18		1-4 days	4-7 days	8-25 days	Half day (1)	Half day (2)
1	6	6	7	6	6	6	6	5	6		(5)	3
2	6	6	7	6	7	7	7	6	5		2	1
3	6	6	7	7	7	7	7	7	6		3	2
4	6	6	7	7	7	7	7	7	6		2	(4)
5	6	6	6	7	6	6	6	7	7		3	3
6	6	6	6	6	5	6	6	7	7		3	2
7	6	6	6	6	6	6	6	4	6		3	3
8	7	7	6	6	7	7	7	4	6		1	1
9	7	7	7	7	7	7	7	7	5		1	1
10	7	7	7	7	7	7	7	7	7		1	1
11	6	7	7	7	7	7	7	7	7		1	2
12	6	5	6	7	6	4	6	7	7		(4)	(5)
13	5	5	5	4	4	5	5	4	6		(6)	(4)
14	5	5	6	5	5	6	5	4	6		3	(4)
15	5	4	4	6	6	5	(4)	6	6		(5)	(5)
16	2	2	3	5	3	3	(2)	4	7		(7)	(7)
17	3	4	4	3	2	5	(3)	5	7		(7)	(4)
18	5	5	5	5	6	6	5	6	7		(4)	2
19	5	6	6	6	6	6	6	6	7		3	2
20	5	4	5	5	6	6	5	6	7		(5)	(5)
21	5	6	6	5	5	6	6	6	7		(4)	2
22	5	5	5	6	6	6	5	5	7		(4)	3
23	6	5	5	5	5	5	5	4	5		2	(4)
24	3	3	3	4	4	4	(3)	4	6		(7)	(6)
25	2	4	5	2	2	5	(3)	5	6		(8)	(4)
26	4	6	6	5	5	6	5	5	6		3	2
27	5	6	6	6	6	6	6	6	6		2	2
28	6	6	6	5	5	7	6	6	7		(4)	2
29	6	7	6	6	7	7	6	6	7		1	3
30	6	6	6	7	7	7	6	7	7		3	3
31	6	6	6	7	7	7	6	7	7		1	2

Score:		02	09	18	1-4 days	4-7 days
Quiet Periods	P	11	11	16	12	6
	S	15	14	10	12	15
	U	0	0	0	0	5
	F	0	0	1	2	0
Disturbed Periods	P	2	0	1	0	0
	S	2	2	3	1	0
	U	1	2	0	3	0
	F	0	2	0	1	5

( ) represent disturbed values.

CRPL RADIO PROPAGATION QUALITY FIGURES AND FORECASTS

NORTH PACIFIC

MAY 1956