 FOR OFFICIAL USE

PART B

SOLAR - GEOPHYSICAL DATA

ISSUED
MAY 1956

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

CRPL-F 141
PART B

NATIONAL BUREAU OF STANDARDS
CENTRAL RADIO PROPAGATION LABORATORY
BOULDER, COLORADO

Issued
31 May 1956

SOLAR - GEOPHYSICAL DATA

CONTENTS

SOLAR - GEOPHYSICAL DATA

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, $\bar{R}$, 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 $\bar{R}$ 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 λ 5303.

R_6 = same for λ6374.

G_1 = highest value of intensity in quadrant, for λ5303.

R_1 = same for λ6374.

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, and Sacramento Peak. 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 (uncorrected 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 both 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.

<u>Note</u>: 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.

<u>North Pacific Radio Path</u> -- 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.

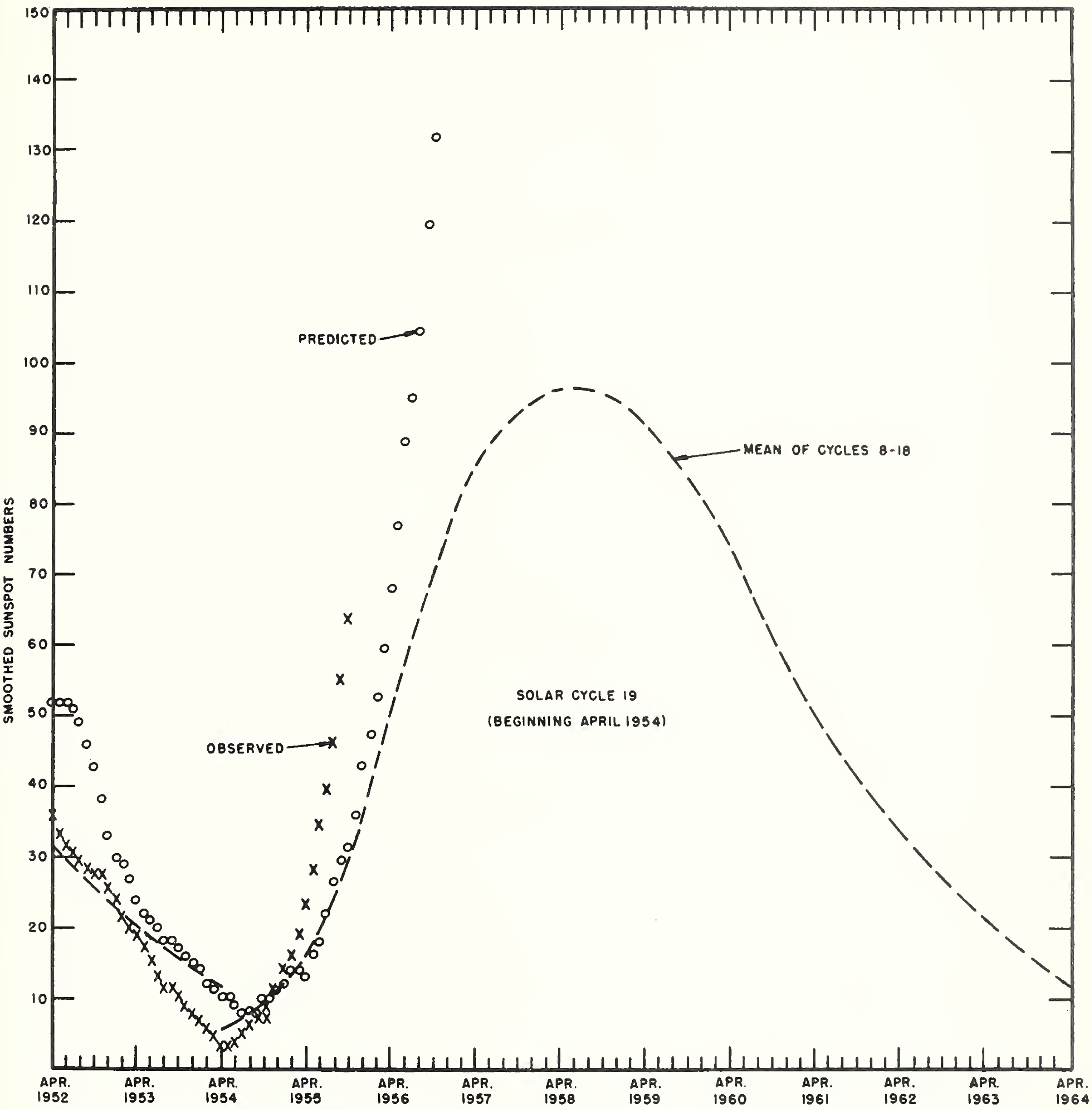
The table, analagous to that for Qa, includes the 9-hourly quality figures; whole day quality figures; short term forecasts issued by NPRWS three times dailv at 02^h, 09^h, and 18^h UT, applicable to the stated 9-hour periods; advance forecasts issued twice weekly by NPRWS (CRPL-Jp report); and half-day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

RELATIVE SUNSPOT NUMBERS

American Relative Sunspot Numbers	
March 1956	
Date	$R_{A'}$
1	127
2	113
3	104
4	98
5	86
6	94
7	102
8	103
9	83
10	80
11	77
12	77
13	85
14	103
15	111
16	123
17	102
18	116
19	118
20	112
21	114
22	146
23	123
24	134
25	110
26	123
27	103
28	105
29	104
30	118
31	88
Mean:	105.9

Zürich Provisional Relative Sunspot Numbers	
April 1956	
Date	R_Z
1	60
2	69
3	66
4	66
5	50
6	45
7	63
8	86
9	103
10	145
11	144
12	160
13	178
14	164
15	150
16	120
17	130
18	140
19	130
20	140
21	140
22	120
23	115
24	96
25	104
26	88
27	94
28	67
29	32
30	70
Mean:	104.5



PREDICTED AND OBSERVED SUNSPOT NUMBERS

CALCIUM PLAGE AND SUNSPOT REGIONS

APRIL 1956

CMP Apr. 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
01.7	S24	3448 (2)	3419	26-1000-2.5	27- 2000-2.5	06-1800-2.5	26- 150a-x	27- 290 -1	04- 50a-x
04.2	S19	'3451 (2)	3425	29- 600-1.5	---	09- 500-1			
04.2	N32	3452	New	01- 600-1.5	05- 1000-2	06- 800-2			
04.8	N20	3450	New	29-1000-3	01- 3000-3.5	10-2000-2	30- 20 -1	31- 70 -3	05- 10 -1
06.8	N22	3455 (3)	3423	04- 900-2	06- 1000-2.5	09- 800-2	04- 50a-x	04- 50a-x	04- 50a-x
08.1	S17	3453	New	01-1000-2	12- 3000-3	14-2000-2	02- 50a-x	10- 80 -3	12- 20 -2
08.3	N34	3454 (2)	3422	01-1000-2.5	06-10000-3.5	15-3000-2	02- 10 -x	08- 560 -16	13-100 -2
09.7	N23	3456 (4)	3428	04-2000-2	05- 5000-2	14- 700-1.5	05- 20 -1	11- 50a-x	11- 50a-x
10.5	S25	3458	New	09- 400-1.5	---	12- 500-1			
11.1	N24	3457 (4)	3431	05-4000-2.5	12- 9500-3	15-6000-3	05- 10 -1	10-1030 -10	16-580 -1
13.3	N22	3459 (3)	3432	08-8000-2	10- 7500-3	17-5000-2.5	08- 190 -2	09- 280 -3	17-100 -1
14.0	N35	3469	New	17-4000-4	---	19-4000-3.5	16- 120 -8	17- 420 -7	19-270 -2
14.3	S23	3460 (2)	3433	08-1400-1	11- 3500-2	18-1100-2	08- 390 -1	10- 400 -1	18-170 -1
15.3	N36	3471	New	18-2200-3	---	20-2500-3	17- 80 -3	18- 400 -4	20-270 -2
15.6	S21	3462 (3)	3435	09-2500-3	11- 7500-4	22-6000-3	09- 390 -1	17- 910 -16	22-220 -2
15.8	N14	3463 (2)	3437	09- 600-3	11- 3600-4	21-1200-2	11- 150a-x	13- 490 -7	21-100 -1
16.9	S33	3461	New	09-1500-2	11-10000-4	24-3000-2	10-1160 -3	10-1160 -3	21-170 -5
17.5	N20	3464 (2)	3438	10-1500-2	12- 8000-4	23-5000-2	11- 150a-x	12- 270 -5	19- 50 -4
19.2	S23	3465 (?)	3465	12-1000-2.5	14- 2800-2.5	25-2000-1.5	13- 150 -1	14- 190 -2	19- 10 -x
21.3	S17	3466 (2)	3449	15-3500-2.5	---	25-2000-1.5*	15- 100a-x	---	22- 10 -x
22.2	N27	3467 (3?)	3440	15-2000-2.5	22-13500-4	28-2800-1	16- 10 -1	22-1530 -30	27-670 -4
22.6	N14	3468	New	15-1000-2	21- 1300-2	24- 600-1.5	17- 90 -2	21- 90 -4	23- 20 -1
23.3	S26	3470 (3)	3442	17-4000-3	22- 4500-3	25-4000-3*	18- 70 -2	24- 150a-x	27- 60 -3
24.6	N27	3473 (4)	3443	19-1000-2	20- 2000-2	25- 600-2.5*			
25.3	S23	3472 (3)	3444	19-1500-3	24- 3500-3	25-3200-2.5*	19- 40 -1	20- 90 -4	25- 50a-x
26.2	N18	3474 (4)	3443	19-1000-2	30- 4000-3	01-1000-2	19- 10 -x	27- 320 -5	30-220 -2
28.8	N24	3475 (3)	3447	23-5000-4	24- 6000-4	04-4000-2.5	23- 290 -1	26- 330 -3	02- 50a-x
28.8	S15	3477	New	25- 200-2.5	03- 3000-3.5	04-3000-3	26- 130 -5	01- 420 -8	03- xx -7
29.9	S28	3476 (3)	3448	23-1000-2	25- 2500-3	03- 500-1	24- xx -1	25- 100 -5	26- 20 -1

* No McMath observation April 26-29.

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
Apr.																
1	113	152	X	X	X	X	X	X	33	52	29	41	46	65	24	30
2	47	84	12	14	21	35	17	22	61	97	25	28	90	125	24	33
3	34	43	21	36	17	23	16	23	X	X	16	26	66	98	24	41
4	81	120	38	72	27	37	18	29	35	40	14	16	78	95	28	32
5	49	72	25	40	25	36	11	20	25	26	15	16	66	77	40	59
6	67	79	40	60	19	22	10	15	27	34	X	X	79	106	41	57
7	71	80	37	96	X	X	X	X	22[a]	29[a]	13	20	88[a]	120[a]	29	36
8	118	146	37	59	24	36	28	59	26	45	23	39	116	150	31	33
9	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
10	65	84	23	36	20	23	11	15	X	X	X	X	X	X	X	X
11	193	283	21	44	20	26	15	20	X	X	X	X	X	X	X	X
12	59*	95	23	32	22	25	18	29	24	34	14	17	104	135	31	70
13	117[a]	160[a]	35[a]	59[a]	27[a]	33[a]	24[a]	41[a]	X	X	X	X	75*	100	15	24
14	94	111	58	99	77	106	59	77	84	111	29	36	90*	119	50	80
15	39	52	20	23	72	121	41	49	101	144	X	X	139	151	X	X
16	107	135	18	44	102	128	19	30	X	X	X	X	X	X	X	X
17	54*	74	20	34	45	58	24	30	X	X	X	X	X	X	X	X
18	103	132	22[a]	59[a]	76	135	25[a]	33[a]	63	84	29	49	45	54	18	23
19	87	120	27	46	79	108	45	59	45	62	26	33	63	79	24	31
20	63	88	19	25	71	106	39	71	39	46	28	32	109	147	35	58
21	83	120	20	36	66	88	28	45	39[a]	62[a]	24	29	127	158	38	62
22	77	112	21	44	43	72	33	54	X	X	X	X	X	X	X	X
23	X	X	X	X	X	X	X	X	X	X	X	X	92	138	X	X
24	X	X	X	X	X	X	X	X	74	127	32	57	70	83	23	33
25	X	X	X	X	X	X	X	X	116	177	24	36	116	150	23	33
26	80	110	34	70	88	135	30	59	18[a]	24[a]	23	36	34[a]	44[a]	17	21
27	64	88	23	39	25	30	15	32	X	X	X	X	X	X	X	X
28	68	96	20[a]	36[a]	37	51	16[a]	20[a]	51	77	38	67	57	93	25	29
29	79	122	31	40	58	90	X	X	76	120	43	73	86	139	30	36
30	X	X	X	X	X	X	X	X	28[a]	39[a]	27	36	33[a]	42[a]	17	18

* Yellow line observed.
a Index computed from low weight data.

SOLAR FLARES

APRIL 1956

Observatory	Date Apr. 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
S. Peak	04	1530	1610	40	106	3454	N33	E47	1535	15	5	1	Slow S-SWF
S. Peak	04	1710	1900	110	152	3454	N33	E47	1720	16	4	1	Slow S-SWF
S. Peak	04	2225	2330	65	190	3454	N33	E44	2233	18	4	1	S-SWF
S. Peak	06	2100	2150	50	152	3453	S16	E17	2120	15	7	1	
S. Peak	06	2345	a2405	>20	179	3454	N35	E16	a2405	15	5	1	
Schaus	09	b0954	1100	>66		3457	N23	E30				2	S-SWF
S. Peak	09	1915	2030	75	142	3450	N23	W67	1935	13	3	1	G-SWF
S. Peak	09	1920	2015	55	109	3461	S30	E80	1950	15	4	1	
S. Peak	12	1940	2215	155	166	3464	N20	E65	2033	>28	6	1	G-SWF
McMath	12	1948	a2017	>29		3464	N20	E65				2	
S. Peak	13	2014	2052	38	106	3464	N16	E45	2035	18	4	1	
McMath	13	2015	2100	45		3464	N18	E45				1	
S. Peak	18	b1313	1530	>137	570	3464	N18	W15	1339	28	4	2	G-SWF
Neder.	18	1324	1440	76		3464	N21	W13				3	
S. Peak	19	1823	a1853	>30	344	3461	S31	W35	1851	24	6	2	
S. Peak	19	2340	a2400	>20	103	3467	N22	E32	2350	16	4	1	
McMath	20	1520	1550	30		3467	N33	E26				1	Slow S-SWF
Tokyo	21	0120	0140	20			N15	W35				1	
Tokyo	21	b0130	0150	>20		3466	S15	W05				1	
Tokyo	21	b0135	0155	>20		3461	S15	W55				1	
S. Peak	21	2045	a2125	>40	12.5	3461	S31	W60	2115	18	5	1	
Tokyo	22	b0056	0126	>30		3467	N25	E05				1	
Tokyo	22	0606	0616	10		3467	N25	E05				1	
Tokyo	24	b0415				3467	N25	W25				2	Slow S-SWF
Schaus.	25	b0739	0753	>14		3474	N17	E03				1	
S. Peak	25	1725	1750	25	113	3474	N16	W06	a1740	18	2	1	
S. Peak	26	a1600	1720	<80	205	3467	N25	W56	1610	22	3	1	Slow S-SWF
S. Peak	26	b1725	1910	>105	232	3467	N28	W53	1745	18	5	1	G-SWF
S. Peak	27	2050	a2150	>60	209	3474	N15	W34	2100	30	3	1	Slow S-SWF
McMath	27	b2100	a2135	>35		3474?						2	
Tokyo	29	2328	2348	20		3474	N15	W55				1	
Tokyo	29	b2347	0147	>60		3479	S15	E67				1	

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

Apr. 1, 1410 (3440)	Apr. 9, 1535 (3457)	Apr. 16, 1810 (3462)	Apr. 26, 1415 (3467
1430 (3440)	1835 (3463)	1920 (3469)	1500 (3467
1815 (3442)	Apr. 10, 1408 (3463)*	19, b1820 (3464)	1945 (3467
2050 (3454)	2110 (3462)	~1850 (3467)	b2330 (3474
2, 1415 (3450)	2250 (3464)	20, b1850 (3467)	27, a1540 (3477
3, 2245 (3443)	11, 1500 (3464)	1915 (3461)?	1655 (3474
4, 1645 (3454)	1850 (3463)*	2300 (3467)	b1908 (3474
7, b1530 (3454)	12, 1545 (3457)*	21, 1355 (3463)	28, 1840 (3475
b1530 (3460)	13, 2000 (3454)	1400 (3461)	a2025 (3474
8, 1555 (3459)	14, 1425 (3464)	1935 (3472)	29, 1355 (3474)
1700 (3462)	b1853 (3462)	22, b1324 (3471)	1415 (3475)
1715 (3454)	16, 1400 (3469)	1520 (3461)	30, 1600 (3479)
1730 (3454)	1435 (3462)	23, 1900 (3461)	1630 (3477)
~1915 (3462)	1525 (3469)	25, 2030 (3474)	1705 (3479)
2035 (3457)	1555 (3463)	2140 (3475)	2230 (3479)
2100 (3454)	1800 (3469)	2210 (3474)	

* McMath observation; all others are Sac. Peak.

IONOSPHERIC EFFECTS OF SOLAR FLARES

MARCH 1956

Mar. 1956	Start UT	End UT	Type	Wide-spread Index	Impor-tance	Observation Stations
1	0310	0335	Slow S-SWF	1	1-	OK
	1726	1748	S-SWF	5	2	AN, BE, HU, MC, PR, WS, NE*
	1808	1827	Slow S-SWF	5	1	AN, BE, HU, MC, PR, WS, NE*
2	1158?	1232	S-SWF	1	2	NE*
3	0830	0900	S-SWF	1	1	NE*
9	0007	0027	G-SWF	4	1-	AN, OK, PR
	1357	1429	G-SWF	5	1	BE, HU, MC, PR
10	0438	0635	Slow S-SWF	5	3-	OK, Japan+
	1130	--	S-SWF	1	1	NE*
12	0042	0130	Slow S-SWF	1	1	OK
13	1452	1600	S-SWF	5	3-	BE, HU, MC, PR, WS, NE*, RCA**
	1620	1700	G-SWF	3	1-	AN, MC, WS
14	1228	1235	G-SWF	2	1-	HU, PR
	1550	1620	G-SWF	4	1-	BE, HU, MC, PR
15	0315	0430	G-SWF	4	1	OK, RCA++
	0510	0645	Slow S-SWF	1	2+	OK
	1623	1823	S-SWF	5	3	AN,BE,HU,MC,PR,WS,NE*,RCA**,SW***
16	1119	1150	G-SWF	1	2	NE*
17	0000	0030	Slow S-SWF	1	2	OK
	0222	0230	S-SWF	1	1	OK
	1350	1402	Slow S-SWF	5	1+	BE, HU, MC, PR, NE*
18	1405	1440	G-SWF	3	1-	BE, HU, MC
19	2133	2330	G-SWF	3	3	AN, CO
20	0228	0342	S-SWF	5	3	OK, Japan+
21	1735	1800	G-SWF	2	1-	HU, MC
22	2218	2255	S-SWF	3	1	AN, CO, WS
28	0831	0850	S-SWF	1	1	NE*
	0939	1010	G-SWF	1	1	NE*
29	0555	0650	Slow S-SWF	1	2+	OK
30	0225	0251	Slow S-SWF	3	1	AN, OK
	0328	0357	S-SWF	1	1	OK
31	0410	0428	S-SWF	3	1-	AN, OK
	1350	1458	S-SWF	5	3	BE,HU,MC,PR,WS,NE*,RCA**,SW***

* Nederhorst den Berg, Netherlands.
** RCA Communications Inc. at Brentwood, N.J., Somerton, England and Barbadoes.
*** Enköping, Sweden.
\+ Hiraiso Radio Wave Observatory, Japan.
++ RCA Communications Inc. at Hong Kong.

SOLAR RADIO WAVES (BOULDER) -- 167 MC

3-HOURLY AND DAILY FLUX

APRIL 1956

April 1956	Flux Hours UT 12-15	15-18	18-21	21-24	Flux Daily	Variability Hours UT 12-15	15-18	18-21	21-24	Variability Daily	Observed Periods Hours UT
1	--	--	--	10	11	(0)	(0)	(0)	(0)	(0)	1244-2509
2	--	--	9	9	9	(0)	0	(0)	(0)	(0)	1243-2508
3	--	10	9	--	9	(0)	(1)	1	1	1	1241-2511
4	--	9	--	--	--	0	0	--	--	0	1239-1404, 1536-1648*
5	--	--	--	--	--	0	0	(1)	--	(1)	1238-1742, 1908-2025
6	--	--	--	--	--	--	--	--	--	--	2321-2514
7	--	9	--	--	--	1	2	--	--	2	1235-1805, 2347-2515
8	--	9	15	13	12	1	2	1	1	2	1233-2516
9	9	9	10	12	10	1	2	2	2	2	1232-2517
10	24	16	11	11	15	3	3	3	3	3	1230-2518
11	12	--	--	--	12	2	(2)	(2)	(2)	(2)	1228-2147, 2253-2519
12	16	18	23	31	22	1	2	2	2	2	1227-2520
13	24	25	19	23	23	3	3	2	3	3	1225-2521
14	19	20	21	20	20	3	(3)	(3)	3	3	1224-2521
15	33	35	31	30	32	3	3	3	(3)	3	1222-2522
16	24	16	11	13	15	3	3	2	3	3	1221-2523
17	18	15	17	22	18	2	2	3	3	3	1219-2525
18	23	34	28	25	28	2	2	2	2	2	1218-2526
19	9	9	9	13	10	2	2	2	2	2	1216-2526
20	8	10	9	8	9	0	2	(2)	2	(2)	1215-2528
21	10	10	9	10	10	2	2	1	1	2	1214-2529
22	8	8	8	8	8	1	0	(2)	(2)	(2)	1212-2529
23	9	8	8	8	8	(1)	(1)	(1)	2	2	1211-2530
24	17	18	19	16	17	1	2	1	2	2	1209-2531
25	--	9	13	--	11	2	2	3	2	3	1208-2532
26	20	19	16	14	17	2	2	2	2	2	1207-2532
27	10	9	9	14	10	2	2	3	3	3	1205-2534
28	8	9	8	8	8	0	(0)	(1)	(1)	(1)	1204-2537
29	8	9	9	14	10	1	2	2	2	2	1203-2538
30	8	8	8	8	8	1	2	(1)	(1)	2	1201-2539

* Additional observing period 2403-2512

SOLAR RADIO WAVES (BOULDER) -- 460 MC

3-HOURLY AND DAILY FLUX

APRIL 1956

April 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	37	36	36	35	36	0	0	0	0	0	1244-2509
2	37	37	37	37	37	0	1	0	0	1	1243-2510
3	36	37	38	37	37	0	0	0	0	0	1241-2511
4	36	37	--	36	36	0	0	0	0	0	1239-2142, 2253-2512
5	35	37	37	37	37	0	0	0	(0)	(0)	1238-2513
6	38	40	39	40	39	0	(0)	0	0	(0)	1236-2514
7	38	40	--	--	39	0	0	--	--	0	1235-1805, 2352-2515
8	39	41	43	43	42	0	0	0	0	0	1233-2516
9	42	44	45	46	45	0	0	0	0	0	1232-2517
10	42	43	45	44	43	0	0	0	0	0	1230-2518
11	42	42	--	--	42	0	0	(0)	(0)	(0)	1228-2519
12	43	45	45	45	45	0	0	0	0	0	1227-2520
13	44	45	44	44	44	0	0	0	0	0	1225-2521
14	47	49	51	49	49	0	0	0	0	0	1224-2521
15	46	48	49	49	48	0	0	0	0	0	1222-2522
16	48	51	50	50	50	0	(0)	(0)	(0)	(0)	1221-2523
17	52	54	50	50	51	0	0	0	0	0	1219-2525
18	50	51	50	49	50	1	0	0	0	1	1218-2526
19	44	44	46	47	46	0	0	0	0	0	1216-2526
20	42	46	45	46	45	0	0	0	0	0	1215-2528
21	45	47	46	47	46	0	0	0	0	0	1214-2529
22	44	45	47	45	46	0	0	0	0	0	1212-2529
23	43	45	43	43	43	0	(0)	0	0	(0)	1211 2530
24	44	45	46	45	45	0	0	0	1	1	1209-2531
25	--	42	42	41	42	--	1	0	1	1	1619-2532
26	40	42	41	41	41	0	0	0	0	0	1207-2532
27	41	42	41	42	42	0	0	1	2	2	1205-2534
28	41	41	41	42	41	0	0	(0)	0	(0)	1204-2537
29	39	40	41	41	40	1	0	0	1	1	1203-2538
30	40	40	41	42	41	0	0	0	0	0	1201-2539

SOLAR RADIO WAVES (BOULDER) -- 167 MC

3-HOURLY AND DAILY FLUX

APRIL 1956

April 1956	Flux: Hours UT 12-15	15-18	18-21	21-24	Flux: Daily	Variability: Hours UT 12-15	15-18	18-21	21-24	Variability: Daily	Observed Periods Hours UT
1	--	--	--	10	11	(0)	(0)	(0)	(0)	(0)	1244-2509
2	--	--	9	9	9	(0)	0	(0)	(0)	(0)	1243-2508
3	--	10	9	--	9	(0)	(1)	1	1	1	1241-2511
4	--	9	--	--	--	0	0	--	--	0	1239-1404, 1536-1648*
5	--	--	--	--	--	0	0	(1)	--	(1)	1238-1742, 1908-2025
6	--	--	--	--	--	--	--	--	--	--	2321-2514
7	--	9	--	--	--	1	2	--	--	2	1235-1805, 2347-2515
8	--	9	15	13	12	1	2	1	1	2	1233-2516
9	9	9	10	12	10	1	2	2	2	2	1232-2517
10	24	16	11	11	15	3	3	3	3	3	1230-2518
11	12	--	--	--	12	2	(2)	(2)	(2)	(2)	1228-2147, 2253-2519
12	16	18	23	31	22	1	2	2	2	2	1227-2520
13	24	25	19	23	23	3	3	2	3	3	1225-2521
14	19	20	21	20	20	3	(3)	(3)	3	3	1224-2521
15	33	35	31	30	32	3	3	3	(3)	3	1222-2522
16	24	16	11	13	15	3	3	2	3	3	1221-2523
17	18	15	17	22	18	2	2	3	3	3	1219-2525
18	23	34	28	25	28	2	2	2	2	2	1218-2526
19	9	9	9	13	10	2	2	2	2	2	1216-2526
20	8	10	9	8	9	0	2	(2)	2	(2)	1215-2528
21	10	10	9	10	10	2	2	1	1	2	1214-2529
22	8	8	8	8	8	1	0	(2)	(2)	(2)	1212-2529
23	9	8	8	8	8	(1)	(1)	(1)	2	2	1211-2530
24	17	18	19	16	17	1	2	1	2	2	1209-2531
25	--	9	13	--	11	2	2	3	2	3	1208-2532
26	20	19	16	14	17	2	2	2	2	2	1207-2532
27	10	9	9	14	10	2	2	3	3	3	1205-2534
28	8	9	8	8	8	0	(0)	(1)	(1)	(1)	1204-2537
29	8	9	9	14	10	1	2	2	2	2	1203-2538
30	8	8	8	8	8	1	2	(1)	(1)	2	1201-2539

* Additional observing period 2403-2512

SOLAR RADIO WAVES (BOULDER) -- 460 MC

3-HOURLY AND DAILY FLUX

APRIL 1956

April 1956	Flux, Hours UT 12-15	Flux, Hours UT 15-18	Flux, Hours UT 18-21	Flux, Hours UT 21-24	Flux, Daily	Variability, Hours UT 12-15	Variability, Hours UT 15-18	Variability, Hours UT 18-21	Variability, Hours UT 21-24	Variability, Daily	Observed Periods, Hours UT
1	37	36	36	35	36	0	0	0	0	0	1244-2509
2	37	37	37	37	37	0	1	0	0	1	1243-2510
3	36	37	38	37	37	0	0	0	0	0	1241-2511
4	36	37	--	36	36	0	0	0	0	0	1239-2142, 2253-2512
5	35	37	37	37	37	0	0	0	(0)	(0)	1238-2513
6	38	40	39	40	39	0	(0)	0	0	(0)	1236-2514
7	38	40	--	--	39	0	0	--	--	0	1235-1805, 2352-2515
8	39	41	43	43	42	0	0	0	0	0	1233-2516
9	42	44	45	46	45	0	0	0	0	0	1232-2517
10	42	43	45	44	43	0	0	0	0	0	1230-2518
11	42	42	--	--	42	0	0	(0)	(0)	(0)	1228-2519
12	43	45	45	45	45	0	0	0	0	0	1227-2520
13	44	45	44	44	44	0	0	0	0	0	1225-2521
14	47	49	51	49	49	0	0	0	0	0	1224-2521
15	46	48	49	49	48	0	0	0	0	0	1222-2522
16	48	51	50	50	50	0	(0)	(0)	(0)	(0)	1221-2523
17	52	54	50	50	51	0	0	0	0	0	1219-2525
18	50	51	50	49	50	1	0	0	0	1	1218-2526
19	44	44	46	47	46	0	0	0	0	0	1216-2526
20	42	46	45	46	45	0	0	0	0	0	1215-2528
21	45	47	46	47	46	0	0	0	0	0	1214-2529
22	44	45	47	45	46	0	0	0	0	0	1212-2529
23	43	45	43	43	43	0	(0)	0	0	(0)	1211 2530
24	44	45	46	45	45	0	0	0	1	1	1209-2531
25	--	42	42	41	42	--	1	0	1	1	1619-2532
26	40	42	41	41	41	0	0	0	0	0	1207-2532
27	41	42	41	42	42	0	0	1	2	2	1205-2534
28	41	41	41	42	41	0	0	(0)	0	(0)	1204-2537
29	39	40	41	41	40	1	0	0	1	1	1203-2538
30	40	40	41	42	41	0	0	0	0	0	1201-2539

SOLAR RADIO WAVES (BOULDER) -- 167 MC

OUTSTANDING EVENTS

APRIL 1956

April 1956	Type	Start UT	Duration Hrs:Mins	Maximum Time UT	Maximum Inst. Flux	Maximum Smd. Flux	Remarks
3	1	1702	06:55	2254.9	57	--	
7	1	(1235)	(05:30)	1527.0	~110	--	
7	1	(2347)	(01:28)	2354.4	~150	--	
8	4	1553	(09:23)	1647.9	310	8	
9	1	(1232)	(08:22)	1637.6	170	--	
9	4	2054.5	(04:23)	2056.1	280	4	
10	6	(1230)	(12:48)	1724.3	590	13	
10	8	2501.5	00:02.2	2502	~900	~300	
11	1	(1228)	(12:51)	1419	330	--	See note 1
12	6	(1227)	(12:53)	~2300	380	22	
13	6	(1225)	(12:56)	~2400	420	17	
14	6	(1224)	(12:57)	2248	>1800	14	
15	6	(1222)	(13:00)	~1600	~1000	27	
16	6	(1221)	(13:02)	~1300	~400	13	
16	8	1944.3	00:00.8	1944.4	>2500	--	
17	6	(1219)	(13:06)	~2200	390	14	
18	6	(1218)	(13:08)	~1700	1400	25	
18	8	1530	00:11	1535	380	210	
19	1	(1216)	(13:10)	~1900	550	--	
20	1	1546	(09:42)	~1800	600	--	
21	1	(1214)	(13:15)	1358	200	--	
22	1	1333	(11:56)	1334	51	--	
23	2	2243.8	00:03.3	2243.9	240	23	
24	6	(1209)	(13:22)	~1800	140	11	
25	6	(1208)	(13:24)	~2000	380	5	
25	8	2241.0	00:04.2	2242.5	>1900	660	
25	8	2353.0	00:01.8	2353.1	>1900	660	
25	8	2438.0	00:08.0	~2439	>1900	~660	
26	6	(1207)	(13:25)	~2400	110	11	
27	1	(1205)	(08:49)	1921	86	--	
27	8	1843.0	00:01.7	1843.4	>2500	750	
27	9	2053.9	04:40	2054.0	>2800	320	
29	1	1357	09:22	1558	90	--	
29	4	2319.7	(02:18)	2320.5	240	25	
30	2	1502	00:37	1513.1	160	--	

Note 1. Interference from nearby ignition may obscure some occurences with flux less than 250 on April 5, 1908-2025 and April 11, 1552-2519.

Note 2. Infrequently interference may have been mistaken for solar activity.

SOLAR RADIO WAVES (BOULDER) -- 460 MC

OUTSTANDING EVENTS

APRIL 1956

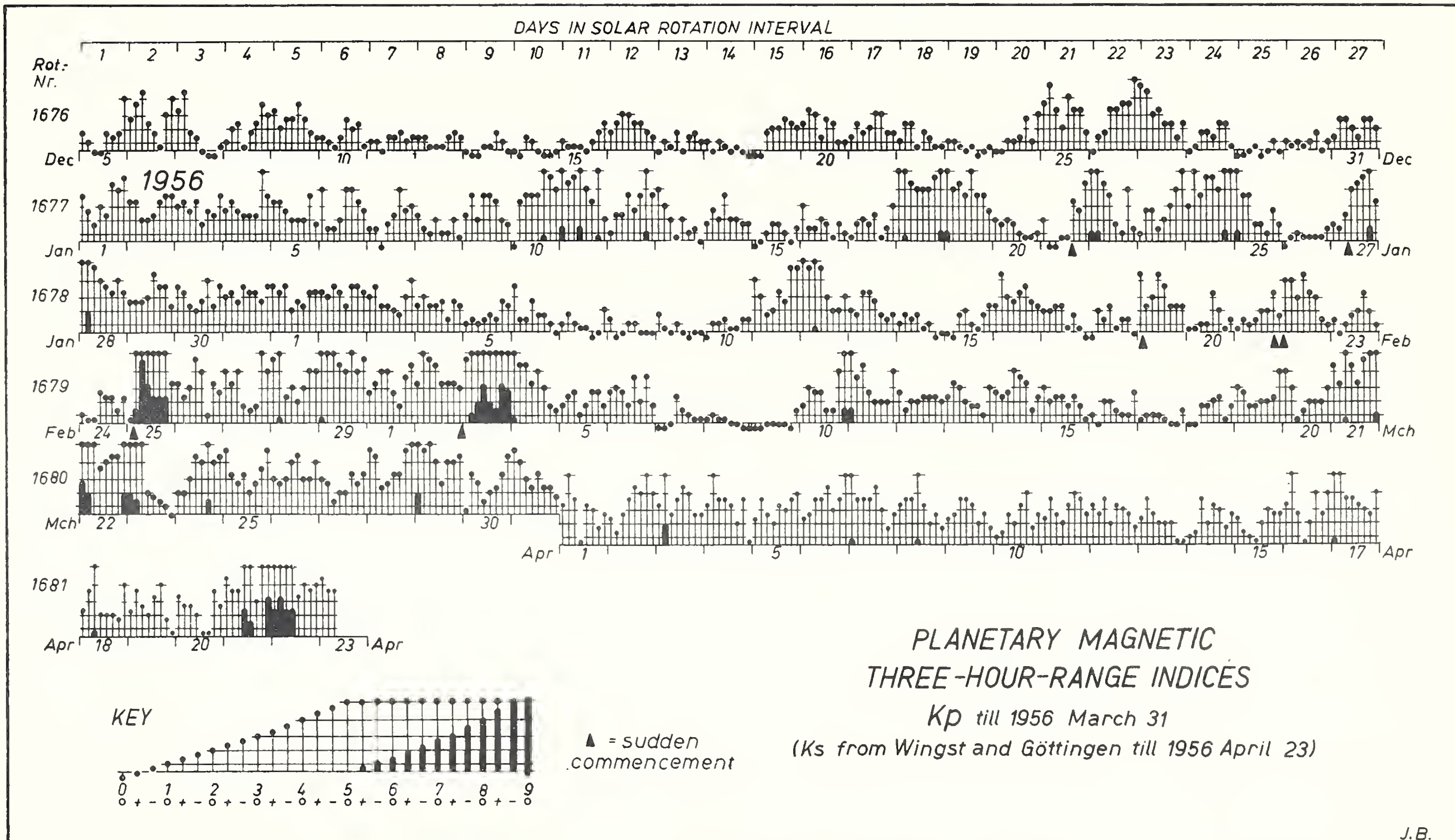
April 1956	Type	Start UT	Duration Hrs:Mins	Maximum Time UT	Maximum Inst. Flux	Maximum Smd. Flux	Remarks
2	3	1656.6	00:01.5	1656.9	120	28	
9	6	1637.6	(08:40)	~2100	--	10	
10	6	(1230)	(12:48)	~1800	--	9	
12	6	(1227)	(12:53)	~2000	--	10	
13	6	(1225)	(12:56)	~1800	--	10	
13	3	1840.9	00:04.2	1842.2	74	13	
14	6	(1224)	(12:57)	~1900	--	15	
15	6	(1222)	(13:00)	~2100	--	14	
16	6	(1221)	(13:02)	~1600	--	14	See note
17	6	(1219)	(13:06)	~1600	--	18	
18	4	1319.4	(12:07)	1323.1	200	15	
19	6	(1216)	(13:10)	~2100	--	12	
20	6	(1215)	(13:13)	~1600	--	11	
21	6	(1214)	(13:15)	~1700	--	11	
22	6	(1212)	(13:17)	~2000	--	11	
24	6	(1209)	(13:22)	~1800	--	10	
25	1	(1619)	(08:26)	2438.5	490	--	
27	3	1843.3	00:00.4	1843.5	190	--	
27	3	1929.2	00:00.6	1929.4	120	--	
27	9	2051.2	01:03	2959	>3000	810	
29	3	1425.3	00:01.3	1425.7	150	71	
29	3	2211.7	00:01.4	2212.5	140	56	
29	2	2312.7	00:06.7	2351.2	78	7	

Note: Interference from nearby ignition may obscure some occurençes with flux less than 100 during the following periods: April 5, 2241-2429; April 11, 1555-2426; April 16, 1645-2523.

GEOMAGNETIC ACTIVITY INDICES

MARCH 1956

Mar. 1956	C	Values Kp Three-hour Gr. interval 1 2 3 4	5 6 7 8	Sum	Ap	Final Selected Days
1	1.2	3- 3+ 4o 4o	3- 2- 4- 4+	26+	20	Five
2	1.1	3+ 5o 5- 4+	3+ 3+ 3+ 3o	30+	26	Quiet
3	1.9	5- 6- 6+ 7+	6+ 6o 7+ 7o	51-	102	
4	1.2	5+ 4+ 4+ 3+	4o 3o 2- 1+	27+	24	7
5	0.6	2- 2+ 3- 1o	2- 3- 3- 2-	16+	8	8
						9
6	0.8	3- 3o 3- 2-	4- 2o 4- 2-	21o	13	17
7	0.1	0o 0o 0+ 2+	1+ 1o 1- 1-	6+	3	18
8	0.1	1- 1o 1- 1-	0+ 0+ 0o 0o	4-	2	
9	0.0	0o 0o 0+ 0+	0+ 0+ 0o 1+	3-	2	
10	1.2	2- 3o 3- 3-	1+ 1+ 4o 6o	23-	20	
11	1.3	6o 4- 4+ 3-	2o 2o 2o 4o	27-	24	Five
12	0.6	3- 1+ 2o 2o	2+ 2+ 2+ 2o	17o	8	Disturbed
13	0.7	2+ 3+ 3o 2o	2- 2- 1o 3o	18o	10	
14	0.8	3- 2+ 3- 4o	4- 3+ 1+ 2+	22+	14	3
15	0.4	3o 2o 2+ 2+	2- 2+ 2- 1-	16o	8	21
						22
16	0.3	1o 0+ 2o 2o	1+ 1o 1o 3-	11+	6	24
17	0.0	1- 1o 1o 1o	1- 0+ 0+ 1+	6+	3	29
18	0.3	0+ 0+ 2- 2-	2o 2+ 1- 2-	11-	5	
19	0.9	3o 3- 2- 2-	2o 2o 2+ 4o	19+	11	
20	0.7	4o 3o 1- 1+	2o 2o 2o 3o	18o	11	
21	1.5	4+ 3+ 5+ 4+	3+ 5- 5o 6-	36o	39	Ten
22	1.8	7o 6+ 5o 4-	4o 4+ 4+ 6+	41o	60	Quiet
23	1.3	6+ 6o 5o 2o	2- 1+ 1o 0+	24-	31	
24	1.2	2o 2o 3o 4+	4o 6o 4o 4+	30-	28	5
25	1.1	5- 3+ 3- 3+	2o 3- 4- 5-	27o	21	7
						8
26	1.2	3o 3- 3o 4o	4+ 3o 3o 4o	27o	20	9
27	0.8	3o 3- 1+ 2o	2o 3+ 3- 3+	20+	12	12
28	1.2	5- 4+ 2+ 3-	3+ 3+ 5- 5o	30+	27	13
29	1.5	6+ 5- 5o 4o	3- 4o 4o 4+	35o	38	15
30	0.9	1- 3+ 3- 1+	2o 2+ 3+ 4+	20o	13	16
31	0.9	5- 4o 3o 2+	3+ 2+ 2+ 2-	24-	16	17
Mean:	0.89			Mean:	20	18


DAYS IN SOLAR ROTATION INTERVAL
Rot.-Nr.
1676
1677
1678
1679
1680
1681
1956
Dec
Jan
Feb
Mch
Apr
KEY
▲ = sudden commencement
PLANETARY MAGNETIC
THREE-HOUR-RANGE INDICES
Kp till 1956 March 31
(Ks from Wingst and Göttingen till 1956 April 23)
J.B.

CRPL RADIO PROPAGATION QUALITY FIGURES AND FORECASTS

NORTH ATLANTIC

MARCH 1956

Mar. 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	6+	7+	7-	6	6	6	6	7-	7	7		3	2
2	6o	6+	7+	7-	6	6	7	7	7-	6	7		(4)	3
3	6o	5+	5+	4o	6	6	5	4	5o	6	7		(5)	(6)
4	4o	4o	6+	7-	4	4	6	6	5+	6	7		(4)	3
5	7-	6+	7+	7o	6	6	7	7	7o	5	7		2	1
6	7o	6+	7o	7o	7	7	7	7	7-	7	5		3	3
7	7o	6o	7-	7o	7	7	7	6	7-	7	6		1	1
8	7+	7-	7o	7o	7	7	7	7	7o	7	6		1	0
9	8-	7o	7+	7+	7	7	7	7	7+	7	7		0	1
10	8-	7o	7+	7-	7	7	7	7	7+	7	7		3	3
11	5+	6-	7-	7o	6	5	7	6	6+	7	7		(4)	3
12	7o	6+	7+	7o	7	6	7	7	7o	7	7		2	2
13	7-	7-	6+	7+	7	6	7	7	7-	7	7		3	2
14	7+	7-	6+	7o	7	7	7	7	7o	7	7		3	2
15	7+	7o	7o	7+	7	7	7	7	7o	7	7		2	2
16	8-	7-	7o	8-	7	7	7	7	7+	7	7		1	2
17	8-	7o	7+	7+	7	7	7	7	7+	6	7		0	1
18	7+	7o	7o	7o	7	7	7	7	7o	4	7		1	1
19	7+	7o	7+	7o	7	7	7	7	7+	4	7		2	2
20	7o	7+	7+	7+	7	7	7	7	7+	7	5		2	2
21	7-	6+	7+	7-	7	7	7	7	7-	7	6		(4)	(4)
22	4+	4+	6o	6-	6	4	6	5	5o	7	6		(5)	(4)
23	5-	5-	7o	7+	4	4	7	7	6+	5	6		(4)	1
24	7o	7o	7-	7-	6	6	7	7	7-	6	6		3	(4)
25	6-	6+	7-	7+	7	6	7	7	7-	7	6		3	3
26	7o	6+	6+	7-	7	6	6	6	7-	7	6		3	3
27	7-	7-	7o	7-	6	7	7	7	7-	6	7		2	2
28	6+	7-	7o	6-	6	6	7	7	7-	6	7		(4)	3
29	4o	5-	7-	7-	6	4	7	7	6-	6	7		(5)	3
30	7-	6+	7+	7-	6	7	7	7	7-	6	6		2	3
31	6-	7-	6+	7-	6	6	7	7	6+	6	6		3	2

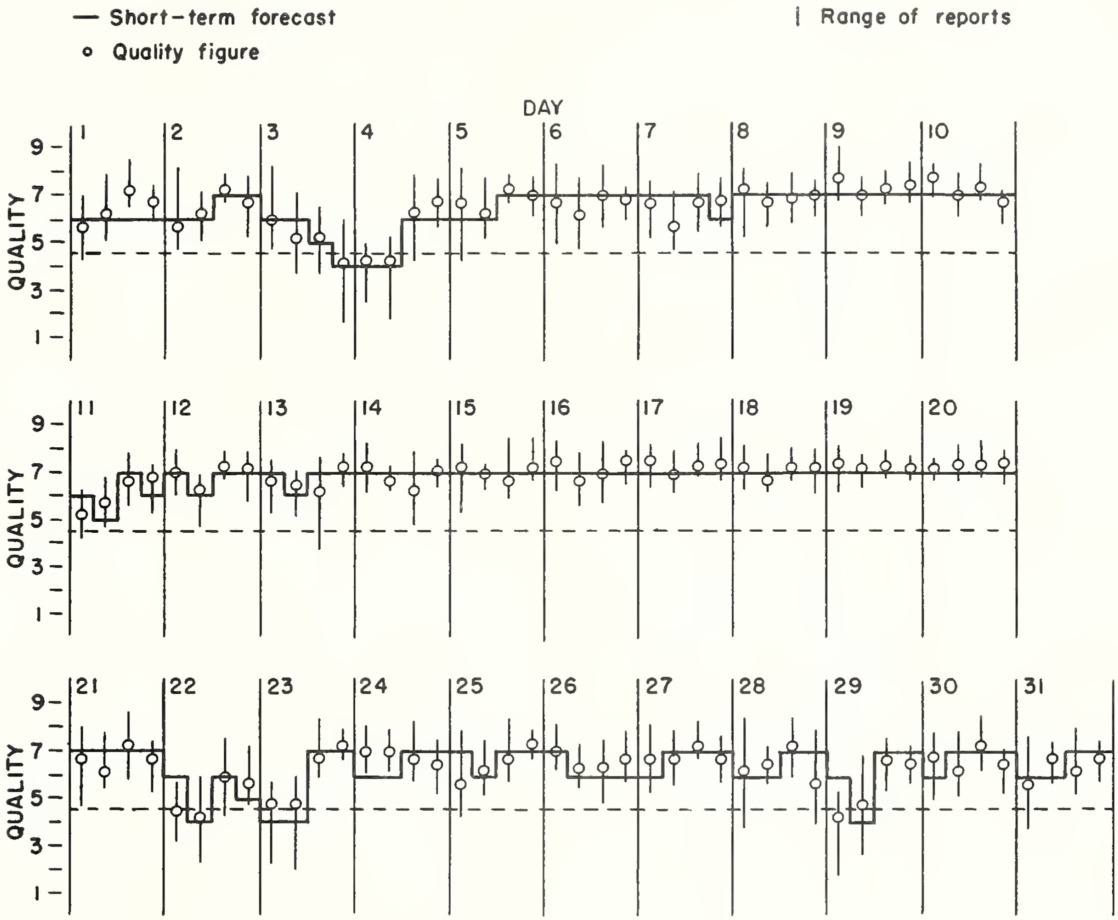
Score		00	06	12	18	1-4 days	4-7 days
Quiet Periods	P	17	17	27	22	17	17
	S	11	12	4	8	10	10
	U	0	0	0	0	2	4
	F	0	0	0	0	2	0
Disturbed Periods	P	1	2	0	1	0	0
	S	0	0	0	0	0	0
	U	0	0	0	0	0	0
	F	2	0	0	0	0	0

( ) represent disturbed values.

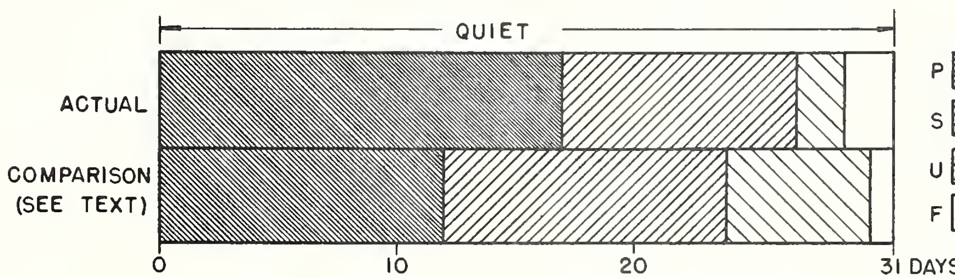
CRPL RADIO PROPAGATION QUALITY FIGURES AND FORECASTS

NORTH ATLANTIC

MARCH 1956

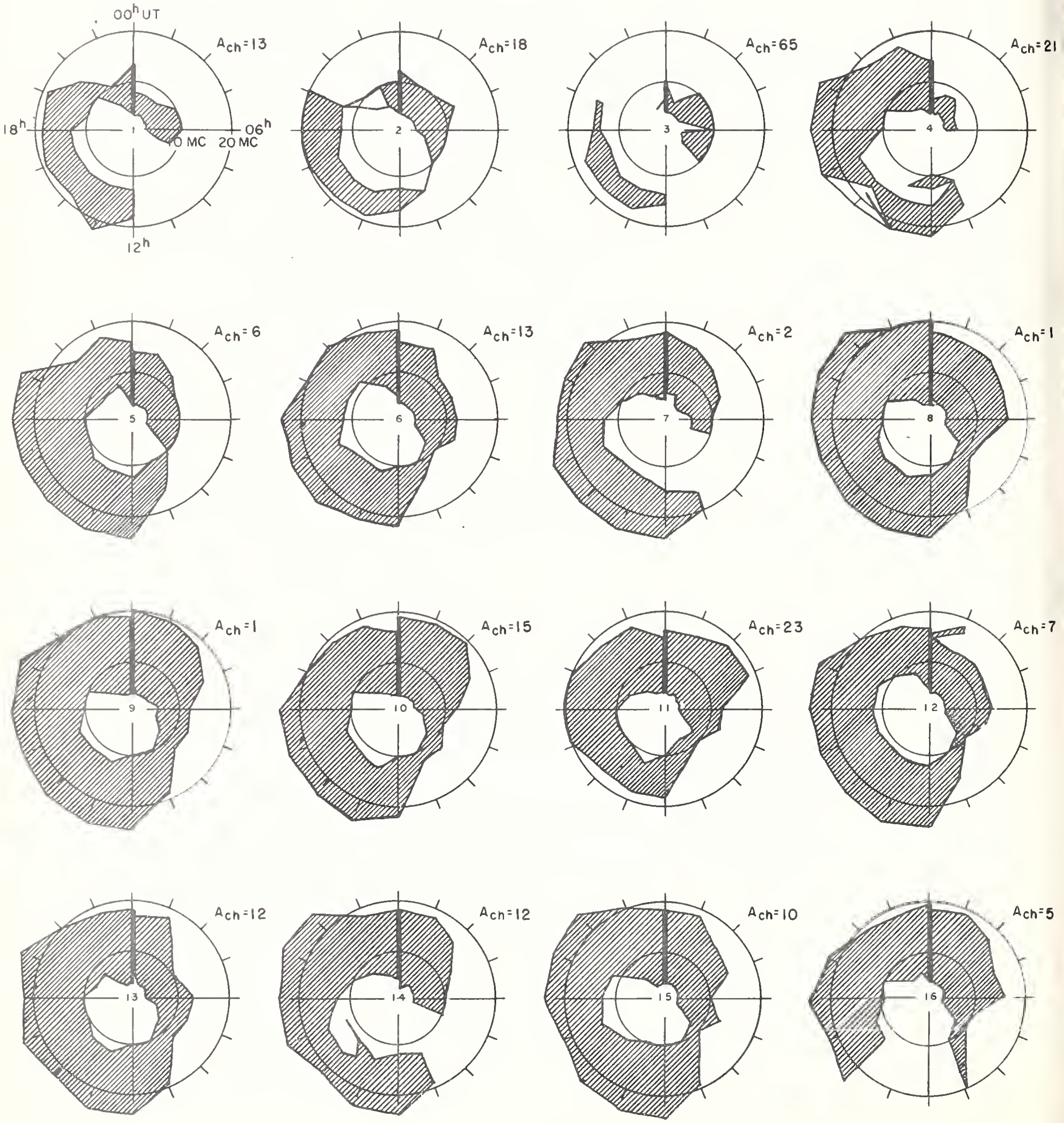


OUTCOME OF ADVANCE FORECASTS (1 TO 4 DAYS AHEAD)

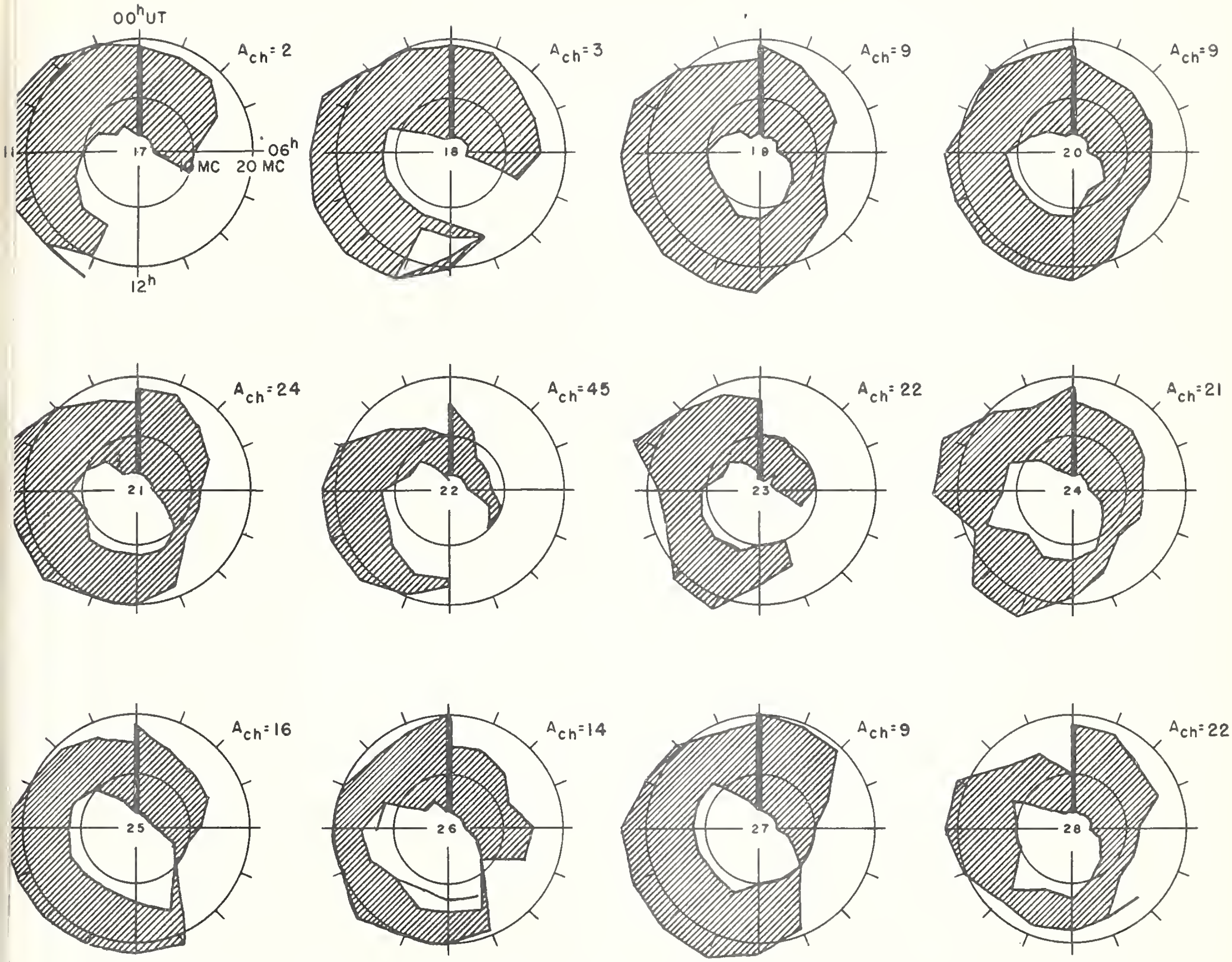


USEFUL FREQUENCY RANGES -- NORTH ATLANTIC PATH

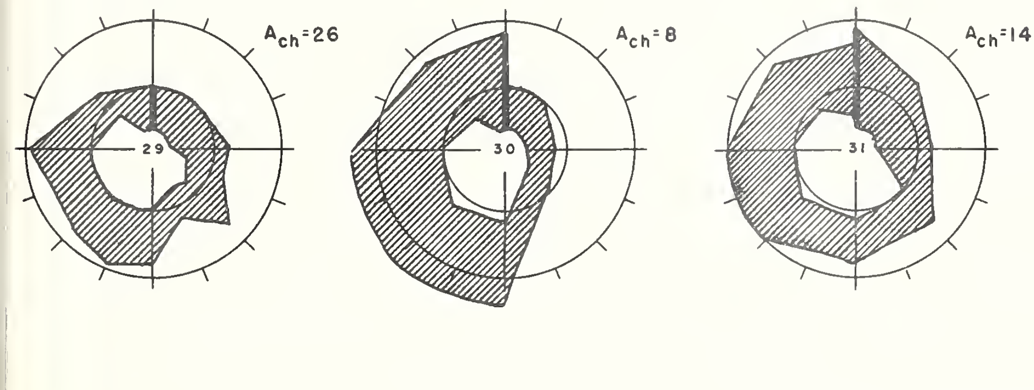
MARCH 1956



MARCH 1956



BEGINNING 1500UT MARCH 29, DATA FOR ONLY EVERY THIRD HOUR



Adapted from Observations by Deutschen Bundespost

CRPL RADIO PROPAGATION QUALITY FIGURES AND FORECASTS

NORTH PACIFIC

MARCH 1956

Mar. 1956	North Pacific 9-hourly quality figures			Short-term forecasts issued at			Whole day index	Advance forecasts (Jp reports) for whole day; issued in advance by:			Geomagnetic 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	6	6	5	6	6	7	6		(4)	3
2	6	5	6	7	6	5	6	7	6		(5)	3
3	4	1	1	6	5	3	(2)	6	6		(7)	(7)
4	2	3	6	4	3	6	(3)	5	6		(4)	3
5	6	5	6	6	6	6	6	4	5		2	2
6	7	6	7	6	6	6	7	4	5		3	2
7	6	5	6	6	6	6	6	6	4		1	1
8	6	6	7	6	6	6	6	6	6		1	0
9	7	6	7	7	7	7	7	6	6		0	1
10	7	7	6	6	7	7	7	6	6		2	2
11	6	7	7	5	6	7	7	5	5		(4)	2
12	7	6	6	6	7	7	6	5	5		1	2
13	6	6	7	7	6	6	7	6	6		3	2
14	6	5	7	5	6	6	6	6	7		2	3
15	6	6	7	7	7	7	6	7	7		3	2
16	6	7	7	7	7	7	7	7	7		2	1
17	7	7	7	7	6	7	7	6	6		1	1
18	7	7	7	7	7	7	7	4	6		1	2
19	6	6	6	7	7	7	6	4	6		1	3
20	6	6	7	6	6	6	7	6	7		1	2
21	6	5	7	7	4	5	6	6	7		(4)	(5)
22	4	4	4	4	4	6	(4)	6	7		(7)	(4)
23	5	6	7	4	5	6	6	5	5		(5)	1
24	6	4	4	6	6	5	5	5	5		3	(4)
25	5	6	6	5	5	6	6	6	6		(4)	3
26	6	5	6	6	5	6	6	7	6		3	2
27	6	6	6	6	6	6	6	7	5		3	3
28	6	6	5	6	6	6	6	6	5		(4)	(4)
29	4	5	6	5	4	5	5	6	5		(5)	3
30	6	6	6	6	6	6	6	5	5		2	3
31	6	6	6	5	6	7	7	5	5		(4)	3
Score: Quiet Periods P				14	12	14		8	10			
S				13	15	13		14	14			
U				0	0	1		2	3			
F				0	0	0		4	1			
Disturbed Periods P				1	2	0		0	0			
S				1	0	1		0	0			
U				1	0	1		1	0			
F				1	2	1		2	3			

( ) represent disturbed values.

CRPL RADIO PROPAGATION QUALITY FIGURES AND FORECASTS

NORTH PACIFIC

MARCH 1956