PART B

SOLAR - GEOPHYSICAL DATA

ISSUED
SEPTEMBER 1956

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

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CONTENTS

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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, $\bar{R}$, 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, 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.

<u>3-hourly and Daily Flux</u> -- 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.

<u>Outstanding Events</u> -- 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. <u>118</u>, 169, 1953). The categories of events are identified in the table by numbers, which do not necessarily indicate the magnitude of the event:

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

1 - <u>Series of bursts</u> -- 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.

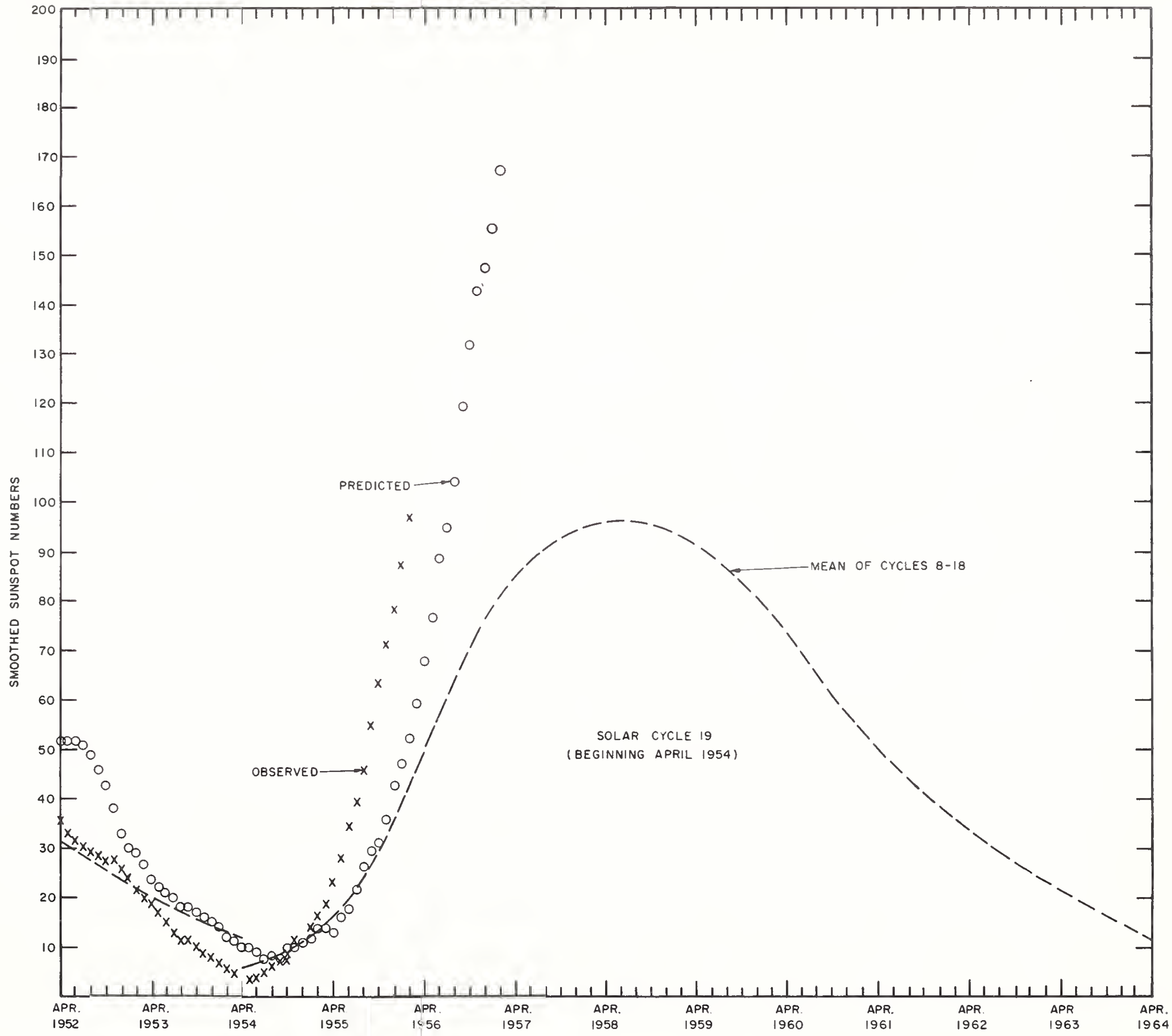
The table, analagous to that for Qa, includes the 9-hourly quality figures; whole day quality figures; short term forecasts issued by NPRWS three times daily at 02^h, 09^h, and 18^h UT, applicable to the stated 9-hour periods; advance forecasts issued twice weekly by NPRWS (CRPL-Jp report); and half-day 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 July 1956	
Date	R_A'
1	154
2	147
3	143
4	133
5	142
6	151
7	151
8	152
9	140
10	154
11	176
12	166
13	169
14	143
15	138
16	115
17	73
18	68
19	58
20	70
21	75
22	80
23	73
24	73
25	82
26	85
27	82
28	105
29	107
30	127
31	123
Mean:	117.9

Zürich Provisional Relative Sunspot Numbers August 1956	
Date	R_Z
1	140
2	148
3	146
4	149
5	152
6	149
7	151
8	140
9	152
10	165
11	146
12	148
13	150
14	140
15	143
16	143
17	131
18	173
19	192
20	217
21	224
22	237
23	213
24	232
25	154
26	178
27	196
28	198
29	200
30	214
31	182
Mean:	171.1



PREDICTED AND OBSERVED SUNSPOT NUMBERS

CALCIUM PLAGE AND SUNSPOT REGIONS

AUGUST 1956

CMP Aug. 1956	Lat.	McMath Plage Number	Return of Region	Calcium Plage Data Date-Area-Intensity			Sunspot Data Date-Area-Count		
				First seen	Maximum	Last seen	First seen	Maximum	Last seen
01.8	S15	3594	New	27-1500-3	04- 4000-4	07-3600-2.5	29- 50a-x	01- 360-5	06- x -4
02.6	N32	3595 (2)	3560	27-1800-3	29- 2000-2	08-1500-1.5			
04.1	N24	3596 (6)	3564	28-2000-2	30- 3200-4	10-2000-2	29- 50a-x	31- 100-8	06- x -2
06.2	N38	3599	New	30-1000-2	01- 2500-2	12-1000-1			
06.4	N18	3598 (2)	3565	30-3000-4	04-15000-4	13-2000-1	30-730 -4	05-1800-17	12- 440 -1
06.5	S24	3600 (5?)	3567	01-1000-2.5	10- 3000-2	13- 500-1	01- 50a-x	05- 80-2	05- 80 -2
07.3	N27	3610	New	07- 600-2.5	09- 1000-2.5	13-1000-2.5	07- 60 -5	07- 60-5	08- 40 -4
08.0	S21	3604	New	04- 800-1.5	04- 800-1.5	09- 400-1.5			
09.0	N21	3602 (3?)	3570?	02-1000-2	04- 3000-2.5	15-2000-1	02- 50 -1	05- 50-1	07- 20 -3
09.3	S32	3606	New	07- 500-1.5	12- 1400-1.5	13-1000-1.5			
10.3	N16	3605 (2)	3571	04-2500-2.5	10- 3500-3	16-3000-2	06- x -4	08- 70-6	09- 20 -3
12.4	N20	3607 (3)	3574	05-2800-1	08- 8000-4	18-6500-2.5	05-870 -1	07-1160-17	18- 270 -3
12.4	N35	3608 (7?)	3572	07-5000-2	07- 5000-2	19-1000-1			
12.9	S18	3611 (5)	3575	07-2000-1.5	08- 2000-2	17-1200-1			
14.0	N16	3612 (3)	3574	08-2000-2.5	11- 2000-2.5	20-1000-1			
14.1	N25	3609 (2)	3577	07-2000-1.5	08- 6000-3	20-3000-2	07-220 -2	11- 300-2	16- 20 -3
14.2	S22	3613 (5)	3576	08-2000-2	10- 2200-2.5	19-3000-2.5			
15.3	S17	3615 (5)	3576	09-5000-3.5	18- 8500-3.5	21-7000-3	09-630 -2*	13-1830-15	21- 150a-x
16.0	N28	3614 (2)	3578	09-4000-3	20- 7000-3	22-3000-2*		20- 270-2	21- 150a-x*
16.7	N27	3618 (2)	3578	10- 600-2			11- x -1		
16.8	N14	3622	New	12- 200-2.5	14- 500-2.5	20- 300-1			
17.1	S20	3621 (2)	3579	12-1500-2	21- 1600-1.5	22-1500-1	12- 70 -1	13- 70-1	16- 20 -1
19.0	S24	3631	New	18- 400-3	21- 3000-3.5	24-4000-3.5	18- 60 -5	23- 700-7	24- 680 -5
20.3	S19	3625	New	15-2000-2	24- 6000-3.5	26-3000-3	17- 30 -3	25-1550-3	25-1550-3
21.0	N23	3624 (2)	3590	13-1000-3	16- 6500-3.5	27-2000-3	14-580 -1	24-1010-21	26- 970-2
21.7	N14	3627	New	16- 700-2	16- 700-2	22- 200-1.5			
22.0	S20	3628	New	16-2500-2.5	22- 6000-3	27-4000-3.5	16- 40 -2	20- 470-10	27- 390-2
23.5	N46	3626	New	15-1000-2.5	18- 5000-3.5	31-3000-2	15-250a-x	17- 480-3	30- 50-1
23.6	N26	3629 (5)	3584,7	16-1000-1	27- 7500-3.5	31-1800-2	17- 70 -1	28-1670-30	31- 730-3
24.1	S24	3630 (3)	3586	17-1000-2.5	26- 8000-3.5	29-6000-3	18-880 -7	20-1280-14	29- 670-3
24.6	S13	3632 (3)	3586	18-2500-2.5		**	19- 20 -1		**
26.0	N32	3633 (3)	3589	19-1000-1		24-2000-1			
26.1	S22	3638	New	24- 400-2	28- 1000-3	31-1000-2	24- 30 -2	27- 80-2	29- 20-4
27.6	N24	3634 (3)	3591	21-2000-2		26-2000-2			
28.6	S20	3637 (2)	3592,4	22-1500-2	25- 5000-2.5	01-3800-2	23- 50 -1	30- 220-4	02- 100-2
28.9	N26	3636	New	22-1000-2	24- 2000-2.5	04-1000-2	23- 50 -2	03- 340-7	03- 340-7
30.7	S32	3640	New?	24-1000-2	25- 4300-2.5	31-1500-2			
30.9	N23	3639 (7)	3596	24-1000-2	01- 1000-2	01-1000-2	29- 30 -3	30- 60-4	30- 60-4

*Region 3618 and its spots combined with region 3614.
**Region 3632 and its spot combined with region 3630.

CORONAL LINE EMISSION INDICES

AUGUST 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
Aug.																
1	60	108	41	120	82	125	X	X	151	220	64	96	99	194	37	72
2	85	130	20	35	112	170	41	50	119	181	41	60	115	184	36	63
3	80	127	X	X	78	125	X	X	76	119	36	40	82	114	42	75
4	104	154	39	74	75	124	40	60	37	48	16	20	54	88	27	33
5	115	188	64	84	82	115	28	50	31	46	19	49	62	120	41	65
6	X	X	X	X	X	X	X	X	57	87	26	39	135	255	48	72
7	X	X	X	X	X	X	X	X	73	97	34	42	169	255	70	95
8	X	X	X	X	X	X	X	X	69	120	15	24	177	280	56	73
9	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
10	152	250	42	91	70	91	24	39	X	X	14	16	92	130	32	47
11	170	300	54	96	51	60	48	64	64	89	18	28	155	190	32	67
12	155	259	45	63	139	190	39	58	67	91	X	X	184	250	X	X
13	160	232	61	90	91	125	47	90	92	127	29	51	115	137	49	89
14	156	240	37	63	112	239	24	44	128	191	23	50	154	184	36	56
15	119	217	34	59	122	160	31	62	92	138	34	58	100	139	32	52
16	68	99	14	43	84	110	23	33	93a	128a	28	44	96a	158a	42	78
17	42	57	41	57	69	87	23	33	68a	90a	X	X	58a	70a	X	X
18	21	23	15	16	28	36	16	20	X	X	X	X	X	X	X	X
19	29	39	19	28	24	25	19	26	100	145	Xa	Xa	79	115	Xa	Xa
20	65	101	35	45	54	80	31	63	82	103	35a	53a	71	119	32a	65a
21	135	190	42	64	107	173	38	91	90	145	36	49	68	99	41	86
22	144	250	61	76	108	151	44	104	110	170	31	33	124	220	29	33
23	X	X	X	X	X	X	X	X	180a	449a	29	73	129a	172a	36	55
24	120	151	27	31	66	100	23	36	138a	272a	38	55	97a	140a	32	48
25	100	128	25	30	98	126	20	30	91	172	13	17	76	100	10	15
26	86	126	X	X	X	X	X	X	84	114	18	35	112	130	33	56
27	87	109	22	31	93	135	20	45	87	120	X	X	X	X	X	X
28	59	89	17	30	95	121	22	44	82	126	19	30	64	95	X	X
29	65	103	30	52	86	124	38	67	46	75	X	X	48	85	X	X
30	71	112	31	61	104	178	38	67	79	152	32	61	76	110	32	59
31	67	122	19	50	77	120	18	40	103	174	33	44	111*	178	35	65

a = index computed from low weight data.

* = yellow line observed.

SOLAR FLARES

AUGUST 1956

Observatory	Date Aug. 1956	Time Observed Start UT	End UT	Duration Min.	Total Area Mill.	McMath Plage Region Number	Approx. Position Lat.	Mer. Dist.	Time Max. Phase U T	Max. Int. Arb.	Rel. Area of Max. Tenths	Importance	Provis. Ionospheric Effect
Capri-S	02	1549	1622	33	209	3598	N15	E52				1+	
Capri-S	04	1411	1423	12	107	3598	N14	E20				1	
Capri-S	05	1134	1147	13	102	3598	N20	W01				1	
Capri-S	05	1338	1358	20	122	3607	N20	E90				1 *	
Capri-S	07	0637	0702	25	102	3598	N20	W22				1	
Capri-S	07	1015	1030	15	102	3602	N25	E24				1	
Capri-S	07	1250	1305	15	194	3607	N19	E62				1	
McMath	07	1803	1845	42		3596	N25	W48				1	McMath lists
S. Peak	07	1755	a1850	>55	115	3596	N25	W49	1818	18	3	1-	as G-SWF
Capri-S	08	0739	0816	37	107	3600	S19	W34				1	
Capri-S	08	1047	1129	42	117	3607	N19	E48				1	
Capri-S	08	1133	1255	82	364	3607	N18	E48				2+	G-SWF
Capri-S	08	1311	1336	25	112	3607	N18	E48				1	
Capri-S	08	1423	1535	72	87	3607	N22	E51				1 *	
Capri-S	09	0554	0619	25	160	3607	N21	E40				1	Slow-SWF 0543
Wendel.	09	0554	0558	4	194	3607	N22	E44				1-2	
S. Peak	09	b1810	1830	>20	140	3607	N19	E38	1812	20	3	1	S-SWF
Capri-S	10	0907	0922	15	136	3607	N22	E28				1	
Capri-S	10	1150	1205	15	194	3598	N13	W53				1+	
Capri-S	10	1239	1310	31	146	3598	N18	W62				1 *	
Capri-S	11	0707	0734	27	190	3607	N22	E16				1	
Capri-S	11	0949	1128	99	243	3607	N22	E15				2	
Capri-S	11	1032	1128	56	233	3598	N13	W62				2	
Capri-S	11	1204	1237	33	160	3607	N21	E12				1+	
Capri-S	11	1337	1421	44	107	3607	N22	E12				1	
McMath	11	b1410				3607	N18	E13				1	
S. Peak	11	1355	1430	35	55	3607	N20	E11	1405	16	3	1-	
S. Peak	11	1615	1645	30	175	3605	N17	W20	~1630	16	1	1	
S. Peak	11	2045	~2120	~35	100	3614	N26	E52	2055	18	4	1	
Capri-S	13	1127	1246	79	267	3607	N23	W12				2	S-SWF
Capri-S	13	1219	1350	91	136	3618	N26	E39				1+	
Capri-S	13	1422	1454	32	107	3615	S12	E21				1	
Capri-S	13	1510	1525	15	146	3598	N21	W90				1	
Capri-S	14	1548	1624	36	156	3615	S18	E09				1+	S-SWF
McMath	14	1555	1620	25		3615	S15	E15				1+	
Capri-S	15	0730	0800	30	131	3624	N28	E80				1	
Capri-S	15	1600	1615	15	224	3614	N28	E12				1+	
McMath	15	1600	1615	15		3614	N30	E15				1	

*Sac. Peak and/or McMath lists as importance 1-.

SOLAR FLARES
AUGUST 1956

Observatory	Date Aug. 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	15	1608	1615	7	136	3624	N28	E76				1	
Capri-S	16	0727	0734	7	194	3628	S26	E85				1	
McMath	16	1830	1854	24		3615	N27	W05				1	G-SWF
S. Peak	17	2320	a2340	>20	200	3625	S20	E32	2330	18	2	1	
Wendel.	18		0841		292	3625	S17	E25				1+	
Capri-S	18	1257	1329	32	112	3625	S19	E24				1	
Capri-S	18	1359	1457	58	102	3625	S19	E23				1	
S. Peak	18	2305	a2400	>55	140	3628	S18	E40	2335	~~16~~	3	1	
Wendel.	19	1629	1641	12	194	3630	S24	E61	1633			1	G-SWF
Capri-S	19	1627	1645	18	73	3630	S22	E61				1-	
Neder.	21	0845				3626	N49	E33				1	S-SWF
Capri-S	21	0843	0912	39	136	3626	N45	E29				1	
Neder.	21	1025				3631	S26	W31				1	
Capri-S	21	1250	1311	21	146	3626	N48	E30				1	
McMath	21	1258	1305	7		3626	N46	E30				1	
McMath	21	1945	2115	90		3625	S20	W18				2+	S-SWF
S. Peak	21	b2005	2200	>115	343	3625	S20	W16	2007	24	3	2	
S. Peak	21	2255	a2355	>60	154	3630	S25	E32	2315	15	6	1	
S. Peak	22	1535	1620	45	140	3630	S26	E20	1605	15	3	1	
S. Peak	22	b2010	a2030		252		S20	E08	~2023	18	2	1+	G-SWF
S. Peak	22	b2010	a2030		147		S22	W36	~2023	16	2	1	
Capri-S	23	0710	0718	8	112	3631	S28	W56				1	
Neder.	23	1225					S26	W53				1	
Neder.	23	1324					S21	W39				1	
S. Peak	24	1630	1700	30		3624	N24	W55				1*	
Capri-S	25	1144	1216	32	117	3630	S27	W21				1	
McMath	25	b1435				3624	N24	W60				1	
Capri-S	25	1426	1505	39	107	3624	N25	W73				1-	
McMath	25	1540	1602	22		3629	N26	W24				1	
S. Peak	25	1525	1600	35	75	3629	N37	W23	~1545	15	5	1-	
Capri-S	25	1542	1557	15	73	3629	N28	W15				1-	
S. Peak	26	2015	2045	30	105	3629	N30	W28	2025	16	6	1	S-SWF
S. Peak	26	2240	2250	10	175	3628	S20	W75	2245	15	3	1	
Capri-S	27	0942	1015	33	102	3629	N32	W35				1	
Capri-S	27	1136	1236	60	180	3643	N22	E71				1	
Capri-S	28	0820	0845	25	233	3629	N30	W43				1+	S-SWF

*Sac. Peak and/or McMath lists as importance 1-.

SOLAR FLARES

AUGUST 1956

Observatory	Date Aug. 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
Capri-S	28	1425	1436	11	214	3642	S19	E60				1 *	S-SWF
S. Peak	28	1520	1630	70	180	3643	N21	E61	1536	21	1	1	
Capri-S	28	1524	1601	37	204	3643	N18	E60				1	Slow S-SWF
McMath	28	1530	1611	41		3643	N16	E60				2	
S. Peak	28	b2220	a2405	>105	460	3643	N16	E50	2252	30	2	2	
Schaus.	29	b0648				3643	N18	E43				1	
Capri-S	29	0938	1053	75	374	3629	N29	W59				2	S-SWF
Neder.	29	b0955				3629	N29	W72				2+	
S. Peak	29	1840	1930	50	280	3629	N31	W63	1850	26	8	1	Slow S-SWF
S. Peak	29	2130	2255	85	100	3643	N18	E50	2140	22	7	1	
S. Peak	29	2303	2401	58	120	3642	S20	E42	2332	22		1	
Capri-S	30	0836	0928	52	413	3629	N27	W73				2	
S. Peak	30	1535	1600	25	110	3644	N35	E45	1545	17	5	1	
Capri-S	30	1541	1559	18	53	3644	N33	E42				1-	
S. Peak	30	1925	2140	135	112	3643	N15	E26	2020	18	4	1	
S. Peak	30	2225	2248	23	147	3643	N15	E27	2233	19	7	1	
S. Peak	31	b1254	1630	>216	915	3643	N16	E14	1258	34	5	3	
Capri-S	31	1230	1615	225	729	3643	N15	E13				3	
McMath	31	b1250	1546	176		3643	N14	E12				3	
Wendel.	31	1228	1421	113	1215	3643	N18	E12	1243			3	
Neder.	31	1225				3643	N20	E20				3+	
S. Peak	31	2155	2330	95	180	3643	N20	E04	~2220	13	3	1	
S. Peak	31	2220	2247	27	245	3643	N15	E12	2241	22	8	1	

*Sac. Peak and/or McMath lists as importance 1-.

SOLAR FLARES
AUGUST 1956

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

August 2,	1605 (3598)+
	1640 (3596)+
	b1945 (3598)+
3,	1320 (3594)
7,	1325 (3607)
9,	0618 (3607)++
	1355 ( )
	b1735 (3614)
10,	1355 (3614)
	1550 (3598)
	1826 (3607)+
11,	1500 (3615)
	1515 (3619)
	1640 (3607)
	1820 (3615)
12,	b1800 (3598)+
13,	b1800 (3607)+
	2345 (3624)
14,	1250 (3615)+
	1402 (3615)+
	1735 (3615)+
	1936 (3615)+
15,	1535 (3614)+
16,	0712 (3621)++
17,	1255 (3607)+
	1530 (3614)+
	1710 (3624)+
	1755 (3615)+
	2035 (3630)+
18,	1510 (3628)
	1615 (3630)
	1650 (3625)
	1740 (3628)
	1835 (3630)
	b1925 (3614)
	b2245 (3625)
	2300 (3630)
19,	1550 (3625)
	1555 (3629)
	b1610 (3629)+
	1629 (3630)++
	2150 (3630)
August 20,	b1610 (3629)
	b1914 (3630)
	~2115 (3625)
21,	b1354 (3624)
	b2005 (3625)
	2255 (3630)
	2305 (3624)
22,	1018 (3625)++
	1340 (3630)
	1605 (3625)
	1720 (3628)
23,	1315 (3625)
	1332 ( )
	1535 (3625)
	1605 (3631)
	b2200 (3631)
	2245 (3625)
24,	1315 (3625)
	1330 (3625)
	~1550 ( )
	b1719 (3625)
	b1804 (3630)+
25,	1310 (3629)
	1415 (3629)
	1700 (3630)
	1745 (3629)
	1915 (3630)
	~2100 (3628)
	2150 (3629)
26,	1615 (3642)
	2145 (3630)
27,	1010 (3629)++
	1536 (3628)+
	1635 (3630)
	1735 (3630)
	1815 (3643)
	1815 (3630)
	2015 (3630)
28,	1753 (3636)
	1810 (3642)
	b1845 (3642)+
	1855 (3646)
August 28,	b1920 (3642)+
	b2220 (3643)
	2311 (3637)
	2335 (3630)
29,	1315 (3629)
	1320 (3643)
	1345 (3641)
	1430 (3630)
	1455 (3637)
	1505 (3629)
	1535 (3641)
	1645 (3641)
	1730 (3643)
	1840 (3644)
	1853 (3630)
	1925 (3641)
	1930 (3637)
	1940 (3630)
	2010 (3642)
	2045 (3644)
	2140 (3644)
	2251 (3644)
	2255 (3630)
	2230 (3629)
	2320 (3643)
30,	1610 (3641)
	1720 (3644)
	1815 (3644)
	1830 (3643)
	1850 (3644)
	1855 (3629)
	1930 (3644)
	2020 (3644)
	2045 (3644)
	2135 (3644)
	2230 (3644)
	2320 (3641)
31,	1650 (3644)
	1655 (3643)
	1850 (3644)+
	1920 (3643)
	2040 (3643)

+ McMath or McMath and Sac. Peak.
++ Wendelstein.

IONOSPHERIC EFFECTS OF SOLAR FLARES

JULY 1956

July 1956	Start UT	End UT	Type	Wide-spread Index	Impor-tance	Observation Stations
6	0235	0308	S-SWF	4	2	AN, OK
10	1738	1809	Slow S-SWF	5	1+	BE, HU, MC, PR, WS
11	2015	2035	G-SWF	3	1-	BE, MC, PR
13	0304	0401	G-SWF	3	1	AN, OK
16	0304	0340	S-SWF	1	2-	OK
	1843	1857	S-SWF	4	1	AN, MC, PR, WS
17	0210	0309	S-SWF	1	2-	OK
17	0730	0750	G-SWF	3	1-	OK, DA*
19	1721	1810	Slow S-SWF	5	2-	BE, HU, MC, PR, WS
	2020	2057	Slow S-SWF	4	1+	AN, BE, HU, MC
21	1510	1552	G-SWF	4	2	BE, HU, MC
	1637	1700	Slow S-SWF	5	1+	BE, HU, MC, WS
	2014	2045	Slow S-SWF	5	1+	BE, HU, MC, PR, WS
22	0917	1047	S-SWF	2	1+	DA*, NE**
	1230	1340	Slow S-SWF	5	2-	BE, HU, MC, DA*, NE**
	1635	1825	S-SWF	5	2+	AN,BE,HU,MC,WS,DA*,NE**,RCA*
	2110	2130	Slow S-SWF	3	1	HU, MC, WS
	2310	2330	Slow S-SWF	5	1	AN, OK, WS
23	1406	1550	G-SWF	3	1+	MC, PR, DA*
24	1525	1550	G-SWF	2	1	MC, PR
	2158	2218	S-SWF	5	1+	AN, BE, MC, OK, PR, WS
	2237	2303	S-SWF	5	1+	AN, BE, HU, MC, OK
25	0310	0339	S-SWF	4	3	OK, TO+
	0525	0601	S-SWF	5	3	OK, DA*, NE**, TO+
26	1239	1400	S-SWF	5	2+	BE,HU,MC,PR,NE**,SW***
	1625	1700	Slow S-SWF	2	1+	MC, PR
	2353	0055	G-SWF	3	1+	BE, OK
28	1352	1358	S-SWF	5	1	BE, HU, MC, PR, WS
29	2017	2048	S-SWF	5	1+	AN, BE, HU, MC, PR, WS

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

SOLAR RADIO WAVES (BOULDER) -- 167 MC

3-HOURLY AND DAILY FLUX

AUGUST 1956

Aug. 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	--	--	--	11	--	--	--	--	2	2	2001-2557
2	11	10	11	12	11	2	2	(1)	(1)	2	1159-1708; 1733-2556
3	318	188	107	130	174	2	2	2	2	2	1200-2555
4	34	39	47	25	36	3	2	3	3	3	1201-2553
5	86	98	53	30	65	3	3	3	3	3	1202-2552
6	65	64	96	130	91	3	3	3	3	3	1203-2551
7	92	55	90	89	81	2	2	2	2	2	1204-2551
8	23	33	23	22	25	2	3	2	2	3	1205-2550
9	25	33	40	44	37	2	1	1	1	2	1206-2549
10	24	24	21	22	23	3	3	3	2	3	1207-2548
11	--	21	22	17	20	2	2	(2)	(2)	(2)	1208-2547
12	--	--	--	--	--	1	1	1	(2)	(2)	1208-2546
13	44	40	16	12	26	2	1	(2)	(2)	(2)	1210-2544
14	10	--	--	9	10	2	--	(2)	1	(2)	1210-1505; 1930-2541
15	10	9	9	--	9	1	1	(1)	(1)	(1)	1211-2539
16	15	14	18	16	16	3	3	3	(2)	3	1212-2538
17	45	49	76	75	63	2	2	2	2	2	1213-2537
18	53	49	63	104	69	2	2	2	(2)	(2)	1214-2535
19	--	--	--	--	--	--	--	--	--	--	---- ----
20	--	62	41	45	49	--	3	3	3	3	1439-2533
21	107	102	208	270	178	1	1	2	2	2	1217-2532
22	13	13	51	38	29	2	2	3	(2)	3	1218-2249; 2355-2530
23	26	38	114	181	96	3	3	3	3	3	1219-2529
24	90	90	58	40	68	3	2	3	3	3	1220-2528
25	16	15	13	13	14	2	2	(2)	(2)	(2)	1221-2526
26	--	8	9	9	9	1	2	2	(2)	(2)	1222-2524
27	10	11	10	10	10	2	2	2	2	2	1223-2523
28	--	19	38	47	32	2	3	3	3	3	1224-2522
29	30	27	30	40	32	2	2	(2)	(2)	(2)	1225-2520
30	344	234	200	181	230	2	2	2	3	3	1226-2519
31	740	143	118	89	230	3	2	1	2	3	1227-2517

SOLAR RADIO WAVES (BOULDER) -- 460 MC

3-HOURLY AND DAILY FLUX

AUGUST 1956 [1]

Aug. 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	--	--	--	57	56	--	--	0	0	0	1929-2557
2	58	60	58	67	59	0	0	0	0	0	1159-2556
3	77	68	63	64	67	0	0	0	0	0	1200-2555
4	72	70	67	68	69	1	0	0	0	1	1201-2553
5	70	71	68	--	70	0	0	1	0	1	1202-2552
6	--	70	69	--	70	0	0	0	0	0	1203-2110; 2224-2551
7	--	74	70	--	72	--	0	(0)	(1)	(1)	1204-1507; 1554-1750 /1
8	71	72	71	69	70	0	0	(0)	1	1	1205-1953; 2142-2550
9	70	71	71	--	70	0	0	1	(0)	1	1206-2054
10	72	75	79	76	76	0	0	0	0	0	1207-2548
11	71	75	70	--	73	0	0	0	--	0	1208-2547
12	70	72	71	--	71	1	0	0	--	1	1208-2546
13	74	74	71	69	72	0	(0)	0	(0)	(0)	1210-2005; 2045-2544
14	71	--	--	72	72	0	--	--	(0)	(0)	1210-1452; 2048-2541
15	74	74	73	72	73	0	0	0	(0)	(0)	1211-2539
16	74	84	73	--	78	0	2	0	(0)	2	1212-2538
17	--	71	73	73	72	0	(0)	(0)	2	2	1213-2537
18	82	80	81	--	80	1	(1)	(0)	(0)	1	1214-2535
19	--	--	--	--	--	--	--	--	--	--	---- ----
20	--	83	80	80	82	--	0	0	3	3	1438-2149; 2257-2533
21	89	97	153	131	120	0	0	2	0	2	1217-2532
22	87	90	103	--	94	1	1	1	--	1	1218-2051
23	--	104	--	--	98	0	0	--	0	0	1219-1330; 1440-1730 /1
24	78	92	86	85	86	0	0	0	(0)	(0)	1220-1500; 1513-2528
25	85	83	80	79	81	0	0	1	(0)	(0)	1221-2526
26	--	--	88	93	91	0	--	1	0	1	1222-1330; 1900-2524
27	--	--	--	83	--	--	--	--	(0)	(0)	2203-2523
28	91	90	99	107	97	(0)	(0)	(0)	3	3	1224-2522
29	107	102	--	81	97	0	(0)	--	2	2	1225-1639; 2238-2520
30	78	77	76	--	76	(0)	0	0	(1)	(1)	1226-2519
31	376	80	--	--	199	3	0	--	--	3	1227-1730; 2157-2517

1. Additional observed periods: Aug. 7, 1902-2551; Aug. 23, 2334-2529.

SOLAR RADIO WAVES (BOULDER) -- 167 MC

OUTSTANDING EVENTS [1]

AUGUST 1956 [2]

Aug. 1956	Type	Start UT	Duration Hrs:Mins	Time UT	Maximum Inst. Flux	Smd. Flux	Remarks
2	1	(1159)	(13:57)	2312.4	220	--	
3-11	6	(1200)	(9 days)	Aug. 3	--	160	Note 3
6	3	2119.1	00:00.3	2119.2	>2100	--	
12	1	(1208)	(13:38)	2356.0	~1400	--	
13	6	(1210)	(07:50)	1310.3	420	48	
16-18	6	(1212)	(3 days)	Aug. 18	--	60	
17	3	1712.5	00:00.6	1712.5	1020	--	
20-25	6	(1439)	(6 days)	Aug. 21	--	170	
20	8	2117.5	00:00.7	2117.9	>6400	--	Off scale
21	9	2033	01:27	2119.6	>1400	1200	
26	1	(1222)	(13:02)	1824.0	520	--	
27	1	(1223)	(13:00)	2258.1	550	--	
28	9	1522.1	07:21.2	1525.1	>4100	33	
28	9	2243.3	(02:39)	2244.4	>6600	210	Off scale
29-30	6	(1225)	2 days	Aug. 30	--	220	
29	3	1536.7	00:00.4	1536.8	>9600	--	Off scale
30	8	2235.0	00:01.1	2235.7	>5800	--	Off scale
31	9	1237.2	(12:40)	1328	>5900	250	Off scale, Note 4

NOTES:

1. Severe sferics and man-made interference may sometimes obscure or be mistaken for solar events. Relatively small events not reported.
2. The month of August was characterized by powerful noise storms lasting several days. In these cases we have reported the highest daily flux as the smoothed flux. The relative levels of the activity can be judged from the 3-hourly and daily flux table.
3. The most energetic noise storm to date during the present sunspot cycle.
4. The maximum energy output to date for this type event during the present sunspot cycle.

SOLAR RADIO WAVES (BOULDER) -- 460 MC

OUTSTANDING EVENTS [1]

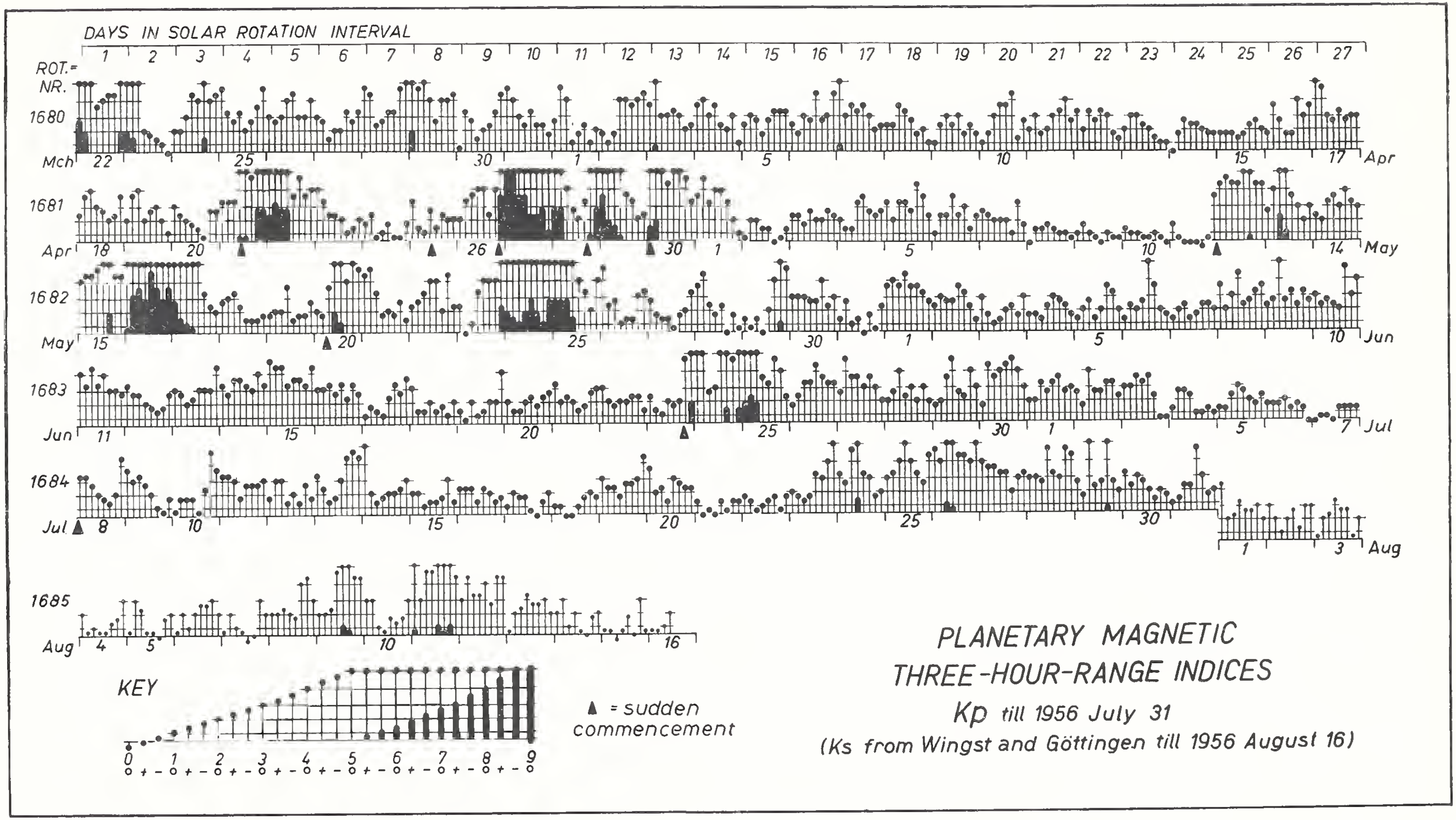
AUGUST 1956 [2]

Aug. 1956	Type	Start UT	Duration Hrs:Mins	Maximum Time UT	Maximum Inst. Flux	Smd. Flux	Remarks
2	1	(1159)	(06:31)	1734.6	130	--	
3	6	(1200)	(05:00)	~1300	--	21	
4	1	(1201)	(13:52)	~1400	270	--	
5	1	(1202)	(06:58)	1811.1	180	--	
9	2	1810.0	00:08.7	1810.2	200	6	
10	6	(1207)	(13:41)	2056.5	160	22	
12	3	1237.9	00:00.4	1238.2	640	--	
16	8	1719	00:33	1747.8	>950	350	
17	8	2324.9	00:04.8	2324.9	>5400	450	
18	6	(1214)	(13:21)	~1300	240	25	
18	3	2517.0	00:00.9	2517.4	>1600	--	
20	6	(1438)	(10:55)	~1500	>1600	27	
20	8	2117.1	00:01	2117.2	>10,100	--	Off scale
20	3	2328.1	00:00.6	2328.2	>3,400	--	
21	6	(1217)	(07:30)	1805.4	260	120	
21	9	1947	(05:45)	2027.7	>3100	170	
22	6	(1218)	(08:33)	1933.3	>4700	47	
23	6	(1219)	(13:10)	1634.8	210	47	
24	6	(1220)	(13:08)	~1600	150	36	
25	6	(1221)	(13:05)	~1800	400	27	
26	6	(1222)	(13:02)	~2200	460	35	
27	6	(2203)	(03:20)	--	--	27	
28	6	(1224)	(10:17)	~1900	--	51	
28	9	2241	(02:41)	2255.2	>5700	2600	Off scale
29	6	(1225)	(12:55)	~1300	--	51	
29	3	2240.5	00:00.4	2240.6	>1000	--	
30	6	(1226)	(12:53)	~1500	--	22	
30	3	(2229.6)	(00:09.8)	2230.0	>940	--	
31	9	1237	01:53	1328	>5400	>5300	Off scale See Note 3
31	6	1430	(03:00)	~1700	--	320	Note 4

Notes:
1. Some relatively small 460 mc/s events are unreported or may have been obscured by interference.
2. The period August 2 thru 31 could be considered to be one continuous noise storm (type 6 event). The level of activity from August 18 thru 31 was considerably greater than August 2 thru 17.
3. The maximum energetic outburst to date during the present sunspot cycle.
4. The most energetic noise storm to date during the present sunspot cycle.

GEOMAGNETIC ACTIVITY INDICES

July 1956	C	Values Kp Three hour Gr. interval 1	2	3	4	5	6	7	8	Sum	Ap	Final Selected Days
1	0.7	2o	2o	3+	3-	3+	4-	3-	3o	23-	14	Five
2	0.7	3-	2-	4o	3-	3-	3+	3+	2+	23-	14	Quiet
3	0.7	3o	3o	4-	3+	4-	2+	1-	1-	20+	13	
4	0.3	1+	3-	3-	2+	1o	1o	1+	1o	13+	7	7
5	0.4	1+	1+	2+	3o	3-	2o	2-	2+	17-	8	17
												18
6	0.2	2-	2-	2-	2o	1+	2-	1+	0+	12-	5	21
7	0.2	0+	1-	1-	0+	1+	1+	1+	1+	7+	4	22
8	0.7	3+	3+	3-	2o	2-	1+	2o	4+	21-	13	
9	0.4	4-	3o	3+	3-	2o	1o	1-	2-	18o	11	
10	0.7	1-	2-	2-	2-	1-	2+	5-	4-	17o	12	
11	0.7	3+	3+	3o	2-	3-	3-	3-	3o	22+	14	Five
12	0.5	2-	3o	3o	1+	2o	1+	3-	2-	17-	9	Disturbed
13	1.1	3+	2+	1+	2-	3o	4+	5-	4+	25o	20	
14	0.7	5o	2o	1+	2-	2o	2o	2+	3o	19+	13	13
15	0.1	2o	2o	1o	1+	1+	2-	3o	1+	14-	7	24
												25
16	0.3	2+	2+	2+	1+	2+	2o	1+	2-	16-	7	26
17	0.1	1o	2o	2-	2-	1-	0+	1+	2o	11-	5	28
18	0.2	1o	1o	0+	0+	1o	2-	2o	2-	9o	4	
19	0.8	3o	2+	2+	2-	3-	3-	3o	4+	22o	14	
20	0.7	4-	2o	2+	1+	3o	3-	2+	2+	20-	11	
21	0.2	1+	0+	1-	0+	1+	1-	1+	1+	7+	4	Ten
22	0.2	2-	1+	1-	1o	1+	2-	1-	2-	10o	5	Quiet
23	0.9	2o	2-	1+	2-	3+	3o	4o	5o	22o	16	
24	1.2	3+	3-	5-	6o	3+	3o	2-	2o	27-	24	4
25	1.1	3o	3+	4o	5o	4o	3+	3-	4+	30-	25	5
												6
26	1.4	5-	4o	6-	5+	4+	4+	4o	5o	37+	41	7
27	1.0	4o	4-	4-	3+	3+	2o	3o	3+	26+	18	15
28	1.0	3o	3o	3-	5-	3+	3o	5-	4+	29-	23	16
29	1.0	3-	2-	5o	2+	3-	5+	3-	2o	24+	20	17
30	0.6	3+	2+	3o	3-	2o	1+	2o	2-	18+	10	18
31	0.7	1o	1+	2+	2+	5-	3o	2-	2o	18+	12	21
Mean:	0.63									Mean:	13	22



PLANETARY MAGNETIC
THREE-HOUR-RANGE INDICES
Kp till 1956 July 31
(Ks from Wingst and Göttingen till 1956 August 16)

CRPL RADIO PROPAGATION QUALITY FIGURES AND FORECASTS

NORTH ATLANTIC

JULY 1956

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

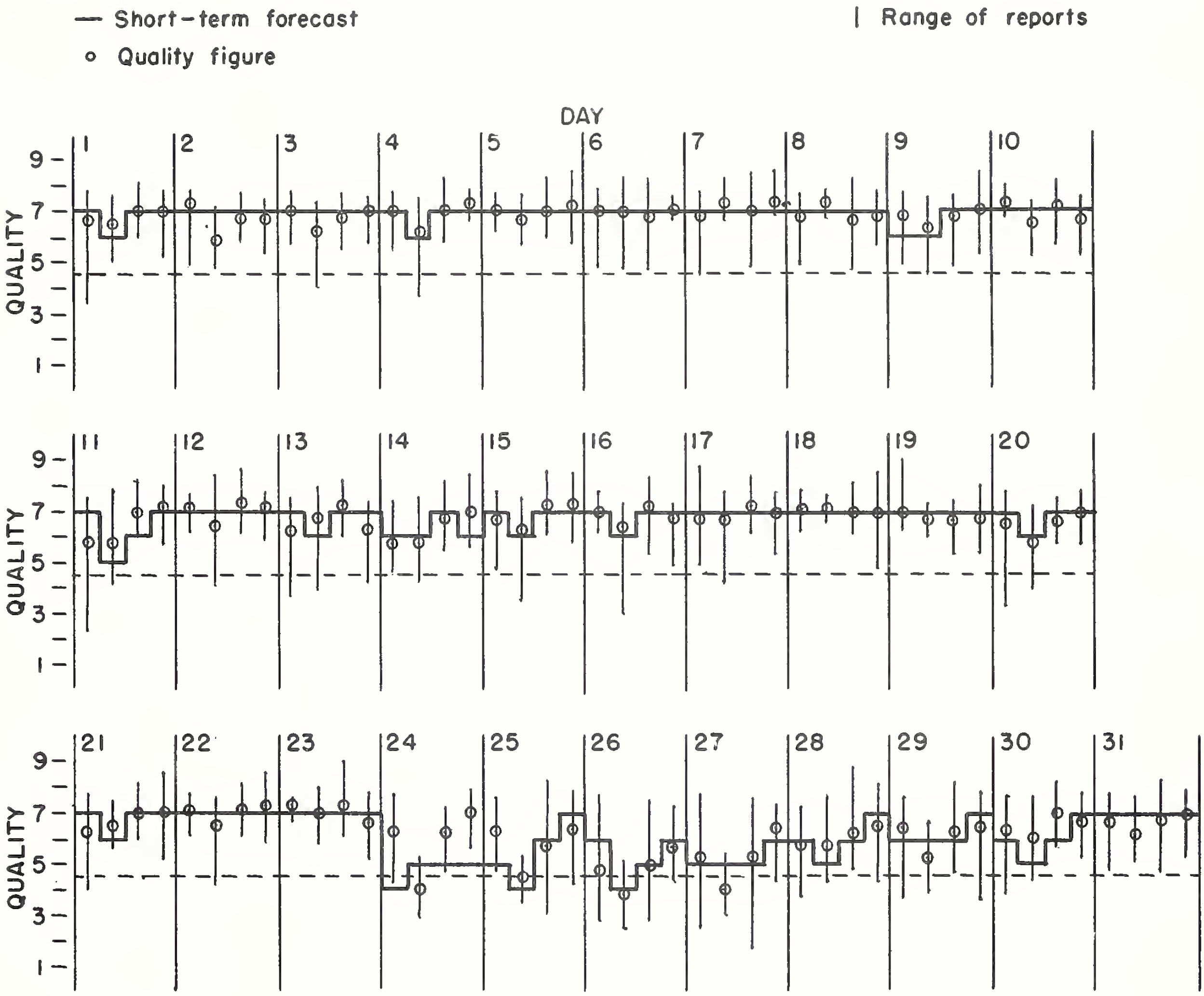
Score:			00	06	12	18	1-4 days	4-7 days
	Quiet Periods	P	24	17	28	26	22	24
		S	6	10	3	4	8	5
		U	0	0	0	1	1	2
		F	1	0	0	0	0	0
	Disturbed Periods	P	0	2	0	0	0	0
		S	0	2	0	0	0	0
		U	0	0	0	0	0	0
		F	0	0	0	0	0	0

( ) represent disturbed values.

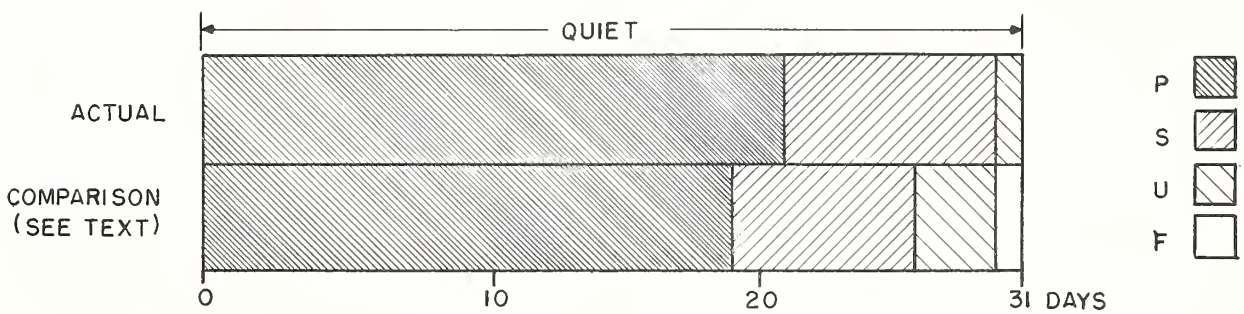
CRPL RADIO PROPAGATION QUALITY FIGURES AND FORECASTS

NORTH ATLANTIC

JULY 1956

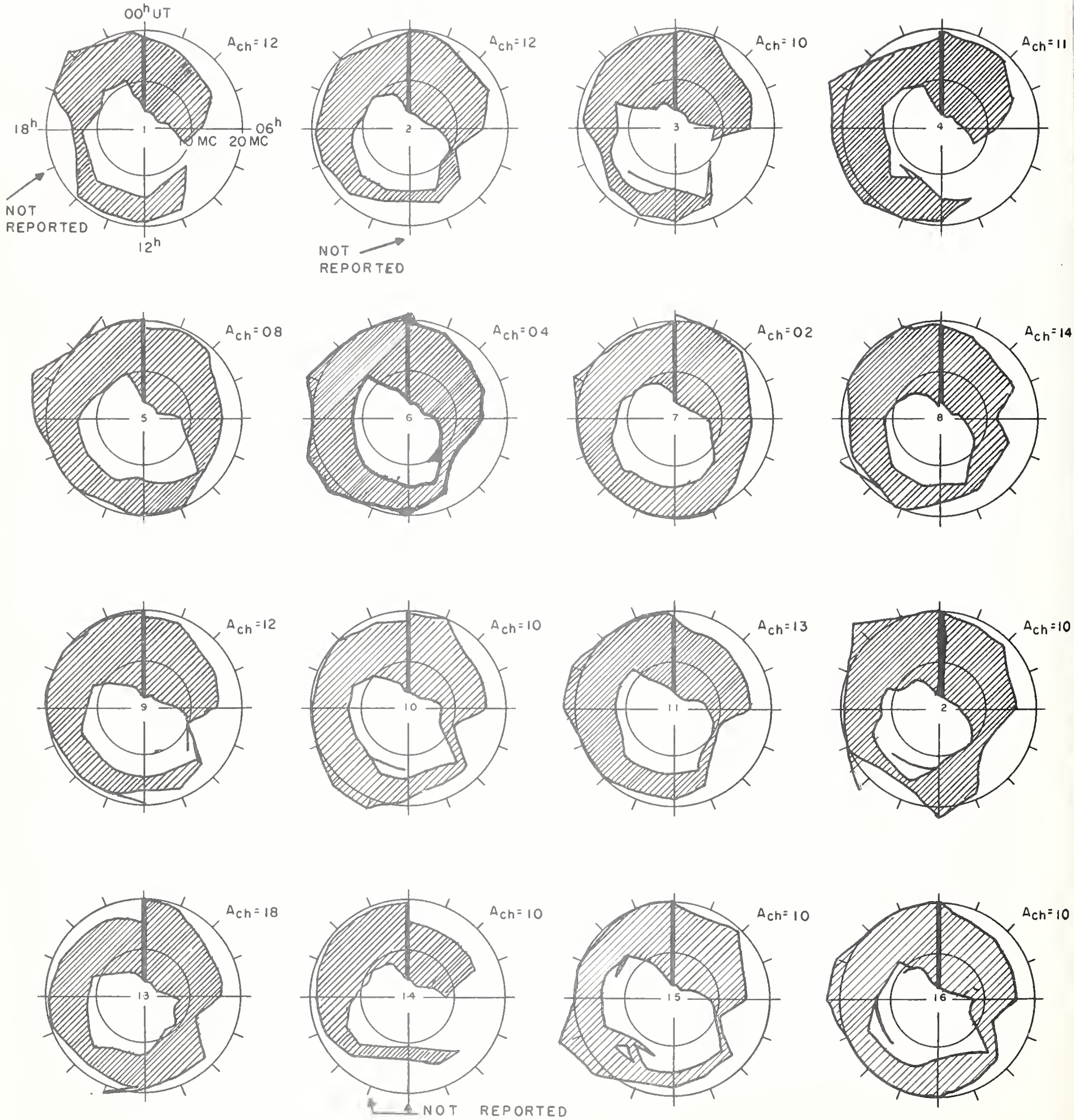


OUTCOME OF ADVANCE FORECASTS (1 TO 4 DAYS AHEAD)

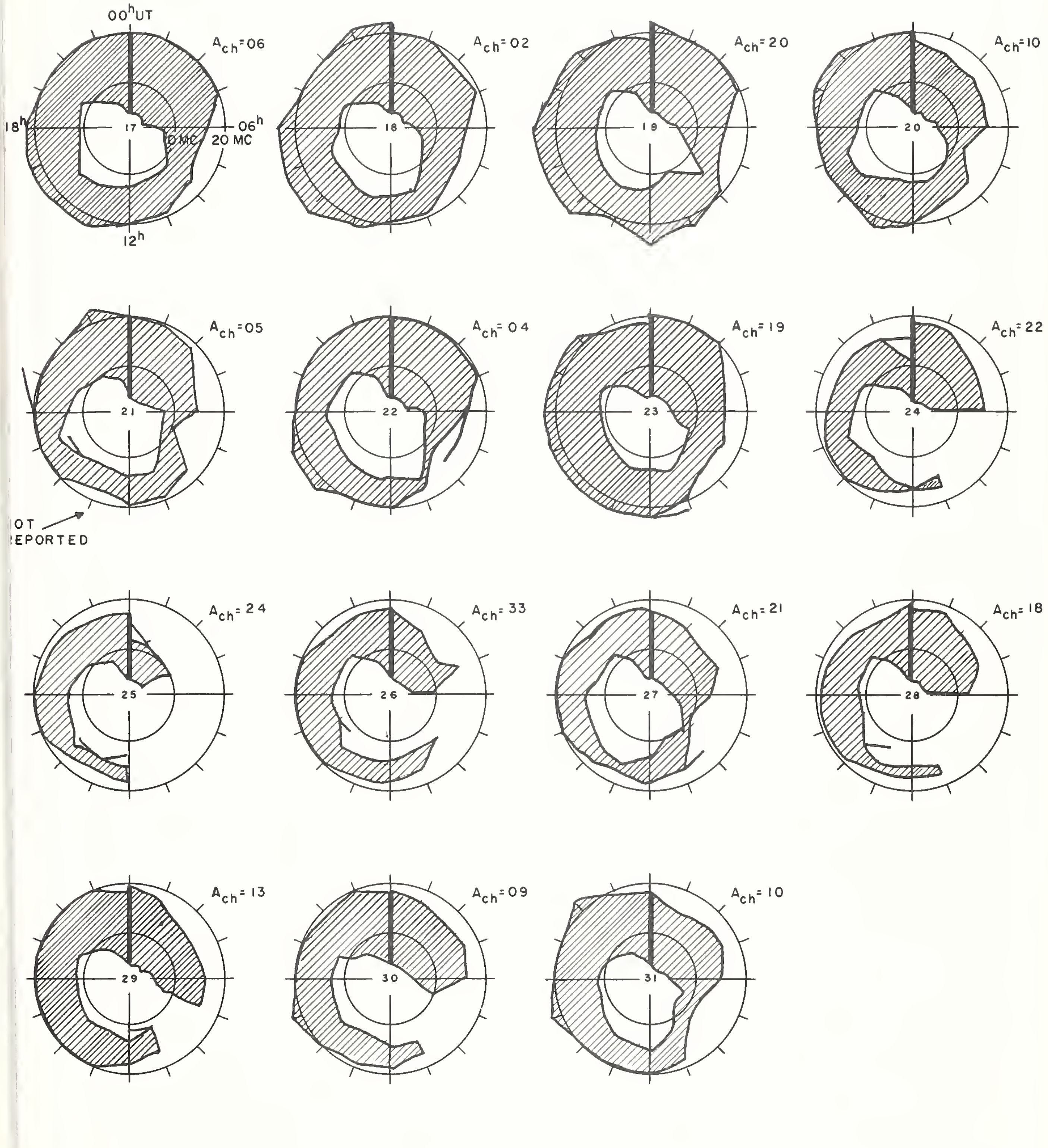


USEFUL FREQUENCY RANGES -- NORTH ATLANTIC PATH

JULY 1956



JULY 1956



Adapted from Obse.:vations by Deutschen Bundespost

CRPL RADIO PROPAGATION QUALITY FIGURES AND FORECASTS

NORTH PACIFIC

JULY 1956

July 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)	(2)
1	5	5	6	5	5	5	5	5	6		3	(4)
2	5	5	6	5	6	6	5	5	6		3	3
3	6	6	6	6	6	6	6	5	7		(4)	3
4	6	6	6	7	7	7	6	6	6		3	2
5	6	6	6	7	6	6	6	6	6		2	2
6	5	5	7	6	6	6	6	6	6		2	1
7	6	6	7	7	7	7	6	6	7		0	1
8	6	6	7	7	6	7	7	6	7		3	3
9	5	5	7	7	5	6	6	5	7		(5)	2
10	6	6	7	6	6	7	6	5	7		2	3
11	6	6	7	6	7	7	7	7	6		3	3
12	6	6	7	6	7	7	7	6	6		2	2
13	6	6	5	6	7	5	6	5	6		3	3
14	6	6	6	5	5	6	6	5	5		3	2
15	5	6	6	7	7	7	6	6	6		2	2
16	6	6	6	6	6	6	6	6	6		3	2
17	6	6	6	6	6	6	6	7	6		2	1
18	6	6	7	7	7	7	7	7	7		1	1
19	6	6	6	6	6	7	7	7	7		3	3
20	6	6	7	6	7	7	6	7	7		2	2
21	6	6	7	7	7	7	6	6	6		1	2
22	6	5	6	7	7	6	6	5	6		1	2
23	6	6	6	7	7	6	6	5	6		2	3
24	4	4	6	5	3	6	5	5	6		(5)	3
25	5	4	5	6	6	6	5	6	6		(5)	(5)
26	4	3	5	5	5	5	(4)	6	6		(5)	(4)
27	5	5	6	4	5	6	5	5	6		(5)	3
28	5	5	5	5	5	5	5	4	4		(4)	3
29	5	5	5	5	5	5	5	4	4		3	3
30	6	6	6	6	6	6	6	5	5		3	2
31	5	5	6	6	6	6	6	6	6		2	3
Score:	Quiet Periods		P	14	13	24		15	14			
			S	13	14	7		15	16			
			U	2	1	0		0	0			
			F	0	0	0		0	0			
	Disturbed Periods		P	0	0	0		0	0			
			S	2	1	0		0	0			
			U	0	1	0		0	0			
			F	0	1	0		1	1			

( ) represent disturbed values.

CRPL RADIO PROPAGATION QUALITY FIGURES AND FORECASTS

NORTH PACIFIC

JULY 1956