PART B

SOLAR - GEOPHYSICAL DATA

ISSUED

AUGUST 1956

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

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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 $\lambda 5303$.

R_6 = same for $\lambda 6374$.

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

R_1 = same for $\lambda 6374$.

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

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

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

where N is the number of indices entering the summation.

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

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

III SOLAR FLARES

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

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

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

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

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

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

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

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

IV SOLAR RADIO WAVES

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

V GEOMAGNETIC ACTIVITY INDICES

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

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

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

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

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

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

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

VI RADIO PROPAGATION QUALITY INDICES

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

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

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

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

P - forecast quality equal to observed

S - forecast quality one grade different from observed

U - forecast quality two or more grades different from observed when 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.

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

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

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

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

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

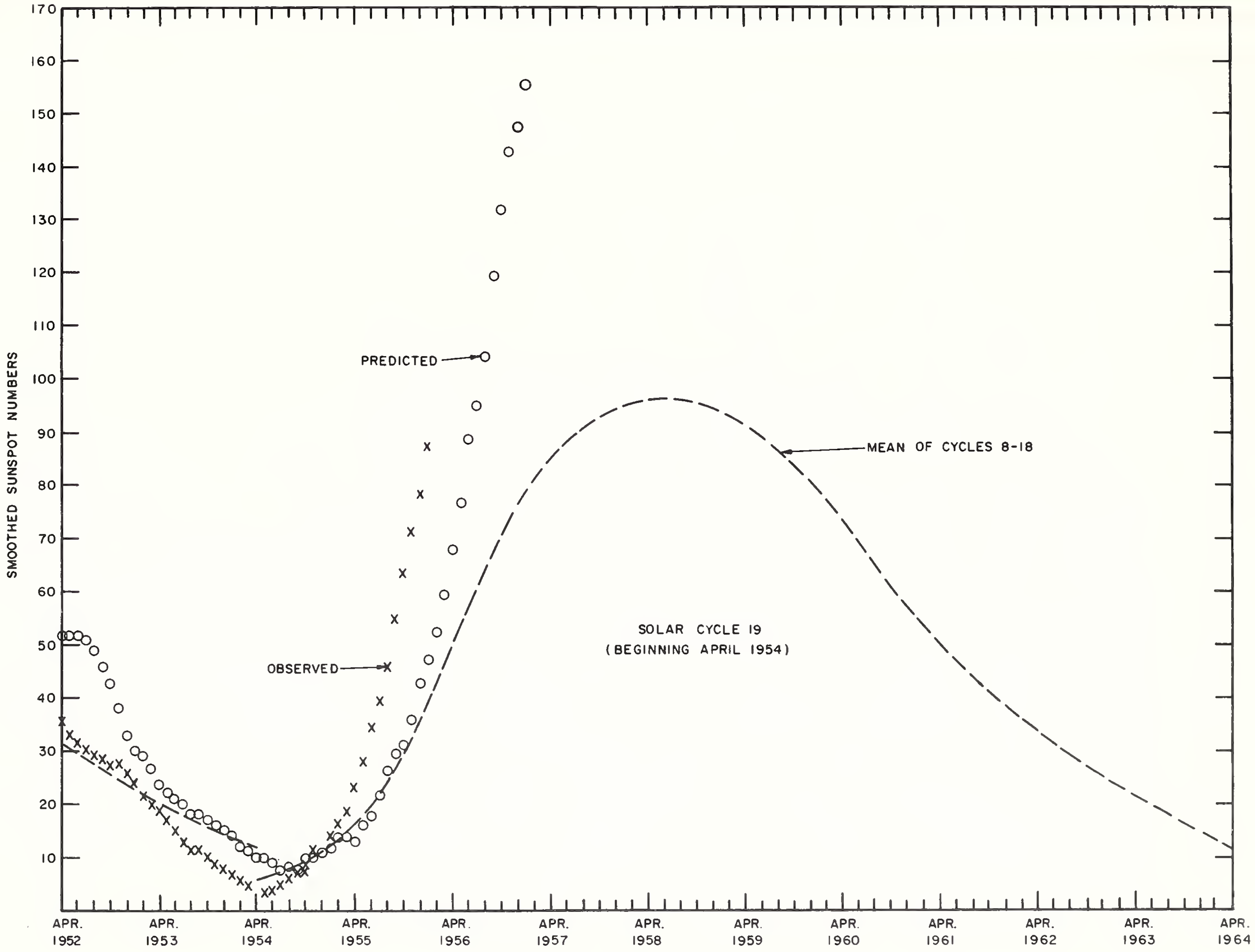
The table, analagous to that for Qa, includes the 9-hourly quality figures; whole day quality figures; short term forecasts issued by NPRWS three times dailv at 02^h, 09^h, and 18^h UT, applicable to the stated 9-hour periods; advance forecasts issued twice weekly by NPRWS (CRPL-Jp report); and half-day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

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

RELATIVE SUNSPOT NUMBERS

American Relative Sunspot Numbers June 1956	
Date	$R_{A'}$
1	94
2	102
3	97
4	92
5	114
6	107
7	98
8	79
9	91
10	90
11	81
12	93
13	92
14	110
15	104
16	120
17	114
18	118
19	145
20	162
21	146
22	116
23	127
24	103
25	90
26	55
27	63
28	95
29	128
30	153
Mean:	106.0

Zürich Provisional Relative Sunspot Numbers July 1956	
Date	R_Z
1	162
2	155
3	133
4	153
5	138
6	139
7	163
8	158
9	150
10	157
11	162
12	216
13	192
14	156
15	156
16	144
17	98
18	67
19	65
20	71
21	78
22	86
23	113
24	84
25	90
26	100
27	116
28	104
29	108
30	130
31	140
Mean:	128.5



PREDICTED AND OBSERVED SUNSPOT NUMBERS

CALCIUM PLAGE AND SUNSPOT REGIONS

JULY 1956

CMP July 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
01.8	N30	3557 (5)	3527	26-2300-1.5	03- 5800-2.5	08-3000-2	26- 10 -2	29- 630 10	06-240 -3
02.0	S26	3556	New	25-1000-2	28- 1800-3	06-1000-1	28- 20 -2	-----------	29- 30 -3
02.6	N20	3558 (7)	3522,30	28-1000-3.5	30- 2500-3.5	08-1000-2	28-160 -4	29- 290 10	06- 20 -1
03.4	S18	3559 (2)	3523,28	28-3200-2.5	28- 3200-2.5	07- 700-1	28- 10 -x	-----------	29- 30 -3
04.8	N29	3560	New	28-2500-3	07- 5000-3	11-3000-3.5	28-440 -1	08- 450 10	10-190 -2
05.1	S18	3562 (4?)	3525	29-3500-2.5	01- 3500-4	10-2000-3	29-560 -2	29- 560 -2	11-190 -4
06.1	S26	3563	New	30-5000-4	08- 7000-3	11-6000-3	30-630 -5	30- 630 -5	11- 20 -1
07.7	N23	3564	New	02-2000-1.5	02- 2000-1.5	13-1000-3	05- 50 -3	08- 150 -5	12- 10 -1
08.7	S24	3566	New	06- 700-3	06- 700-3	10- 300-1.5			
09.7	N20	3565	New	03-1800-3	13- 6000-3	16-3000-4	03-140 -3	08- 900 -9	16-340 -2
10.1	S23	3567 (4?)	3531	06-2400-3	13- 5000-3	16-5000-2	06-340 -1	12- 360 -7	16-100 -1
11.0	N30	3568	3533	06- 800-1.5	07- 1500-1.5	10- 900-1.5			
11.3	S30	3569	3531	06-1000-1.5	08- 2500-2	17-1500-2			
12.3	N15	3570 (2)	3534	06-3000-3	17- 6000-3	18-6000-3	06-240 -4	12- 660 10	18-190 -1
14.1	N18	3571	New	07-1000-2	18- 5500-3	20-2000-2.5	08-440 -7	12- 720 10	19- 30 -1
14.6	S21	3573 (6)	3538	08-1000-2	18- 1000-2.5	19-1000-2	11- 20 -1	11- 20 -1	11- 20 -1
15.0	N33	3572 (6?)	3535	08-5000-3	11- 7000-3	21-4000-2.5	08-190 -2	13- 390 10	18- 10 -1
16.7	S15	3575 (4)	3543	10-1000-1.5	11- 2500-2.5	22-1500-2	11- 20 -1	-----------	14- xx -1
17.0	N18	3574 (2)	3540,41	10-1500-3	13- 9000-3	23-4000-2.5	11-460 -8	11- 460 -8	17- 20 -2
18.5	N26	3577	New	16- 800-2.5	24- 4500-4	25-2000-2.5	16- 70 -5	23-1720 10	25-290 -1
18.6	S21	3576 (4)	3543	13-5000-2.5	23- 7000-2.5	25-3500-1			
20.6	N28	3578	New	16-1000-2.5	19- 1000-2.5	26- 700-1	18- 10 -1	18- 10 -1	18- 10 -1
20.8	S18	3579	New	15-2800-1	15- 2800-1	26-2500-3	15-270 -1	15- 270 -1	26-190 -1
22.4	S21	3580	New	16-3500-4	16- 3500-4	27-3000-2	16-150 -1	17- 150 -2	22- 50a-x
23.6	N26	3581 (2)	3546	16-1500-1	19- 2500-2.5	29-1000-1			
24.9	S15	3583 (3)	3550	19-2500-1.5	30- 3000-1.5	30-3000-1.5	22- 50a-x	22- 50a-x	25- xx -2
25.6	N26	3590	New	25-1500-4	28- 2500-3	30-5000-3.5	25-270 10	26- 370 10	31-150 -1
26.2	S11	3585 (3)	3550	20-2500-2.5	21- 3000-2.5	30-2500-1.5			
26.6	N23	3584 (4)	3552,3,4	20-1000-1.5	21- 2000-1	01-1500-1			
27.3	S24	3586 (2)	3551	20-2000-3	30- 8000-4	03-1000-2	21-820 -3	23-1610 10	02-150 10
28.0	N25	3587 (4)	3552,3,4	22-2000-2	30- 3000-2.5	03-1000-2			
29.8	N30	3589 (2)	3557	24-2200-3	25- 5000-3	04-3500-2			
31.5	S27	3592	New	26-2500-3	29-14000-x	09-4000-2.5	26-150 -1	27- 780 -6	07- 50 -1
31.7	N27	3591 (2)	3560	25-1500-2	04- 4000-3	07-1500-1.5	26-130 -6	02- 230 10	04- x -1
31.5	S16	3593 (5?)	3562	26-4000-1.5	26- 4000-1.5	04-1500-1			

CORONAL LINE EMISSION INDICES

JULY 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
July																
1	67	120	X	X	53	86	X	X	76	92	24	40	131	207	43	61
2	85[a]	124[a]	X	X	40[a]	48[a]	X	X	52	75	28	41	122	197	44	71
3	54	91	21[a]	35[a]	43	57	9[a]	20[a]	66	120	37	53	107	140	56	106
4	70[a]	109[a]	18[a]	29[a]	69[a]	108[a]	15[a]	16[a]	86	131	45	56	90	154	41	105
5	67	126	29	63	73	103	16	30	X	X	X	X	X	X	X	X
6	97	150	38[a]	59[a]	93	140	35[a]	80[a]	90	120	34	49	74	92	25	31
7	X	X	X	X	X	X	X	X	76	116	X	X	86	132	X	X
8	X	X	X	X	X	X	X	X	59	78	50	75	77	99	57	68
9	X	X	X	X	X	X	X	X	95	125	34	61	138	250	54	94
10	137	213	37	75	87	144	25	42	78	128	24	36	108	155	40	67
11	90	116	35	54	70	88	25	47	92	140	43	80	141	184	58	92
12	86	112	33	40	53	103	27	31	85	128	37	45	160	258	47	100
13	103	123	38	60	76	113	19	20	62	80	44	74	155	209	66	128
14	101	156	38	62	56	88	19	30	X	X	X	X	109	150	X	X
15	154	193	53	92	105	135	31	44	28[a]	31[a]	14	16	40[a]	49[a]	33	53
16	124	181	36	52	99	107	41	66	103	122	28	43	181	195	60	130
17	104	140	51	100	101	141	51	80	122	204	16	33	173	232	37	38
18	73	81	27	40	100	120	45	101	106	175	49	90	113	172	49	87
19	X	X	X	X	X	X	X	X	110	115	30	65	66	126	17	40
20	64	120	10[a]	15[a]	92	153	23[a]	36[a]	136	235	35	59	44*	86	22	30
21	102	200	X	X	151	235	X	X	102	232	26	36	68	115	38	44
22	62	127	30	61	67	138	30	52	82	146	37	53	57	89	35	47
23	77	184	17	40	53	110	32	51	X	X	X	X	X	X	X	X
24	48	68	10	15	55	63	14	20	X	X	X	X	X	X	X	X
25	55	70	18	35	98	155	20	37	X	X	X	X	X	X	X	X
26	56	80	30	52	150	185	16	27	X	X	X	X	X	X	X	X
27	58	87	36	54	126*	169	23	46	57	82	16	27	54	88	24	42
28	101	149	X	X	96	120	X	X	57	89	26	47	82	113	33	71
29	28[a]	39[a]	16[a]	21[a]	18[a]	23[a]	9[a]	16[a]	56	87	18	31	133	254	32	78
30	86	173	25	36	59	75	7	24	65	113	29	39	91	150	36	91
31	78	141	16	29	68	98	37	60	116	182	67	96	106	178	39	87

a = index computed from low weight data.
* = yellow line observed.

SOLAR FLARES

JULY 1956

Observatory	Date July 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
Schaus.	04	0635	0642	7		3560	N27	W13				1	
Schaus.	04	0649	0682	33		3567	S23	E85				1	
Meudon	05	1014	1024	10		3563	S25	E05				1	
Capri-S	05	0955	1026	31	194	3563	S27	E09				1	
Capri-S	05	1259	1310	11	145	3563	S21	W02				1 *	
Capri-S	05	1319	1330	11	145	3563	S21	W01				1	
Capri-S	05	1347	1407	20	290	3567	S22	E68				1+	
Capri-S	05	1600	1620	20	339	3557	N25	W63				1+	
Capri-S	06	0855	0905	10	145	3565	N20	E44				1	
{ Kanzel.	06	0955	1010	15		3565	N15	E45				1 }	
{ Capri-S	06	0954	1035	41	145	3565	N20	E44				1 }	
Meudon	06	1003	1013	10		3567	S25	E55				1	
Capri-S	07	0921	0945	24	339	3563	S23	W13				1+	
Capri-S	07	1616	1625	9	232	3565	N20	E22				1 *	
Capri-S	08	0647	0658	11	106	3563	S26	W23				1	
Capri-S	08	1333	1348	15	111	3567	S27	E08				1 *	
Capri-S	08	1449	1504	15	194	3562	S13	W56				1	
Capri-S	08	1528	1615	47	218	3567	S27	E07				1 *	
Capri-S	08	1422	1441	19	242	3560	N28	W60				1+	
Capri-S	10	1105	1122	17	290	3562	S12	W84				1+	
Capri-S	10	1204	1217	13	213	3565	N17	W09				1+	
Capri-S	10	1347	1440	53	97	3565	N17	W10				1	
Capri-S	11	0818	0837	19	194	3574	N14	E80				1+	
Capri-S	11	1339	1404	25	111	3565	N20	W28				1 *	
McMath	11	2015	2058	43		3570	N15	E05				1	
Capri-S	12	0555	0622	27	131	3574	N13	E65				1	
Capri-S	12	0658	0735	37		3560	N34	W90				1+	
Capri-S	12	0806	0855	49	203	3565	N19	W33				1+	
Capri-S	12	0832	0902	30	145	3574	N13	E60				1	
Capri-S	12	0935	0950	15	106	3574	N20	E60				1	
Capri-S	12	1511	1538	27	145	3567	S26	W25				1 *	
Capri-S	13	0933	0951	18	150	3565	N17	W51				1	
Capri-S	14	1427	1512	45	290	3565	N16	W64				1+*	
Capri-S	14	1615	1630	15	232	3565	N16	W65				1	
McMath	14	1858	1910	12		3574	N18	E30				1	
Capri-S	15	0859	0911	12	213	3567	S20	W60				1	

* Sac. Peak lists as importance 1-.

SOLAR FLARES

JULY 1956

Observatory	Date July 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	0933	0951	18	252	3574	N12	E18				1+	
Capri-S	15	1416	1508	52	160	3570	N16	W59				1 *	
Capri-S	15	1635	1647	12	184	3565	N23	W74				1	
Capri-S	16	1145	1206	21	194	3570	N18	W73				1	
Capri-S	16	1320	1346	26	106	3570	N17	W73				1	
Capri-S	16	1532	1607	35	97	3570	N18	W75				1	
S. Peak	16	2115	a2155	>40	140	3567	S21	W90	2135	18	6	1	
Capri-S	17	0727	0748	21	242	3570	N16	W85				1+	
Capri-S	17	0837	0844	7	131	3571	N15	W47				1	
Meudon	18	0557		>100		3577	N25	E05				1	
McMath	18	2040	2147	67		3577	N26	W02				2	
Tokyo	21	b0136		~10		3577	N15	W25				1	
Capri-S	21	1216	1226	10	106	3577	N26	W39				1	
{ McMath	21	1513	1555	42		3577	N25	W40				1 }	G-SWF
S. Peak }	21	1500	a1520	>20	90	3577	N26	W37	1515	18	5	1- }	
Schaus.	21	1525	1550	25		3581	N25	E35				1	
Mt.Wilson	21	1614	1704	50		3577	N25	W45				1	Slow S-SWF
McMath	21	2013	2037	24		3577	N25	W40				1	Slow S-SWF
Tokyo	21	b2309		~10		3586	S25	E75				1	
Capri-S	22	1022	1038	16	203	3586	S27	E60				1	S-SWF
S. Peak	22	1535	~1600	~25	115	3586	S22	E52	1545	15	6	1	
Mt.Wilson	22	1624	1644	20		3577	N25	W45				2	S-SWF
{ S. Peak	22	a1635	1720	<45	175	3577	N31	W55	1641	30	5	1 }	
Meudon	22	1652	1807	75		3577	N25	W55				1+ }	
McMath }	22	~1730				3577	N25	W50				1+ }	
S. Peak	22	2300	a2340	>40	530	3586	S24	E55	a2315	23	1	2	S-SWF
McMath	23	~1400				3586	S24	E48				1	G-SWF
Neder.	23	1425	1435	10		3577	N25	W60				1	
Tokyo	24	b0631		~20		3586	S25	E45				1	
Schaus.	26	b0626	0640	>14		3586	S27	E17				1	
{ Capri-S	26	1350	1406	16	145	3586	S29	E15				1 }	
McMath	26	~1400				3586	S24	E10				1 }	
Schaus.	26	1350	1420	30		3586	S31	E15				1 }	
Neder. }	26	b1353				3586	S28	E18				1 }	
McMath	26	1631	1710			3586	S24	E10				1	

*Sac. Peak lists as importance 1-.

SOLAR FLARES

JULY 1956

Observatory	Date July 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
McMath	27	1340	1410	30		3592	S30	E90				1	
Capri-S	27	1552	1623	31	145	3592	S32	E68				1 *	
{ McMath	28	1346	1427	41		3592	S27	E80				1 ** }	S-SWF
{ Capri-S	28	1342	1400	18	242	3592	S30	E87				1+ }	
Capri-S	29	0831	0850	19	145	3586	S22	W23				1	
McMath	29	~2045				3586	S23	W28				1	S-SWF
Capri-S	30	0751	0801	10	242	3594	S16	E27				1	
Schaus.	30	b1733	1815	>42		3599	N35	E80				1	
Schaus.	30	b1800	1825	>25		3592	S30	E28				1	
Capri-S	31	0908	0925	17	111	3586	S19	W50				1	
Capri-S	31	0928	0953	25	242	3586	S21	W50				1	
Capri-S	31	1009	1022	13	106	3594	S16	E17				1	

*Sac. Peak lists as importance 1-.

**Accompanied by large bright surge.

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

July 3, 2220 (3562)
4, 2105 (3562)
5, 1555 (3557)
6, b1957 (3563)
2015 (3563)
7, 1525 (3570)
1525 (3565)
8, 1445 (3562)
1450 (3571)
b1600 (3563)
9, 1430 (3560)++
10, 2009 (3571)+

July 11, 1450 (3572)
1925 (3565)+
12, 1430 (3574)
1445 (3565)
1521 (3567)++
13, 1550 (3574)
1740 (3565)+
16, 1500 (3565)
17, b1345 (3570)
1430 (3571)
20, b1619 (3577)
~2040 (3577)+

July 21, 1618 (3577)+
~1703 (3577)+
b2310 (3577)
b2310 (3586)
22, 1355 (3577)
b1450 (3577)
1505 (3577)
1620 (3586)
2300 (3577)
25, 1400 (3583)
26, 1523 (3586)++
30, 1715 (3599)
31, 1645 (3600)

\+ McMath or McMath and Sac. Peak.

++ Wendelstein.

Erratum (CRPL-F 143, Part B): Capri-S flare of May 31 at 1814 UT should be importance 1, not importance 3.

IONOSPHERIC EFFECTS OF SOLAR FLARES

JUNE 1956

June 1956	Start UT	End UT	Type	Wide-spread Index	Importance	Observation Stations
2	2250	2330	Slow S-SWF	5	3-	AN, BE, MC, OK, WS, RCA+
3	1850	1900	G-SWF	3	1-	BE, MC, PR
4	0939	1020	S-SWF	3	2-	NE*, SW**
6	0545	0656	Slow S-SWF	4	3-	DA***, OK
7	1715	1800	Slow S-SWF	4	2+	BE, MC, PR
	1840	1958	Slow S-SWF	5	3-	AN, BE, HU, MC, PR, WS, NE*
13	1501	1656	Slow S-SWF	5	2	BE, HU, MC, PR, WS, NE*
14	0356	0456	S-SWF	4	3+	AN, OK
	0955	1100	S-SWF	2	3-	DA***, NE*
	1235	1310	G-SWF	2	1-	MC, PR, NE*, DA***
	1813	1900	Slow S-SWF	5	1+	AN, BE, HU, MC, PR, NE*
15	0340	0400	S-SWF	1	1-	OK
	0835	0857	S-SWF	3	1+	OK, NE*
17	1148	1210	S-SWF	2	1	PR, DA***
18	2043	2118	G-SWF	5	1+	BE, HU, MC, PR, WS
19	1220	1250	Slow S-SWF	2	1-	WS, NE*
	1840	1905	G-SWF	5	1	AN, BE, MC, PR, NE*
20	1817	1855	S-SWF	5	2-	AN, BE, HU, MC, PR, WS, NE*
	1937	2040	Slow S-SWF	5	3-	AN, BE, HU, MC, PR, WS, NE*
	2107	2125	G-SWF	3	1	BE, MC, PR
21	0320	0400	Slow S-SWF	4	2-	AN, OK
22	0709	0729	S-SWF	4	1-	OK, NE*, DA***
	1548	1655	Slow S-SWF	5	3-	BE, HU, MC, PR, NE*, RCA*, SW**
24	0120	0200	Slow S-SWF	5	2+	AN, CO, OK
	1255	1325	S-SWF	5	3	BE, HU, MC, PR, WS, NE*
	2215	2305	Slow S-SWF	1	1+	OK
25	0118	0150	Slow S-SWF	4	1+	OK, WS
	0215	0303	S-SWF	1	2-	OK
	1410	1440	G-SWF	3	1-	BE, MC, PR

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

SOLAR RADIO WAVES (BOULDER) -- 167 MC

3-HOURLY AND DAILY FLUX

JULY 1956

July 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	--	8	9	9	8	1	0	(0)	(0)	1	1135-2617
2	--	8	8	--	8	(1)	(1)	(1)	--	(1)	1525-2121, 2306-2616
3	--	9	9	10	9	2	(1)	(1)	(1)	2	1330-2616
4	--	13	14	14	14	1	1	(1)	2	2	1136-2616
5	--	27	66	31	40	(2)	3	3	3	3	1137-2615
6	24	24	37	36	31	2	2	3	3	3	1137-2615
7	17	14	12	13	14	2	2	2	3	3	1138-2615
8	11	11	11	13	11	3	2	2	3	3	1139-2614
9	10	10	10	11	10	2	3	2	(2)	3	1139-2022, 2133-2614
10	12	14	12	11	12	3	3	(2)	(2)	3	1140-2614
11	--	10	11	11	11	--	(1)	(2)	(2)	(2)	1521-2613
12	12	10	11	11	11	2	(1)	(2)	(2)	(2)	1141-2613
13	10	10	10	11	10	(1)	(2)	2	(1)	2	1142-2612
14	9	9	9	10	9	0	1	1	(1)	1	1143-2612
15	9	9	10	10	9	1	0	(0)	(0)	1	1144-2611
16	9	9	9	9	9	(0)	(0)	(0)	(0)	(0)	1144-2611
17	11	11	12	14	12	(1)	2	(2)	(1)	2	1145-2609
18	8	9	13	13	11	2	(1)	(2)	(2)	2	1146-2608
19	--	50	97	62	70	2	3	3	3	3	1147-2606
20	18	16	13	11	14	3	(2)	(2)	3	3	1148-2606
21	34	45	92	56	59	3	2	3	2	3	1148-2605
22	31	24	15	23	23	3	3	(2)	2	3	1149-2604
23	81	34	22	29	38	3	3	2	2	3	1150-2602
24	13	12	14	42	21	2	3	2	3	3	1151-2601
25	14	14	29	143	53	2	2	2	3	3	1152-2600
26	16	27	29	62	36	2	2	3	3	3	1153-1514, 1538-2600
27	46	24	18	31	28	3	2	3	3	3	1154-2600
28	11	13	36	74	36	1	2	3	3	3	1154-2559
29	17	14	18	16	16	3	3	(2)	(1)	3	1155-2559
30	9	10	9	--	9	(0)	(0)	(0)	(0)	(0)	1156-2558
31	9	12	12	--	11	(1)	(2)	3	--	3	1157-2114

SOLAR RADIO WAVES (BOULDER) -- 460 MC

3-HOURLY AND DAILY FLUX

JULY 1956

July 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	39	40	40	40	40	0	0	0	0	0	1135-2600
2	--	40	40	40	40	--	0	0	(0)	(0)	1525-2616
3	42	41	42	42	42	1	0	0	(0)	1	1136-2616
4	41	41	42	42	42	0	0	0	0	0	1136-2616
5	44	45	45	44	45	0	0	0	0	0	1137-2615
6	45	44	45	44	45	0	0	0	0	0	1137-2615
7	45	45	45	45	45	0	0	0	0	0	1138-2615
8	47	47	47	47	47	0	0	1	0	1	1139-2614
9	49	48	48	49	48	0	0	0	0	0	1139-2614
10	48	49	49	50	49	0	0	0	0	0	1140-2614
11	--	51	52	51	51	--	0	0	0	0	1520-2613
12	48	50	51	50	50	0	0	0	0	0	1141-2613
13	49	50	50	50	50	0	0	0	0	0	1142-2612
14	47	47	48	48	47	0	0	0	0	0	1143-2612
15	47	48	49	48	48	0	0	0	0	0	1144-2611
16	48	49	49	50	49	0	0	0	0	0	1144-2611
17	48	49	49	49	49	0	0	0	0	0	1145-2609
18	50	50	53	50	51	0	(0)	2	2	2	1146-2608
19	50	50	52	--	51	0	0	0	--	0	1147-1625, 1647-2042*
20	46	47	46	45	46	0	0	0	0	0	1148-2606
21	48	48	50	48	49	1	0	0	0	1	1148-2605
22	48	49	51	54	51	2	0	0	0	2	1149-2604
23	133	195	108	73	127	2	1	1	1	2	1150-2602
24	58	56	57	69	60	0	1	1	2	2	1151-2601
25	55	55	56	86	61	0	1	0	1	1	1152-2600
26	53	56	56	69	59	2	0	0	(1)	2	1153-2600
27	54	53	53	56	54	1	1	0	1	1	1154-2600
28	52	54	62	69	60	0	0	0	0	0	1154-2559
29	57	59	60	55	58	0	0	1	1	1	1155-2559
30	53	--	58	57	56	0	--	(0)	0	(0)	1156-1559, 1839-2558
31	56	61	60	--	59	0	0	0	--	0	1157-2114

* Additional observed period 2433-2606.

SOLAR RADIO WAVES (BOULDER) -- 167 MC
OUTSTANDING EVENTS [1.]
JULY 1956

July 1956	Type	Start UT	Duration Hrs:Mins	Time UT	Maximum Inst. Flux	Smd. Flux	Remarks
3	8	1419.1	00:08.1	1419.4	> 1100	21	
4	6	(1136)	(14:40)	1604.6	460	6	
5	6	(1137)	(14:38)	~ 1900	> 1500	59	
5	8	2346.2	00:01.1	2346.8	> 3000	--	Off scale See Note 2
6	6	(1137)	(14:38)	~ 1930	260	29	
7	6	(1138)	(14:37)	~ 1400	--	9	
7	8	(2233)	(00:03)	2233.3	640	310	
8	6	(1139)	(14:35)	2339.4	480	5	
9	1	(1139)	(14:35)	1703.7	1000	--	
10	6	(1140)	(14:34)	1423.2	350	5	
11	1	1837	(07:36)	1915.9	610	--	
13	8	1917.7	00:11.1	1928.1	100	28	
17	6	1530	(10:39)	~ 2230	130	5	
18	3	1336.3	00:00.8	1336.7	230	--	
18	6	1815	(07:54)	Note 3	> 1700	6	Off scale
19	6	(1147)	(14:19)	~ 2000	900	88	
20	6	(1148)	(14:18)	Note 4	990	9	Off scale
21	6	(1148)	(14:17)	1858	> 1500	83	
21	8	1220	00:04	1223	> 2900	380	
22	6	(1149)	(14:15)	~ 1300	> 1900	21	
23	6	(1150)	(14:12)	~ 1500	480	67	
24	6	(1151)	(14:10)	~ 2330	> 1800	33	
25	6	(1152)	(14:08)	2219	> 3200	130	
26	6	(1153)	(14:07)	Note 5	> 3200	53	
27	6	(1154)	(14:06)	~ 2300	750	32	
28	6	2008	(05:51)	2105	1200	110	
29	6	(1155)	(14:04)	~ 1300	570	10	
31	1	1437	06:14	1848.7	350	--	

Notes:
1. Severe sferics and man-made interference may sometime obscure or be mistaken for solar events. Relatively small events not reported.
2. Other large bursts at: 1248, 1309, 1819, 1850, 2056, and 2228.
3. Off scale bursts at: 2049, 2107, 2312, 2318, 2428, 2430, 2433.
4. Off scale bursts at: 1429, 1537, 2320 to 2326.
5. Off scale burst at 1236, large bursts at 1350 and 1939.

SOLAR RADIO WAVES (BOULDER) -- 460 MC

OUTSTANDING EVENTS [1.]

JULY 1956

July 1956	Type	Start UT	Duration Hrs:Mins	Time UT	Maximum Inst. Flux	Smd. Flux	Remarks
3	3	1420.8	00:00.1	1420.8	460	--	
8	2	1942.5	00:10.3	1944.8	> 1200	1	
16	8	1839.1	00:00.6	1839.2	> 2900	--	off scale
18	8	2048	00:30	2102.7	> 3300	210	
18	3	2313.0	00:00.7	2313.6	> 1000	--	
18	8	2428.9	00:15	2429.0	> 2900	2	
20	3	2158.8	00:00.1	2158.8	93	--	
21	2	1218.9	00:01.7	1219.0	180	--	
22	3	1213.1	00:00.1	1213.1	870	--	
22	1	1346	06:14	1407:9	130	--	
22	6	2000	(06:04)	2451.9	130	6	
23	6	(1150)	(14:12)	1524.6	630	160	See Note 2
23	8	1935.6	00:19	1948:4	580	210	
24	6	(1151)	(14:10)	1623.5	220	15	
24	8	2157.0	00:02.7	2159.0	> 2100	180	
25	6	(1152)	(14:08)	2240.2	220	39	
25	3	1614.0	00:00.8	1614.3	310	--	
26	6	(1153)	(14.07)	2238.5	280	22	
26	8	1232.7	00.05.6	1232.8	> 2100	670	off scale
27	6	(1154)	(14:06)	1741.8	160	9	
27	3	2124.1	00:00.1	2124.1	740	--	
28	6	(1154)	(14:05)	2056.1	130	23	
28	3	1201.8	00:00.1	1201.8	> 2100	--	off scale
29	6	(1155)	(14:03)	2225.7	150	15	
30	6	(1156)	(14:02)	~ 2000	--	10	
31	6	(1157)	(09:17)	~ 1700	130	14	

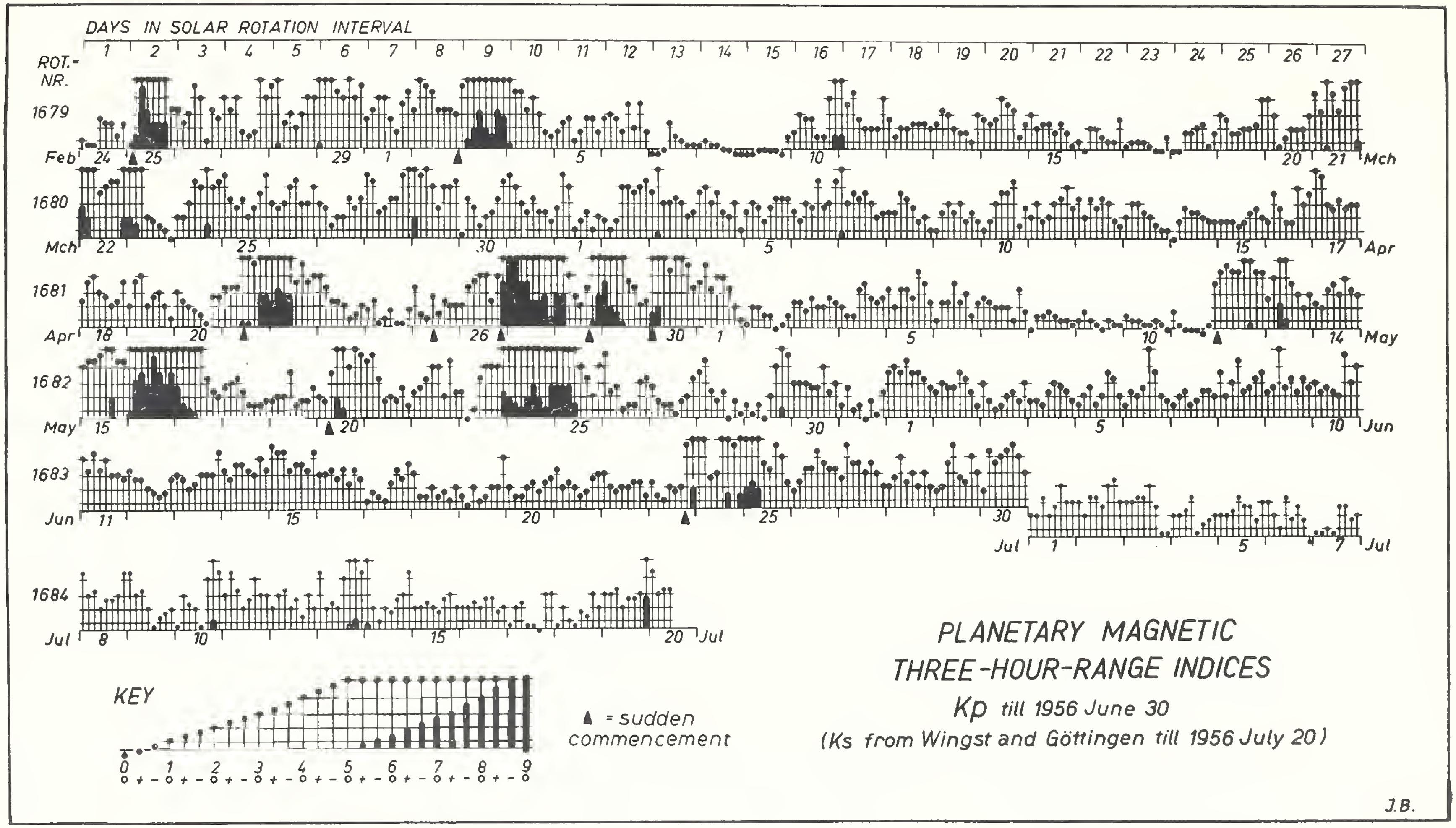
Notes: 1. Some relatively small 460 mc/s events are unreported or may have been obscured by interference.

2. The most energetic noise storm to date during the present sunspot cycle occurred between 1400 and 2000 U.T. on July 23, 1956.

GEOMAGNETIC ACTIVITY INDICES

JUNE 1956

June 1956	C	Values Kp Three hour Gr. interval 1	2	3	4	5	6	7	8	Sum	Ap	Final Selected Days
1	1.0	4-	4o	4-	4+	4-	4-	3+	3-	29o	22	Five
2	0.8	2+	3o	3-	3-	4-	3+	2+	1+	21+	13	Quiet
3	0.4	3o	2-	1o	1+	2o	2+	2-	3o	16o	8	
4	0.5	2-	2-	1+	2+	3o	3-	2+	2-	17-	8	3
5	0.6	1+	2o	3-	1+	2o	4-	3+	2o	18+	10	7
												18
6	0.9	1+	2+	2o	3-	5o	4-	2o	2-	21-	14	19
7	0.3	1+	2o	2+	1+	2-	2+	2+	2o	15+	7	20
8	0.8	4-	2o	3o	4+	2+	3-	3+	4-	25o	17	
9	0.9	2+	3-	5o	3-	3+	2+	3+	3-	24+	17	
10	0.9	3o	2+	3-	2+	2o	5-	3o	4o	24o	17	
11	1.0	4o	3+	4+	3+	4o	3o	3o	3-	28-	20	Five
12	0.6	3+	3-	3-	2o	2-	1+	2-	3-	18o	10	Disturbed
13	0.8	3o	3-	2o	2+	3o	3o	3o	4+	23+	15	
14	0.9	3+	3-	4-	4-	3+	3o	4o	3+	27o	19	1
15	1.2	5-	4+	4+	3+	4-	4-	3+	4+	32-	27	15
												24
16	0.8	3o	3o	3+	3-	3+	2+	3+	3-	24-	15	25
17	0.6	1o	2-	1+	1o	2+	3+	3-	4-	17o	10	30
18	0.3	3o	1+	1+	2o	1+	2-	1o	2o	14-	7	
19	0.4	1+	1-	2o	1o	1+	2o	2o	4o	14+	8	
20	0.6	2o	1+	1+	2o	2+	2-	2+	3-	16-	8	
21	0.6	3+	2o	2+	2o	1+	2-	3-	3o	18+	10	Ten
22	0.4	3o	2o	2-	2o	2o	2+	2+	1+	17-	8	Quiet
23	0.9	2+	1+	1o	2o	2-	2o	5-	6+	21+	21	
24	1.5	5o	5o	3-	3o	5o	6o	5-	6o	37+	46	3
25	1.6	6+	7-	6+	4-	3+	5-	4o	2+	37+	52	4
												7
26	0.9	2-	2+	3+	3+	4+	4-	3+	3+	25+	18	12
27	1.0	3-	5-	4-	4-	3o	4-	3o	2o	26+	19	17
28	0.6	2o	3-	4o	2+	3o	2o	3o	2o	21o	12	18
29	0.9	2-	2o	4-	5-	3-	2+	4o	3o	24o	17	19
30	1.0	2-	4+	4-	4o	4+	5-	4o	3o	30-	25	20
Mean:	0.78									Mean:	17	21
												22


DAYS IN SOLAR ROTATION INTERVAL
ROT.-NR.
1679
1680
1681
1682
1683
1684
KEY
▲ = sudden commencement
PLANETARY MAGNETIC
THREE-HOUR-RANGE INDICES
Kp till 1956 June 30
(Ks from Wingst and Göttingen till 1956 July 20)
J.B.

CRPL RADIO PROPAGATION QUALITY FIGURES AND FORECASTS

NORTH ATLANTIC

JUNE 1956

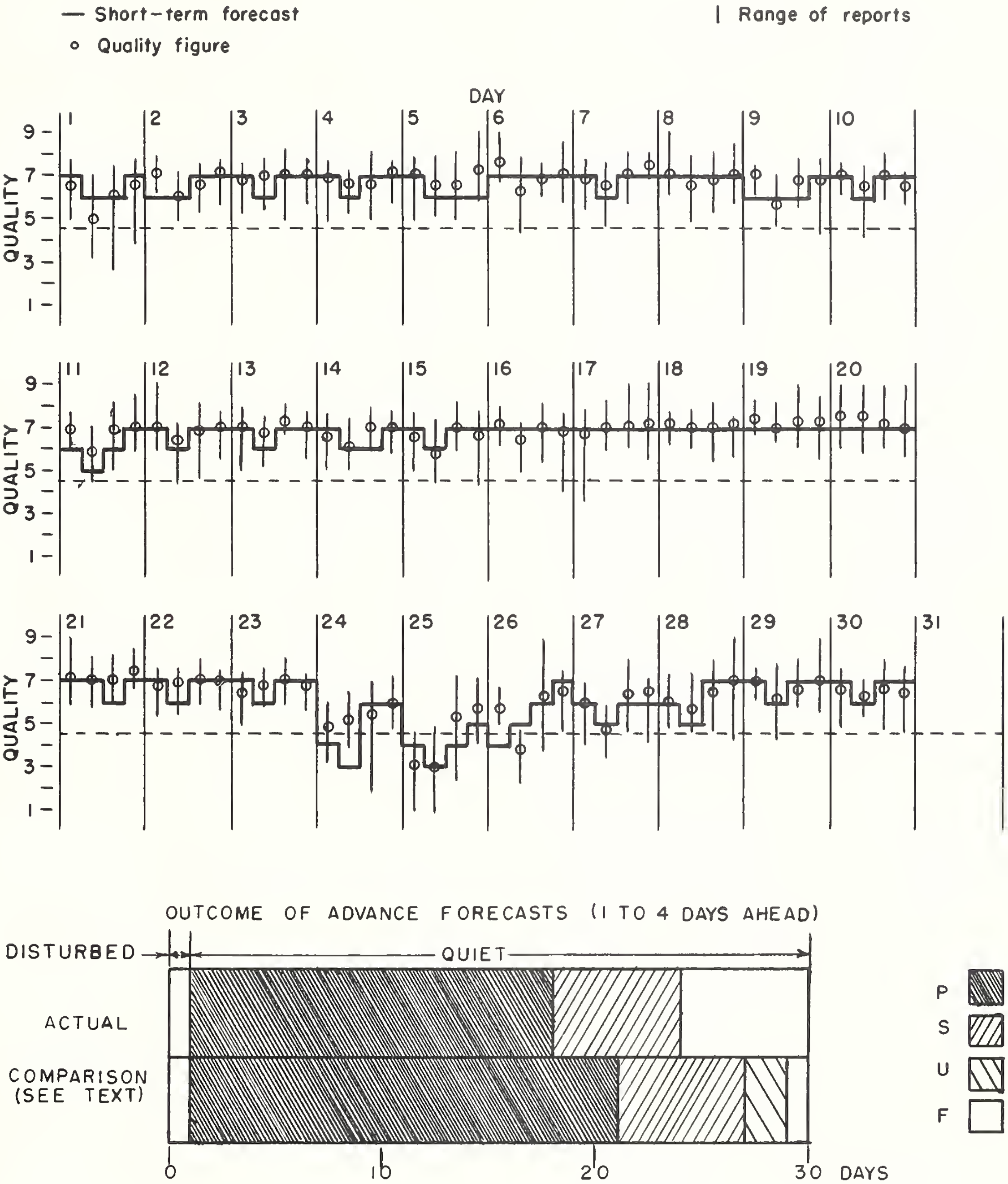
June 1956	North Atlantic 6-hourly quality figures				Short-term forecasts issued about one hour in advance of:					Whole day index	Advance forecasts (J-reports) for whole day; issued in advance by:			Geomag-netic K_{Ch}	
	00 to 06	06 to 12	12 to 18	18 to 24		00	06	12	18		1-4 days	4-7 days	8-25 days	Half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

( ) represent disturbed values.

CRPL RADIO PROPAGATION QUALITY FIGURES AND FORECASTS

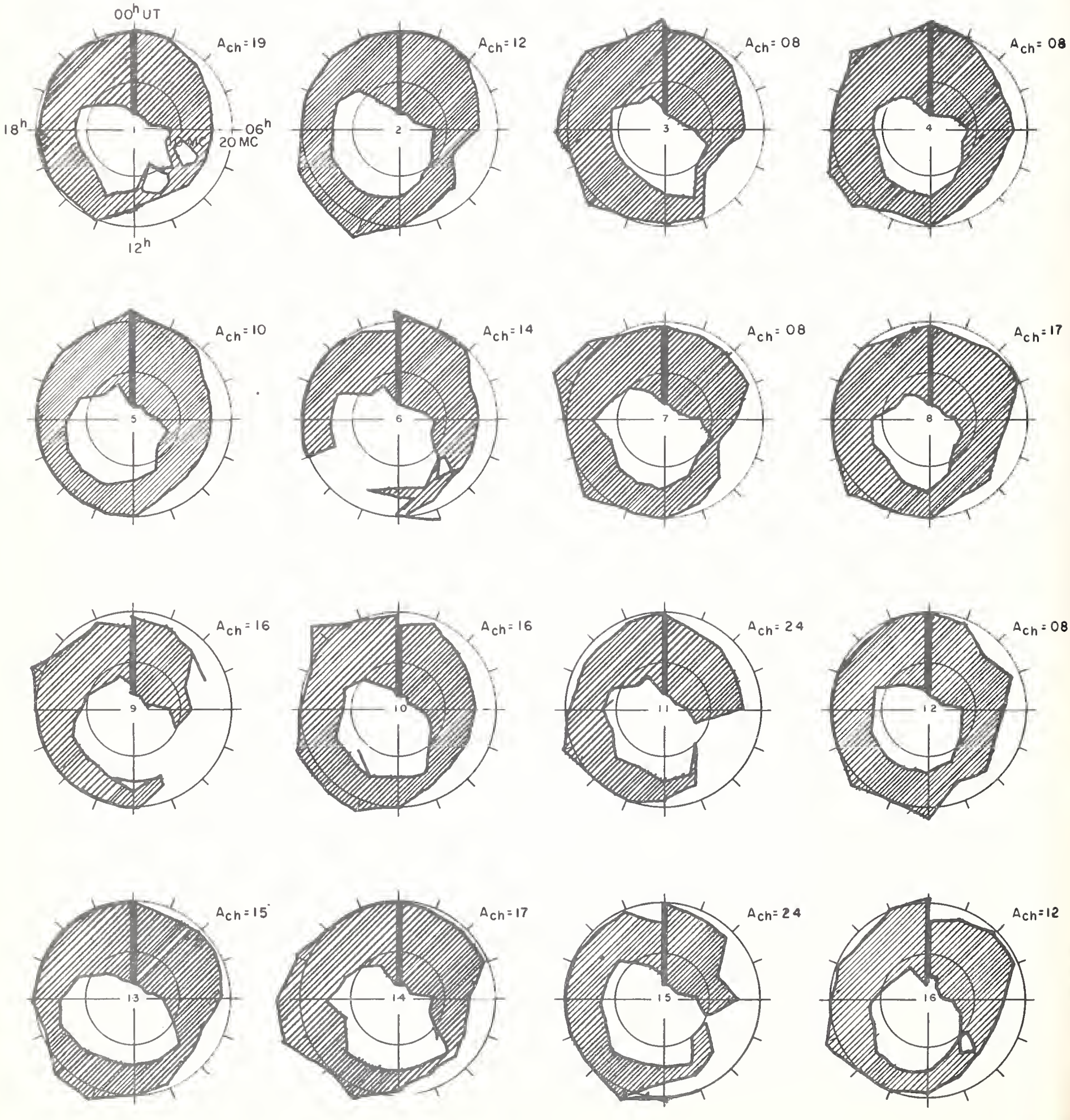
NORTH ATLANTIC

JUNE 1956

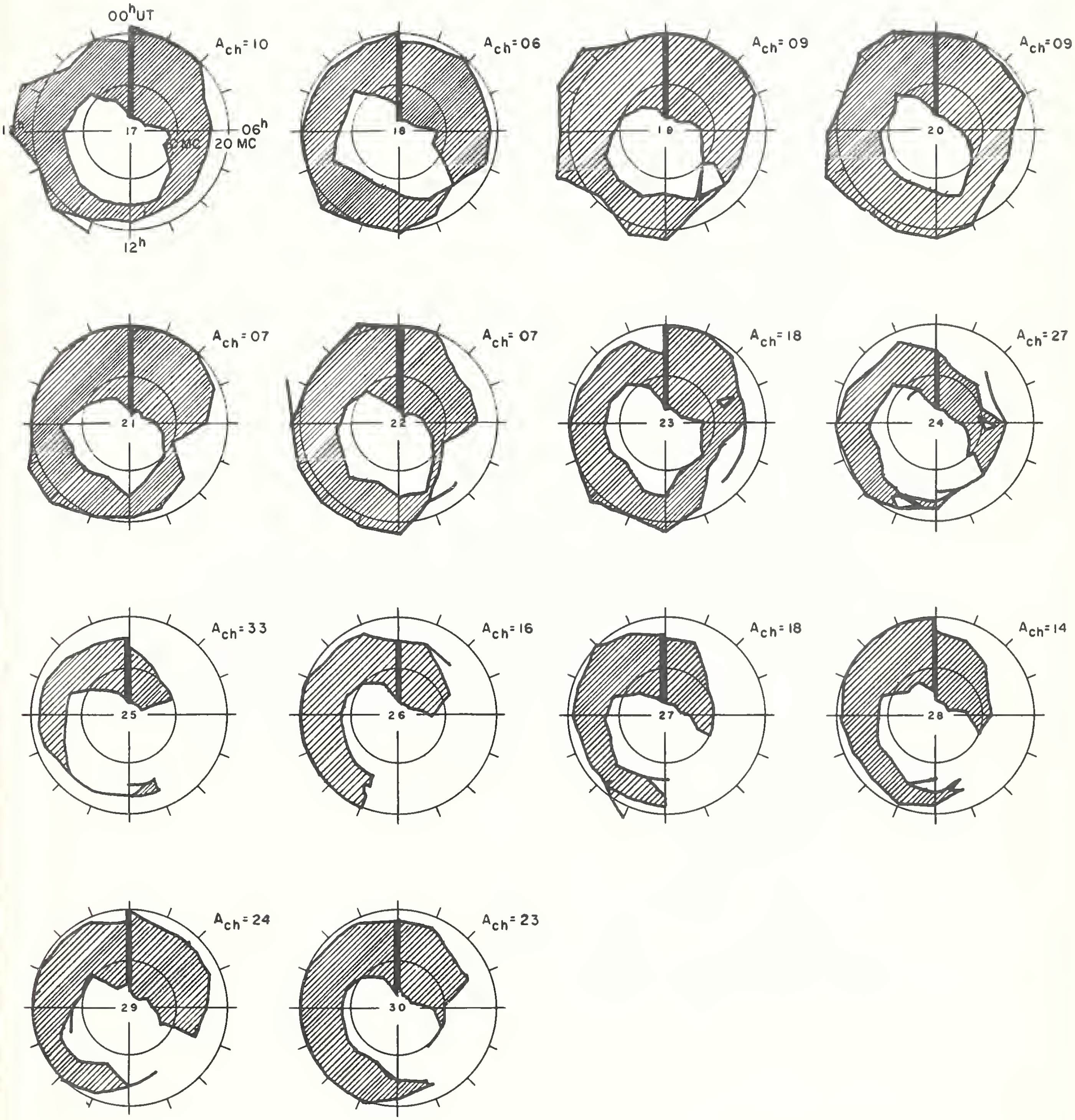


USEFUL FREQUENCY RANGES -- NORTH ATLANTIC PATH

JUNE 1956



JUNE 1956



Adapted from Observations by Deutschen Bundespost

CRPL RADIO PROPAGATION QUALITY FIGURES AND FORECASTS

NORTH PACIFIC

JUNE 1956

June 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_{S1}	
	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		7	4	5	5	7	7		(5)	3
2	6	6	6		5	6	7	5	4	7		3	3
3	6	6	6		7	6	6	6	3	6		2	2
4	5	5	5		6	6	6	6	5	6		2	2
5	6	6	6		6	6	7	6	6	6		2	3
6	6	6	6		6	7	7	6	6	7		3	3
7	6	6	6		6	6	6	6	3	7		2	2
8	6	6	7		7	7	7	6	3	7		3	3
9	6	6	7		6	5	7	7	6	5		3	3
10	6	6	7		7	6	7	7	6	6		3	3
11	6	6	6		7	6	6	6	6	6		(5)	3
12	5	6	6		6	6	7	5	6	6		3	2
13	6	6	6		6	7	7	6	7	6		3	3
14	6	6	6		6	6	6	6	7	7		3	3
15	5	5	6		6	5	6	5	7	7		(4)	3
16	5	6	6		6	6	6	6	6	7		3	3
17	6	6	7		6	7	7	6	6	7		2	3
18	6	6	6		6	7	7	6	7	7		2	2
19	5	5	6		6	7	7	6	7	7		2	2
20	6	6	5		6	7	7	6	3	3		2	2
21	6	6	7		7	6	6	6	4	4		3	2
22	6	5	7		7	7	6	6	4	5		3	2
23	6	6	6		7	7	6	6	4	5		2	3
24	4	4	5		4	4	4	(4)	4	6		(5)	(5)
25	3	5	6		3	3	6	(4)	5	7		(7)	3
26	4	4	5		5	6	5	5	6	7		(4)	(4)
27	4	5	6		5	5	6	5	5	7		3	3
28	5	5	6		5	6	6	5	6	7		(4)	2
29	5	5	5		6	5	5	5	6	7		(4)	(4)
30	5	5	5		5	5	5	5	5	6		(4)	(4)
Score:	Quiet Periods			P	11	14	17		7	5			
				S	14	11	12		12	13			
				U	1	3	1		2	8			
				F	0	0	0		7	2			
	Disturbed Periods			P	2	1	0		1	0			
				S	2	0	0		1	0			
				U	0	0	0		0	0			
				F	0	1	0		0	2			

( ) represent disturbed values.

CRPL RADIO PROPAGATION QUALITY FIGURES AND FORECASTS
NORTH PACIFIC
JUNE 1956