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PART B

SOLAR - GEOPHYSICAL DATA

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JUNE 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 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 trüe 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.

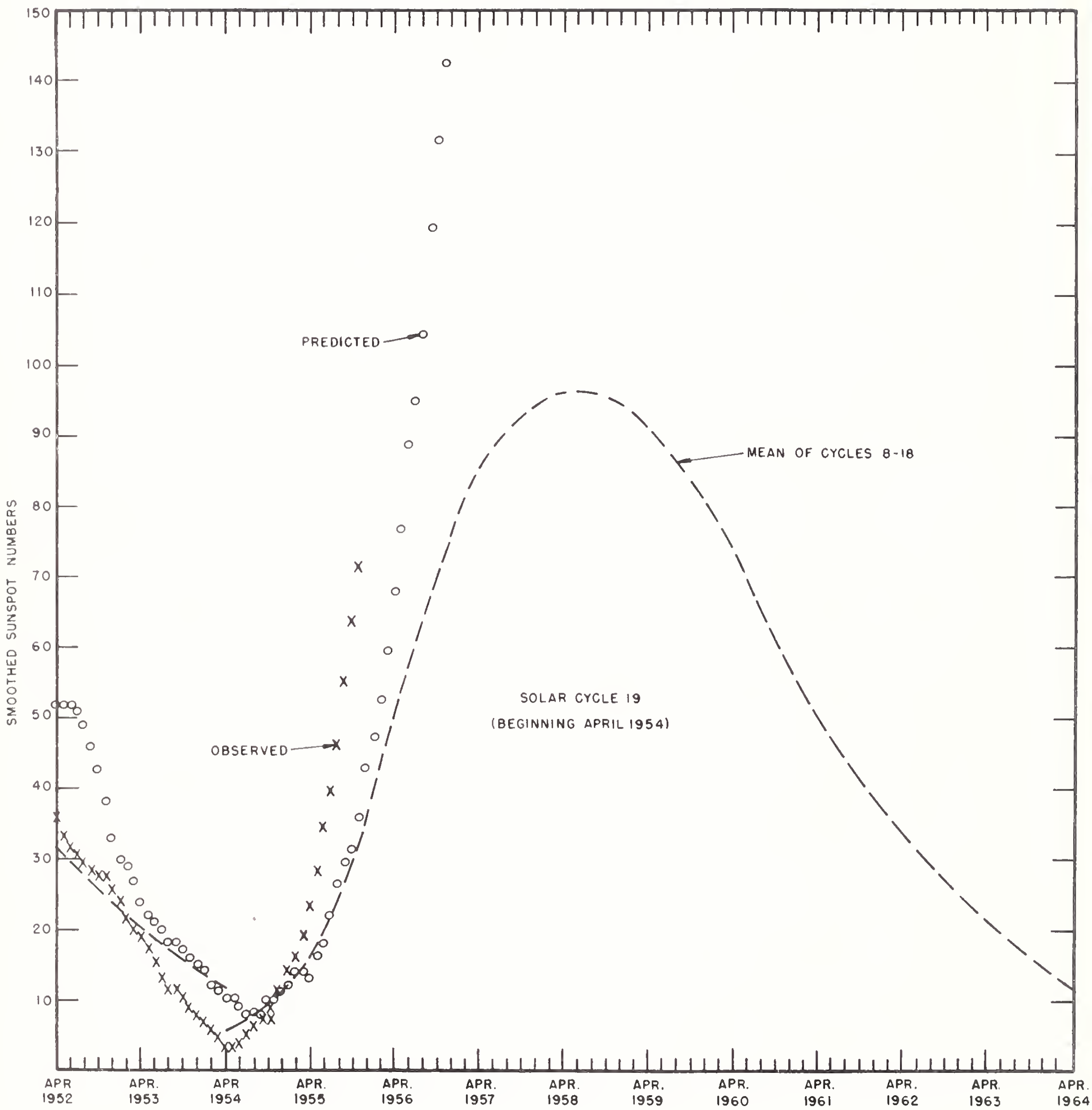
The table, analagous to that for Qa, includes the 9-hourly quality figures; whole day quality figures; short term forecasts issued by NPRWS three times dailv at 02^h, 09^h, and 18^h UT, applicable to the stated 9-hour periods; advance forecasts issued twice weekly by NPRWS (CRPL-Jp report); and half-day 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 April 1956	
Date	$R_{A'}$
1	79
2	49
3	37
4	22
5	31
6	36
7	53
8	84
9	107
10	134
11	140
12	169
13	170
14	147
15	161
16	130
17	188
18	173
19	161
20	139
21	135
22	124
23	86
24	76
25	91
26	82
27	78
28	57
29	57
30	77
Mean:	102.4

Zürich Provisional Relative Sunspot Numbers May 1956	
Date	R_Z
1	78
2	93
3	138
4	169
5	158
6	162
7	162
8	186
9	180
10	178
11	175
12	163
13	142
14	133
15	110
16	122
17	132
18	144
19	136
20	127
21	144
22	119
23	82
24	102
25	103
26	120
27	115
28	137
29	136
30	146
31	123
Mean:	136.0



PREDICTED AND OBSERVED SUNSPOT NUMBERS

CALCIUM PLAGE AND SUNSPOT REGIONS

MAY 1956

CMP May 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
02.4	S27	3483	New	02- 300-2.5	07- 2000-3	08-2000-3	04-120 -3	06- 340 -3	06-340 -3
02.8	S15	3478	New	30- 400-2.5	08- 3000-3	08-3000-3	30- 60 -4	01- 250 -7	06- 50a-x
05.1	S15	3484	New	02- 600-2	07- 1000-2	08-1000-2	03- xx -2	---	04- 50 -1
06.1	S20	3479(2)	3453	29-2000-2	30- 4000-4	12-2000-2	30-450 -8	30- 450 -8	12-150a-x
06.1	N32	3480(3)	3454	30-5000-2.5	04- 5500-2	08-4000-2	01- 80 -3	01- 80 -3	04- 40 -1
06.8	N18	3481	New	30-5000-3.5	06-11400-3.5	12-5000-3	30-680 -1	04-1590 -17	12-150a-x
06.7	S14	3482	New	30-4000-2	---	04- 200-1.5			
08.5	N21	3485(5)	3457	02-5000-2.5	06-11400-4	14-5000-3	02-150a-x	10-1210 -12	14-700 -4
09.7	N17	3486(4)	3459	04-2000-2	---	08- 400-2	07- 20 -2	---	09- 20 -2
09.8	S25	3487	New	07- 400-2	---	12- 400-1.5	07- 70 -2	08- 100 -4	12- 50a-x
11.9	S18	3488(4)	3461,62	06-5700-2	11- 5700-2	18-3000-2	06-150a-x	13- 810 -14	17-100 -1
12.3	N33	3489(2)	3471	07-2500-2	08- 5000-2	16- 800-2.5			
13.4	S33	3490(2)	3461	07-2000-2.5	18- 2000-3	18-2000-3	07-140 -2	18- 190 -7	18-190 -7
13.7	N18	3491(3)	3464	08-3000-2.5	19- 3000-2.5	19-3000-2.5	09- 50 -5	17- 60 -3	17- 60 -3
14.2	N37	3493	New	12- 700-2	19- 2000-1.5	19-2000-1.5	08-290 -3	08- 290 -3	19-100 -2
14.6	S27	3492(2)	3461	08-3000-3	15- 4000-2	20-3000-3	08-290 -3	08- 290 -3	19-100 -2
14.8	N29	3494	New	11-1000-3	16- 3200-3	20-3000-3	11-150a-x	15-1040 -28	20-460 -3
15.3	N22	3495(3)	3464	12- 600-2.5	21- 3200-3.5	22-3000-2.5	16- 50a-x	21- 480 -4	22-340 -1
16.6	S37	3496	New	12-3000-2.5	12- 3000-2.5	23-1000-1			
16.6	S22	3497(2?)	3465	11-4000-2	21- 6000-3	22-6000-3	11-150a-x	20- 720 -3	22-290 -1
17.7	S18	3498(3)	3466	12-1000-2	---	21- 800-1			
18.9	N28	3499(4?)	3467	13-2000-2	23- 3500-3	24-3000-3	23-100 -2	23- 100 -2	24- 40 -2
20.0	S24	3500(4)	3470	14-2000-2	22- 1000-1.5	24-1000-1			
20.5	N30	3501(4?)	3467	14-6000-2.5	16- 9000-3	26-3000-2	14- 20 -1	21- 480 -13	25-240 -1
21.6	N35	3504	New	18-2000-2.5	22- 2000-2	27-2000-1.5			
22.1	N20	3505(5)	3474	18- 500-2	21- 1500-2	26- 700-1.5			
22.5	S24	3503	New	16-9500-4	26- 7000-3.5	28-5000-3	16-150 -6	20- 820 -11	28-340 -1
24.8	S20	3506(2)	3477	18-2500-3	29-12000-4	31-8000-3	18- 50a-x	21-1550 -23	31-520 -3
25.5	N27	3508(4)	3475	19-2000-1	30- 2000-1	31-1000-1			
25.6	S15	3507(2)	3477	19-3000-3	20- 3600-3	26-1000-2	21- 20 -3	22- 210 -9	22-210 -9
26.8	S21	3511	New	24- 300-2.5	30- 3000-3	31-2600-3	24- 80 -4	26- 150 -5	30- 20 -2
26.9	N32	3509(4)	3475	21-1600-1	23- 1800-1	31- 800-1			
27.0	N24	3510(4)	3475	21-1000-2	23- 1400-1.5	31-1000-1.5			
30.2	S20	3512(2)	3478	24-2000-2	25- 2000-2	30- 900-1.5			
30.9	S16	3513(2)	3484	25-2000-3	30- 2400-3	05-1000-2	25- 50 -1	29- 110 -7	03- 50a-x

CORONAL LINE EMISSION INDICES

MAY 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
May 1	X	X	X	X	X	X	X	X	46	69	24	32	41	56	14	16
2	34	48	13	15	18	23	13	16	X	X	X	X	X	X	X	X
3	28	35	15	16	19	23	9	12	24	29	20	36	23	31	13	15
4	36	48	23	33	23	33	18	33	51	90	24	45	39	50	26	34
5	54	76	22[a]	31[a]	24	44	23[a]	36[a]	31	46	10	36	41	58	31	41
6	X	X	X	X	X	X	X	X	31	60	22	30	64	76	32	48
7	105	173	X	X	43[a]	57[a]	X	X	28[a]	34[a]	14[a]	16[a]	93[a]	160[a]	37[a]	57[a]
8	158	210	20	31	23	26	9	12	22	29	X	X	111	131	X	X
9	144	190	20	32	25	30	12	15	15[a]	19[a]	15[a]	18[a]	43[a]	63[a]	23[a]	36[a]
10	81	104	10	15	20	23	14	16	33	64	28	43	49	75	21	28
11	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
12	78	94	20	33	94	142	43	54	X	X	X	X	X	X	X	X
13	86	104	26	36	113	172	55	75	X	X	X	X	X	X	X	X
14	40[a]	46[a]	15[a]	21[a]	79[a]	115[a]	38[a]	57[a]	X	X	X	X	X	X	X	X
15	60	76	15[a]	21[a]	77*	126	30[a]	38[a]	86*	185	58	94	103	153	29	38
16	X	X	X	X	X	X	X	X	26	40	X	X	X	X	X	X
17	31	36	11	13	41	51	21	33	29[a]	37[a]	16	21	37[a]	54[a]	25	45
18	56	72	30	52	53	70	41	57	62[a]	121[a]	X	X	179[a]	298[a]	X	X
19	64	115	25	42	34	48	26	49	70[a]	87[a]	41	60	117[a]	214[a]	69	110
20	110	167	42[a]	70[a]	50	86	51[a]	114[a]	44	62	30	45	88	139	30	42
21	53[a]	63[a]	31[a]	57[a]	47[a]	93[a]	41[a]	75[a]	76	108	30	60	102	135	29	45
22	84	97	X	X	51	71	X	X	79	140	26	65	61	78	19	25
23	51	66	17[a]	21[a]	58	93	44[a]	53[a]	86	130	30	43	48	55	13	20
24	50	68	22	30	66	119	35	73	64	96	63	107	37	46	19	25
25	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
26	X	X	X	X	X	X	X	X	76	162	36	87	60	78	12	18
27	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
28	23	29	X	X	26	31	X	X	X	X	X	X	X	X	X	X
29	27	34	15	21	35	46	29	39	X	X	X	X	X	X	X	X
30	X	X	X	X	X	X	X	X	69[a]	113[a]	24	42	26[a]	45[a]	27	35
31	11	13	11	13	38	58	19	29	74	126	33[a]	73[a]	26	36	23[a]	34[a]

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

Observatory	Date May 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	01	b1537	1555	>18		3479	S20	E60				1	
{S.Peak	01	1535	1610	35	40	3479	S18	E55	1545	14	7	1-	
Capri-S	03	0754	0803	9	150	3481	N14	E54				1	
Capri-S	03	0852	0856	4	240	3481	N19	E38				1	
Capri-S	03	1058	1105	7	150	3485	N21	E73				1	
Capri-S	03	1256	1305	9	150	3481	N14	E51				1*	
{S.Peak	03	1955	2019	24	240	3481	N11	E33	2010	20	4	1+	
{McMath	03	b2007	2015	>8		3481	N19	E40				1	
Tokyo	04	0112		~10		3481	N05	E35				1	
Tokyo	04	0137		~10		3481	N15	E35				1	
Tokyo	04	0220		~10		3481	N25	E25				1	
Tokyo	04	b0657		~10		3481	N15	E25				1	
{Wendel	04	0703	0713	10	150		N15	W27				1	
{Capri-S	04	1037	1102	25	240	3485	N19	E61				1+	
{Neder	04	b1036	1058	>22		3485	N18	E57				1	
McMath	04	1859	1925	26		3481	N18	E30				2	S-SWF
McMath	04	2001	2030	29		3485	N12	E55				1	
Capri-S	05	1252	1304	12	240	3483	S28	W42				1+	
Capri-S	06	0832	0904	32	240	3481	N18	W01				1+	
Capri-S	06	0845	0900	15	150	3483	S26	W56				1	
Capri-S	07	0701	0719	18	200	3486	N19	E45				1	
Capri-S	07	1135	1145	10	150	3486	N24	E25				1	
Tokyo	07	2230		~20		3491	N15	E85				1	
Tokyo	07	2245		~20		3481	N25	W25				1	
Tokyo	07	2300		~10		3484	S05	W55				1	
Tokyo	08	0300		~30		3492	S35	E85				1	
Schaus.	08	b0638	0650	>12		3485	N15	E05				1+	
Kanzel.	08	0758	0813	15		3492	S25	E85				1	
Capri-S	08	0758	0822	24	~240	3492	S31	E90				1+	
Capri-S	08	1246	1301	15	200	3491	N15	E73				1*	
Schaus.	08	b1255	1301	>6		3489	N34	E61				1+	
{S.Peak	08	1308	1410	62	101	3492	S28	E88	1322	32	5	1	S-SWF
{McMath	08	b1310	1345	>35		3492	S25	E80				1+	
{Capri-S	08	1310	1405	55	390	3492	S30	E80				2	
{Neder.	08	b1320	1340	>20		3492	S27	E90				2	

* S.Peak and/or McMath lists as Imp. 1-.

SOLAR FLARES

MAY 1956

Observatory	Date May 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
Schaus.	08	b1323	1410	>47		3492	S25	E75				2	
Capri-S	08	1619	1624	5	200	3481	N20	W17				1*	
Capri-S	09	0734	0740	6	150	3485	N28	W06				1	
Capri-S	09	1043	1045	2	200	3485	N22	W14				1	
Capri-S	10	0748	0810	22	240	3481	N19	W52				1+	
Capri-S	10	0821	0829	8	150	3485	N21	W29				1	
Capri-S	10	0934	1044	70	730	3492	S28	E43				3	S-SWF
S.Peak	10	b1232	1330	>58	115	3485	N19	W24	1300	22	2	1	
Capri-S	10	1251	1320	29	200	3485	N20	W30				1	
Capri-S	10	1349	1404	15	200	3485	N20	W30				1*	
Capri-S	10	1436	1459	23	200	3492	S29	E57				1*	
S.Peak	10	b2045	2220	>95	185	3488	S15	E03	2102	27	4	1	
Capri-S	11	1020	1047	27	340	3490	S28	E37				2	
Capri-S	11	1447	1507	20	200	3488	S16	W09				1	
Capri-S	11	1515	1530	15	200	3488	S16	W09				1	
S.Peak	11	1810	1852	42	300	3488	S15	W08	1815	26	6	2	S-SWF
McMath	11	b1825				3488	S14	W06				2	
S.Peak	11	2235	2320	45	200	3491	N16	E28	2240	15	4	1	
Capri-S	12	1016	1027	11	150	3488	S15	W20				1	Slow S-SWF
Capri-S	12	1040	1112	32	150	3488	S15	W20				1	
S.Peak	13	1750	1950	120	145	3488	S18	W30	1809	18	5	1	
Capri-S	14	1021	1028	7	150	3485	N23	W71				1	
Capri-S	14	1332	1342	10	240	3494	N21	W05				1*	
McMath	14	2010	2025	15		3488	S14	W44				1+	
Neder.	16	0700	0725	25	348	3488	S16	W65				1	
Capri-S	16	0702	0724	22	290	3488	S15	W68				2	
Schaus.	16	b0719	0730	>11		3488	S16	W67				1	
Capri-S	16	0924	0942	18	240	3488	S15	W69				1	
Capri-S	16	1011	1026	15	390	3488	S15	W69				2	
S.Peak	16	1240	1415	95	280	3488	S16	W67	1250	18	2	1	Slow S-SWF
Capri-S	16	1242	1410	88	870	3488	S18	W64				3	
Schaus.	17	0830	0904	34		3503	S24	E70				1+	
Capri-S	17	0834	0927	53	530	3503	S24	E69				2	
S.Peak	17	2230	a2404	94	938	3497	S24	W18	2305	32	6	3	
Capri-S	18	0812	0839	27	240	3501	N24	E27				1+	
Capri-S	18	0839	0858	19	240	3503	S26	E49				1+	S-SWF
Capri-S	18	1043	1056	13	200	3503	S26	E47				1	
Capri-S	18	1318	1335	17	150	3503	S26	E45				1*	
Capri-S	18	1402	1415	13	200	3503	S26	E45				1*	
Capri-S	18	1504	1516	12	150	3503	S26	E44				1	
Capri-S	18	1527	1542	15	150	3503	S26	E44				1	
S.Peak	19	2145	2255	70	300	3497	S29	W44	2150	18	2	1	
Tokyo	20	b2155		~20		3503	S15	E25				1	
Tokyo	20	2255		~20		3503	S15	E25				1	
Tokyo	20	2310		~10		3503	S25	E15				1	

* S.Peak and/or McMath lists as Imp. 1-.

Observatory	Date May 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
Tokyo	20	b2310		~60		3495	N25	W55				1	
Tokyo	21	0610		~20		3507	S15	E55				1	
Wendel	21	0952	1001	9	200	3495	N24	W64	0932			1	
McMath	21	1801	1820	19		3503	S22	E10				1	
McMath	21	1840	1912	32		3501	N29	W15				1	
Wendel.	22	0957	1013	16	240	3503	S24	E02	1002			1	
{McMath	22	1507	1516	9		3503	S24	E00				1	G-SWF
{S.Peak	22	1505	1520	15	30	3503	S26	W02	1510	15	2	1-	
{S.Peak	22	1635	1800	85	315	3506	S19	E33	1715	16	1	2	
{McMath	22	1710	1740	30		3506	S20	E25				1-	
{S.Peak	22	1830	1845	15	190	3503	S26	W03	1835	28	7	1	Slow S-SWF
{McMath	22	1830	1840	10		3503	S24	E05				1+	
{S.Peak	23	1830	2020	110	224	3506	S21	E18	1838	12	3	1	Slow S-SWF
{McMath	23	1840	1920	40		3506	S20	E14				1	
S.Peak	23	2020	2130	70	286	3506	S21	E17	2030	14	5	1	
{S.Peak	24	1440	1530	50	105	3506	S22	E06	1455	15	5	1	
{McMath	24	1502	1520	18		3506	S20	E04				1	
{S.Peak	24	~1800	1850	~15	105	3506	S22	E02	1814	16	3	1	
{McMath	24	1805	1840	35		3506	S20	E04				1-	
Capri-S	25	0808	0834	26	240		S28	E67				1+	
Capri-S	25	0843	0847	4	200	3506	S20	W07				1	S-SWF
S.Peak	25	b1240				3506	S20	W08				1	
{S.Peak	25	b1510	1540	>30	110	3506	S22	W09	b1514	18	7	1	
{McMath	25	1506	1535	29		3506	S20	W08				2	
Capri-S	25	1618	1636	18	200	3513	S17	E85				1*	
{S.Peak	25	1805	1840	35	145	3513	S18	E90	1810	17	2	1	Slow S-SWF
{McMath	25	1810	1850	40		3513	S15	E90				2	
Capri-S	26	0844	0857	13	150	3513	S16	E85				1	
Capri-S	26	1002	1011	9	240	3513	S16	E85				1+	
Capri-S	26	1333	1348	15	150	3506	S23	W23				1*	Slow S-SWF
{McMath	26	1458	1525	27		3514	S13	E76				2	
{Capri-S	26	1455	1509	14	200	3514	S16	E82				1	G-SWF
{S.Peak	26	1445	1520	35	40	3514	S15	E75	1500	14	2	1-	
{Schaus.	26	1455	1515	20		3514	S15	E73				1+	
S.Peak	26	b2229	a2403	>94	165	3506	S22	W22	2230	18	2	1	
McMath	27	1630	1655	25		3506	S20	W46				1	
Capri-S	28	1239	1310	31	150	3518	N19	E85				1	
{Wendel.	28	1627	1655	28	200	3506	S21	W52	1634			1	Slow S-SWF
{S.Peak	28	1605	1700	55	78	3506	S20	W49	1640	20	2	1-	

* S.Peak and/or McMath lists as Imp. 1-.

SOLAR FLARES

MAY 1956

Observatory	Date May 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
Tokyo	29	0151		~10		3511	S25	W35				1	
Meudon	29	0810				3518	N25	E65				1	
Capri-S	29	0811	0824	13	150	3518	N18	E58				1	
S.Peak	29	1825	1850	25	128	3506	S20	W63	1834	12	4	1	
S.Peak	29	2004	2035	31	121	3506	S22	W47	2010	14	5	1	
S.Peak	29	2032	2040	8	135	3506	S18	W71	2034	30	8	1	
McMath	29	b2030				3506	S20	W75				1	
S.Peak	29	2325	2340	15	121	3506	S20	W68	2328	18	6	1	
Stock.	30	b0942				3518	N15	E55				1	
Wendel.	30		1026		>390	3518	N23	E53				2+	
S.Peak	30	2115	2215	60	100	3518	N23	E44	2135	20	4	1	
S.Peak	30	2320	2357	37	202	3513	S20	E02	2330	25	5	1	
Capri-S	31	0752	0832	40	340	3518	N25	E38				2	S-SWF
Capri-S	31	0814	0827	13	150	3506	S18	W90				3	
Wendel.	31		0921		580	3518	N25	E34				2	
S.Peak	31	b2313	2350	>37	108	3518	N20	E38	b2313	15	6	1	

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

May 1,	1700 (3479)	May 8,	2025 (3492)	May 19,	1335 (3503)	May 27,	1605 (3503)
2,	1325 (3481)		2040 (3492)		1742 (3503)+		1640 (3518)
	1850 (3475)		2330 (3485	21,	1142 (3503)		2125 (3503)
	2005 (3481)	9,	1455 (3485)		1305 (3503)	29,	1400 (3518)
3,	1425 (3481)		2310 (3488)		1440 (3501)		b1505 (3506)
	1455 (3481)	10,	1425 (3492)		1550 (3503)		1515 (3506)
	1700 (3475)		1520 (3488)		1640 (3503)		1545 (3506)
	1715 (3481)		2020 (3485)	22,	1300 (3503)		1630 (3506)
	1745 (3481)+	11,	2230 (3488)		1330 (3507)		1720 (3506)
	1925 (3481)	12,	1555 (3488)		1455 (3503)		1750 (3506)
	2120 (3481)		1935 (3485)		1916 (3506 +		1852 (3518)
	2124 (3481)	13,	1440 (3492)		b2300 (3503)		1908 (3518)
5,	1625 (3483)		2155 (3492)	23	1550 (3518)		1918 (3506)
	2035 (3485)	14,	1700 (3488)		b1518 (3506)		1952 (3518)
6,	1305 (3483)		1950 (3492)		2300 (3506)		2110 (3518)
	1340 (3483)		1950 (3488)	25,	b1425 (3513)+		2122 (3510)
	1600 (3485)		2210 (3492)		1630 (3503)		2229 (3506)
	2030 (3486)	16,	1435 (3488)		1735 (3506)		2300 (3506)
	2040 (3490)		1905 (3488)		2325 (3503)	30,	0908 (3506)++
7,	1450 (3488)		2310 (3488)	26,	1337 (3506)+		1445 (3506)
	1705 (3481)	18,	1425 (3488)		1705 (3514)+		b1731 (3518)
	1930 (3481)		1600 (3503)		b1745 (3503)+		1801 (3506)
	1950 (3479)		1845 (3503)+		1850 (3514)+		2045 (3522)
	2030 (3481)		1955 (3503)		2229 (3514)+	31,	1221 (3518)++
8,	1945 (3492)		a2045 (3503)	27,	1605 (3514)		1530 (3523)
	2010 (3492)		2310 (3503				

\+ McMath or McMath and Sac. Peak.

++ Wendelstein or Wendelstein and Sac. Peak.

Otherwise observations are Sac. Peak.

IONOSPHERIC EFFECTS OF SOLAR FLARES

APRIL 1956

Apr. 1956	Start UT	End UT	Type	Wide-spread Index	Impor-tance	Observation Stations
1	1415	1455	S-SWF	5	2	BE, HU, MC, PR, WS, NE*
2	0500	0600	S-SWF	1	2	OK
4	1530	1600	Slow S-SWF	3	1-	BE, MC, PR
	{1710	--	Slow S-SWF	4	1-	AN, BE, HU, MC
	{1718	1749	S-SWF	5	2-	BE, HU, MC, PR, WS, NE*
	1809	1827	Slow S-SWF	4	1	BE, HU, MC, WS
	2225	2300	Slow S-SWF	5	2-	AN, BE, HU, OK, WS, Japan+, RCA++
5	1614	1630	S-SWF	1	1	NE*
8	0252	0345	G-SWF	1	2-	OK
	0922	0953	G-SWF	1	1	NE*
	1006	1025	G-SWF	1	1	NE*
9	0945	1055	S-SWF	3	2	NE*, RCA
	1920	2000	G-SWF	3	1-	BE, MC, PR
10	0555	0639	S-SWF	1	2+	OK
	1100	1118	S-SWF	2	1+	AN, NE*
	1925	1950	Slow S-SWF	5	1+	AN, BE, HU, MC, PR, WS
11	1518	1538	S-SWF	4	1-	AN, MC, PR
	2340	0020	S-SWF	1	-	Japan+
12	0530	0550	S-SWF	4	2	OK, Japan+
	1945	2125	G-SWF	5	2	AN, BE, HU, MC, PR, WS
15	0923	0939	S-SWF	1	1	NE*
16	1659	1723	S-SWF	1	1	NE*
18	0346	0430	G-SWF	3	1+	AN, OK
	1320	1425	G-SWF	5	1+	AN, BE, HU, MC, PR, WS, NE*, RCA**
20	0945	1024	S-SWF	4	2	PR, NE*, RCA**
	1516	1534	Slow S-SWF	4	1	BE, HU, MC, PR
	1927	1938	Slow S-SWF	5	1	AN, BE, HU, MC, PR
21	0145	0200	S-SWF	1	-	Japan+
	0638	0738	G-SWF	1	2-	OK
22	0215	0235	S-SWF	2	1	CO, OK
	0504	0520	S-SWF	1	2-	OK
	1010	1050	S-SWF	1	2	NE*
24	0420	0543	Slow S-SWF	1	2-	OK
	1255	1400	G-SWF	3	1-	BE, MC, NE*
26	0150	0253	G-SWF	1	2	OK
	1605	1637	Slow S-SWF	5	1	AN, BE, MC, PR, WS, NE*
	1725	1755	G-SWF	5	1-	BE, MC, PR, WS
	2000	2015	G-SWF	3	1-	AN, MC, WS
27	2053	2117	Slow S-SWF	3	1+	BE, MC, PR
29	1859	1935	Slow S-SWF	5	1	AN, BE, HU, MC, PR
30	0342	0415	Slow S-SWF	3	1	AN, OK
	0535	0555	S-SWF	1	2	OK
	1558	1638	Slow S-SWF	5	1	BE, HU, MC, PR, WS, NE*

NE* Nederhorst den Berg, Netherlands.
RCA** RCA Communications Inc., Somerton, England and Brentwood, N.J.
Japan+ Hiraiso Radio Wave Observatory, Japan.
RCA++ RCA Communication Inc., Point Reyes, California.

SOLAR RADIO WAVES (BOULDER) -- 167 MC

3-HOURLY AND DAILY FLUX

MAY 1956

May 1956	Flux: Hours UT 12-15	15-18	18-21	21-24	Daily	Variability: Hours UT 12-15	15-18	18-21	21-24	Daily	Observed Periods: Hours UT
1	11	12	12	14	13	2	2	2	2	2	1200-2540
2	12	12	14	--	12	2	(2)	2	(1)	2	1159-2540
3	11	17	17	10	14	3	3	3	3	3	1158-2541
4	13	12	12	--	12	3	3	2	(3)	3	1157-2537
5	12	12	12	15	13	(1)	(1)	2	2	2	1155-2542
6	12	12	13	11	12	(1)	2	1	(1)	2	1154-2543
7	13	18	18	16	17	1	2	2	(1)	2	1153-2538
8	16	10	11	11	12	3	2	3	3	3	1152-2541
9	83	124	141	179	137	3	3	3	3	3	1151-1717; 1821-2537
10	60	49	53	81	61	3	3	3	3	3	1150-2538
11	27	21	24	50	32	3	3	3	3	3	1149-2544
12	--	--	--	34	--	2	1	1	3	3	1148-2548
13	--	10	11	15	12	2	2	2	3	3	1147-2549
14	--	--	--	8	--	2	2	2	(2)	2	1146-2545
15	--	9	8	8	8	2	1	1	(2)	2	1145-2541
16	8	8	8	8	8	3	2	2	1	3	1144-2550
17	8	8	7	24	12	1	1	1	3	3	1143-2550
18	8	10	8	9	9	3	3	3	2	3	1142-2551
19	9	9	10	9	9	1	(1)	1	1	1	1141-2552
20	15	20	10	16	15	2	3	(2)	(2)	3	1140-2554
21	17	16	12	--	14	3	3	(2)	(2)	3	1140-2556
22	--	10	10	11	10	--	(1)	2	(2)	2	1633-2556
23	8	9	9	8	8	1	2	(2)	(2)	2	1138-2557
24	7	8	8	9	8	1	1	(1)	(1)	1	1138-2559
25	8	8	8	8	8	2	(2)	(1)	(1)	2	1137-2600
26	--	--	--	--	--	--	--	--	--	--	---- ----
27	--	--	--	--	--	3	3	(2)	(2)	3	1136-2603
28	--	15	23	38	25	--	3	3	3	3	1500-2604
29	19	17	10	9	13	2	3	3	(2)	3	1135-2604
30	10	9	8	9	9	3	1	1	2	3	1134-2605
31	8	9	8	13	10	1	1	(2)	2	2	1134-2520

SOLAR RADIO WAVES (BOULDER) -- 460 MC

3-HOURLY AND DAILY FLUX

MAY 1956

May 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	43	43	43	44	43	0	0	0	1	1	1200-2540
2	42	42	43	42	42	0	0	0	0	0	1159-2540
3	41	46	53	45	47	1	2	2	1	2	1158-2541
4	46	44	44	44	44	1	1	0	1	1	1157-2542
5	42	43	44	44	43	0	0	1	0	1	1155-2542
6	44	46	45	43	45	1	0	1	0	1	1154-2543
7	42	46	46	46	45	1	1	1	1	1	1153-2544
8	45	45	47	45	46	1	0	1	0	1	1152-2546
9	55	69	64	61	63	0	0	2	1	2	1151-2547
10	50	52	52	49	51	0	0	2	2	2	1150-2547
11	50	50	52	54	51	0	0	0	0	0	1149-2547
12	54	51	53	61	55	0	0	0	0	0	1148-2548
13	50	53	55	57	54	1	1	1	0	1	1147-2549
14	53	50	50	49	50	0	0	0	0	0	1146-2549
15	46	47	48	48	47	0	0	0	0	0	1145-2550
16	47	47	44	44	45	2	0	0	0	2	1144-2550
17	45	45	47	142	72	0	1	0	3	3	1143-2550
18	45	48	48	46	47	1	1	0	(0)	1	1142-2140; 2240-2551
19	47	45	45	44	45	0	0	0	0	0	1141-2552
20	50	46	46	46	47	0	0	0	(0)	(0)	1140-2554
21	48	50	52	51	50	(0)	1	1	(0)	1	1140-2556
22	--	53	51	50	51	--	0	1	1	1	1633-2556
23	42	42	43	43	43	0	0	0	0	0	1138-2557
24	47	44	46	45	45	0	(0)	0	0	(0)	1138-2559
25	43	42	44	47	44	0	1	0	0	1	1137-2600
26	--	--	--	--	--	--	--	--	--	--	---- ----
27	48	47	51	52	50	0	(0)	(0)	(0)	(0)	1136-2603
28	--	49	--	--	49	--	0	(0)	(0)	(0)	1455-1945; 2428-2603

Note: Data for May 29, 30, 31 will be included in the report for June when calibration is completed.

OUTSTANDING EVENTS

MAY 1956

May 1956	Type	Start UT	Duration Hrs:Mins	Maximum Time UT	Maximum Inst. Flux.	Maximum Smd. Flux	Remarks
1	6	(1200)	(13:40)	~1400	65	6	
2	6	(1159)	(13:41)	1914	200	6	
3	6	(1158)	(13:43)	~2000	>2100	10	
3	8	1955	00:15	2007	>2100	230	
3	8	2120.9	00:03.9	2122	>2100	940	See note 4, page IVd.
4	6	(1154)	(13:49)	~1300	--	5	
4	2	1647	00:16	1655	>2200	17	
4	2	2247	00:07	2250	>1600	230	
5	1	(1155)	(13:47)	1813.5	680	--	
6	3	1756.7	00:00.2	1756.8	380	--	
7	6	(1153)	(13:45)	~2500	>2100	13	
8	1	(1152)	(13:49)	2135.5	1100	--	
8	8	1312.6	00:08	--	1100	68	
9	6	(1151)	(13:44)	~2200	>2200	170	
9	8	2406	00:24	2408	>2100	420	
10	6	(1150)	(13:48)	~2100	>2500	78	
10	8	2100	00:11	2101	>1800	780	
11	6	(1149)	(13:55)	~2300	>2800	42	
12	6	(1148)	(14:00)	~2400	470	26	
13	9	1751.8	(07:57)	1752.5	530	10	
14	1	(1146)	(13:59)	2422.8	320	--	
15	1	(1145)	(13:56)	2409	70	--	
16	9	1241.0	(12:09)	1245	>2100	7	
17	1	(1143)	(14:07)	2510.8	680	--	
17	8	2233.6	01:32	2250	590	100	
17	8	2528.9	00:08	2530	~1200	~800	
18	1	(1142)	(14:09)	*	>2600	--	*See note 5, page IVd.
18	8	1401.2	00:08	1401.4	>2600	710	
18	8	1603.3	00:12	1604.5	>2600	280	
20	6	(1140)	(14:14)	~2400	--	12	
21	6	(1140)	(14:16)	~1400	220	10	
22	8	1911.6	00:01.6	1912.9	440	240	
25	2	(1137)	(01:47)	1207	~120	3	
25	3	2335.4	00:00.2	2335.5	310	--	
27	1	(1136)	(14:27)	~2430	250	--	
28	6	(1500)	(11:04)	~2300	1000	30	
29	6	(1135)	(08:31)	~1630	800	10	
30	1	(1134)	(14:31)	2458.8	>2400	--	
31	4	1847.6	(06:32)	1848.5	300	4	

SOLAR RADIO WAVES (BOULDER) -- 460 MC

OUTSTANDING EVENTS

MAY 1956

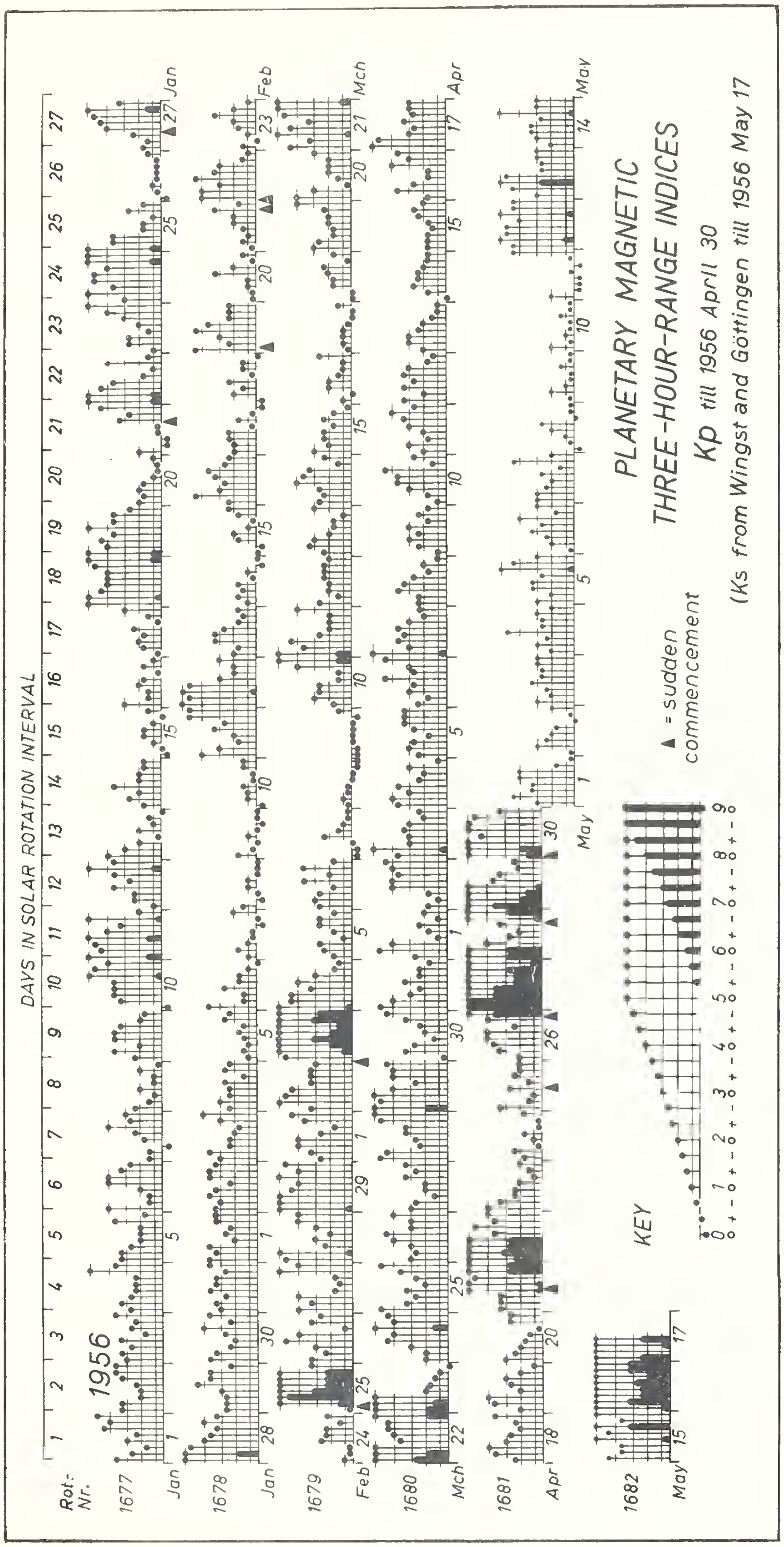
May 1956	Type	Start UT	Duration Hrs:Mins	Maximum Time UT	Maximum Inst. Flux	Maximum Smd. Flux	Remarks
1	1	1410	(11:30)	2159.6	120	--	
3	1	1241	05:05	1310.3	130	--	
3	9	1745.6	06:20	1747.5	>1600	10	
4	1	(1157)	(13:45)	2249.0	190	--	
5	3	1803.2	00:00.3	1803.3	250	--	
6	2	1240.5	00:02.4	1240.6	450	43	
6	3	1852.9	00:00.8	1853.3	>1200	--	
7	1	1236.8	09:34	1236.8	250	--	
8	4	1310.6	00:57	1311.5	120	7	
8	2	2008.3	00:01.5	2009.7	520	44	
9	6	(1151)	(13:56)	1955.9	420	27	
10	1	(1150)	(08:47)	1715.3	93	--	
10	9	2037	04:43	2108.5	>1700	23	
11	6	(1149)	(13:58)	~2400	--	12	
12	6	(1148)	(14:00)	~2400	--	22	
13	6	(1147)	(14:02)	~2200	--	15	
13	8	1747	00:33	1815.6	260	52	
14	3	2525.0	00:00.3	2525.2	230	--	
16	8	1240.2	00:47	1303.8	320	120	
17	1	1617.1	01:44	1639.0	130	--	
17	9	2232	01:58	2312.8	>1900	>1400	
17	3	2516.6	00:00.1	2516.6	100	--	
17	8	2530.0	00:10	2530.1	660	46	
18	8	1401.2	00:22	1401.9	100	28	
18	8	1604.0	00:39	1604.7	120	35	
20	1	1333	03:03	1341.0	97	--	
21	6	1552.3	(10:04)	1809.9	>1400	9	
22	6	(1633)	(09:23)	~1833	~ 240	10	
25	3	1806.4	00:02.6	1807.3	150	45	

Notes:
1. Some relatively small 460 Mc events are not reported.
2. Intense interference may have obscured bursts on 460 Mc during the following periods: May 18, 2240-2551; May 27, 1628-1955; May 28, 1920-2439.
3. 460 Mc outstanding events for May 29-31 will be included in the report for June when new calibration is completed.
4. Several additional bursts with flux >500 during May 3.
5. Intense bursts at 1745.3, 1848.1, 1958.7, and 2405.0 on May 18.
6. Relatively small 167 Mc events occurred on all days not listed in table.
7. Sferics may have occasionally obscured short duration events on 167 Mc.

GEOMAGNETIC ACTIVITY INDICES

APRIL 1956

Apr. 1956	C	Values Kp, Three hour Gr. interval 1 2 3 4	5 6 7 8	Sum	Ap	Final Selected Days
1	0.6	3- 5- 4o 1o	2- 2+ 1o 2o	19+	14	Five
2	1.0	2- 1o 2- 4o	4o 4- 4o 4+	24+	19	Quiet
3	1.0	4- 5+ 3o 3o	3+ 3o 2o 2+	26-	20	
4	0.8	4- 4o 3o 4-	2+ 2o 3o 1o	23-	15	13
5	0.8	2+ 3o 3- 2-	3- 3+ 3+ 3+	22+	14	14
						15
6	0.8	2+ 2- 3o 3-	4+ 3- 3o 4+	24o	17	24
7	1.0	5+ 3o 4- 3+	4- 3o 2o 2+	26+	20	25
8	0.6	2+ 2+ 4- 3+	3- 2- 2o 1o	19o	11	
9	0.5	1o 2+ 3o 2+	3o 2- 2+ 2-	17+	9	
10	0.7	1o 2- 3o 4-	4- 4+ 1+ 3-	21+	15	
11	0.8	2o 3o 2- 2o	3o 3+ 4o 3-	22-	13	Five
12	0.7	3+ 2o 3+ 3-	3+ 3o 2- 1+	21-	12	Disturbed
13	0.2	2o 3o 3o 2+	2o 1+ 1o 1o	16-	8	
14	0.2	0+ 2- 3- 2+	2+ 2o 2- 2-	15-	7	21
15	0.4	2- 2- 2- 1+	2- 2+ 3- 2o	15o	7	22
						27
16	0.8	2- 4- 3- 2-	2- 4o 3o 4-	22o	14	28
17	1.0	5o 5- 3o 3-	3+ 3- 3o 3o	27+	22	30
18	0.8	2+ 4- 4o 3o	3- 2o 2+ 4-	24-	15	
19	0.7	2o 4- 4o 2o	3- 3o 2o 1o	20+	13	
20	0.5	3o 2+ 2o 2-	1+ 1- 3- 3-	16+	9	
21	1.7	3+ 3+ 3+ 5+	5+ 5- 7o 7o	39+	59	Ten
22	1.7	7- 7+ 7o 7o	4- 5- 4- 4o	44o	80	Quiet
23	0.7	4o 3+ 2+ 2+	2o 1o 1+ 2o	18+	10	
24	0.1	2- 2+ 1- 1o	2- 1- 1- 2-	10+	5	8
25	0.4	3+ 1+ 1o 3-	1+ 2+ 2o 2o	16o	8	9
						12
26	1.4	2o 3+ 4- 4o	4o 2+ 4o 8-	31o	40	13
27	2.0	9- 9- 8- 8-	7- 7- 7o 6-	59-	172	14
28	1.6	7o 7o 4o 3-	2o 3+ 5+ 7o	38+	64	15
29	1.6	8- 6+ 6o 5+	4- 3+ 2o 2+	37-	58	20
30	1.6	6o 6+ 5o 4+	5o 5o 5- 3+	40-	51	23
						24
Mean:	0.89			Mean:	27	25



DAYS IN SOLAR ROTATION INTERVAL
1956
Rot: Nr.
KEY
▲ = sudden commencement
PLANETARY MAGNETIC
THREE-HOUR-RANGE INDICES
Kp till 1956 April 30
(Ks from Wingst and Göttingen till 1956 May 17

NORTH ATLANTIC

APRIL 1956

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

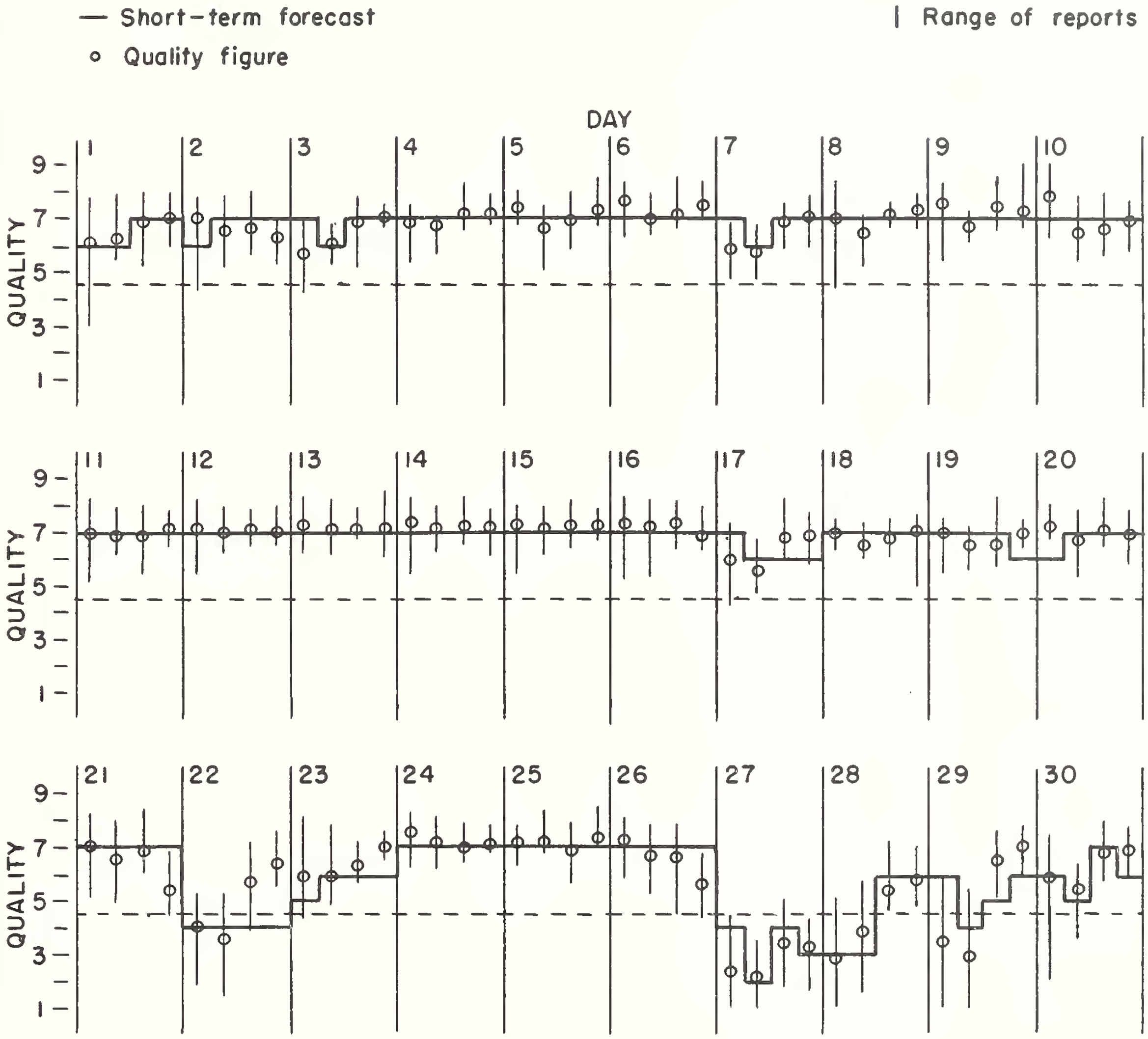
Score		00	06	12	18	1-4 days	4-7 days
Quiet Periods	P	17	24	26	20	14	18
	S	9	2	1	7	13	8
	U	0	0	1	1	0	1
	F	0	0	1	1	0	0
Disturbed Periods	P	2	1	0	1	0	0
	S	0	3	1	0	0	0
	U	1	0	0	0	0	0
	F	1	0	0	0	3	3

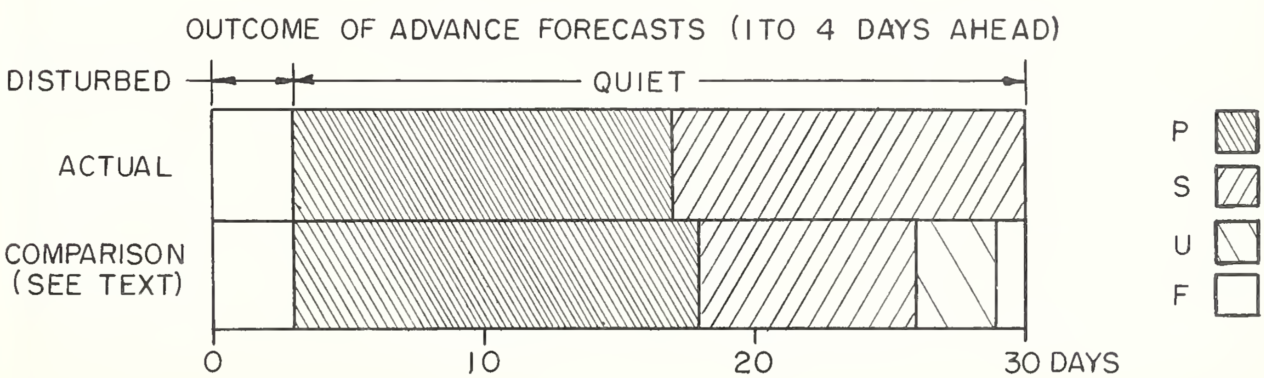
( ) represent disturbed values.

CRPL RADIO PROPAGATION QUALITY FIGURES AND FORECASTS

NORTH ATLANTIC

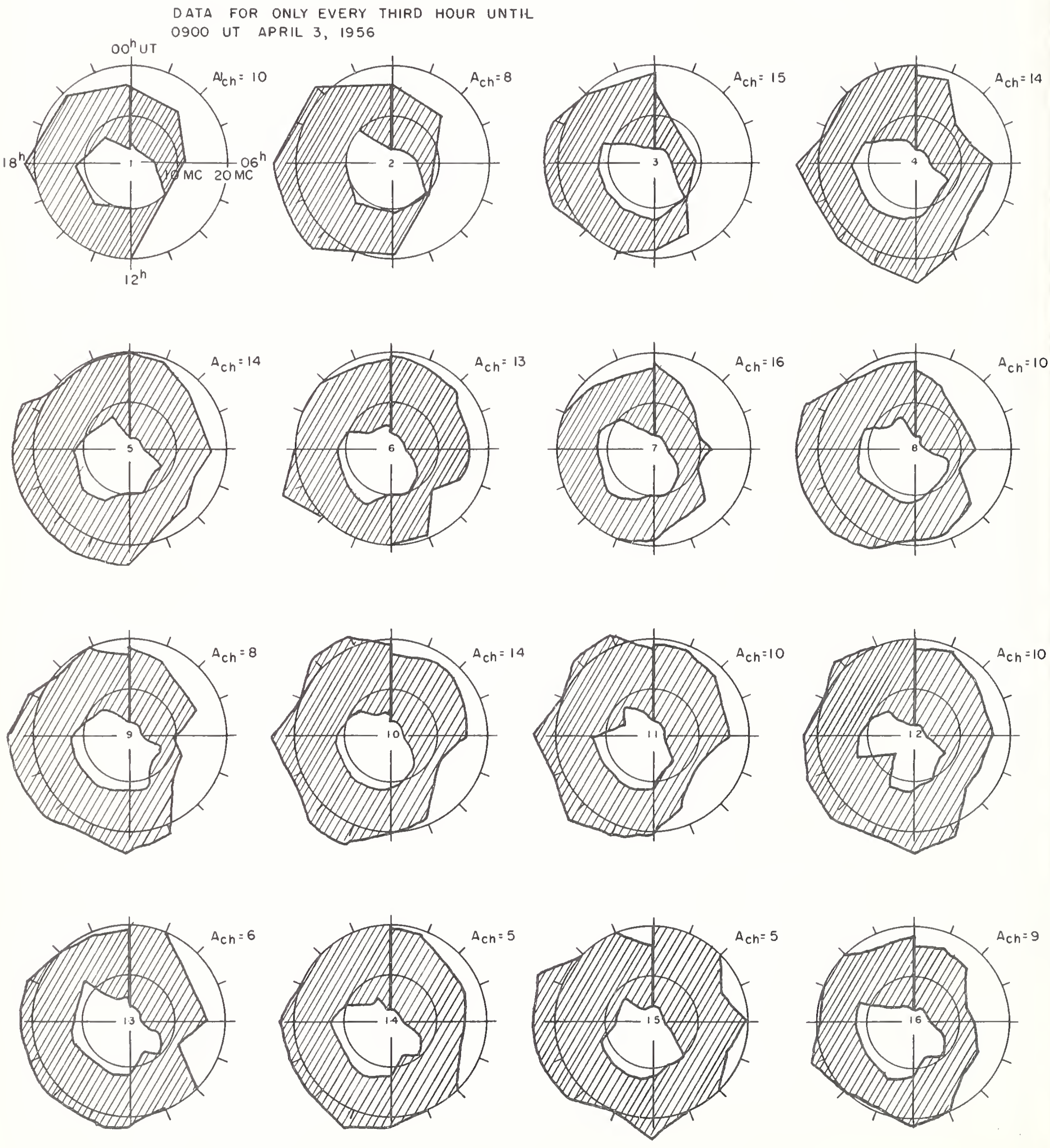
APRIL 1956



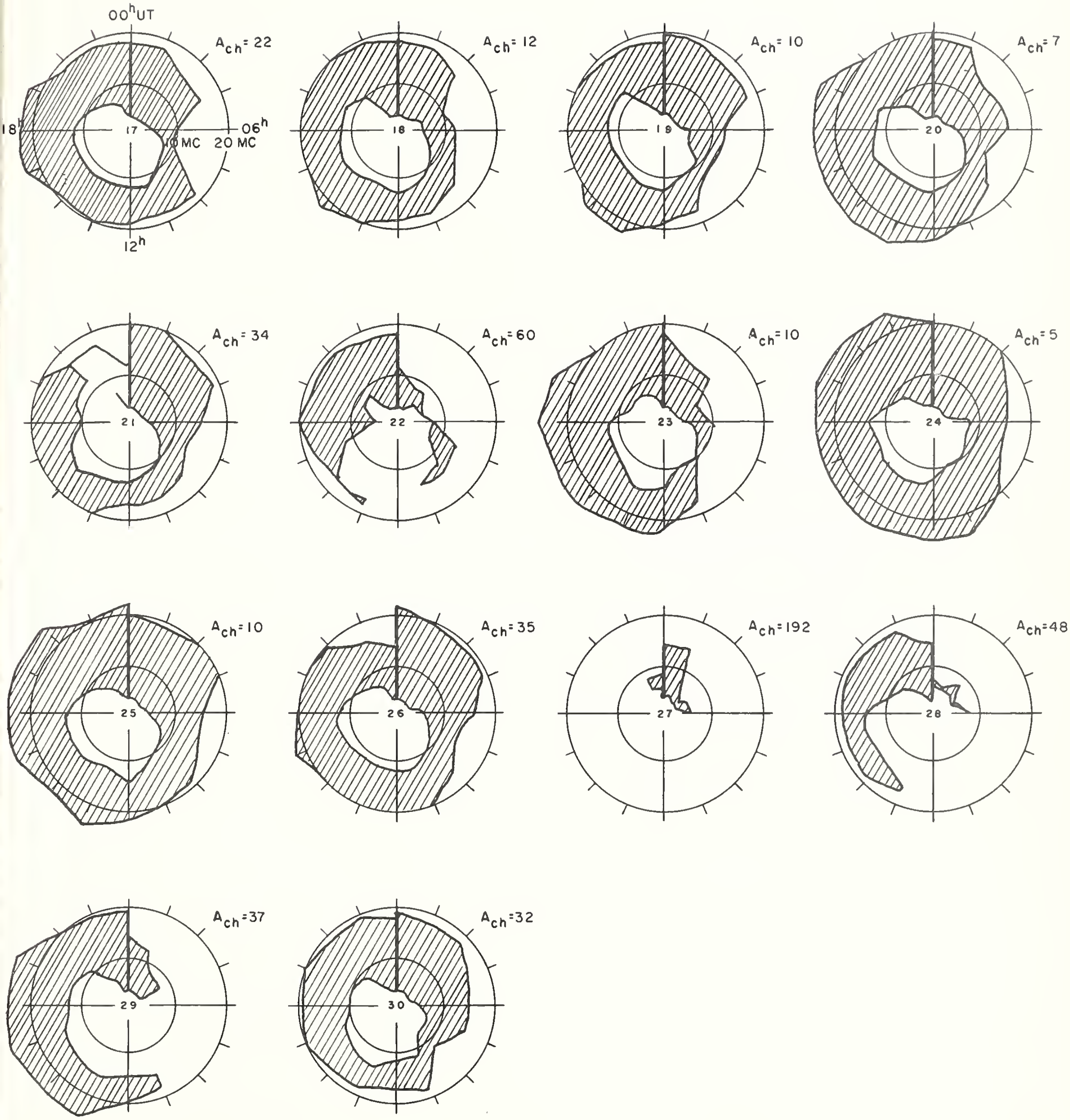


USEFUL FREQUENCY RANGES -- NORTH ATLANTIC PATH

APRIL 1956



APRIL 1956



Adapted from Observations by Deutschen Bundespost

NORTH PACIFIC

APRIL 1956

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

Score		02	09	18	1-4 days	4-7 days
Quiet Periods	P	15	8	18	18	14
	S	7	19	10	9	13
	U	3	1	1	0	0
	F	1	0	0	0	0
Disturbed Periods	P	2	1	0	0	0
	S	1	0	1	1	1
	U	0	1	0	1	0
	F	1	0	0	1	2

( ) represent disturbed values.

CRPL RADIO PROPAGATION QUALITY FIGURES AND FORECASTS

NORTH PACIFIC

APRIL 1956