PART B

SOLAR - GEOPHYSICAL DATA

ISSUED
MAY 1957

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

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PART B

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CONTENTS

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INTRODUCTION

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

I DAILY SOLAR INDICES

Relative Sunspot Numbers -- The table includes (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.

Solar Flux Values, 2800 Mc -- The table also lists the daily values of solar flux at 2800 Mc recorded in watts/M^2/cycle/second bandwidth (x 10^{-22}) in two polarizations by the National Research Council at Ottawa, Canada. These solar radio noise indices are being published in accordance with CCIR Report 25 that a basic solar index for ionospheric propagation should be measured objectively and "preferably refer to a property of the sun such as radiation flux which has direct physical relationship to the ionosphere."

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, R, is used throughout, the data being final R_Z numbers except for the current year. Predictions shown are those made for one year after the latest available datum by the method of A. G. McNish and J. V. Lincoln (Trans. Am. Geophys. Union, 30, 673-685, 1949) modified by the use of regression coefficients and mean cycle values recomputed for Cycles 8 through 18. Cycle 19 began April 1954, when the minimum $\overline{R}$ of 3.4 was reached.

II SOLAR CENTERS OF ACTIVITY

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

The table gives the heliographic coordinates of each center (taken as the calcium plage unless two or more significantly and individually active sunspot groups are included in an extended plage) in terms of the Greenwich date of passage of the sun's central meridian (CMP) and the latitude; the serial number of the plage as assigned by McMath-Hulbert Observatory; the serial number of the center in the previous solar rotation, if it is a persisting region; particulars of the plage at CMP: area, central intensity; a summary of the development of the plage during the current transit of the disk, where b = born on disk, ℓ = passed to or from invisible hemisphere, d = died on disk, and / = increasing, - = stable, \ = decreasing; and age in solar rotations; particulars of the associated sunspot group, if any, at CMP: area and spot count and the summary of development during the current disk transit, similar to the above. The unit of area is a millionth of the area of a solar hemisphere; 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, 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 continum 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 λ5303.

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, Mitaka, and Swedish Astrophysical Station on Capri. The remainder report through the URSIgram centers in Europe. 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 their heliographic coordinates.

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

2800 Mc Observations

The data on solar radio wave events made in Ottawa, Canada by the Radio and Electrical Engineering Division of the National Research Council at 2800 Mc (10-cm emission) are presented. Near local noon (about 1700 UT) the sensitivity of the radiometer is determined and a mean flux for the whole day calculated. These values are given in a tabular form (see table I-1) in units of 10^{-22} watts/M^2/c/s. Burst phenomena are measured above this level and are given in terms especially suitable for the variations observed on this frequency. These classifications are described by Dodson, Hedeman and Covington, Ap. J. 119, 541, 1954:

1 - Single -- Any one burst without reference to structure, but usually applied to bursts of short duration and with intensity only a few times receiver noise.

2 - Single-simple -- A single burst with only one maximum.

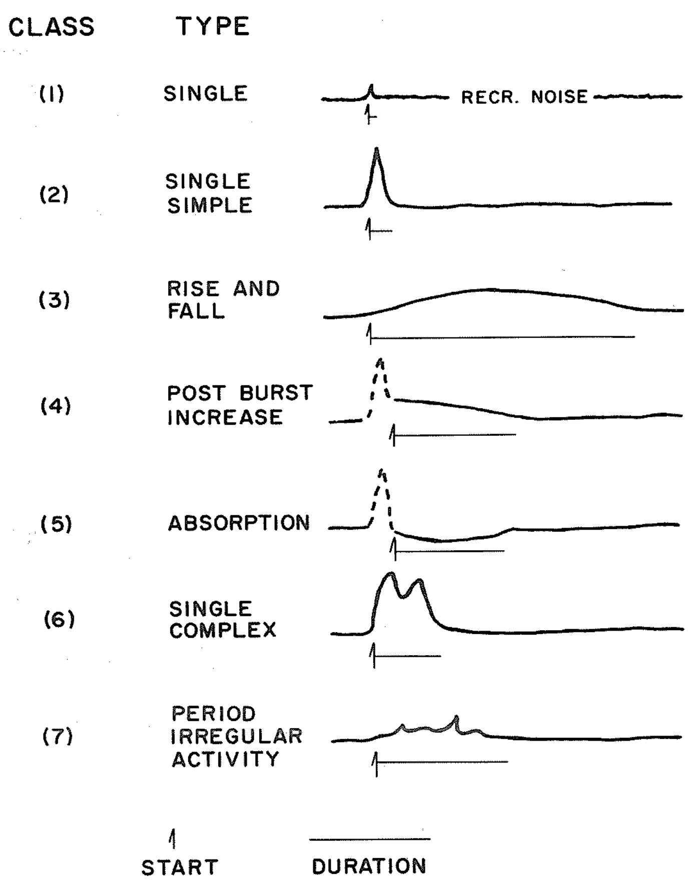
3 - Rise and fall -- A distinct, but less sudden, increase in flux than the usual burst. It may last from tens of minutes to several hours. These events range from large distinct features on the records to tiny bursts, only a few times receiver noise.

4 - Post-burst increase -- Postburst level is greater than the preburst level. The gradual return to normal flux may require as long as several hours.

5 - Absorption following burst (negative post).

6 - Single complex -- A single burst which shows two or more comparable maxima before the activity has declined to zero.

7 - Period of irregular activity.



200 Mc Observations

Data on solar radio waves made at Cornell University, Ithaca, N.Y. on 201.5 Mc are presented. All times are in Universal Time (UT or GCT). The half width of the antenna lobe is appreciably greater than the solar disk. The flux reported is that contained in one linear component.

3-hourly Flux -- The mean of the three hourly flux measurements is given in terms of KTB where the quiet sun level equals 1.40 KTB.

The variability index is as described for 167 Mc and 460 Mc observations.

Outstanding Events -- A separate table lists the outstanding occurrences classified according to the same system as used for 167 Mc and 460 Mc observations.

167 Mc and 460 Mc Observations

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.

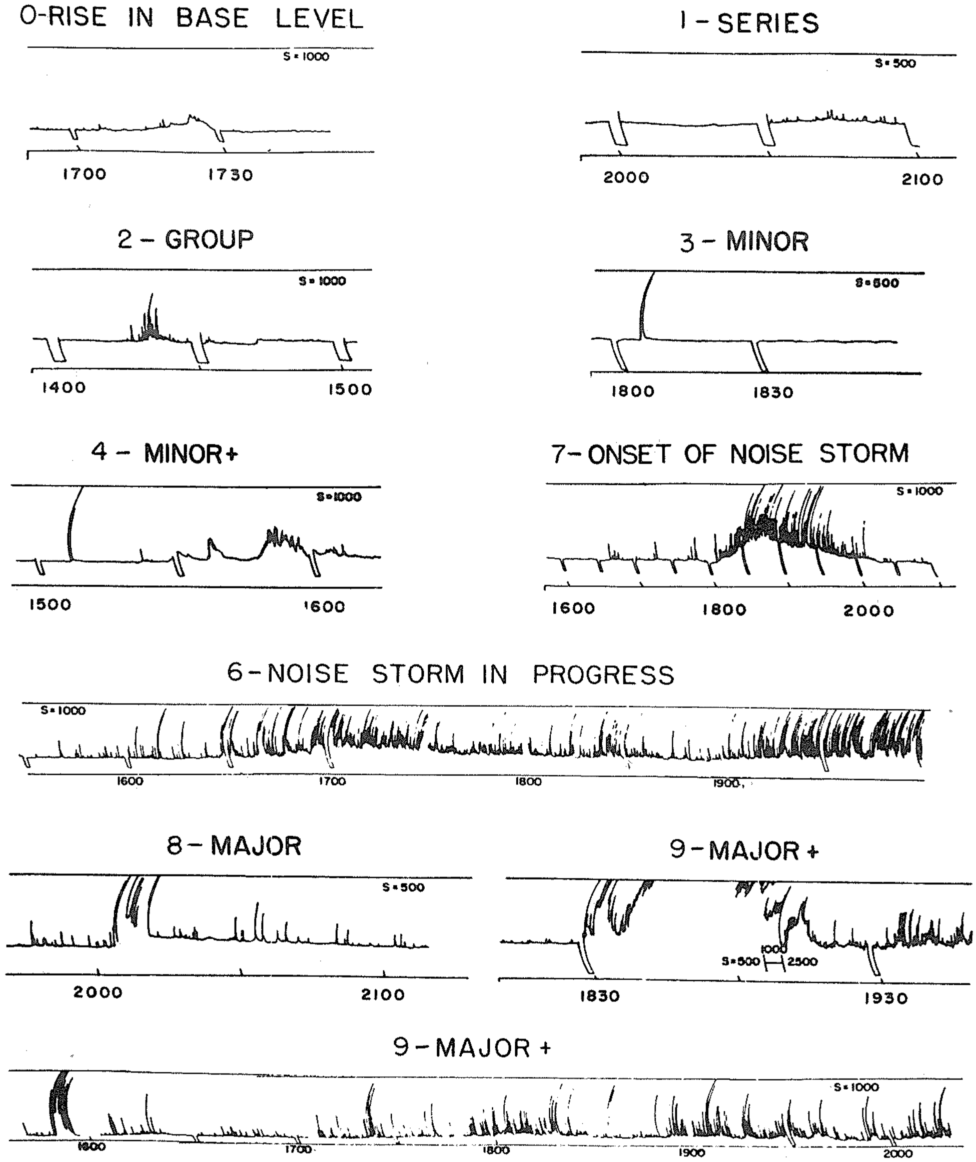
4 - Minor burst and second part -- A double rise in flux in which the early rise is a minor burst.

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 > 5, or both < 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 Corporation, 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 Fredericksburg 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. 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. The magnetic activity index, A_{Fr}, from Fredericksburg, Va., is also given for each day.

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

<u>North Pacific Radio Path</u> -- The CRPL quality figures, Qp, are compiled by the North Pacific Radio Warning Service (NPRWS), the CRPL forecasting center at Anchorage, Alaska, from radio traffic data for moderately long transmission paths in the North Pacific equivalent to Seattle-to-Anchorage or Anchorage-to-Tokyo. These include reports to CRPL by the Alaska Communications System, 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 8 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:

03-10 hours UT	5.33
11-18	5.33
19-02	6.00
00-24	5.67

The 8-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 8-hourly quality figures; whole day quality figures; short term forecasts issued by NPRWS three times daily at 02^h, 10^h, and 18^h UT, applicable to the stated 8-hour periods; advance forecasts issued twice weekly by NPRWS (CRPL-Jp report); and half-day averages of geomagnetic K indices from Sitka.

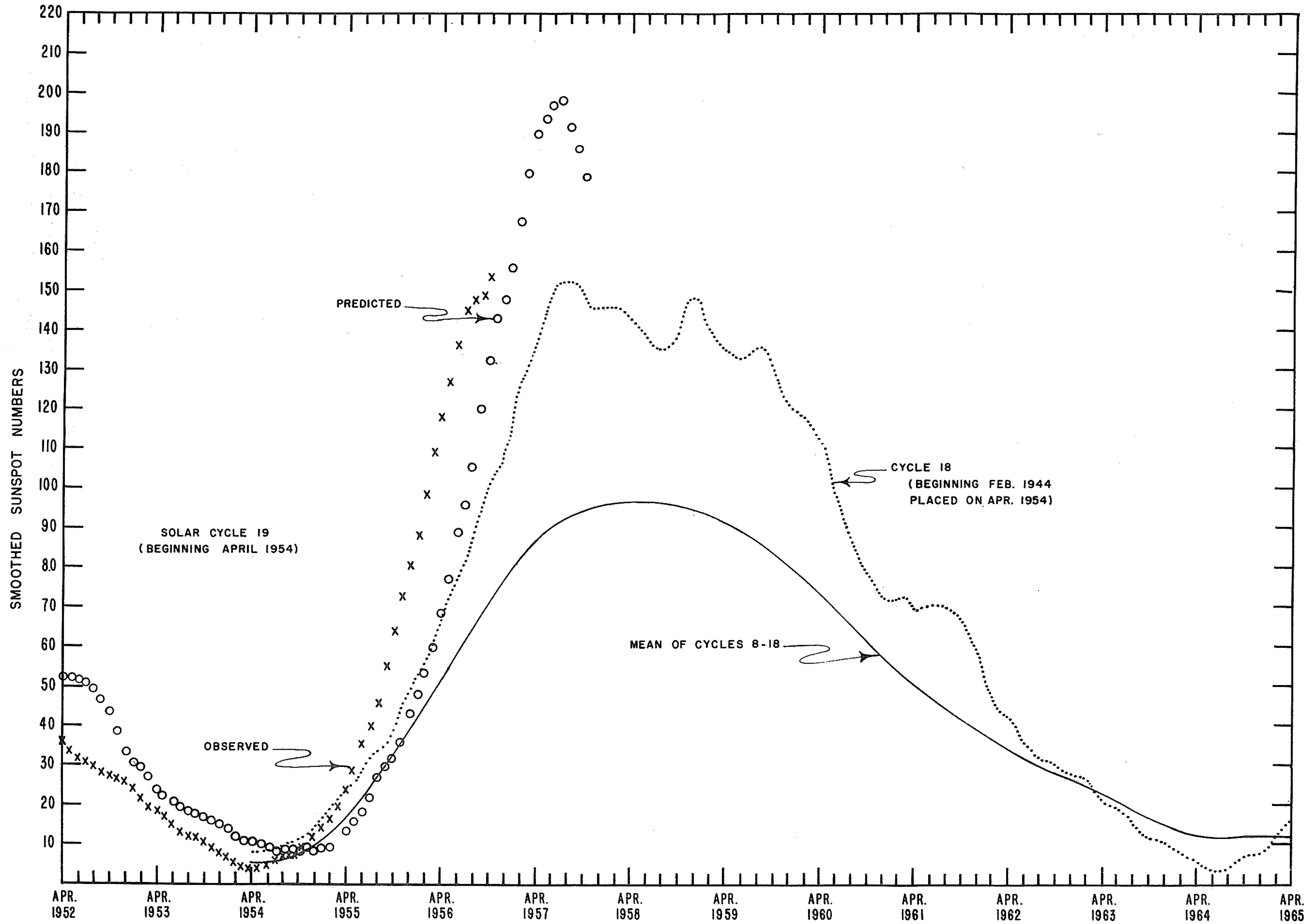
The chart compares the outcome of advance forecasts, on the same basis as the similar chart for the North Atlantic Radio Path.

Note: Beginning with November 1956 the short-term forecast formerly made at 0900 UT was changed to 1000 UT. The North Pacific quality figures used for evaluation are now 8-hourly rather than 9-hourly.

DAILY SOLAR INDICES

Mar. 1957 Date	American Relative Sunspot Numbers R_A'
1	144
2	158
3	120
4	121
5	92
6	111
7	137
8	114
9	141
10	177
11	170
12	191
13	178
14	145
15	112
16	114
17	124
18	123
19	126
20	128
21	108
22	132
23	139
24	122
25	102
26	112
27	149
28	143
29	135
30	139
31	132
Mean:	133.5

Apr. 1957 Date	Zurich Provisional Relative Sunspot Numbers R_Z	Daily Values Solar Flux at 2800 Mc, Ottawa, Canada Flux
1	140	219
2	156	203
3	135	183
4	156	193
5	138	192
6	108	169
7	138	171
8	160	195
9	163	209
10	150	193
11	121	186
12	114	180
13	143	186
14	122	183
15	162	202
16	181	209
17	202	212
18	205	204
19	207	207
20	208	209
21	218	204
22	212	217
23	226	214
24	248	215
25	251	224
26	223	233
27	213	214
28	223	199
29	177	188
30	155	177
Mean:	175.2	199.7



PREDICTED AND OBSERVED SUNSPOT NUMBERS

CALCIUM PLAGE AND SUNSPOT REGIONS

APRIL 1957

CMP Apr. 1957	Lat.	McMath Plage Number	Return of Region	Calcium Plage Data CMP Area	Values Int.	History, Age		Sunspot Data CMP Area	Values Count	History
02.4	S16	3910	3873	2,400	2	ℓ / ℓ	2	20	2	b – d
02.8	N32	3912	3875	(600)	(2)	ℓ \ d	3			
03.0	N21	3911	3878	(1,900)	(3)	ℓ – d	2	(10)	(1)	b – d
03.9	S16	3913	3876	4,800	1	ℓ ∧ ℓ	3	40	1	b / ℓ
04.6	N16	3918	New	(100)	(1)	b / ℓ	1	(50a)	-	b ∧ ℓ
05.2	S22	3914	3879	5,000	2	ℓ ⌐ ℓ	3	(410)	(9)	b ∧ ℓ
05.6	N21	3919	New	1,000	1	b / ℓ	1	(120)	13	b / ℓ
06.9	N25	3920	New	(2,000)	(3)	b – ℓ	1	(490)	(6)	b / ℓ
07.0	N10	3915	New	2,000	2	ℓ – ℓ	1	100	4	b ∧ d
07.3	S05	3921	3882	(500)	(1.5)	b – d	3			
08.0	S23	3916	3881	3,800	2	ℓ ⌐ ℓ	3	300	4	ℓ ⌐ ℓ
08.5	N12	3917	3883	(500)	(1)	ℓ \ d	5	---	(1)	b – d
09.5	S19	3922	3884	2,200	3	b / ℓ	6	290	6	b ⌐ ℓ
10.3	N14	3927	New	700	2	b ⌐ ℓ	1	20	4	b – d
11.2	N30	3938	New	(500)	(2)	b / ℓ	1	(130)	(2)	b \ ℓ
12.3	S23	3923	3888	6,100	3.5	ℓ ⌐ ℓ	7	640	19	ℓ ∧ ℓ
13.2	N08	3924	3891	400	2	b \ d	6			
13.2	N17	3928	3889	800	2	b – d	6			
14.2	N16	3926	3891	2,500	2.5	ℓ ⌐ ℓ	6	(20)	(2)	ℓ \ d
14.3	S38	3925	New	1,000	2	ℓ – d	1			
14.4	S23	3939	New*	800	4	b / ℓ	1*	90	2	b ∧ d
15.0	N13	3932	New	800	2.5	b ⌐ ℓ	1	50	3	b – d
15.4	S22	3929	3892	(1,000)	(2)	b – d	3			
16.0	N36	3943	New	500	2.5	b / ℓ	1	150	3	b \ d
17.0	N24	3930	3893	(1,600)	(1.5)	ℓ \ d	6			
17.8	S13	3934	New	(200)	(1.5)	b \ d	1			
17.9	S45	3933	New	(300)	(2)	b \ d	1			
18.5	S26	3931	New	2,200	3	ℓ – ℓ	1	(10)	(1)	ℓ \ d
18.6	N24	3935	New	2,000	3	ℓ ∨ ℓ	1	100	5	ℓ ¬ d
19.0	S16	3936	3897	1,200	3	ℓ ⌐ ℓ	3	30	2	ℓ \ d
19.7	N16	3937	New	1,600	3	ℓ – ℓ	1	110	5	b ∧ d
20.2	S18	3940	**	3,000	3	ℓ – ℓ	3,1	190	1	b – ℓ
20.2	N34	3951	++	300	2	b – d	1			
20.2	S04	3952	++	300	2	b – d	1			
21.2	S13	3942	+	2,600	3	ℓ – d	+	220	7	ℓ ⌐ ℓ+
22.6	S16	3944	3899	7,500	3	b ⌐ ℓ	2	780	12	b ∧ ℓ
23.0	N27	3941	3908	6,000	3	ℓ ¬ ℓ	2	480	10	ℓ ∧ d
24.2	S16	3945	3901	2,000	3	b / ℓ	3	590	10	b ∧ ℓ
24.5	N09	3946	3906	300	2	ℓ \ d	2			
25.6	S12	3947	3907	2,300	2.5	ℓ \ ℓ	7	(20)	(3)	ℓ \ d
25.7	N25	3949	3909	1,700	3	ℓ – ℓ	3	20	1	ℓ ∧ d
26.2	S28	3948	3907	1,700	3	ℓ – ℓ	7	190	5	ℓ \ d
27.0	N22	3950	3909	2,000	1.5	ℓ – d	3			
28.0	S17	3953	New	3,500	3	ℓ ⌐ ℓ	1	630	9	ℓ ∧ ℓ
28.1	S11	3954	New	2,000	3	ℓ / ℓ	1	440	6	b ⌐ ℓ
28.7	N19	3966	New	(500)	(2.5)	b / ℓ	1	(70)	(4)	b – d
29.0	S31	3961	New	(300)	(2)	b / ℓ	1	(60)	(8)	b \ d
29.9	S18	3955	3910	1,500	2.5	ℓ ∧ ℓ	3	(150)	(2)	ℓ / d
30.1	S05	3956	New	2,800	3	ℓ ⌐ ℓ	1	250	13	ℓ \ ℓ
30.7	S12	3957	3913	1,200	2.5	ℓ ⌐ ℓ	4	210	4	ℓ \ ℓ

* = Essentially new - disk revival of decayed 3929.
** = Part of old 3897 (3 rotations), part new.
\+ = Merged with 3940.
++ = New and ephemeral.
( ) = Values extrapolated several days to CMP.

CORONAL LINE EMISSION INDICES

APRIL 1957

CMP Apr. 1957	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
1	39	49	x	x	78	108	x	x	158	313	58	93	83	131	58	72
2	35*	50	32	45	70	124	42	85	x	x	x	x	x	x	x	x
3	93	130	62	100	180	246	62	150	49	80	31	48	42	52	29	48
4	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
5	x	x	x	x	x	x	x	x	60	92	42	68	71	100	21	80
6	51	65	25	38	106	109	44	72	148	228	36	80	123	152	34	76
7	71	102	23	42	95	152	38	70	186	216	x	x	140	205	x	x
8	x	x	x	x	x	x	x	x	74	96	27	48	46	75	30	52
9	x	x	x	x	x	x	x	x	138	156	30	45	92	175	24	42
10	x	x	x	x	x	x	x	x	164	200	40	90	133	200	55	108
11	x	x	x	x	x	x	x	x	188	216	22a	45a	128	240	22a	36a
12	86*	124	13	28	115	140	18	28	162a	252a	33a	52a	86a	120a	18a	25a
13	49*	92	26	50	68	94	17	20	101	150	30	48	66	90	23	34
14	x	x	x	x	x	x	x	x	162	240	30	84	135	148	24	52
15	116	216	33	40	123	150	27	57	x	x	35	76	x	x	36	60
16	x	x	x	x	x	x	x	x	83	116	19	22	81	160	29	37
17	44	52	28	56	69	112	36	70	70	138	12	23	102	180	22	38
18	x	x	x	x	x	x	x	x	127	176	19	35	134	180	17	30
19	66	100	48	106	97	150	59	84	128a	170a	28a	48a	135a	172a	30a	44a
20	113	152	47	100	146	186	56	114	x	x	x	x	x	x	x	x
21	102	132	x	x	148	221	x	x	148	304	x	x	121	240	x	x
22	57	74	19	30	120	159	56	109	140	216	x	x	128	200	x	x
23	108	186	31	66	148	264	50	78	128	198	40	84	128	212	36	72
24	91	112	39	50	39	50	51	83	141	246	64	111	118	200	48	81
25	156	232	31a	45a	189	288	24a	45a	138	196	63	90	105	192	42	75
26	61a	84a	48a	92a	37a	52a	30a	52a	102a	134a	43a	64a	86a	158a	28a	52a
27	56	125	48	78	56	100	58	120	134a	212a	58a	104a	76a	104a	29a	40a
28	58	88	26	40	84	144	36	60	x	x	x	x	x	x	x	x
29	56	76	24	35	109	200	47	75	x	x	x	x	x	x	x	x
30	108	164	32	82	147	200	37	60	x	x	x	x	x	x	x	x

* = yellow line observed.
a = index computed from low weight data.
x = no observations.

SOLAR FLARES

APRIL 1957

Observatory	Date Apr. 1957	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
Mitaka	01	0454	0508	14		3908	N30	W90				1	S-SWF
Mitaka	01	0542	0600	18	135	3907	S17	W30				1	Slow S-SWF
Schaus.	01	b1100	1200	>60		3907	S13	W38				2	
Capri-S	01	b1319	a1359	>40		3907	S16	W36				1-	
Schaus.	01	b1321	1400	>39		3907	S19	W40				1+	G-SWF
Neder.	01	1333	1359	26		3904	S15	W34				1	
Neder.	01	1450	1458	08		3909	N28	W32				1	
Mitaka	02	0139	0156	17	135	3914	S23	E45				1	G-SWF
Sydney	02	b0255	~0415	>80		3907	S15	W45	0330			2	G-SWF
Mitaka	02	0309	a0325	>16	135	3907	S16	W40				1	
Meudon	02	b0751	0836	>45		3914	S25	E45				3	
Mitaka	03	0311	0315	04	184	3907	S14	W55				1	
Stckhlm.	03	b0856	1000	>64		3907	S18	W63				2+	S-SWF
Capri-S	03	b1337	1355	>18	121	3916	S20	E31				1	
Mitaka	03	b2330	2340	>10	135	3907	S16	W72				1	
Wendel.	04	0737	0746	09		3907	S16	W72				1	
Wendel.	04	1400	1424	24		3909	N15	W54				1	
Mitaka	07	0202	a0240	>38	457	3909	N09	E01	0217			1+	G-SWF
S.Peak	07	1458	1518	20	100	3923	S22	E55	1502	22	4	1	S-SWF
Capri-S	07	b1459	a1507	>08	53	3923	S18	E55				1-	
S.Peak	07	1525	1605	40	100	3918	N14	W54	1540	18	7	1	
Mitaka	08	0320	0328	08	367	3916	S25	W11				1+	
Mitaka	08	b0333	0340	>07	135	3923	S22	E51	0336			1	
Mitaka	08	b0342	0357	>15	552	3923	S22	E51	0342			2	S-SWF
Mitaka	08	0442	0459	17	180	3923	S23	E50				1	G-SWF
Mitaka	08	b0616	0651	>35	552	3916	S18	E00	0622			2	Slow S-SWF
Meudon	08	b0732				3916	S15	W05				1	
Capri-S	08	1200	1314	74	136	3923	S20	E46				1	
McMath	09	b1420	a1430	>10		3919	N22	W50				1	S-SWF
Schaus.	09	b1426	1445	>19		3914	S23	W47				1	
Neder.	09	1446	1454	08		3919	N23	W51				1+	
Neder.	09	1457	1504	07		3914	S25	W55				1	
Ottawa	09	1808	1823	15		3919	N23	W55	1809	—		1+	G-SWF
S.Peak	09	b2050	2058	>8	160	3916	S23	W35	≥2050	16	6	1	
S.Peak	10	2213	2345	92	140	3916	S27	W51	2235	17	3	1	
Simeiz	11	b0530				3926	N09	E39	0530			1	
S.Peak	11	1722	1805	43	370	3923	S24	E04	1738	28	2	2	S-SWF
McMath	11	b1735	a1820	>45		3923	S22	E05				3	
Simeiz	12	b0703				3923	S20	W06	0703			1	
Capri-S	12	b1324	a1519	>115	258	3923	S24	W08				2	Slow S-SWF
McMath	12	b1330				3923	S23	W03				1	
S.Peak	12	1850	2002	72	250	3916	S27	W70	1924	26	3	2	S-SWF
McMath	12	b1935				3916	S23	W75				2	
S.Peak	13	1430	1458	28	150	3920	N19	W90	1438	16	9	1	
S.Peak	13	1902	1935	33	130	3916	S26	W90	1910	16	5	1	
S.Peak	13	1945	2040	55	180	3923	S24	W24	1958	17	3	1	G-SWF
Mitaka	14	0230	0245	15	135	3935	N24	E63				1	
Simeiz	14	b0640				3927	N13	W53	0640			1	
Simeiz	14	b0640				3923	S31	W31	0640			1	
S.Peak	14	1708	1735	27	130	3923	S25	W33	1715	17	4	1	S-SWF
McMath	14	b1715				3923	S23	W28				1	

SOLAR FLARES

APRIL 1957

Observatory	Date Apr. 1957	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	14	b1920				3923	S23	W30				1+	G-SWF
Mitaka	14	b2309	2327	>18	184	3938	N28	W48	2313			1	
Mitaka	15	b0556	0614	>18	135	3923	S25	W33				1	G-SWF
Arcetri	15	b1001				3923	S25	W40				1	
McMath	15	b1410	a1430	>20		3941	N25	E90				2	S-SWF
{ Capri-S	16	b1048	1214	>86	156	3941	N32	E90				2	
Wendel.	16	b1053	1143	>50		3941	N31	E86	1053			2+	S-SWF
Schaus. }	16	b1055	1240	>105		3941	N32	E90				2	
{ Capri-S	17	b1006	1104	>58	233	3941	N28	E76				1+	
Wendel.	17	b1010	1118	>68		3941	N27	E72	1022			3	S-SWF
Stckhlm. }	17	b1020	1100	>40		3941	N30	E85				2	
{ Capri-S	17	1455	1514	19	151	3942	S15	E72				1+	
S.Peak }	17	b1500	a1508	>08	27	3942	S18	E75	1503	15	8	1-	Slow S-SWF
Capri-S	17	1619	a1640	>21	102	3939	S20	W41				1	G-SWF
Honolulu	17	2000	2300	180		3941	N12	E70	2116			3+	Slow S-SWF
Honolulu	17	b2112	2124	>12		3939	S16	W48	2114			2	
S.Peak	17	b2220	2255	>35	185	3941	N27	E69	2245	15	2	1+	
{ Honolulu	18	b0148	0211	>23		3939	S17	W53	0154			1	
Mitaka }	18	b0158	0205	>07	275	3939	S21	W49	0201			1	
Capri-S	18	0907	0924	17	117	3923	S22	W77				1	S-SWF
{ Capri-S	18	b1310	a1314	>04	141	3945	S14	E62				1+	
Stckhlm.	18	b1317	1340	>23		3945	S14	E67				1+	S-SWF
S.Peak }	18	b1323	1340	>17	95	3945	S17	E65	1330	16	2	1-	
S.Peak	18	2025	2150	85	300	3941	N32	E56	2033	18	6	2	S-SWF
Capri-S	19	b0512	0630	>78	194	3941	N28	E46				1+	G-SWF
{ S.Peak	19	1325	1338	13	50	3941	N26	E48	1328	18	8	1-	
Capri-S }	19	1326	a1335	>09	131	3941	N25	E48				1	
{ S.Peak	19	1702	1722	20	120	3941	N30	E54	1705	16	2	1	
McMath }	19	b1705	a1735	>30		3941	N35	E60				2	
{ S.Peak	19	1743	1832	59	55	3941	N21	E40	1758	18	2	1-	G-SWF
McMath }	19	b1800				3941	N27	E40				1	
Capri-S	20	1017	1217	120	282	3941	N30	E35				2	G-SWF
{ S.Peak	20	b1452	1558	>58	150	3942	S16	E12	1505	16	4	1	Slow S-SWF
Capri-S }	20	b1453	1544	>51	185	3942	S15	E13				1+	
Capri-S	21	b1030	a1130	>60	121	3945	S23	E28				1+	
Capri-S	21	1218	a1250	>32	185	3941	N28	E15				1	
Capri-S	21	1340	1413	33	126	3950	N15	E64				1	
Capri-S	22	b0551	0726	>95	311	3944	S17	W07				2+	
Capri-S	22	b1027	a1239	>132	253	3940	S23	W32				2	
Capri-S	22	1141	a1224	>103	97	3941	N25	E02				1	
{ Capri-S	22	1201	a1220	>19	58	3944	S12	E06				1-	
Schaus. }	22	b1202	1217	>15		3944	S10	E05				1	
Capri-S	22	1341	a1358	>17	121	3944	S11	E04				1	S-SWF
{ S.Peak	22	1420	1440	20	258	3941	N28	E00	1425	20	3	2	S-SWF
Capri-S }	22	1424	1544	80	258	3941	N25	E03				2	
Schaus.	22	b1422	1444	>22		3944	S22	E00				2	
Capri-S	23	b0612	a0647	>35	107	3941	N26	W07				1	
{ Capri-S	23	0840	0907	27	63	3944	S13	W06				1-	S-SWF
Arcetri }	23	b0849				3944	S11	W05				1	
Capri-S	23	1224	1241	17	97	3944	S11	W17				1	
Capri-S	24	0557	a0632	>35	156	3941	N28	W15				1+	
Capri-S	24	b0705	0727	>22	248	3953	S17	E51				1+	
Capri-S	24	0835	a0852	>17	107	3944	S14	W28				1	
Arcetri	24	0838				3944	S15	W30				1	
S.Peak	24	1658	1732	34	135	3953	S20	E48	1718	17	2	1	

SOLAR FLARES

APRIL 1957

Observatory	Date Apr. 1957	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	24	b1720				3953	S17	E40				1	
S.Peak	24	1735	1752	17	165	3941	N27	W29	1737	16	3	1	
Capri-S	25	b0558	0620	> 22	121	3945	S24	W29				1	
Capri-S	25	0827	0834	07	97	3955	S21	E58				1	
Capri-S	25	b0847	a0921	> 34	117	3937	N13	W80				1	
Wendel.	25	b0904	0937	> 33	121	3944	S14	W36				1	
S.Peak	25	1313	1322	09	85	3941	N29	W32	1315	17	2	1-	
Capri-S	25	b1313	1414	> 61	272	3941	N26	W34				2	
Stckhlm.	25	b1315	1402	> 47		3941	N30	W30				2	Slow S-SWF
S.Peak	25	1325	1405	40	185	3941	N30	W36	1340			1+	
McMath	25	b1335				3941	N28	W32				1	
Capri-S	25	1523	1540	17	112	3944	S14	W38				1	
S.Peak	25	1523	1535	12	48	3944	S13	W41	1525	14	5	1-	
McMath	25	b1535	a1543	> 08		3944	S12	W40				1-	
S.Peak	25	1555	1625	30	110	3944	S12	W45	1600	16	1	1	
Capri-S	25	b1558	a1621	> 23	185	3944	S14	W40				1	
McMath	25	b1600				3944	S12	W40				1	
Meudon	25	2314	2345	31		3953	S10	E23	2320			2	
S.Peak	25	b2320	2355	> 35	170	3953	S16	E21	≤2320	20	6	1+	
Mitaka	25	b2330	2355	> 25	89	3953	S16	E22				1	
Mitaka	26	0005	a0015	> 10	184	3941	N33	W59				1	
Capri-S	26	b0632	a0803	> 91	511	3941	N25	W43				2+	
Capri-S	26	0807	a0826	> 19	121	3944	S09	W53				1	
Capri-S	26	b1032	1111	> 39	160	3954	S08	E24				1+	
Arcetri	26	b1038				3954	S07	E21				1	
Capri-S	26	1122	a1213	> 51	214	3945	S15	W30				1+	
S.Peak	26	1448	1500	12	45	3945	S16	W31	1450	15	2	1-	
Capri-S	26	1449	a1541	> 57		3945	S17	W29				1	
S.Peak	26	2032	2048	16	170	3941	N31	W49	2035	18	6	1	S-SWF
S.Peak	26	2050	2108	18	35	3941	N30	W52	2055	18	8	1-	
McMath	26	b2050	a2110	> 20		3941	N28	W50				1+	
Capri-S	27	b0939	a1021	> 42	121	3941	N26	W53				1	
Capri-S	27	b1104	a1123	> 19	311	3945	S13	W50				1+	
Capri-S	28	0911	0914	03	165	3944	S08	W73				1	
Capri-S	28	b0940	a0953	> 13	107	3941	N27	W65				1	
Capri-S	28	b1546	a1547	> 01	175	3945	S16	W55				1+	G-SWF
Capri-S	29	b0941	1009	> 28	165	3944	S14	W69				1	
Meudon	29	b2047	2127	> 40		3956	S08	E10	2101			1	
Meudon	29	b2347	2407	> 20		3956	S08	E11	2357			1	
Mitaka	30	0207	0215	08	135	3954	S09	W29				1	
McMath	30	b1920	a1940	> 20		3954	S10	W35				1	

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

S. Peak: unmarked McMath: ++
Capri-S: + Mitaka: *

April 01, b1518 (S20,W38)
1532 (N30,W85)
1550 (N25,W39)

April 03, 0244 (N27,W56)*
1319 (S20,E59)+
05, 1652 (N14,W69)

April 05, 1822 (S20,E32)
1847 (N24,W69)
1957 (N28,W90)

SOLAR FLARES

APRIL 1957

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

S. Peak: unmarked McMath: ++
Capri-S: + Mitaka: *

Date	Time	Coordinates
April 06,	0517	(N23,W69)*
	1400	(N24,W90)
	1528	(N23,W87)
	1615	(S22,E70)
	1735	(S22,E68)
	1910	(S22,E67)
	b2354	(S21,E64)*
07,	1615	(S23,E56)
	1725	(N15,W55)
	1800	(S23,E56)
08,	b1343	(N17,W61)+
	b1346	(N15,W67)
	1440	(S22,E43)
	1608	(S26,W18)
	1735	(S22,E42)
	2123	(S26,W22)
09,	b0426	(S27,W20)*
	b0510	(N13,W70)*
	b1610	(N23,W53)
	b1625	(N22,W50)++
	2225	(N25,W56)
	2338	(N08,E69)
	2350	(N22,W57)
10,	1425	(S23,E22)
	1453	(S20,W34)
	1605	(S24,E90)
	1620	(S23,W45)
	1723	(S23,E15)
	1820	(S22,E15)
	2317	(S14,W40)
11,	b1209	(N27,W60)+
12,	1438	(N28,W80)
	1638	(S24,E88)
	2318	(S25,W67)
13,	1331	(N25,E69)
	1725	(N24,E69)
	2010	(S20,E84)
14,	0829	(S15,E66)+
	0922	(S25,W26)+
	1353	(S25,W32)
	1415	(S25,W33)
	1700	(S16,W62)
	1955	(S13,E85)
15,	1648	(S22,W47)
April 15,	b1827	(N14,E52)
	2250	(S23,W18)
16,	1330	(S27,W52)
	1645	(N15,E38)
	2118	(S26,W56)
	2218	(N15,E36)
	2338	(N15,E35)
17,	b0727	(S20,W66)+
	1223	(S20,W68)+
	1333	(S21,W43)
	1347	(N28,E73)+
	b1507	(S22,W39)+
	b1709	(S24,W40)
	b1709	(S22,W77)
	b1851	(S18,E73)
18,	1325	(N30,E60)
	1508	(S22,W90)
	1533	(S14,E35)
	1550	(N29,E60)
	1803	(N26,E63)
	1855	(S17,E59)
	1930	(S17,E63)
	2035	(S15,E52)
	2125	(S21,W62)
19,	b1300	(N10,W62)+
	1343	(S15,E23)
	1520	(N28,E46)
	1825	(S12,E34)
	1838	(N32,E50)
	b2200	(S10,E28)
20,	0552	(N26,W19)+
	b0656	(S09,E25)+
	1843	(N32,E24)
21,	b0735	(S15,E41)+
	b1150	(S16,E37)+
	1330	(S11,E90)
	1333	(N17,E66)
	1347	(N26,W35)
	b1354	(N24,W32)
	1425	(N28,W37)
	1555	(N30,E15)
	1700	(N35,W80)
	1815	(N26,E10)
	2328	(S23,E12)
April 21,	2335	(N28,E08)
22,	b1045	(N25,E02)+
	1400	(N35,W90)
	1450	(N35,W90)
	1525	(S12,E05)
	1600	(S13,E05)
23,	0607	(S13,W03)+
	0628	(S10,W04)+
	0941	(N26,W09)+
	b1326	(N21,E54)+
	b1334	(S03,E90)
	b1414	(N25,E29)+
	1520	(S03,E90)
	1640	(N24,W17)
	2318	(S16,W28)
	2335	(S17,W35)
24,	0639	(S13,W46)+
	0808	(S13,W47)+
	1001	(S13,W47)+
	b1236	(S18,E51)
	1922	(S20,E49)
	2133	(S05,E68)
25,	1230	(S17,E33)+
	1345	(S18,E36)
	1423	(N18,W86)
26,	b0727	(S17,E28)+
	b0901	(N13,W90)+
	1112	(S08,W54)+
	b1252	(S12,W38)
	1350	(S04,E47)
	1658	(N30,W38)
	1705	(S13,W67)
	1728	(N20,E53)
	1758	(S14,W37)
	1825	(S17,W33)
	1900	(S16,W35)
	2023	(S15,W37)
27,	0456	(S10,E11)+
	b0822	(S10,E10)+
	0832	(N17,E44)+
	b1505	(S14,E37)+
29,	b0451	(S09,E17)*
30,	b1222	(S10,W02)+
	1420	(S35,W36)

SOLAR FLARES

MARCH 1957

Observatory	Date Mar. 1957	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
Mitaka	07	0312	0335	23	89	3872	S13	W49	0322			1	
Mitaka	09	b0002	a0008	>06	275	3884	S21	E68				1	G-SWF
Mitaka	09	0414	0421	07	184	3884	S21	E68				1	
Mitaka	13	b0232	0248	>16	135	3888	S21	E38				1	
Mitaka	16	0005	a0025	>20	367	3892	S23	E36	0010			1+	
Mitaka	21	b0204	a0211	>07	135	3892	S23	W21				1	
Mitaka	27	0415	a0611	>116	745	3906	N10	E20	0431			2	G-SWF
Mitaka	28	b2322	a2426	>64	1112	3907	S13	E10				2+	
Mitaka	29	b0643	a0711	>28	275	3905	N32	W02	0659			1	

CORRECTIONS TO SOLAR FLARES REPORTED BY SACRAMENTO PEAK

CRPL-F No.	Date	Start UT	Importance	Coordinates Should Be Lat. Mer. Dist.
146	11 Sep.'56	1430	1-	S15 E88
148	22 Nov.'56	1750	1-	N14 E72
148	22 Nov.'56	2000	2	S19 W21
148	27 Nov.'56	1600	1-	S25 W60
148	27 Nov.'56	1625	1-	S12 E82
148	27 Nov.'56	1750	1-	S25 W62
148	27 Nov.'56	1925	1-	S22 W64
148	27 Nov.'56	2100	1-	S22 W64
149	16 Dec.'56	1545	1-	S26 W50
149	16 Dec.'56	1700	1-	S22 W42
149	16 Dec.'56	1905	1-	N22 W12
149	17 Dec.'56	b1517	1-	S24 W65
150	14 Jan.'57	b1945	1-	S20 W85
151	3 Feb.'57	1530	1-	S18 E20
151	3 Feb.'57	b1833	1-	S18 E54
151	9 Feb.'57	1710	1-	S27 E11
151	9 Feb.'57	1830	1-	S30 E24
152	8 Mar.'57	b1510	1-	S26 E33
152	8 Mar.'57	1600	1-	S14 W76
152	8 Mar.'57	1940	1	S13 E45
152	8 Mar.'57	2147	1-	N12 E48
152	9 Mar.'57	1835	1-	S25 E17
152	15 Mar.'57	1550	1-	S26 E42

Importance 1- is a subflare report.

In earlier months many of the McMath, Capri-S, and Mitaka flares should have had start b for before or end a for after time stated. The original reports were misinterpreted. Since these reports are preliminary records on a rapid schedule, it is not felt that a detailed correction sheet needs to be furnished.

IONOSPHERIC EFFECTS OF SOLAR FLARES

(SHORT-WAVE RADIO FADEOUTS)

MARCH 1957

Mar. 1957	Start UT	End UT	Type	Wide-spread Index	Importance	Observation stations	Known Flare, UT CRPL-F 152B
1	0040	0150	G-SWF	1	1-	OK	
	1310	1520	Slow S-SWF	3	2+	BE, MC, WS, DA*	
4	1330	1400	G-SWF	2	1-	MC, PR	b1415
19	0445	0500	S-SWF	1	2- 67E	OK	
20	1656	1745	Slow S-SWF	3	1-	BE, MC, PR	
24	0125	0145	Slow S-SWF	1	1	TO+	
	1832	1915	Slow S-SWF	5	2- 73E	BE, HU, MC, PR, WS	1848
27	0414	0525	Slow S-SWF	1	2+ 18E	OK	0415
28	0300	0335	Slow S-SWF	1	1	OK	
	1012	1050	S-SWF	1	1 27W	NE**	1013
29	1024	1235	S-SWF	2	3 37W	NE**, SW***	b1116
	1712	1810	G-SWF	4	1 48W	AN, MC, PR	b1744
30	0415	0450	Slow S-SWF	1	1+	OK	
	1900	1935	Slow S-SWF	3	1-	BE, MC, PR	
31	0648	0718	S-SWF	1	1- 62W	OK	b0643
	1740	1813	Slow S-SWF	2	1- 26W	BE, PR	

DA* Darmstadt, Germany
NE** Nederhorst den Berg, Netherlands
SW*** Enköping, Sweden
TO+ Hiraiso Radio Wave Observatory, Japan

SOLAR RADIO WAVES (OTTAWA)--2800 MC

OUTSTANDING EVENTS

APRIL 1957

Apr. 1957	Type*	Start UT Hrs:Mins	Duration Hrs:Mins	Maximum Time UT Hrs:Mins	Maximum Peak Flux	Remarks
1	1	15 25.5	2.5	15 26.5	12	
1	1	17 26.5	2	17 27.3	3	
2	1	12 23	1.5	12 23.5	13	
2	3	15 55	15	16 02.5	5	
2	Group (2)	19 14	1 39			
	6	19 14	38	19 23.2	247	
	2	19 55	23	19 59	176	
	4		35		14	
2	1	21 36.5	1.5	21 37	3	
5	6	14 07	12	14 11.5	50	
	4		15		6	
5	3	14 56.5	5	14 58	4	
5	1	22 30	1	22 30.3	14	
6	2	12 04	2.5	12 05	9	
6	2	19 16	2.5	19 17	6	
6	2	22 44.2	2	22 44.4	7	
7	6	14 58.5	9	15 01	44	
7	2	16 19.3	1.5	16 19.5	6	
8	1	14 40.5	1	14 41	4	
8	3	16 21.5	8	16 24	10	
8	3	22 22	40	22 34	10	
9	1	14 57.2	1	14 57.3	6	
10	3	22 10	35	22 16	9	
10	1	22 57.5	1.5	22 58.2	8	
11	3	17 25	1 15	indet.	16	
11	6	17 29.5	16	17 33.3	135	Superimposed on Rise and Fall
11	2	19 32.2	1.5	19 33	9	
12	3	17 37	7	17 40	4	
12	2	18 55.5	23	19 00.5	525	
	4		1		20	
13	2	18 51.2	1.5	18 51.7	6	
13	3	19 52	1 20	20 20	9	
13	6	19 54.5	2	19 55.8	16	Superimposed on Rise and Fall
13	1	22 25	5	22 27	7	
14	3	17 05	6 30	19 20	25	
14	1	20 55.5	2	20 56	6	Superimposed on Rise and Fall
15	2	13 51	19	13 54	160	
15	3	15 22.5	10	15 24	7	
16	6	10 40	54	10 46	1650	
				10 49	1650	
	4		1 50		15	
16	3	16 29	10	16 33	5	
16	3	22 43	7	22 46.5	8	
17	3	14 54	10	14 57.5	7	
17	1	14 56.5	1	14 57	15	Superimposed on Rise and Fall
17	1	16 17.5	5	16 19.5	5	
17	1	17 46.5	1	17 46.8	10	
17	3	18 40	4 30	indet.	90	
17	Group (2)	18 44	8			
	2	18 44	5	18 45.3	142	
	1	18 50	2	18 51	5	Superimposed on Rise and Fall

* See page 6.

SOLAR RADIO WAVES (OTTAWA)--2800 MC

OUTSTANDING EVENTS

APRIL 1957

Apr. 1957	Type*	Start UT Hrs:Mins	Duration Hrs:Mins	Maximum Time UT Hrs:Mins	Maximum Peak Flux	Remarks
17	6	20 06	1 19	20 42	6000	
18	2	13 04.5	7	13 06.8	385	
	4		13		15	
18	3	13 50	13	13 55	8	
18	3	15 30	2 10	16 15	12	
18	6	20 30	12	20 32	200	
	4		1 50		30	
18	2	22 53.5	3.5	22 55	205	
	4		10		10	
19	Group (2)	17 44.5	50			
	1	17 44.5	2.5	17 45	8	
	2	17 50.5	4	17 52	56	
	4		40		6	
20	6	18 44.5	3	18 46	16	
20	2	19 38.3	2.5	19 38.8	21	
20	1	21 41.2	0.5	21 41.3	9	
21	2	13 43.5	2	13 44	20	
21	3	18 12	15	18 17	10	
22	Group (2)	14 18	17.7			
	1	14 18	1	14 18.5	8	
	6	14 21.7	14	14 23.5	296	
22	2	17 23.7	5	17 25.1	112	
	4		8		9	
23	2	12 23	3	12 23.7	9	
24	3	17 32.5	10	17 34	6	
25	1	13 12.5	2	13 13.3	10	
25	1	19 04	1	19 04.2	5	
26	1	11 12.5	1	11 13	17	
26	2	16 59	3.5	16 59.5	22	
26	2	20 33	8	20 36.3	14	
28	1	15 42.5	7	15 45.5	9	

* See page 6.

<u>Periods of Observation - on 2800 Mc</u>
1957

JANUARY : Daily - from 13:00 UT to 21:30 UT (approx.)

Exception: No observations Jan. 2 - 17:00-17:15
Jan. 8 - 16:20-16:40.

FEBRUARY: Daily - from 12:40 UT to 22:05 UT (approx.)

Exception: Observations started at 15:50 on Feb. 26.

MARCH : Daily - from 11:40 UT to 23:00 UT (approx.)

Exception: Observations started at 17:20 on Mar. 16.

SOLAR RADIO WAVES (CORNELL)--200 MC

3-HOURLY FLUX

APRIL 1957

Apr. 1957	Flux Hours UT 12 15	Flux Hours UT 15 18	Flux Hours UT 18 21	Variability Hours UT 12 15	Variability Hours UT 15 18	Variability Hours UT 18 21
1	[[5.15	3.95	3.10	[[2	2	2
2	[[1.60	1.35	2.25	[[1	1	1
3	[[1.30	1.35	1.60	[[0	0	1
4	[[2.05	1.95	2.15	[[1	1	2
5	[[1.80	1.65	1.65	[[1	1	1
6	[[1.90	1.95	2.10	[[2	2	2
7		2.60	4.95		2	2
8	[[1.95	2.05	1.90	[[1	1	1
9	[[3.55	3.20	1.75	[[2	2	1
10	[[1.80	1.85	2.00	[[1	1	1
11	[[2.15	1.95	2.00	[[1	1	1
12	[[1.95	1.80	1.45	[[1	0	1
13		1.45	2.00		0	1
14	[[1.40	1.50	2.15	[[1	1	1
15	[[1.40	1.40	1.40	[[1	0	0
16	[[2.05	1.80	1.60	[[2	1	1
17	[[1.60	1.60	3.10	[[1	1	2
18	[[2.25	2.15	2.30	[[1	1	1
19	[[2.55	2.50	2.35	[[2	1	1
20		2.40	1.95		1	1
21		1.90	2.20		1	1
22	[[2.35	2.35	2.05	[[2	2	1
23	[[2.10	2.05	2.05	[[1	1	1
24	[[1.45	1.60	1.75]]	[[0	1	1]]
25	[[1.40	1.35	1.40	[[0	1	1
26						
27	[[1.40	1.55	1.70]	[[0	0	L*]
28	[2.10	2.05	3.30]	[1	1	2]
29	[5.35	6.65	6.70]	[3	2	2]
30	[3.55	3.70	2.60]	[2	2	1]

[= first hour missing.
[[= first two hours missing.
]] = last two hours missing.
] = last hour missing.

* = lightning.
Flux in terms of KTB.
Quiet sun ≃ 1.45 KTB.

SOLAR RADIO WAVES (CORNELL)--200 MC

OUTSTANDING EVENTS

APRIL 1957

Apr. 1957	Type	Start UT	Duration Minutes	Maximum Inst. Flux	Maximum Smd. Flux	Remarks
2	0	1902 1/2	27			
2	8	1912	10	> 22.4	> 22.4	
2	8	1954	3	> 22.4	> 22.4	
8	1	1552 1/2	34 1/2			
11	2	1733	12			
12	2	1858	17			
14	3	1549 1/2	5	>10.6	>10.6	
15	8	1358	5	>10.6	>10.6	off-scale
16	3	1824 1/2	1/2	>10.6	8.40	
16	3	1827 1/2	1 1/2	>10.6	>10.6	
16	3	2002	1	9.30	8.10	
16	3	2023 1/2	1	>10.6	>10.6	off-scale
16	3	2033 1/2	1/2	>10.6	>10.6	off-scale
16	3	2040 1/2	1	>10.6	>10.6	off-scale
17	8	1618	3 1/2	>10.6	>10.6	off-scale-1618 1/2-19 1/2 UT
17	8	1842 1/2	8 1/2	>10.6	>10.6	off-scale-1844 1/2-45 1/2, 1846-48 UT
17	9	2020 1/2	12	>10.6	>10.6	off-scale-2026 1/2-29 UT
17	9	2033	25	>22.4	>22.4	off-scale
18	3	1620 1/2	1/2	>10.6	>10.6	off-scale
18	3	1802	4	>10.6	>10.6	off-scale-1802 1/2-03 UT
22	3	1422 1/2	2	>10.6	>10.6	
24	3	1716	1 1/2	>10.6	>10.6	off-scale
25	3	1838 1/2	1	>10.6	9.00	

SOLAR RADIO WAVES (BOULDER) -- 167 MC

3-HOURLY AND DAILY FLUX

MARCH 1957

Mar 1957	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	--	14	13	13	14	--	2	2	0	2	1540-2430
2	--	13	--	12	13	1	1	1	1	1	1345-1630; 2139-2435
3	--	12	12	12	12	--	2	1	(0)	2	1422-2435
4	--	11	9	9	10	1	1	0	0	1	1335-2435
5	--	10	11	11	11	0	0	0	1	1	1335-2435
6	--	12	10	12	11	2	2	1	2	2	1335-2440
7	--	12	13	13	13	--	1	2	1	2	1423-2440
8	--	12	12	13	12	0	0	1	1	1	1330-2440
9	--	13	--	16	14	0	0	--	2	2	1330-1726; 2230-2440
10	--	12	12	13	13	--	0	0	0	0	1427-2440
11	--	14	15	14	14	2	2	2	2	2	1325-2440
12	--	54	--	94	72	3	3	3	3	3	1320-2400
13	--	20	19	--	20	--	3	3	3	3	1445-2400
14	--	13	13	13	13	--	0	0	(0)	(0)	1438-2445
15	--	13	14	16	14	(0)	1	1	2	2	1320-2445
16	--	42	24	17	29	2	2	2	(1)	2	1315-2450
17	--	16	15	16	15	0	2	2	2	2	1315-2450
18	--	14	22	16	17	2	2	3	2	3	1315-2455
19	--	--	--	--	--	--	--	--	--	--	--
20	--	--	--	--	--	--	--	--	--	--	--
21	--	--	--	--	--	--	--	--	--	--	--
22	--	--	--	--	--	--	--	--	--	--	--
23	--	--	--	--	--	--	--	--	2	2	2215-2445 Note 1.
24	--	--	--	--	--	2	(1)	2	2	2	1305-2430
25	--	--	--	72	70	--	--	2	1	2	1638-2500
26	--	41	--	29	37	2	1	--	2	2	1300-1938; 2125-2500
27	--	24	17	22	21	2	2	1	(1)	2	1330-2500
28	--	20	18	20	19	--	2	1	2	2	1438-2500
29	--	14	15	25	18	(0)	1	1	2	2	1255-2500
30	--	--	14	13	13	1	1	1	1	1	1255-2500
31	--	22	28	30	26	1	2	2	2	2	1255-2505

Note 1: March 23 and 24, no medians due to calibration difficulties.

SOLAR RADIO WAVES (BOULDER) -- 167 MC

3-HOURLY AND DAILY FLUX

APRIL 1957

April 1957	Flux					Variability					Observed Periods
	Hours UT					Hours UT					
	12 15	15 18	18 21	21 24	Daily	12 15	15 18	18 21	21 24	Daily	Hours UT
1	--	40	31	37	40	2	2	3	3	3	1250-2500
2	--	--	--	--	--	--	--	--	--	--	--
3	--	--	--	--	--	--	--	--	--	--	--
4	--	--	--	14	14	--	--	2	2	2	1910-2505
5	--	--	13	20	16	--	--	2	2	2	1245-1330; 1730-2505
6	--	--	--	17	17	1	--	3	3	3	1240-1430; 1937-2505
7	--	--	--	--	--	--	--	--	--	--	1240-1330
8	--	13	15	36	22	--	2	2	3	3	1526-2510
9	--	35	15	15	21	2	2	2	2	2	1235-1430; 1551-2510
10	--	15	17	20	17	2	2	2	2	2	1235-2515
11	--	--	16	15	16	--	2	2	2	2	1600-2515
12	--	25	17	17	20	--	2	3	1	3	1230-1330; 1452-2515
13	--	--	--	14	14	--	--	--	2	2	1230-1330; 2002-2520
14	--	--	20	--	--	--	--	2	1	2	1230-1300; 1800-2520
15	--	--	12	--	--	--	--	(1)	(1)	(1)	1803-2025; 2120-2520

Radiometer inoperative after April 15, 1957, because of mechanical failure.

SOLAR RADIO WAVES (BOULDER) -- 460 MC

3-HOURLY AND DAILY FLUX

MARCH 1957

Mar 1957	Flux Hours UT 12-15	Flux 15-18	Flux 18-21	Flux 21-24	Flux Daily	Variability Hours UT 12-15	Variability 15-18	Variability 18-21	Variability 21-24	Variability Daily	Observed Periods Hours UT
1	--	75	72	69	72	(0)	(0)	0	(0)	(0)	1335-1630: 1825-1915 /1.
2	--	66	64	66	66	0	0	1	0	1	1355-2435
3	--	70	73	69	71	0	0	0	0	0	1445-2435
4	--	76	66	63	69	0	(0)	0	(0)	(0)	1330-2435
5	--	67	60	58	62	0	0	0	0	0	1330-2435
6	--	64	64	61	63	0	(0)	(0)	(0)	(0)	1330-2440
7	--	67	66	66	66	--	(0)	0	0	(0)	1423-2440
8	--	67	65	69	68	0	(0)	0	(0)	(0)	1325-2440
9	--	66	--	61	64	--	0	--	0	0	1325-1726; 2117-2440
10	--	64	63	65	64	--	0	0	0	0	1427-2440
11	--	68	66	67	67	0	(0)	0	(0)	(0)	1320-2440
12	--	67	69	67	68	0	0	0	0	0	1320-2445
13	--	69	71	71	71	0	(0)	0	(0)	(0)	1320-2445
14	--	62	63	62	62	--	(0)	0	(0)	(0)	1438-2445
15	--	67	67	68	68	0	(0)	0	(0)	(0)	1315-2450
16	--	73	70	65	70	0	(0)	0	(0)	(0)	1310-2450
17	--	72	69	69	71	0	0	0	0	0	1310-2450
18	--	68	68	67	68	0	0	0	(0)	(0)	1310-2450
19	--	69	--	--	71	0	(0)	--	--	(0)	1310-1730
20	--	--	--	--	--	--	--	--	--	--	--
21	--	--	--	--	--	--	--	--	--	--	--
22	--	--	--	--	--	--	--	--	--	--	--
23	--	--	--	--	--	--	--	--	--	--	--
24	--	68	70	--	69	--	(0)	2	(0)	2	1545-2230
25	--	--	65	66	66	--	--	(0)	(0)	(0)	1720-2455
26	--	62	59	63	61	0	(0)	(0)	(0)	(0)	1255-2052; 2144-2455
27	--	71	70	72	71	(0)	1	0	(0)	1	1255-2500
28	--	67	65	68	67	--	(0)	(0)	(0)	(0)	1440-2500
29	--	67	67	72	69	0	0	0	(0)	(0)	1250-2500
30	--	69	67	68	68	0	(0)	(0)	(0)	(0)	1250-2500
31	--	74	77	73	75	0	1	1	0	1	1250-2505

Note 1: March 1 additional observed period: 1945-2430.

SOLAR RADIO WAVES (BOULDER) -- 460 MC

3-HOURLY AND DAILY FLUX

APRIL 1957

April 1957	Flux					Variability					Observed Periods
	Hours UT					Hours UT					
	12 15	15 18	18 21	21 24	Daily	12 15	15 18	18 21	21 24	Daily	Hours UT
1	78	77	71	70	74	0	(0)	(0)	(0)	(0)	1245-2505
2	--	--	--	--	--	0	--	--	--	--	1245-1508
3	--	--	--	65	66	--	--	0	(0)	(0)	1842-2505
4	--	--	72	70	71	--	--	0	(0)	(0)	1804-2505
5	70	70	68	67	69	1	(0)	(0)	(0)	1	1240-2510
6	69	68	67	66	68	0	(0)	(0)	0	1	1240-2510
7	76	74	73	70	73	0	0	0	0	0	1235-2510
8	82	79	76	91	81	0	(0)	0	(0)	(0)	1235-2030;2148-2510
9	86	84	74	76	79	0	(0)	0	(0)	(0)	1235-2510
10	81	73	73	72	74	0	(0)	0	(0)	(0)	1230-2515
11	--	77	75	74	75	--	(0)	0	(0)	(0)	1600-2515
12	--	74	72	70	72	0	0	1	(0)	1	1230-2515
13	73	70	71	70	71	0	0	0	0	0	1230-2515
14	78	72	72	70	72	0	0	0	0	0	1225-2515
15	76	72	67	67	70	0	0	0	1	1	1225-2520
16	77	73	--	70	73	0	0	--	(0)	(0)	1225-1810; 2105-2520
17	77	75	102	--	84	0	0	2	0	2	1220-2115; 2243-2520
18	--	74	73	--	73	--	0	0	--	0	1440-2112; 2307-2520
19	--	72	66	67	69	--	0	0	0	0	1220-2430
20	71	73	72	69	71	0	0	2	1	2	1215-2430
21	75	72	72	68	72	0	0	0	(0)	0	1215-2525
22	80	76	74	71	75	1	0	0	(0)	1	1215-2525
23	78	75	74	75	75	0	0	0	0	0	1210-2136; 2325-2525
24	81	80	79	79	80	0	1	(1)	2	2	1210-2525
25	--	80	76	--	78	--	0	0	--	0	1437-2030; 2404-2525
26	86	87	82	81	84	0	0	0	0	0	1210-2525
27	84	81	83	86	84	0	0	0	0	0	1205-2530
28	88	83	78	78	81	0	0	0	0	0	1205-2530
29	89	82	81	89	85	0	0	0	(0)	(0)	1205-2530
30	81	77	74	71	75	0	0	0	0	0	1205-2530

SOLAR RADIO WAVES (BOULDER) -- 167 MC

OUTSTANDING EVENTS

MARCH 1957

Mar 1957	Type	Start UT	Duration Hrs:Mins	Maximum Time UT	Maximum Inst. Flux	Maximum Smd. Flux	Remarks
1	1	1540	04:20	1959	110	--	
2	1	1414	03:49	1414.7	640	--	
3	2	1718.3	00:07.0	1725	150	13	
4	1	1427	03:33	1428	110	--	
6	1	1423	03:28	1427.3	160	--	
6	3	2422.5	00:00.7	2422.8	~880	--	
7	1	1813	03:34	1828	110	--	
8	2	1852	00:05	1854.7	110	12	
9	1	2110	(03:30)	2118.7	430	--	
11	1	(1325)	(11:15)	2110	190	--	
12-13	6	(1320)	2 days	2324*	--	84	*March 12
15	1	2012	(04:33)	2140	120	--	
16-18	6	(1315)	3 days	1937*	480	12	*March 18
23-27	6	(2215)	~4 days	Note 2	--	59	
24	8	1411	00:14	1421.4	~1700	~150	
24	8	1844	00:08	1850.0	~1000	~320	
27	8	1517.7	00:01	1518.1	330	--	
27	3	2152.8	00:00.2	2152.9	800	--	
28-29	1	(1438)	2 days	2121.7*	770	--	*March 29
31	6	(1255)	(12:10)	~2200	--	17	
31	3	1742.8	00:00.7	1743.3	270	--	

Notes: 1. Interference may sometimes obscure or be mistaken for solar events.
2. Noise storm in progress on March 23 when receiver operation was resumed. Maximum may have been on March 24 or 25, but due to lack of calibrations on March 23 and 24, exact values of medians cannot be determined.

SOLAR RADIO WAVES (BOULDER) -- 167 MC

OUTSTANDING EVENTS

APRIL 1957

April 1957	Type	Start UT	Duration Hrs:Mins	Maximum Time UT	Maximum Inst. Flux	Maximum Smd. Flux	Remarks
1	6	(1250)	(12:10)	~1400	460	42	
4	6	(1910)	(04:32)	2115.6	150	2	
4	8	2354	00:14	2359.1	350	69	
5	2	1751	00:22	1751.1	280	--	
5	6	2044	(04:21)	2313	200	9	
6	1	(1937)	(05:28)	~2300	--	5	
6	8	2044.3	00:00.8	2044.4	2800	--	Note 2
6	8	2319.1	00:01.0	2319.5	3600	--	
6	8	2352.9	00:01.8	2353.3	>4800	360	
8	1	(1526)	(07:32)	1721	540	--	
8	6	2258	(02:02)	2422	580	51	
9	6	(1235)	(05:25)	1621	130	21	
9	1	1800	(07:10)	2055.8	1200	--	
10	1	(1235)	(12:40)	2258	290	--	
11	1	(1600)	(09:15)	2407.9	460	--	
11	8	1725.6	00:13	1733.5	270	16	
12	6	(1230)	(06:28)	~1600	--	15	
12	9	1858	00:15	1907.0	1600	280	
13	1	2002	(05:18)	2427	420	--	
14	3	1253.5	00:00.5	1253.9	140	--	
14	6	(1800)	(01:42)	1819	220	16	
15	8	1359	00:06	1402	Note 3		

Notes:

1. Interference may sometimes obscure or be mistaken for solar events. Radiometer inoperative after April 15, 1957, due to mechanical difficulties.
2. Other large bursts on April 6, 1957, at 2120.3 and 2228.2.
3. April 15, 1957, large type "8" event observed although antenna was off sun. Intensity >>1500.

SOLAR RADIO WAVES (BOULDER) -- 460 MC

OUTSTANDING EVENTS

MARCH 1957

March 1957	Type	Start UT	Duration Hrs:Mins	Maximum Time UT	Maximum Inst. Flux	Maximum Smd. Flux	Remarks
2	3	1812.0	00:00.9	1812.0	1200	--	
24	8	1846.8	00:06	See Note 2	>1000	400	Off Scale
27	3	1559.1	00:00.7	1559.2	290	--	
31	3	1742	00:03	1743.1	390	120	
31	3	1834.0	00:01	1834.7	260	80	

Notes: 1. Frequent interference may have obscured some small solar events.

2. March 24, off scale intermittently between 1847 and 1851.

SOLAR RADIO WAVES (BOULDER) -- 460 MC

OUTSTANDING EVENTS

APRIL 1957

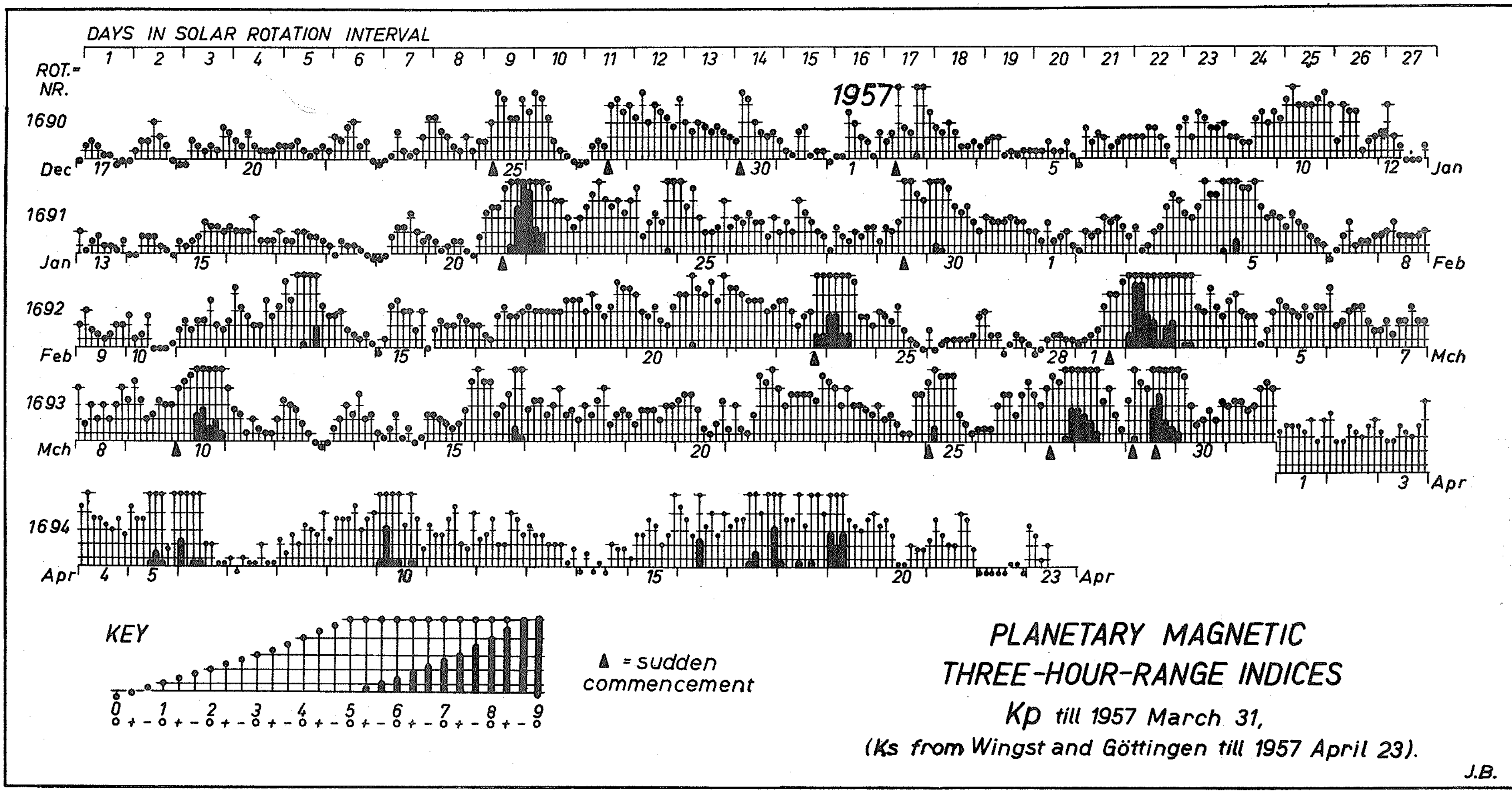
April 1957	Type	Start UT	Duration Hrs:Mins	Maximum Time UT	Maximum Inst. Flux	Maximum Smd. Flux	Remarks
7	3	2343.4	00:00.1	2343.4	230	--	
8	6	(1235)	(12:35)	~2300	--	24	
9	6	(1235)	(07:05)	~1600	--	20	
11	2	1717.1	00:11	1727.8	150	9	
12	0	1858	00:25	1900	160	40	
15	4	2310	01:57	2451.9	190	18	
17	3	1846.9	00:00.9	1847.4	260	--	
17	9	2014	00:42	2041	600	280	
18	3	1805.3	00:04	1805.6	850	--	
20	8	1844.4	00:01.6	1845.0	630	130	
20	1	1933	02:10	2141.6	420	--	
22	2	1422	00:06	1424	370	69	
22	3	2202.6	00:00.2	2202.7	200	--	
24	6	(1210)	(13:15)	1805	230	12	
25	6	(1437)	(10:48)	~1600	--	11	
26	6	(1210)	(13:15)	~1500	--	19	
26	3	1729.5	00:00.1	1729.6	220	--	
27	6	(1205)	(13:25)	~2300	--	17	
28	6	(1205)	(05:55)	~1400	--	19	
29	6	(1205)	(13:25)	~2400	--	20	

Note: 1. Frequent interference may have obscured some small solar events.

GEOMAGNETIC ACTIVITY INDICES

MARCH 1957

Mar. 1957	C	Kp 1	Kp 2	Kp 3	Kp 4	Kp 5	Kp 6	Kp 7	Kp 8	Sum	Ap	Final Selected Days
		Values Kp — Three hour Gr. interval										
1	1.0	1-	1o	1+	2-	3+	4o	4o	5-	21-	16	Five Quiet: 7, 11, 12, 13, 14
2	2.0	6o	8+	8+	7o	7-	5+	6+	7-	55-	132	
3	1.2	5o	5+	5+	3+	3o	4+	3+	3-	32+	32	
4	0.7	4-	4o	3o	3-	3-	1-	2-	3o	21+	14	
5	0.8	4-	3+	3o	3-	3+	3-	3+	3+	25+	17	
6	0.9	4+	2o	2+	3o	3+	3+	2+	2-	22+	14	
7	0.6	2-	2+	1+	2+	2+	3+	2+	2+	18o	9	
8	0.8	4o	2-	3o	2o	3o	2o	3o	4o	23-	15	
9	0.9	3+	4+	3+	2o	2+	3+	3o	3o	25-	16	
10	1.9	4o	4+	5-	7-	7o	6o	6+	6-	45-	73	
11	0.4	4o	3-	2+	1o	2o	1+	1o	1o	15+	9	Five Disturbed: 2, 10, 27, 28, 29
12	0.3	2o	3+	3o	3-	2-	1o	0+	0o	14o	8	
13	0.6	0+	1+	2o	3o	2+	4-	2o	2+	17o	10	
14	0.0	1o	1-	1+	2+	1-	1+	0+	1-	8+	4	
15	0.7	2+	2+	2o	2-	1+	2-	3-	4+	18+	11	
16	1.4	5o	4+	4+	2+	3o	4-	6o	5+	34o	37	
17	0.8	3-	3+	3+	2+	3o	4o	2+	3-	24-	15	
18	0.7	2o	3o	2+	3+	4o	2-	2+	3-	21+	13	
19	0.7	2+	2-	3-	3-	3-	2o	3o	3o	20o	11	
20	0.7	3+	4-	4-	3-	1+	1o	2-	3+	21-	13	
21	1.0	1+	3o	1+	1o	2+	5-	4+	5o	23o	20	Ten Quiet: 7, 11, 12, 13, 14, 15, 19, 20, 24, 26
22	1.2	4o	3o	4-	4-	4-	4-	3+	5-	30-	23	
23	0.9	4+	4o	3o	4o	3o	3o	3-	2+	26+	19	
24	0.6	3o	2o	2+	2-	1o	1o	4-	4-	18+	11	
25	1.2	4+	6o	5-	5-	5-	2+	2-	1o	29+	31	
26	0.8	1+	1+	1+	3o	4-	4-	2+	4-	20+	13	
27	1.5	4+	4-	3o	4o	5-	4+	5+	7o	36+	44	
28	1.6	7o	7-	6+	6-	3+	4o	2+	1+	37-	58	
29	1.8	3+	5+	4+	4o	7o	8-	6+	6o	44o	77	
30	1.0	6-	5-	3o	2-	2o	3-	2o	3+	25o	21	
31	1.0	3o	3+	3+	3-	3o	4o	4+	4o	28-	20	
Mean:	0.96									Mean:	26	


DAYS IN SOLAR ROTATION INTERVAL
ROT.-NR.
1957
1690
Dec
Jan
1691
Feb
1692
Mch
1693
Apr
1694
KEY
▲ = sudden commencement
PLANETARY MAGNETIC
THREE-HOUR-RANGE INDICES
Kp till 1957 March 31,
(Ks from Wingst and Göttingen till 1957 April 23).
J.B.

CRPL RADIO PROPAGATION QUALITY FIGURES AND FORECASTS

NORTH ATLANTIC

MARCH 1957

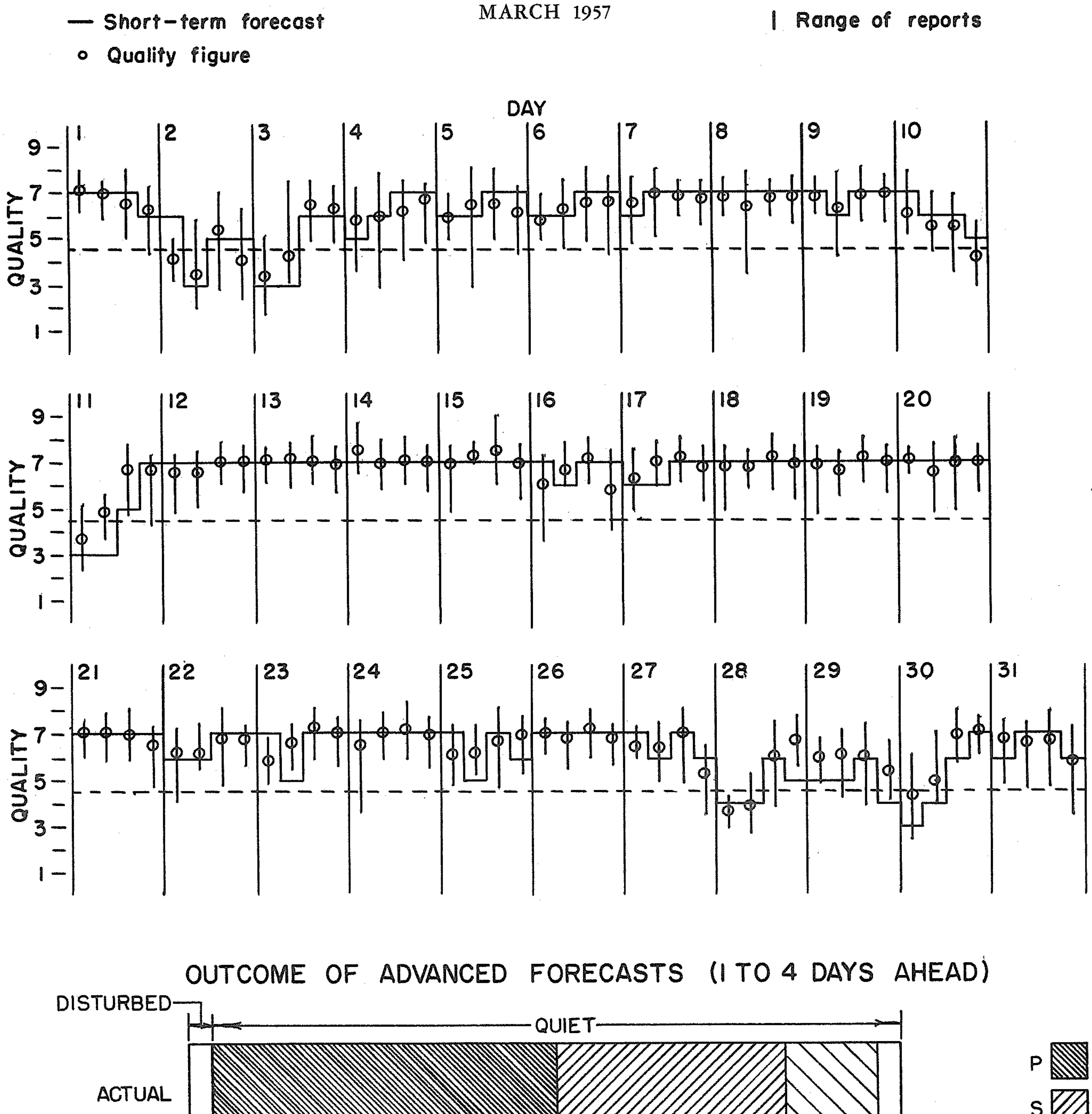
Mar. 1957	North Atlantic 6-hourly quality figures				Short-term forecasts issued about one hour in advance of:				Whole day index	Advance forecasts (J-reports) for whole day; issued in advance by:			Geomagnetic K_{Fr}	
	00 to 06	06 to 12	12 to 18	18 to 24	00	06	12	18		1-4 days	4-7 days	8-25 days	Half Day (1)	(2)
1	7+	7o	7-	6+	7	7	7	6	7-	6	7		1	(4)
2	4+	3+	5+	4+	6	3	5	5	(4+)	6	7		(7)	(5)
3	3+	4+	7-	6+	3	3	6	6	5-	6	7		(5)	3
4	6o	6o	6+	7-	5	6	7	7	6+	4	7		3	2
5	6o	7-	7-	6+	6	6	7	7	6+	6	4		3	3
6	6-	6+	7-	7-	6	6	7	7	6+	7	6		3	3
7	7-	7o	7-	7-	6	7	7	7	7-	7	6		2	2
8	7-	6+	7-	7o	7	7	7	7	7-	7	7		2	3
9	7-	6+	7-	7o	7	6	7	7	7-	7	7		3	2
10	6o	6-	6-	4+	7	6	6	5	5o	7	7		(5)	(5)
11	4-	5o	7-	7-	3	3	5	7	5o	7	7		2	1
12	7-	7-	7o	7o	7	7	7	7	7-	6	7		3	2
13	7o	7o	7o	7-	7	7	7	7	7o	7	7		2	2
14	7+	7o	7o	7o	7	7	7	7	7o	7	7		1	1
15	7o	7+	7+	7o	7	7	7	7	7o	7	7		2	3
16	6o	7-	7+	6o	7	6	7	7	6+	7	7		(4)	(4)
17	6+	7o	7+	7-	6	6	7	7	7-	5	7		3	3
18	7-	7-	7+	7o	7	7	7	7	7o	5	7		3	3
19	7-	7-	7+	7o	7	7	7	7	7o	7	7		2	2
20	7o	7-	7o	7o	7	7	7	7	7o	7	7		3	2
21	7o	7o	7-	7-	7	7	7	7	7-	7	7		2	3
22	6+	6+	7-	7-	6	6	7	7	7-	7	7		3	3
23	6o	7-	7+	7o	7	5	7	7	7-	7	7		(4)	2
24	7-	7o	7+	7o	7	7	7	7	7o	7	7		2	2
25	6o	6+	7-	7o	7	5	7	6	6+	7	7		(4)	2
26	7o	7-	7o	7-	7	7	7	7	7o	6	7		1	3
27	7-	6+	7o	5+	7	6	7	6	6+	5	7		(4)	(4)
28	4-	4-	6o	7-	4	4	6	5	5-	4	7		(6)	3
29	6o	6o	6o	5+	5	5	6	4	6o	5	4		(4)	(6)
30	4+	5o	7o	7o	3	4	6	7	6-	6	7		3	3
31	7-	7-	7-	6o	6	7	7	6	7-	7	7		3	(4)

Score:		00	06	12	18	1-4 days	4-7 days
Quiet Periods	P	18	19	27	23	15	18
	S	8	7	3	5	10	6
	U	0	2	1	1	4	4
	F	0	0	0	0	1	2
Disturbed Periods	P	2	2	0	0	0	0
	S	2	1	0	2	0	0
	U	0	0	0	0	0	0
	F	1	0	0	0	1	1

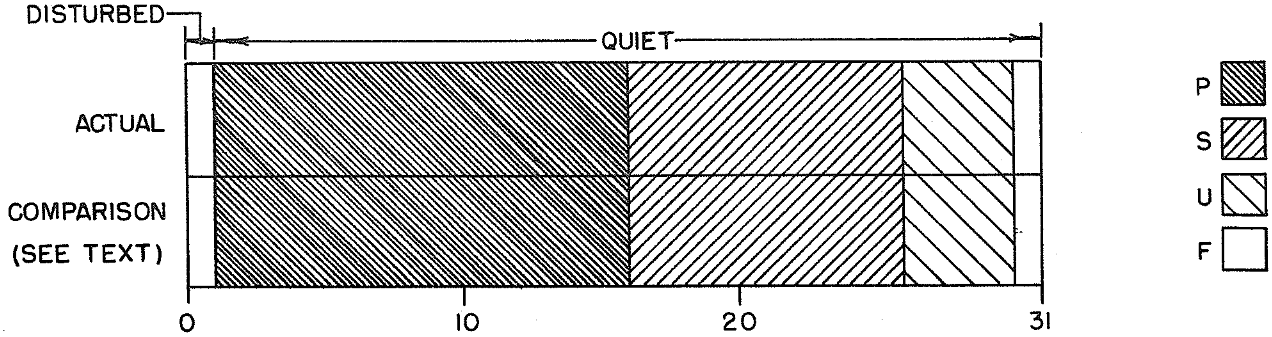
( ) represent disturbed values.

CRPL RADIO PROPAGATION QUALITY FIGURES AND FORECASTS
NORTH ATLANTIC

MARCH 1957

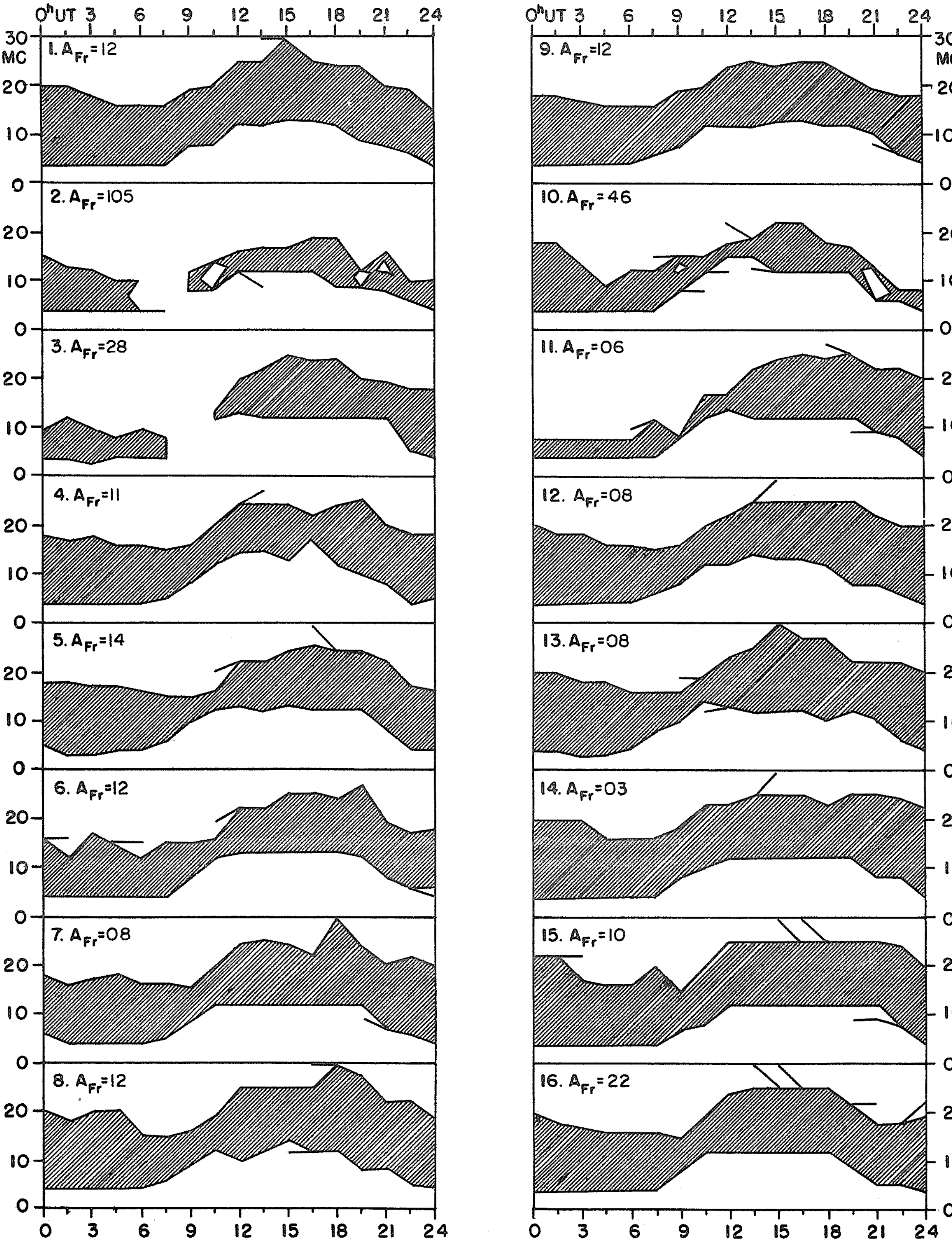


OUTCOME OF ADVANCED FORECASTS (1 TO 4 DAYS AHEAD)

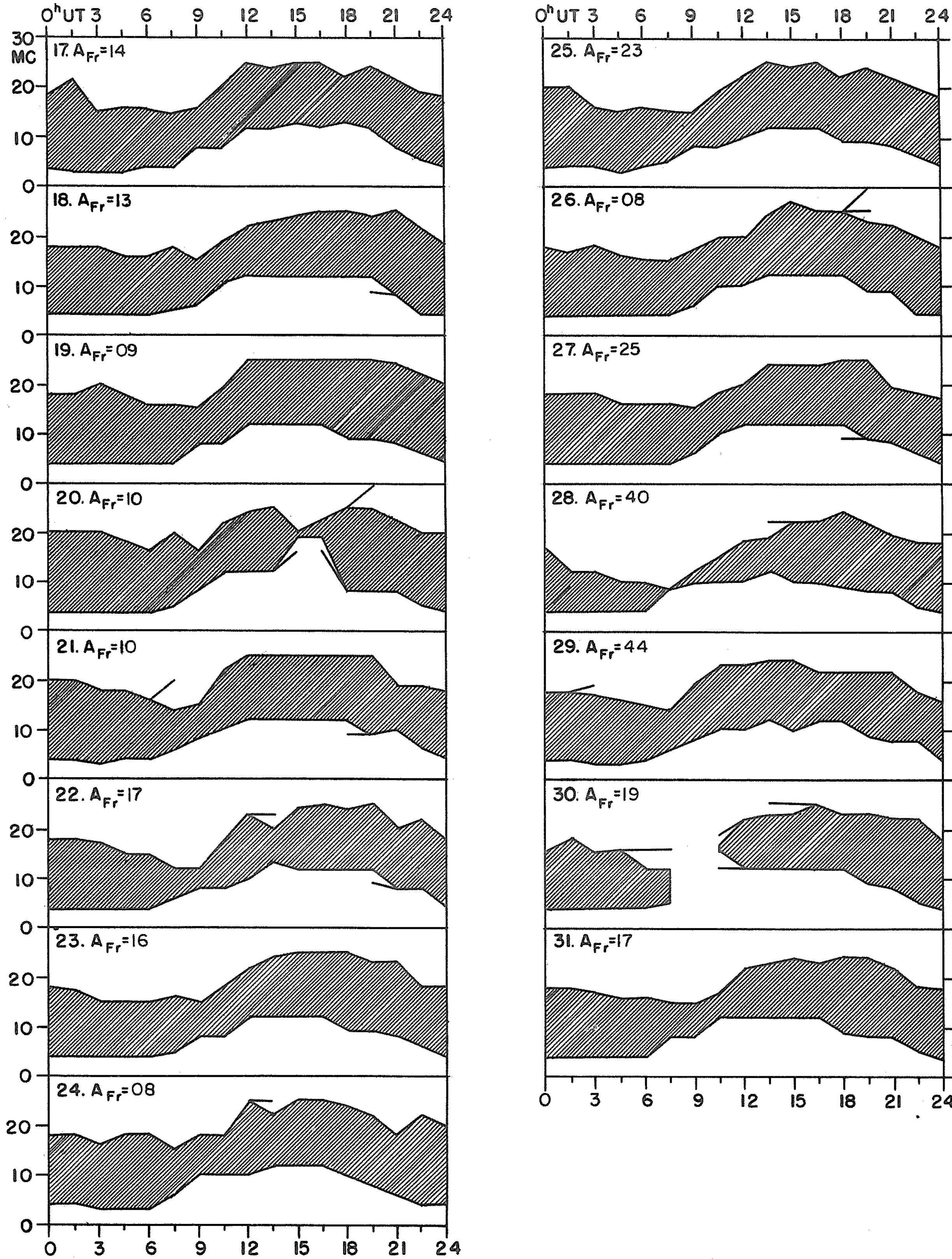


USEFUL FREQUENCY RANGES -- NORTH ATLANTIC PATH

MARCH 1957



MARCH 1957



Adapted from Observations by Deutsches Bundespost

CRPL RADIO PROPAGATION QUALITY FIGURES AND FORECASTS

NORTH PACIFIC

MARCH 1957

Mar. 1957	North Pacific 8-hourly quality figures			Short-term forecasts issued at			Whole day index	Advance forecasts (Jp reports) for whole day; issued in advance by:			Geomagnetic K_{Si}	
	03 to 11	11 to 19	19 to 03	02	10	18		1-4 days	4-7 days	8-25 days	Half day (1)	Half day (2)
1	6	6	7	6	5	6	7	6	6		1	(4)
2	4	2	4	5	3	3	(3)	5	7		(7)	(7)
3	3	3	6	3	4	5	(3)	5	7		(5)	3
4	6	6	6	5	6	6	6	5	7		3	2
5	5	6	4	6	5	6	5	6	7		3	3
6	4	5	5	5	5	5	5	6	6		3	3
7	6	5	4	6	6	6	5	6	6		2	2
8	5	6	5	6	5	7	6	6	6		2	3
9	5	5	5	6	6	6	5	6	6		2	2
10	5	2	3	6	5	3	(3)	7	6		(6)	(6)
11	4	5	6	4	5	7	5	7	6		2	1
12	6	6	6	7	7	7	6	7	6		2	1
13	6	6	5	6	6	6	6	5	7		2	2
14	6	7	6	6	6	7	6	5	7		1	1
15	6	6	6	7	6	6	6	6	7		0	2
16	6	6	6	6	7	6	6	5	6		3	(4)
17	5	5	7	5	5	5	6	5	7		2	3
18	7	7	5	6	7	7	7	6	7		3	2
19	6	6	6	7	6	6	6	6	7		3	2
20	6	7	7	6	6	7	7	7	6		3	2
21	7	6	5	7	7	5	7	7	6		1	(4)
22	5	5	6	6	5	6	6	7	6		(4)	(4)
23	6	7	8	5	6	6	7	5	7		(4)	3
24	6	7	6	6	7	7	7	5	6		2	1
25	6	4	7	6	3	6	6	6	6		(6)	(4)
26	7	6	5	6	6	6	6	6	6		1	3
27	6	6	4	5	5	6	5	3	4		(4)	(6)
28	2	3	6	3	2	4	(3)	4	4		(7)	2
29	6	3	4	6	5	3	(4)	5	5		3	(7)
30	4	6	6	3	5	6	5	3	6		3	2
31	7	7	5	6	6	6	7	5	6		2	3

Score		02	10	18	1-4 days	4-7 days
Quiet Periods	P	11	11	9	7	8
	S	14	14	11	13	17
	U	0	0	4	6	1
	F	0	0	1	0	0
Disturbed Periods	P	2	0	1	0	0
	S	4	4	2	2	2
	U	0	0	0	2	0
	F	0	2	3	1	3

( ) represent disturbed values.

CRPL RADIO PROPAGATION QUALITY FIGURES AND FORECASTS

NORTH PACIFIC

MARCH 1957