PART B

SOLAR - GEOPHYSICAL DATA

ISSUED
MARCH 1957

U. S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS
CENTRAL RADIO PROPAGATION LABORATORY
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PART B

NATIONAL BUREAU OF STANDARDS
CENTRAL RADIO PROPAGATION LABORATORY
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SOLAR - GEOPHYSICAL DATA

INTRODUCTION

This monthly report series is intended to keep research workers abreast of the major particulars of solar activity and the associated ionospheric, radio propagation and other geophysical effects. It is made possible through the cooperation of many observatories, laboratories and agencies as recorded in the detailed description of the tables and graphs which follows. The 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, $\bar{R}$, 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; 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 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 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.

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 - <u>Single</u> -- 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 - <u>Single-simple</u> -- A single burst with only one maximum.

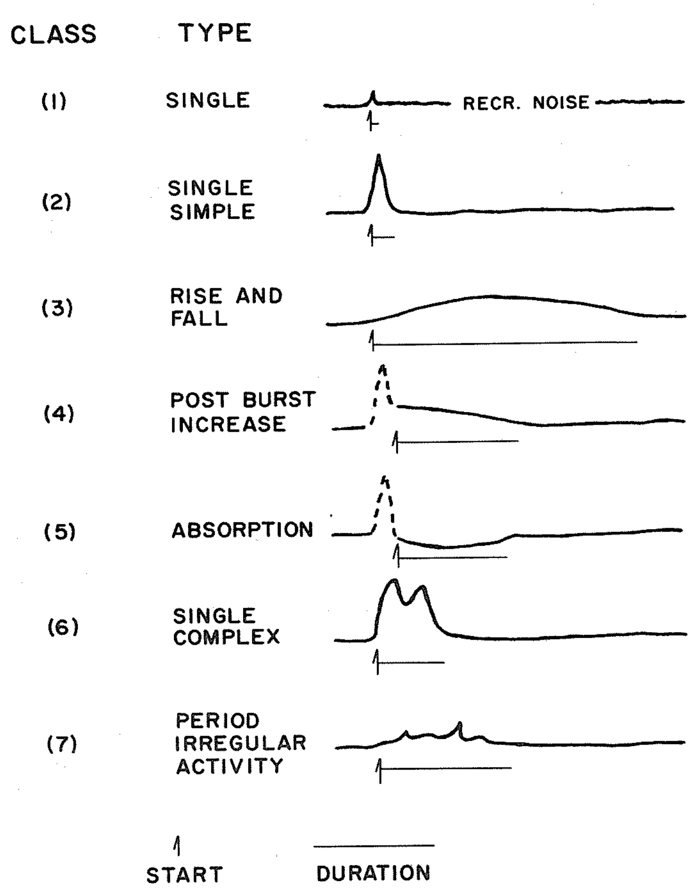
3 - <u>Rise and fall</u> -- A distinct, but less sudden, increase in flux than the usual burst. It may last from tens of minutes to several hours. These events range from large distinct features on the records to tiny bursts, only a few times receiver noise.

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

5 - <u>Absorption following burst (negative post)</u>.

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

7 - <u>Period of irregular activity</u>.



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).

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.

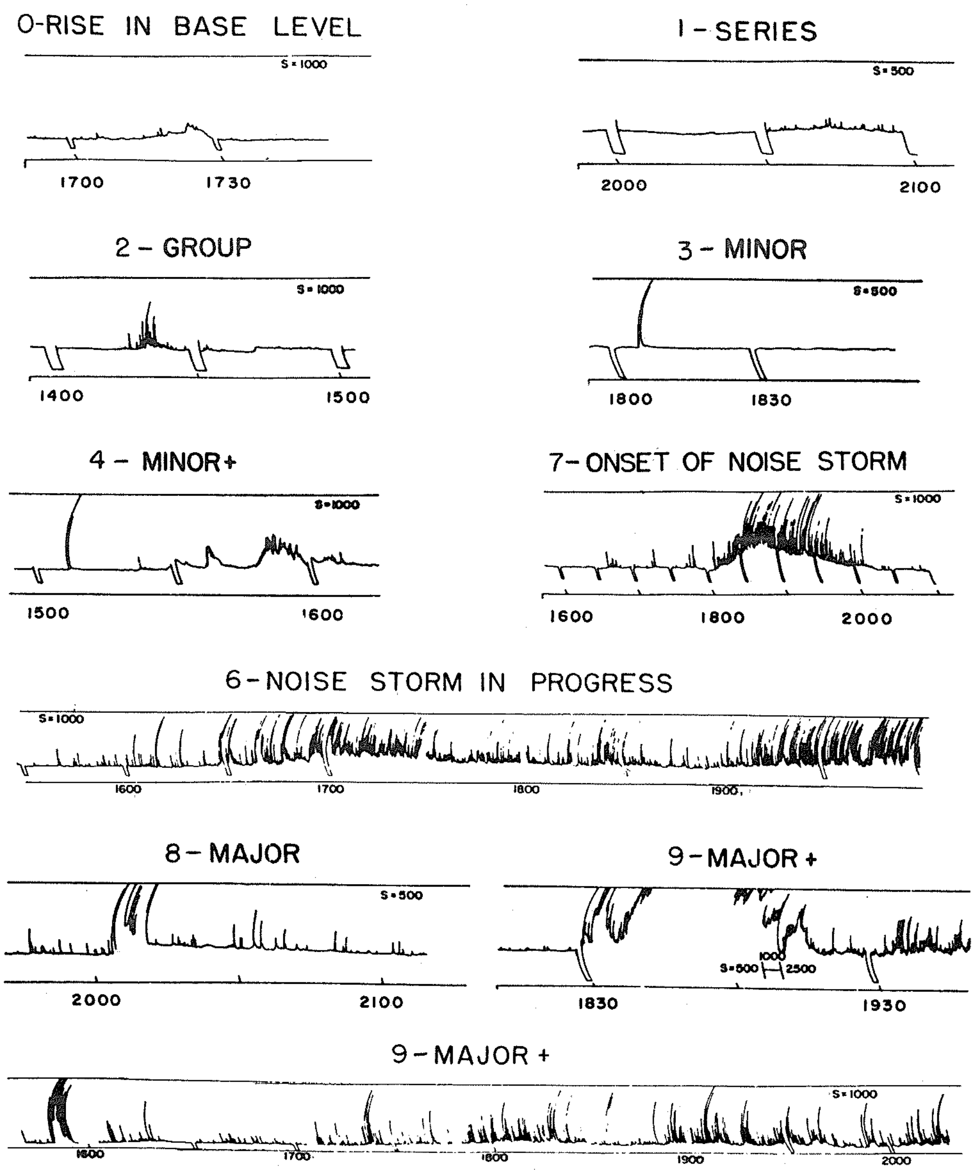
4 - Minor burst and second part -- A double rise in flux in which the early rise is a minor burst.

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 - <u>Major burst and second part</u> -- 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	U - forecast quality two or more grades different from observed when both forecast and observed were >5, or both <5
S - forecast quality one grade different from observed	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 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.

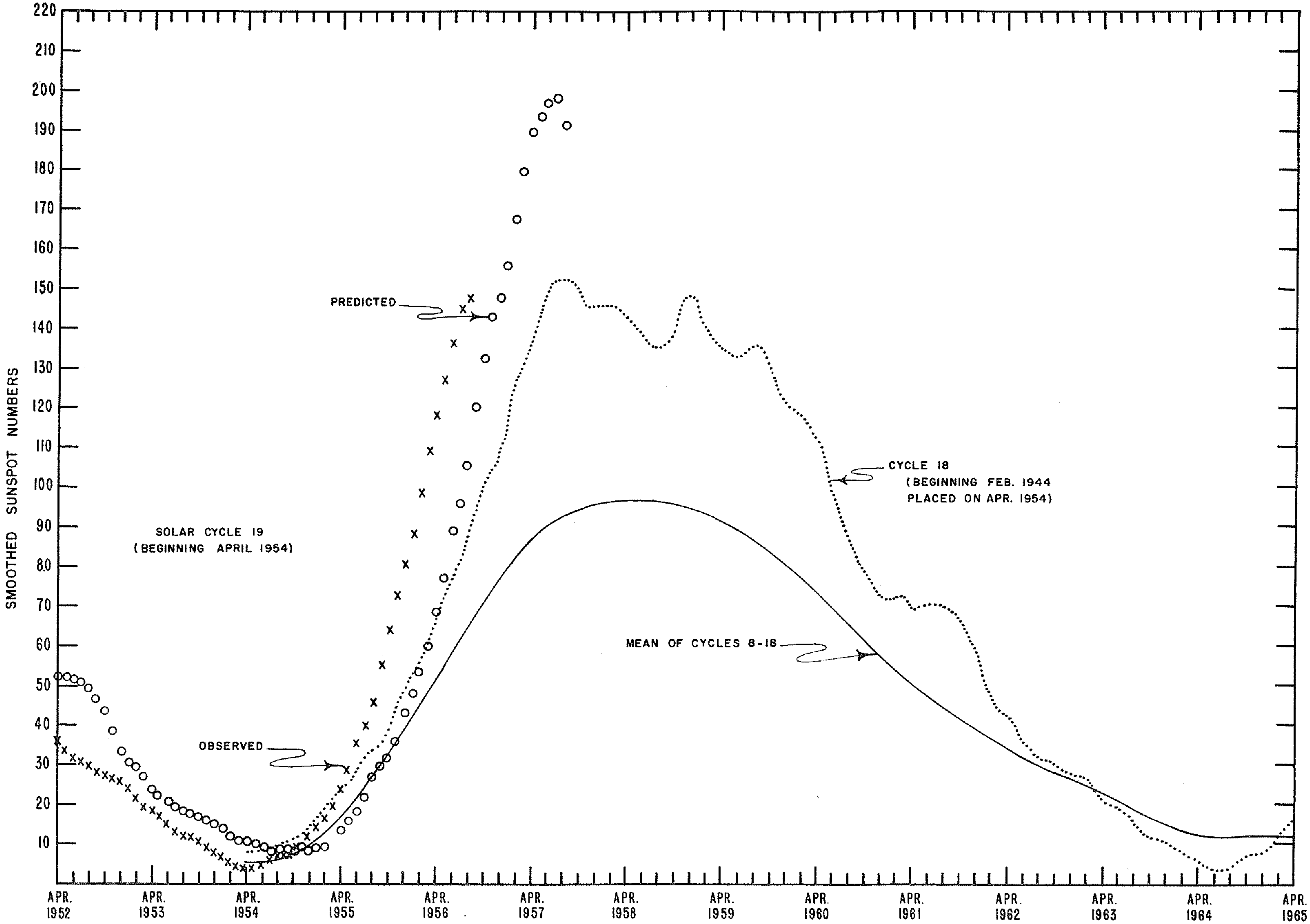
The chart compares the outcome of advance forecasts, on the same basis as the similar chart for the North Atlantic Radio Path.

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

Jan. 1957 Date	American Relative Sunspot Numbers R_A'
1	157
2	137
3	169
4	198
5	194
6	209
7	153
8	145
9	124
10	99
11	102
12	118
13	110
14	85
15	66
16	54
17	81
18	138
19	151
20	142
21	138
22	144
23	123
24	138
25	155
26	151
27	125
28	115
29	96
30	88
31	98
Mean:	129.1

Feb. 1957 Date	Zürich Provisional Relative Sunspot Numbers R_Z	Daily Values Solar Flux at 2800 MC, Ottawa, Canada Flux
1	105	197
2	114	182
3	73	185
4	103	181
5	94	183
6	110	193
7	123	186
8	136	200
9	144	190
10	126	184
11	113	190
12	116	193
13	100	175
14	115	180
15	120	188
16	139	176
17	127	181
18	120	188
19	109	173
20	90	172
21	111	184
22	115	186
23	126	204
24	126	185
25	127	184
26	128	180
27	133	183
28	126	180
Mean:	116.8	185.1



PREDICTED AND OBSERVED SUNSPOT NUMBERS

CALCIUM PLAGE AND SUNSPOT REGIONS

FEBRUARY 1957

CMP Feb. 1957	Lat.	McMath Plage Number	Return of Region	Calcium Plage Data: CMP Area	Calcium Plage Data: Values Int.	Calcium Plage Data: History	Calcium Plage Data: Age	Sunspot Data: CMP Area	Sunspot Data: Values Count	Sunspot Data: History
01.6	S21	3833	3811	2,100	1.5	ℓ∧d	4			
02.7	N23	3836	New	400	2	ℓ\d	1			
03.2	N14	3837	3816	600	2	ℓ—ℓ	2	(50a)	(1)	b\d
04.8	S20	3838	3813	11,000	3.5	ℓ—ℓ	4	440	2	ℓ—ℓ
05.4	N18	3839	New	1,300	3.5	ℓ—ℓ	1	200a	5	b∧d
06.9	S12	3842	New	(600)	(2)	ℓ\d	1			
07.8	S18	3843	New	4,300	3	ℓ—ℓ	1	250		ℓ—ℓ
07.8	N28	3845	New	700	3	b⌐ℓ	1	50a	9	b—ℓ
08.3	S28	3841	New	(600)	(2)	ℓ\d	1			
10.7	S25	3844	New	5,700	2	ℓ—ℓ	1	1030	14	ℓ∧ℓ
11.4	N18	3850	New	600	2.5	b—d	1	20	1	b—d
12.6	S23	3847	New	1,200	2.5	ℓ—ℓ	1	120	4	ℓ∧d
13.2	S09	3860	New	(400)	(2)	b/ℓ	1	(30)	(1)	b/ℓ
13.6	N16	3848	3818	2,800	3	ℓ—ℓ	3	(100)	(1)	ℓ\d
14.8	S23	3849	3820	4,000	2.5	ℓ—ℓ	4	170	5	b—d
15.5	N15	3857	New	400	2.5	b—ℓ	1	60	3	b—d
16.0	S18	3852	New	600	2	ℓ\d	1	(20)	(1)	b—d
16.5	S32	3851	3820	1,600	2	ℓ—d	4			
17.4	S19	3853	3822	1,800	2.5	ℓ—ℓ	5	(20)	(1)	b—d
18.0	N15	3854	3823	3,000	2	ℓ—ℓ	4	150	2	ℓ\d
19.1	N14	3856	3823	1,300	2	ℓ∨ℓ	4	130	5	b/ℓ
19.2	S21	3855	New	2,200	3.5	ℓ—ℓ	1	930	30	ℓ∧ℓ
20.2	N23	3858	3823	2,000	2	ℓ—ℓ	4			
21.0	S22	3859	3824	3,500	2.5	ℓ—ℓ	2	240	3	ℓ—ℓ
22.5	N17	3864	New	400	2	b⌐ℓ	1	20	(2)	b—d
24.1	S13	3861	New	(1,600)	(2.5)	ℓ—d	1	(40)	(1)	ℓ\d
25.1	N18	3863	New	(3,200)	(2.5)	ℓ—ℓ	1	500	(8)	ℓ/ℓ
27.2	N20	3865	New	2,000	2.5	ℓ—ℓ	1	70	1	ℓ\d
28.1	N32	3866	New	2,800	3.5	b/ℓ	1	950	19	b/ℓ

( ) values extrapolated several days to CMP.

CORONAL LINE EMISSION INDICES

FEBRUARY 1957

CMP Feb. 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	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
2	X	X	X	X	X	X	X	X	109	144	34	48	114	135	21	30
3	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
4	X	X	X	X	X	X	X	X	94	137	38	74	62	94	29	58
5	X	X	X	X	X	X	X	X	143	182	33	42	62	114	29	54
6	X	X	X	X	X	X	X	X	118	150	X	X	33	48	X	X
7	X	X	X	X	X	X	X	X	154	192	40	78	38	52	14	24
8	39	52	20	28	128	196	32	48	X	X	40	48	X	X	X	X
9	38[a]	60[a]	0[a]	0[a]	142[a]	220[a]	35[a]	55[a]	X	X	X	X	X	X	X	X
10	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
11	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
12	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
13	X	X	X	X	X	X	X	X	108	124	53	92	101	136	16	27
14	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
15	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
16	131	170	29	42	168*	226	46	64	X	X	X	X	X	X	X	X
17	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
18	X	X	X	X	X	X	X	X	120	186	31	68	96	112	17	36
19	104*	122	20	26	90	128	27	50	97	152	36	56	67	103	10	34
20	90	127	17	21	96	124	X	X	170	260	58	82	127	160	35	70
21	111	138	14	16	110*	122	24	43	90	128	31	60	74	108	26	68
22	X	X	X	X	X	X	X	X	94	116	31	44	80	100	29	60
23	X	X	X	X	X	X	X	X	81	101	22	32	77	132	25	34
24	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
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	X	X	X	X	X	X	X	X
27	67	72	21	40	53	60	17	28	X	X	X	X	X	X	X	X
28	X	X	X	X	X	X	X	X	84	145	33	84	120	193	19	36

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

SOLAR FLARES

FEBRUARY 1957

Observatory	Date Feb. 1957	Time Observed Start UT	End UT	Duration Min.	Total Area Mill.	McMath Plage Region Number	Approx. Position Lat.	Mer. Dist.	Time Max. Phase UT	Max. Int. Arb.	Rel. Area of Max. Tenths	Importance	Provis. Ionospheric Effect
Mitaka	01	0111	0126	15	89	830	N23	W19				1	
Capri-S	01	0955	1053	58	215		S04	E60				1+	
Capri-S	01	1412	1437	25	105	836	N28	E17				1	
S.Peak	01	1525	1740	135	480	830	N21	W34	1600	20	3	2	
Capri-S	01	1532	1555	23	380	830	N20	W32				2+	
Capri-S	03	1533	1602	29	105	838	S19	E18				1	
Wendel.	04	1332	1341	09		843	S18	E44				1+	
Schaus.	04	b1335		>09		843	S16	E45				1	
Capri-S	06	1152	1220	28	105	838	S18	W14				1	
Capri-S	06	1232	1330	58	135	843	S18	E15				1	
S.Peak	06	1600	1830	150	192	843	S20	E16	1742	25	3	2-	Slow S-SWF
McMath	06	1755	1813	18		843	S20	E15				2	
Capri-S	07	1146	1216	30	105	844	S24	E52				1	S-SWF
Schaus.	07	1146		20		844	S28	E52				1+	
Capri-S	07	1515	1534	19	125	838	S20	W36				1	
S.Peak	07	1515	a1530	>15	125	838	S20	W38				1	
Mitaka	08	0640	0652	12	367	847	S27	E44	0646			1+	
Capri-S	08	0844	0931	47	300	848	N14	E73				1	
Capri-S	08	1051	1115	24	100	844	S26	E39				1	
S.Peak	08	1550	1610	20	285	844	S29	E38	1555	25	8	2	S-SWF
McMath	08	1555	1615	20		844	S28	E37				1+	
Kanzel	10	b0819		>10		838	S25	W65				2	S-SWF
Mitaka	12	0324	0342	18	135	843	S14	W59	0326			1	
Mitaka	12	0408	0428	20	135	843	S14	W59	0412			1	
Mitaka	13	0044	0110	26		849	S24	E26	0046			2	G-SWF
Mitaka	13	0228	0237	09		849	S24	E26				1	
Mitaka	14	0422	0435	13	123	848	N13	E01	0428			1	
Capri-S	17	1000	1434	274	165	860	S11	W53				1+	
Capri-S	17	1014	1210	116	105	855	S23	E28				1	
Mitaka	20	0306	0311	5		855	S19	W04				1	
S.Peak	21	1605	a2205	>360	1840	856	N20	W33	1930	18	1	*	
S.Peak	23	1512	a1530	>18	120	854	N12	W70	1520	15	3	1	
Capri-S	25	1327	1331	4	245	859	S23	W79				1+	
Capri-S	25	1412	1452	40	100	863	N19	E06				1	
Mitaka	26	0117	a0150	>33	649	866	N36	E27	0120			2	
Capri-S	26	0921	0934	13	100	859	S34	W67				1	
Capri-S	26	1355	1420	25	205	859	S35	W71				1+	S-SWF
Mitaka	28	0005	0057	52	1020	863	N18	W35	0014			3	Slow S-SWF
Capri-S	28	1137	1148	71	135	873	S10	E66				1	
Schaus.	28	b1141				873	S10	E70				1	
Capri-S	28	1339	1351	12	85	876	S20	E90				1	
Neder.	28	1345		10		876	S22	E85				1	

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

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

February 01, 0021 (N15,W14)*
1945 (N20,W88)
2215 (N19,W88)
02, 0440 (N13,W25)*
0520 (S18,E41)*
1006 (S16,W19)+
1240 (N15,W90)+
1900 (S20,E34)
2150 (S13,E68)
03, 1530 (N08,W21)
b1833 (N13,W53)
05, 0740 (S21,W06)+++
1029 (S19,E29)+
1052 (S20,W03)+
1059 (S25,W03)**

February 05, 1219 (S20,W05)+
1655 (S22,W10)
1725 (S25,E75)
1920 (N17,W05)
06, 1417 (S25,E50)+
b1437 (N16,W16)
1510 (S21,E16)
1850 (S28,E47)
2155 (S29,E46)
07, 0932 (S23,E54)+
1005 (S24,E53)+
1500 (N14,E90)
1500 (S22,E04)
1920 (S22,W40)
2200 (S14,E09)

February 08, 0837 (S11,E06)+
1202 (S22,W41)+
1500 (S27,E25)
1555 (S12,E01)
1730 (S16,W14)
09, 1710 (N15,W11)
1830 (N17,W12)
10, b1607 (N12,E38)
1640 (S28,E13)
11, 0955 (S24,W18)+
0957 (S16,W47)+
1242 (N15,E22)+
1550 (S14,W53)
1735 (S14,W54)
1905 (N18,E90)

*Area and brightness suggest importance 3+, but slow rise and low integrated brightness makes flare identification uncertain.

SOLAR FLARES

FEBRUARY 1957

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

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

February 11, 1920 (S25,E12)
2005 (S15,W54)
12, 0119 (S26,W07)*
0421 (S28,W05)*
1205 (S14,W61)+
1345 (S23,W63)+
b1530 (S14,W66)
b1542 (N19,E80)
1745 (S22,E01)
1830 (N18,E68)
2015 (S14,W69)
2130 (S15,W72)
13, 0426 (S28,W17)*
1136 (S13,W71)*
b1537 (N19,E63)
b1537 (S13,W80)
1540 (N17,E57)+
1700 (S12,W80)
1955 (S30,W30)
14, 1445 (S21,W26)
1515 (S13,W90)
1523 (S22,W27)
1525 (N14,E13)
1600 (S14,W90)
1640 (S14,W90)
1655 (S21,W27)

February 14, 1715 (N14,E60)
1850 (S22,E64)
15, 0002 (S27,W42)*
17, 1109 (N20,E14)+
19, 1353 (S23,E01)+
b1650 (S10,W90)
20, b1535 (S21,W16)
b1815 (S22,W14)
21, 1455 (N15,W29)
1520 (S22,W31)
b1540 (S22,W31)
1800 (S23,W27)
22, 1220 (N18,E61)+
23, 0343 (N14,E30)*
1511 (N15,E25)
b1615 (N14,W72)
1625 (N18,E48)
24, 1600 (N31,E46)
1720 (N31,E47)
1745 (N17,E25)
2005 (N31,E42)
2205 (S36,W50)
25, 1500 (S23,W85)
1525 (N31,E35)
1620 (S23,W85)
1735 (S23,W85)

February 25, 1825 (S23,W85)
1940 (S23,W85)
2110 (N33,E32)
26, 0108 (N30,E29)*
1033 (N32,E25)+
b1439 (N13,W75)
1500 (S08,E90)
1530 (S16,E67)
1625 (S23,W90)
1920 (S35,W74)
1935 (S08,E90)
2015 (S36,W76)
2025 (S18,E64)
27, 1700 (N16,W32)
28, 0811 (N17,W88)+
0918 (S10,E69)+
1215 (N32,E01)+
b1429 (N22,E27)
1500 (N32,E70)
1510 (S22,E90)
1515 (N19,W90)
1540 (N22,E24)
1600 (N22,E24)
1720 (N23,E26)
1815 (S21,E90)
2300 (S18,E31)*

SOLAR FLARES

JANUARY 1957

Observatory	Date Jan. 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	03	0150	0200	10		3813	S21	E81				1	Slow S-SWF
Mitaka	03	0230	0255	25		3808	N18	E03				1	
Mitaka	05	0116	0200	44	592	3808	N17	W31	0116			2	Slow S-SWF
Mitaka	05	0157	0240	43	820	3813	S24	E61	0157			2+	S-SWF
Mitaka	08	0120	0151	31	367	3808	N15	W69				1	
Mitaka	08	0317	0341	24	184	3808	N17	W69	0329			1+	
Mitaka	19	0226	0239	13	132	3820	S28	W04				1	
Mitaka	21	0012	0023	11	135	3824	S13	E44				1	
Mitaka	22	0247	0302	15	178	3820	S23	W42	0247			1	
Mitaka	22	0315	0332	17	221	3822	S11	W09	0320			1	
Mitaka	22	0412	0440	28	543	3828	N22	E62				1	G-SWF
Mitaka	22	0454	0619	85	552	3823	N15	E05	0459			2	
Mitaka	23	0001	0020	19	420	3823	N16	W09				1	
Mitaka	23	0148	0157	9	184	3823	N18	W16				1+	
Mitaka	23	0156	0219	23	135	3820	S23	W53				1	
Mitaka	23	0156	0219	23	135	3820	S24	W47				1	
Mitaka	23	0207	0219	12	135	3820	S28	W45				1	
Mitaka	23.	0235	0252	17	184	3820	S33	W45				1	
Mitaka	24	0156	0228	32	90	3820	S20	W75	(0217)			1	
Mitaka	24	0248	0342	54	920	3823	N14	W25	0250			2+	S-SWF
Mitaka	24	0559	0606	7	275	3823	N20	W27				1	S-SWF
Mitaka	26	0436	0510	34	367	3823	N13	W53				1	G-SWF
Mitaka	26	0537	0552	15	135	3823	N16	W49				1	
Mitaka	26	0537	0557	20	184	3823	N16	W53				1	
Mitaka	27	0446	0502	16	135	3832	N25	E10				1	
Mitaka	27	0530	0542	12	89	3823	N18	W61				1	
Mitaka	28	0010	0025	15	89	3835	N17	E48				1	
Mitaka	28	0411	0432	21		3826	S22	W37	0414			1+	S-SWF

IONOSPHERIC EFFECTS OF SOLAR FLARES

(SHORT-WAVE RADIO FADEOUTS)

JANUARY 1957

Jan. 1957	Start UT	End UT	Type	Wide-spread Index	Impor-tance	Observation stations	Known Flare, UT CRPL-F 149B
1	1337	1407	S-SWF	3	1+	HU, PR	
	1516	1535	Slow S-SWF	5	2+	BE, HU, MC, PR, NE*	
	1530	1625	Slow S-SWF	4	1	BE, HU, MC, PR	
	1757	1900	G-SWF	4	1	BE, HU, MC, PR	
	2020	2038	S-SWF	5	1	AN, HU, PR, WS	
2	0140	0216	S-SWF	5	2+	OK, TO+, CW+	
	1213	1242	S-SWF	5	1+ 02E	HU, PR, NE*	1208
	1639	1656	Slow S-SWF	5	1+	BE, HU, MC, PR, WS	
3	0135	0340	Slow S-SWF	5	3- 81E	OK, TO+, CW++	
	1242	1257	Slow S-SWF	4	1-	HU, MC, PR	
	1443	1506	Slow S-SWF	3	1+	HU, PR	
	1610	1640	G-SWF	5	2-	BE, HU, MC, PR, WS	
4	0119	0150	G-SWF	5	1	AN, OK, TO+	
	1516	1647	Slow S-SWF	5	3-	BE,HU,MC,PR,WS,RCA*	
5	0050	(0153)	Slow S-SWF	5	2+ 31W	OK, TO+	0116
	0153	0300	S-SWF	5	2+ 61E	OK, TO+, CW++	0157
	1730	1810	Slow S-SWF	5	2+ 50E	AN,BE,HU,MC,PR,WS,NE*	b1730
	2020	2040	Slow S-SWF	5	3-	AN,BE,HU,MC,PR,WS	
6	0213	0257	Slow S-SWF	1	2 47W	OK	
	1330	1400	S-SWF	5	2+ 48W	HU, MC, PR, NE*	1329
	1702	1755	S-SWF	5	2+	AN,BE,HU,MC,PR,WS,NE*,RCA***,CW*	
	1932	1955	Slow S-SWF	4	1	HU, MC, PR	
7	0410	0457	S-SWF	1	2 90W	OK	
	1342	1435	Slow S-SWF	5	2 63W	BE, HU, MC, PR, SW*	b1344
	1510	1555	G-SWF	5	2-	BE, HU, MC, PR	
	1612	1650	S-SWF	5	2-	AN, BE, HU, MC, PR, WS	
	1700	(1725)	G-SWF	5	1	BE, HU, MC, PR, WS	
	1725	1925	S-SWF	5	3	BE,HU,MC,PR,WS,SW*,RCA***,CW*	1830
	2010	2033	G-SWF	4	1+	HU, MC, PR, WS	
8	1330	1440	Slow S-SWF	5	2 76W	BE,HU,MC,PR,NE*,RCA***,CW*	1324
	1658	1720	Slow S-SWF	5	1	BE, HU, MC, PR, WS	
	1820	1843	S-SWF	5	1	BE, HU, MC, PR, WS	
	2021	2045	Slow S-SWF	3	1	HU, PR, WS	
9	0430	0449	S-SWF	1	2-	OK	
10	0102	0240	Slow S-SWF	5	3	OK, TO+	
	0525	0551	G-SWF	4	1-	AN, OK	
	1042	1100	S-SWF	4	2- 90W	PR, NE*	
	1120	1140	Slow S-SWF	3	1- 16W	PR, NE*	1105
10	1548	1613	Slow S-SWF	4	1 18W	AN, HU, MC, PR	1557
11	1426	1450	Slow S-SWF	3	1- 30W	HU, PR	1425

IONOSPHERIC EFFECTS OF SOLAR FLARES

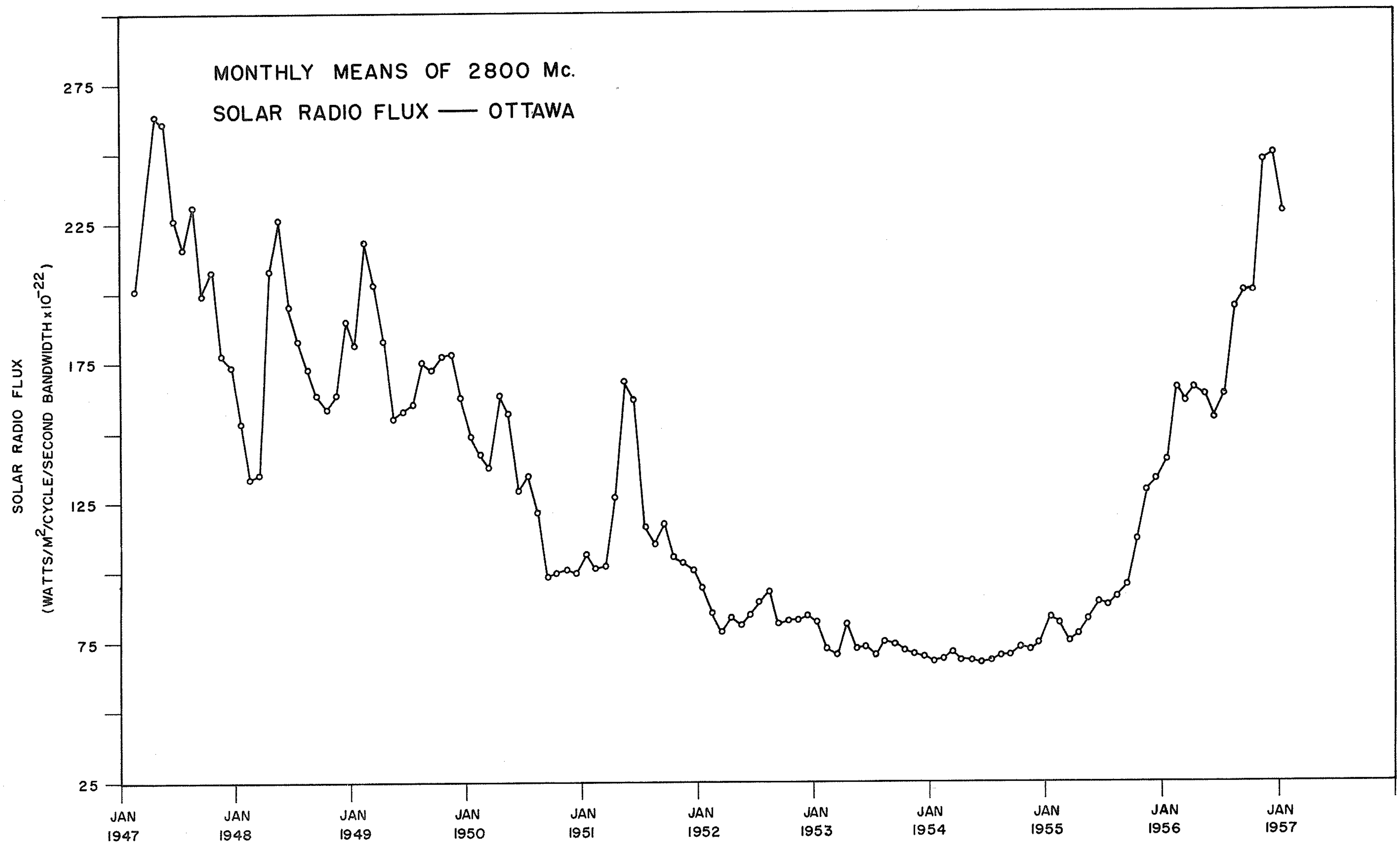
(SHORT-WAVE RADIO FADEOUTS)

JANUARY 1957

Jan. 1957	Start UT	End UT	Type	Wide-spread Index	Impor-tance	Observation stations	Known Flare, UT CRPL-F 149B
11	1656	1712	Slow S-SWF	4	1- 32W	AN, PR, WS	b1705
12	1658	1710	S-SWF	4	1+ 45W	HU, MC, PR, WS	1645
18	1217	1245	Slow S-SWF	3	1- 02E	PR, NE*	b1218
	1418	1428	Slow S-SWF	3	1- 04E	PR, NE*	1420
19	1037	1130	Slow S-SWF	5	2 38E	MC, PR, NE*	1058
	1131	1150	G-SWF	3	1 38E	HU, MC	1140
21	1238	1257	Slow S-SWF	3	1- 36W	AN, MC, PR	1242
	1515	1545	Slow S-SWF	5	2+	AN,BE, HU,MC,PR,WS,NE*,CW*	b1513
22	0400	0432	S-SWF	1	1 62E	OK	b1412
	0435	0528	G-SWF	1	1 05E	OK	0454
23	1057	1110	S-SWF	4	1+ 16W	PR, NE*	b1055
	1745	1815	Slow S-SWF	5	2	BE, HU, MC, PR, WS	
	1835	1845	S-SWF	5	1+ 25W	AN, BE, HU, MC, PR, WS	1835
	1930	2000	Slow S-SWF	3	2-	BE, HU	
	2255	2350	Slow S-SWF	5	2 17W	AN, OK	
24	0240	(0300)	S-SWF	5	2 26W	OK, TO†,CW‡	0248
	0300	0350	Slow S-SWF	1	2	OK	
	1235	1310	Slow S-SWF	5	2 31W	BE, HU, PR, SW*, NE*,RCA***	
	1527	1542	Slow S-SWF	5	1+ 35W	AN, HU, MC, PR	(b1535)
	1638	1705	S-SWF	5	2+ 80W	BE, HU, MC, PR	1638
	2121	2153	S-SWF	5	2 40W	AN, BE, HU, MC, PR, WS,CW*	2115
25	0210	0235	Slow S-SWF	1	1+	OK	
	0235	0320	Slow S-SWF	1	2-	OK	
	0320	0420	S-SWF	4	3-	OK,CW†	
	0528	0548	S-SWF	1	1 89W	TO†	
	1325	1400	S-SWF	5	2	HU, PR, NE*, SW*,RCA***	
	1910	1935	S-SWF	5	1+	AN, BE, HU, MC, PR, WS	
26	0420	0520	Slow S-SWF	1	2 53W	OK	b0436
	0520	0600	G-SWF	1	1 51W	OK	0537
	1412	1427	S-SWF	5	1+ 21W	BE, HU, MC, PR, NE*	
27	0742	0826	S-SWF	5	2+	OK, NE*,RCA***,CW†	
28	0413	0423	S-SWF	1	1- 37W	OK	0411
31	0356	0520	G-SWF	1	1 05E	OK	

NE* Nederhorst den Berg, Netherlands.
RCA* RCA Communications Inc. Riverhead, N.Y.
RCA** RCA Communications Inc. Somerton, England.
RCA*** RCA " Communications Inc. Brentwood, N.J.
SW* Enköping, Sweden.

CW* Cable and Wireless, Barbadoes.
CW† Cable and Wireless, Hong Kong.
CW‡ Cable and Wireless, Singapore.
TO† Hiraiso Radio Wave Observatory, Japan.


MONTHLY MEANS OF 2800 Mc.
SOLAR RADIO FLUX —— OTTAWA
SOLAR RADIO FLUX
(WATTS/M²/CYCLE/SECOND BANDWIDTH x 10⁻²²)
275
225
175
125
75
25
JAN 1947
JAN 1948
JAN 1949
JAN 1950
JAN 1951
JAN 1952
JAN 1953
JAN 1954
JAN 1955
JAN 1956
JAN 1957

SOLAR RADIO WAVES (OTTAWA)--2800 MC

OUTSTANDING EVENTS

FEBRUARY 1957

Feb. 1957	Type*	Start UT Hrs:Mins	Duration Hrs:Mins	Maximum Time UT Hrs:Mins	Maximum Peak Flux	Remarks
1	3	15 34	2 25	16 25	17	
1	2	15 34.5	2	15 35.5	46	
3	1	15 32	1.5	15 32.5	3	
3	1	15 52.5	2	15 53.5	3	
3	2	16 56.5	4	16 59	50	
	4		15		7	
4	1	13 30	1.5	13 31	13	
4	1	18 21	2.5	18 22	5	
4	1	21 12	4	21 13.5	7	
6	1	19 31	1	19 31.5	9	
7	1	15 14.5	3	15 15.5	12	
7	1	19 22	1.5	19 22.5	4	
8	2	15 50	6	15 51	865	
	4		5		7	
8	2	20 40.5	1	20 40.8	19	
9	2	13 29.5	3	13 30	16	
12	1	15 40	2	15 40.5	6	
13	Group (2)	15 36	6.5			
	1	15 36	1.5	15 36.8	6	
	1	15 39.5	3	15 40.3	7	
13	1	19 57.3	2	19 58.4	14	
14	1	19 47.5	1	19 48	4	Doubtful
14	1	20 05.5	2	20 06.5	12	Doubtful
17	1	19 52	6	19 54	3	
17	3	21 35	> 50	21 42	10	
18	1	14 01	1	14 01.5	3	
19	1	13 53.5	1.5	13 53.8	3	
19	1	20 29.5	1	20 30	18	
21	3	17 50	4	19 15	19	
24	1	13 10	2	13 11	10	
25	Records Incomplete	b11 47	> 13	indet.	> 35	Doubtful (in sunrise oscillation)
26	2	19 22	3	19 22.5	33	
	4		20		7	
26	6	20 58	7	21 01	18	

* See page 6.

SOLAR RADIO WAVES (CORNELL)--200 MC

3-HOURLY AND DAILY FLUX

FEBRUARY 1957

Feb. 1957	Flux Hours UT 12	15	18	Variability Hours UT 12	15	18
1	[[1.40	1.50	1.40	[[0	0	0
2	[[1.40	1.40	1.40	[[0	0	0
3	[[1.40	1.40	1.40	[[1	0	0
4	[[1.40	1.40	1.40]	[[0	1	1]
5	[[1.40	1.40	1.40]	[[0	1	1]
6		1.40	1.45		0	1
7	[[1.40	1.45	2.15	[[1	1	1
8	[[1.75	2.35	1.80	[[1	2	1
9	[[1.85	1.85	1.85	[[2	1	1
10	[[2.20	2.15	2.05	[[1	1	1
11	[[1.30	1.35	1.35	[[0	0	0
12	[[1.40	1.45	1.45	[[0	0	0
13	[[1.75	1.70	1.75	[[1	1	1
14	[[1.40	1.45	1.45]	[[1	1	1]
15	[[1.40	1.40	1.40	[[0	0	0
16	[[1.40	1.50	1.40	[[1	1	0
17	[[1.40	1.40	1.60	[[0	0	1
18	[[2.15	2.05	2.15	[[2	2	1
19	[[1.70	1.50	1.45	[[1	0	0
20	[[1.95	1.90	2.05	[[1	1	1
21	[[1.60	1.60	2.75	[[1	1	2
22	[[1.40	1.50	1.55	[[0	0	0
23	[[1.40	1.45	1.35	[[0	0	0
24	[[2.15	1.90	1.70	[[1	1	1
25						
26	[[7.25	10.4	6.75	[[3	3	2
27	[[1.70	1.75	1.55	[[1	1	1
28	[[1.60	1.50	1.55	[[1	1	1

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

Flux in terms of KTB.
Quiet sun = 1.40 KTB.

SOLAR RADIO WAVES (CORNELL)--200 MC

OUTSTANDING EVENTS

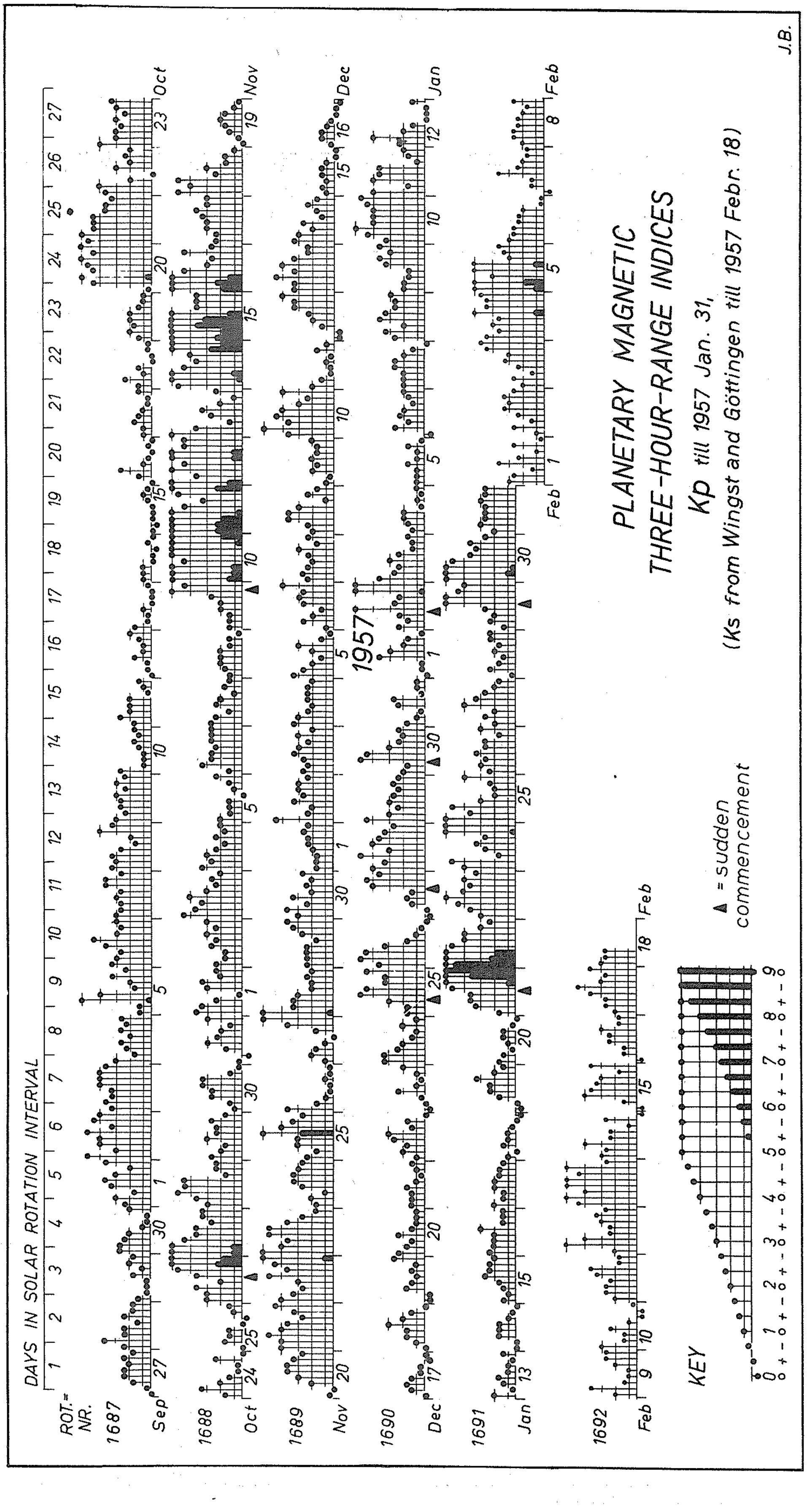
FEBRUARY 1957

Feb. 1957	Type	Start UT	Duration Minutes	Maximum Inst. Flux	Maximum Smd. Flux	Remarks
7	3	1514 1/2	3 1/2	>10.4	>10.4	off-scale 1515-15 1/2 UT
7	3	1921 1/2	1 1/2	>10.4	>10.4	off-scale
7	3	2012	1	>10.4	>10.4	off-scale
8	9	1551 1/2	5	>10.4	>10.4	off-scale 1552-55 UT
8	9	1603 1/2	108			
13	3	1957 1/2	1 1/2	>10.4	>10.4	off-scale 1958-58 1/2 UT
14	3	1709 1/2	5	>10.4	>10.4	
14	3	1954 1/2	3	>10.4	>10.4	off-scale 1956-56 1/2 UT
16	3	1428	1 1/2	>10.4	7.5	
16	3	1615 1/2	4	>10.4	>10.4	
19	3	2038	1 1/2	>10.4	8.3	

GEOMAGNETIC ACTIVITY INDICES

JANUARY 1957

Jan. 1957	C	Values Kp Three hour Gr. interval								Sum	Ap	Final Selected Days
		1	2	3	4	5	6	7	8			
1	0.3	0+	1-	1-	4-	3o	2o	2-	1-	13-	8	Five
2	1.3	2+	2-	2+	5o	3-	2+	5+	5o	27-	25	Quiet
3	0.6	4-	3-	2+	3o	2+	1+	1+	2-	18+	10	
4	0.1	1+	2-	2o	2o	1-	1o	1-	1o	10+	5	5
5	0.1	1o	1o	1o	2-	1o	1o	2-	1-	9o	4	13
												14
6	0.3	0o	3-	2-	2+	2o	1+	2-	2o	14-	6	18
7	0.3	2o	2o	2o	3-	3-	2o	1+	0+	15o	7	20
8	0.9	3-	3+	2o	4-	3+	3-	3-	3o	23+	14	
9	1.0	2o	2o	2-	2-	3+	4-	3o	4-	21o	13	
10	1.4	3+	4+	5o	4o	4o	4o	4+	5-	34-	31	
11	0.6	4o	2-	4o	4-	4-	1o	2-	2o	22-	15	Five
12	0.3	2+	4o	2o	1+	0+	0+	0+	1+	12o	7	Disturbed
13	0.1	2o	1-	1+	2-	1o	1o	1-	1+	10-	5	
14	0.1	0+	0+	2-	2-	2-	1o	1-	0+	8-	4	10
15	0.4	1+	1o	1+	2-	3-	2+	2+	2o	15-	7	21
												22
16	0.3	2+	2o	2o	2o	3o	1+	1+	1+	15+	8	23
17	0.1	2o	1+	1+	2o	2o	2-	2-	1+	13+	6	30
18	0.0	1o	0+	1+	1o	1o	1-	0+	0o	6-	3	
19	0.4	0o	0+	2-	2+	2+	3+	2o	1+	13+	7	
20	0.1	2-	1+	1-	1o	1+	1+	1-	0+	8+	4	
21	1.9	2-	3+	4-	4-	5-	6-	8-	9-	39o	82	Ten
22	1.8	8+	7-	6+	5-	4o	4o	3o	2+	39+	70	Quiet
23	1.3	3o	4-	4+	5o	4o	4-	4o	3+	31o	26	
24	1.2	4o	5-	2-	3-	3+	3-	5+	5o	29+	27	4
25	1.1	5o	4-	5-	3o	2o	2o	2+	4o	27-	22	5
												6
26	0.6	2+	3o	3-	3+	3-	3-	2-	3o	21+	12	12
27	0.6	2o	3-	2o	4o	3+	3-	2o	2-	20+	12	13
28	0.2	1-	2+	2-	1+	2o	2-	2+	2+	14+	7	14
29	1.4	1+	2+	2o	3-	5o	5o	4+	4o	27-	24	17
30	1.3	5o	6-	5+	5-	4-	3+	4-	3-	34o	36	18
31	0.6	2o	3o	3-	3-	3-	3o	3-	3-	21+	12	20
Mean:	0.67									Mean:	17	28


PLANETARY MAGNETIC
THREE-HOUR-RANGE INDICES
Kp till 1957 Jan. 31,
(Ks from Wingst and Göttingen till 1957 Febr. 18)
DAYS IN SOLAR ROTATION INTERVAL
ROT.= NR.
1687
1688
1689
1690
1691
1692
1957
▲ = sudden commencement
KEY
J.B.

CRPL RADIO PROPAGATION QUALITY FIGURES AND FORECASTS

NORTH ATLANTIC

JANUARY 1957

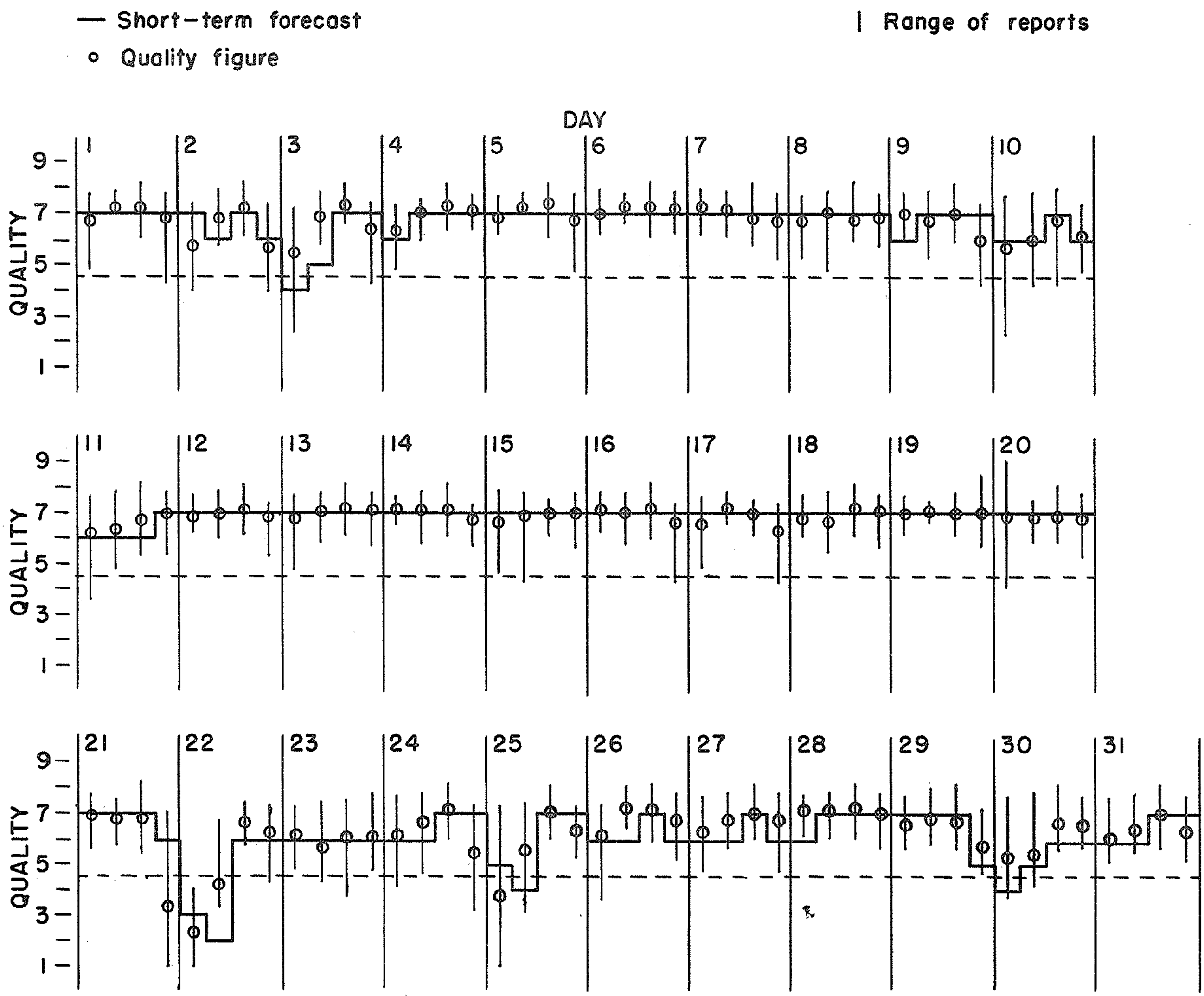
Jan. 1957	North Atlantic 6-hourly quality figures				Short-term forecasts issued about one hour in advance of:				Whole day index	Advance forecasts (J-reports) for whole day; issued in advance by:			Geomagnetic K_{Fr}	
	00 to 06	06 to 12	12 to 18	18 to 24	00	06	12	18		1-4 days	4-7 days	8-25 days	Half (1)	Day (2)
1	7-	7+	7+	7-	7	7	7	7	7o	7	7		1	2
2	6-	7-	7o	6-	7	6	7	6	7-	7	7		2	3
3	6-	7o	7+	6+	4	5	7	7	7-	7	7		3	1
4	6+	7o	7+	7+	6	7	7	7	7o	6	7		2	1
5	7o	7+	7+	7-	7	7	7	7	7o	6	7		1	1
6	7o	7+	7+	7o	7	7	7	7	7o	7	7		1	2
7	7+	7o	7-	7-	7	7	7	7	7o	7	7		2	2
8	7-	7o	7-	7o	7	7	7	7	7-	5	7		2	2
9	7o	7-	7o	6o	6	7	7	7	7-	4	7		2	3
10	6-	6o	7-	6o	6	6	7	6	6+	4	7		3	3
11	6+	6+	7-	7o	6	6	6	7	7-	6	6		3	2
12	7o	7o	7o	7-	7	7	7	7	7o	6	6		3	0
13	7o	7o	7+	7o	7	7	7	7	7o	7	7		1	1
14	7o	7o	7o	7-	7	7	7	7	7o	7	7		1	1
15	7-	7o	7o	7o	7	7	7	7	7o	7	7		2	3
16	7o	7o	7+	7-	7	7	7	7	7o	7	7		2	2
17	7-	7+	7o	6+	7	7	7	7	7-	7	7		1	2
18	7-	7-	7+	7o	7	7	7	7	7o	7	7		1	1
19	7o	7o	7o	7o	7	7	7	7	7o	7	7		1	2
20	7o	7o	7o	7o	7	7	7	7	7o	7	7		1	1
21	7o	7-	7-	3+	7	7	7	6	6o	7	7		3	(6)
22	2+	4+	7-	6+	3	2	6	6	(4+)	4	7		(5)	3
23	6+	6-	6o	6o	6	6	6	6	6o	4	7		(4)	3
24	6+	7-	7+	6-	6	6	7	7	6+	6	7		2	(4)
25	4-	6-	7o	6+	5	4	7	7	5+	7	7		3	2
26	6o	7o	7o	7-	6	6	7	6	7-	7	7		3	2
27	6+	7-	7o	7-	6	6	7	6	7-	7	7		2	2
28	7o	7o	7+	7o	6	7	7	7	7o	7	7		1	2
29	7-	7o	7-	6-	7	7	7	5	7-	7	7		2	(4)
30	5+	6-	7-	7-	4	5	6	6	6o	7	7		(5)	3
31	6+	7-	7o	6+	6	6	7	7	7-	7	7		2	3

Score:		00	06	12	18	1-4 days	4-7 days	8-25 days
Quiet Periods	P	24	22	28	20	19	22	
	S	4	6	3	10	6	7	
	U	0	1	0	0	2	1	
	F	1	1	0	0	3	0	
Disturbed Periods	P	0	1	0	0	1	0	
	S	2	0	0	0	0	0	
	U	0	0	0	0	0	0	
	F	0	0	0	1	0	1	

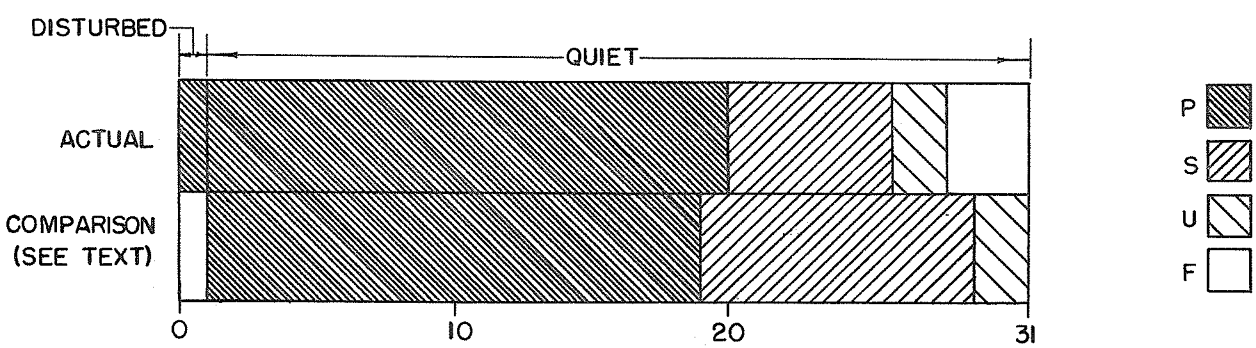
( ) represent disturbed values.

CRPL RADIO PROPAGATION QUALITY FIGURES AND FORECASTS
NORTH ATLANTIC

JANUARY 1957

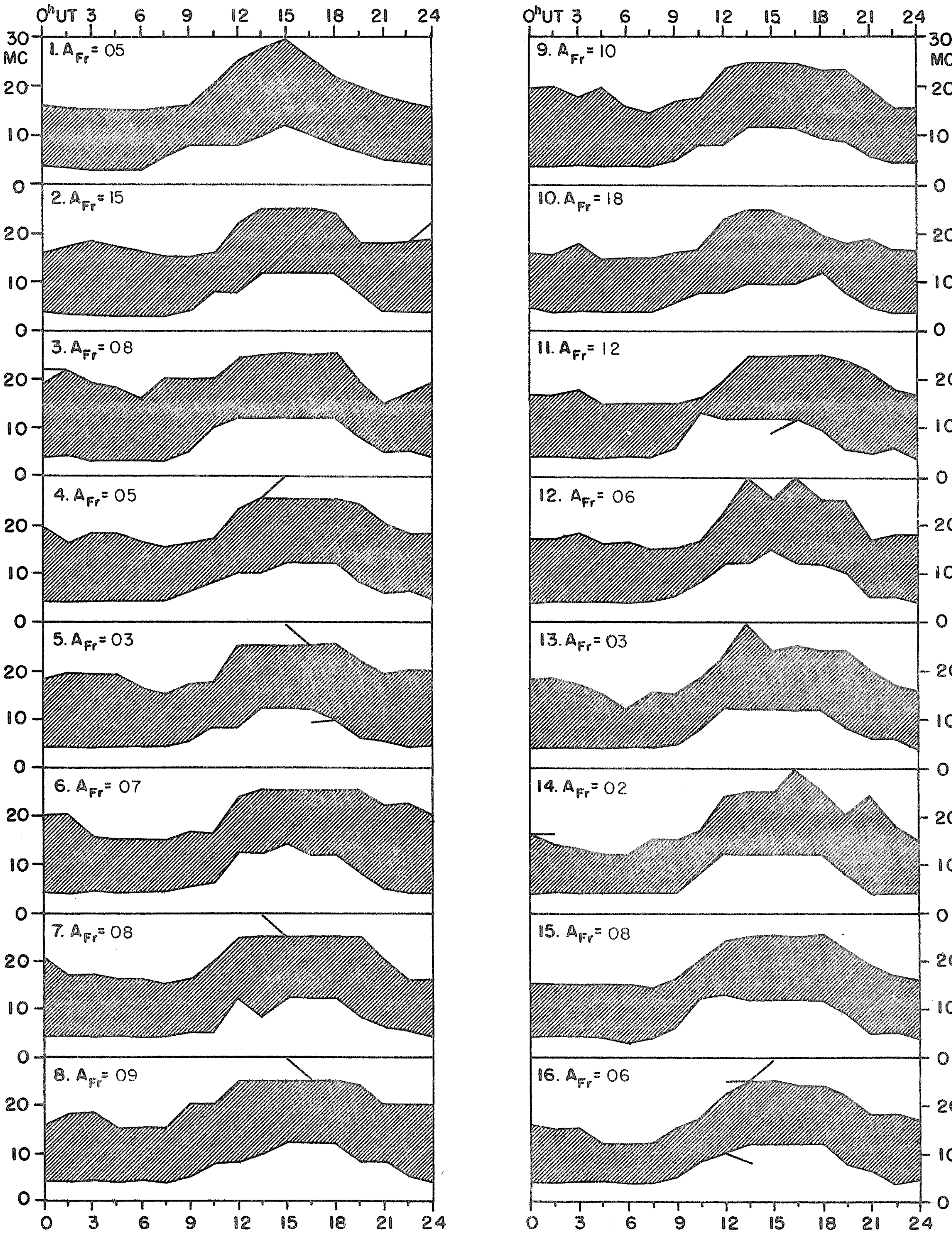


OUTCOME OF ADVANCED FORECASTS (1 TO 4 DAYS AHEAD)

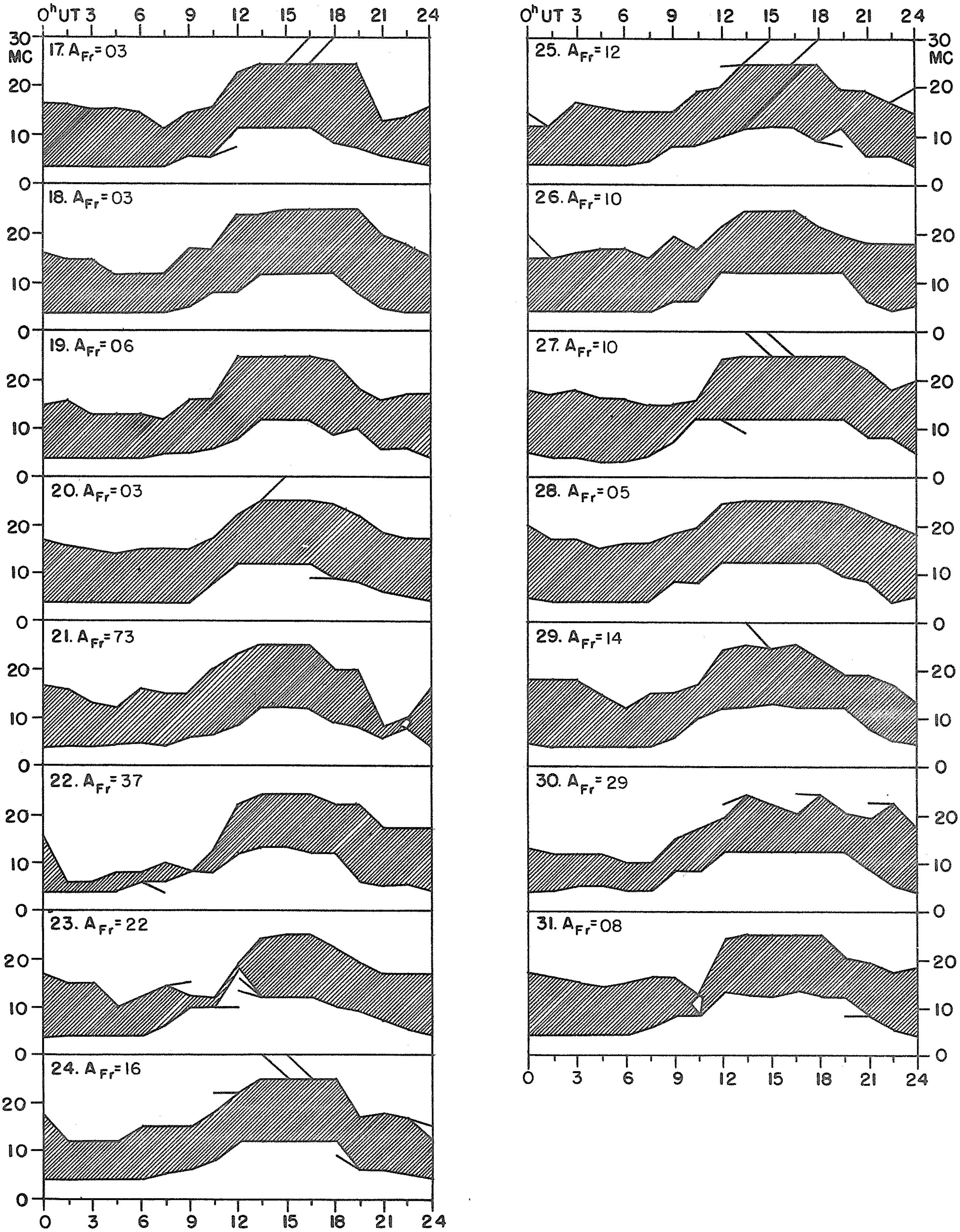


USEFUL FREQUENCY RANGES -- NORTH ATLANTIC PATH

JANUARY 1957



JANUARY 1957



Adapted from Observations by Deutsches Bundespost

CRPL RADIO PROPAGATION QUALITY FIGURES AND FORECASTS

NORTH PACIFIC

JANUARY 1957

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

( ) represent disturbed values.

CRPL RADIO PROPAGATION QUALITY FIGURES AND FORECASTS

NORTH PACIFIC

JANUARY 1957

OUTCOME OF ADVANCED FORECASTS (1 TO 4 DAYS AHEAD)