

CRPL-F 161

PART B

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PART B
SOLAR - GEOPHYSICAL DATA

ISSUED
JANUARY 1958

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

SOLAR - GEOPHYSICAL DATA

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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 $\text{watts/M}^2/\text{cycle/second bandwidth}$ ($\times 10^{-22}$) 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 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, \backslash = 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 $\lambda 5303$) and red (Fe X at $\lambda 6374$) coronal lines. The indices are based on measurements made at 5° intervals around the periphery of the solar disk by the High Altitude Observatory at Climax, Colorado, and by Harvard University observers at Sacramento Peak (The USAF Upper Air Research Observatory at Sunspot, New Mexico, under contract AF 19(604)-146). The measurements are expressed as the number of millionths of

an Angstrom of the continuum of the center of the solar disk (at the same wavelength as the line) that would contain the same energy as the observed coronal line. The indices have the following meanings:

G_6 = mean of six highest line intensities in quadrant for $\lambda 5303$.

R_6 = same for $\lambda 6374$.

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

R_1 = same for $\lambda 6374$.

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

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

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

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 $H\alpha$ 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 on 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: McMath-Hulbert, Wendelstein, Sacramento Peak, Mitaka and Swedish Astrophysical Station on Capri. The remainder report through the URSIgram centers or are available through the IGY World Data Center for Solar Activity in Boulder. 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, the date, beginning and ending times, time of maximum phase, the heliographic coordinates in degrees, McMath serial number of the region, duration, the flare importance on the IAU scale of 1- to 3+, observing conditions where 1 means poor, 2 fair and 3 good, time of measurement for tabulated width of H α or tabulated area, measured (i.e. projected) maximum area in square degrees, corrected maximum area in square degrees which equals measured area times secant h where h is the heliocentric angle, maximum effective line-width in H α expressed in Angstroms, and maximum intensity of H α expressed in per cent of the continuous spectrum. The following symbols are used in the table:

D = Greater than
E = Less than

F = Approximately
G = Plus

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. A graph presents intervals for which there were no patrols for flare observations from the observatories whose complete data are published in the table.

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 (A. E. Covington) 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/M²/c/s. Burst phenomena are measured above this level and are given in terms especially suitable for the variations

observed on this frequency. The basis for the classifications is described by Covington - J.R. Astro. Soc. Can. 45, 49, 1951 and Dodson, Hedeman and Covington, Ap. J. 119, 541, 1954. A modification in terminology with a view to simplification has been introduced and consists essentially of the omission of the descriptive word "Single" from the "Single-Simple" and "Single-Complex" classes; in designating the "Single", "Single-Simple" and "Rise and Fall" bursts into a single classification designated as "Simple Bursts" with an appropriate type number; in the addition of the letter "f" to indicate that the burst deviates from the basic pattern by the presence of one or more small fluctuations in intensity; and by the addition of the letter "A" to indicate that the event has another smaller duration event superimposed upon it.

Simple Burst

Any single burst which rises to one maximum and then decreases to the pre-burst level.

1 - Simple 1 -- Simple burst, type 1 (formerly "single"). Bursts of intensity less than 7 1/2 flux units and duration less than 7 1/2 minutes.

2 - Simple 2 -- Simple burst, type 2 (formerly "single-simple"). Bursts of impulsive nature with intensity greater than 7 1/2 flux units.

3 - Simple 3 -- Simple burst, type 3 (formerly "rise and fall"). Bursts of moderate intensity with duration greater than 7 1/2 minutes.

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 - Complex -- (formerly "single-complex"). A single burst which shows two or more comparable maxima before the activity has declined to zero.

7 - Period of irregular activity or fluctuations -- Series of overlapping bursts of moderate intensity and duration.

8 - Group -- Series of single isolated bursts occurring in succession with intensity between the events equal to the level before and after the group.

9 - Precursor -- A small increase of intensity occurring before a larger increase.

Great Burst

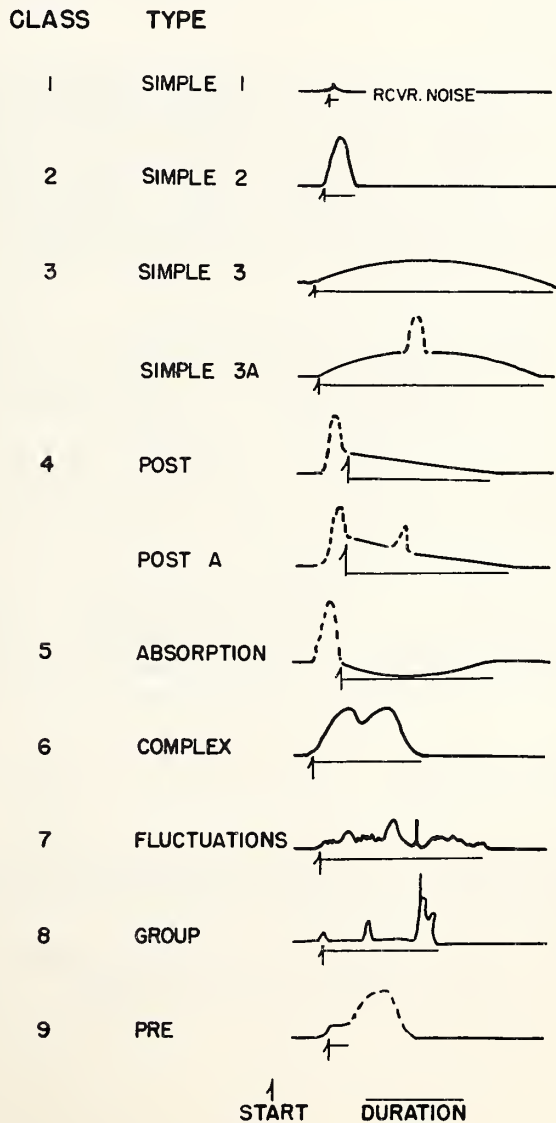
Infrequently occurring bursts of great intensity, often of complicated structure.

Letter "A"

Indicates that this event has another event superimposed upon it.

Letter "f"

Indicates that the basic form of the event is modified by secondary fluctuations.



200 Mc Observations

Data on solar radio waves made at Cornell University, Ithaca, N.Y. (Marshall Cohen) on 201.5 Mc are presented. All times are in Universal Time (UT or GCT). The antenna is linearly polarized and has a pattern appreciably broader than the solar disk. Flux is reported in units of 10^{-22} watts/m²/cps and the tabulated numbers are twice the values observed in the one linear component.

Tables of flux and outstanding occurrences are given in general according to the systems used for the NBS 170 Mc and 450 Mc data.

170 Mc and 450 Mc Observations

Data on solar radio emission at the nominal frequencies of 170 Mc and 450 Mc recorded at the Gunbarrel Hill (Boulder) station of the National Bureau of Standards (R.S. Lawrence) are presented. The half width of the antenna lobe is appreciably greater than the solar disk. Polarization is not determined, but the dipole is oriented E-W. All times are in Universal Time (UT or GCT).

3-Hourly and Daily Flux Density and Variability -- Flux density is given in power units. These units are approximately 10^{-22} watts 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 having at least thirty minutes of usable record and an applicable gain calibration. 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 four required). A dash indicates that insufficient measurements were made to meet the above requirements or that the records were not of usable quality. Flux values may be followed by the qualifying symbols D, S, and X defined subsequently.

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. The variability index is omitted if measurements were made for less than one hour during the period. The variability for the day is the mean of the three-hourly values. The letter S follows variability indices which are in doubt because of atmospheric or local interference.

The observing periods are given in U. T. to the nearest 1/10 hour and they usually extend into the next Greenwich day.

Outstanding Occurrences -- A separate table lists the occurrences which are not adequately described by the three-hourly values of flux density and variability. Two classifications are given: (1) A system in general accord with that described and illustrated by Dodson, Hedeman, and Owren (Ap. J. 118, 169, 1953) and (2) the system described in the IGY Solar Activity Instruction Manual, prepared by the Radio Emission editor of the I.A.U. Quarterly Bulletin on Solar Activity.

In system (1) the occurrences are identified by numbers which do not necessarily indicate the magnitude of the event, as follows:

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.

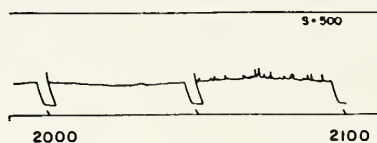
8 - Major burst -- An outburst, or other burst of large amplitude and more than average duration. A major burst is usually complex, with a duration of the order of one to ten minutes.

9A, 9B, or 9 - Major burst and second part or large event without distinct first and second parts -- If there is a double rise in flux, the first part, a major burst, is listed as 9A and the second part as 9B. The second part may consist of a rise in base level, a group or series of bursts, a noise storm. A major increase in flux with duration greater than ten minutes but without distinct first and second parts, is listed simply as 9.

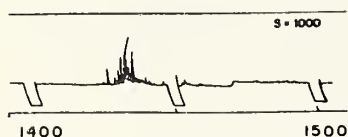
O-RISE IN BASE LEVEL



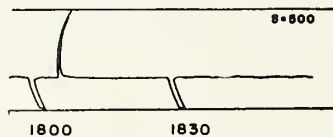
I - SERIES



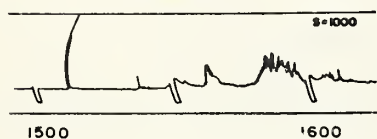
2 - GROUP



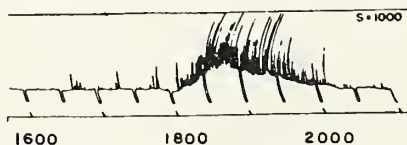
3 - MINOR



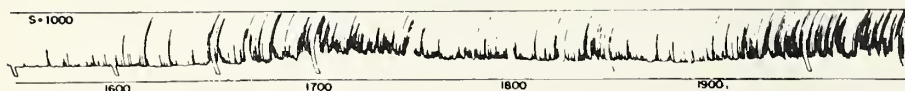
4 - MINOR+



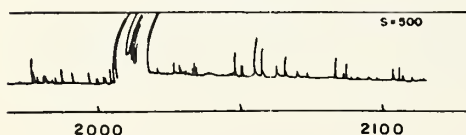
7-ONSET OF NOISE STORM



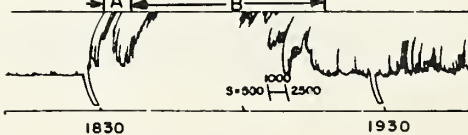
6-NOISE STORM IN PROGRESS



8 - MAJOR



9 - MAJOR +



In system (2) combinations of the following letters are used to describe some distinctive characteristics of the recorded disturbances:

- S = simple rise and fall of intensity,
- C = complex variation of intensity,
- A = appears to be part of general activity,
- D = distinct from (i.e. apparently superimposed upon) the general background,
- M = multiple peaks separated by relatively long periods of quietness,
- F = multiple peaks separated by relatively short periods of quietness,
- E = sudden commencement or rise of activity.

Starting and maximum times are read to the nearest 1/10 minute if they are very definite and otherwise to the nearest minute. If the duration is less than five minutes, it is given to the nearest 1/10 minute; otherwise to the nearest minute (see also qualifying symbols below).

Maximum flux densities are given in units of 10^{-22} watts meter⁻²(c/s)⁻¹. The instantaneous maximum flux density is the highest peak in the disturbance measured above the sky level. The smoothed maximum flux density is the maximum value of a smooth curve drawn through the outstanding occurrence with a smoothing period of 20 to 50 percent of the total duration; it is measured above the estimated level in the absence of the disturbance. The intention is that (smoothed maximum) x (duration) should give a measure of the energy radiated in the disturbance.

A dash indicates missing or insignificant data. Observations are interrupted during the period from 26 to 29 minutes after each hour for calibrations. Observing periods are given in the Daily Data tables. The following qualifying symbols are used:

- B - Event in progress before observations began.
- D - Greater than.
- I - Event apparently continued during an interruption of the observations. The period of the interruption may be given in the remarks.
- N - See footnotes.
- X - Measurement is uncertain or doubtful.
- S - Measurement may be influenced by interference or atmospherics.

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 $4\frac{2}{3}$, 5o is $5\frac{0}{3}$, and 5+ is $5\frac{1}{3}$. 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 <u>both</u> 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 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. 5.0 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_F , from Fredericksburg, Va., is also given for each day.

Note: Beginning with data for September 1955, Qa has been determined from reports that are available within a few hours or at most within a few days, including for the first time, the CRPL observations. Therefore these are the indices by which the forecasters assess every day the conditions in the recent past. Over a period of several years, they have closely paralleled the former Qa indices which 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.

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

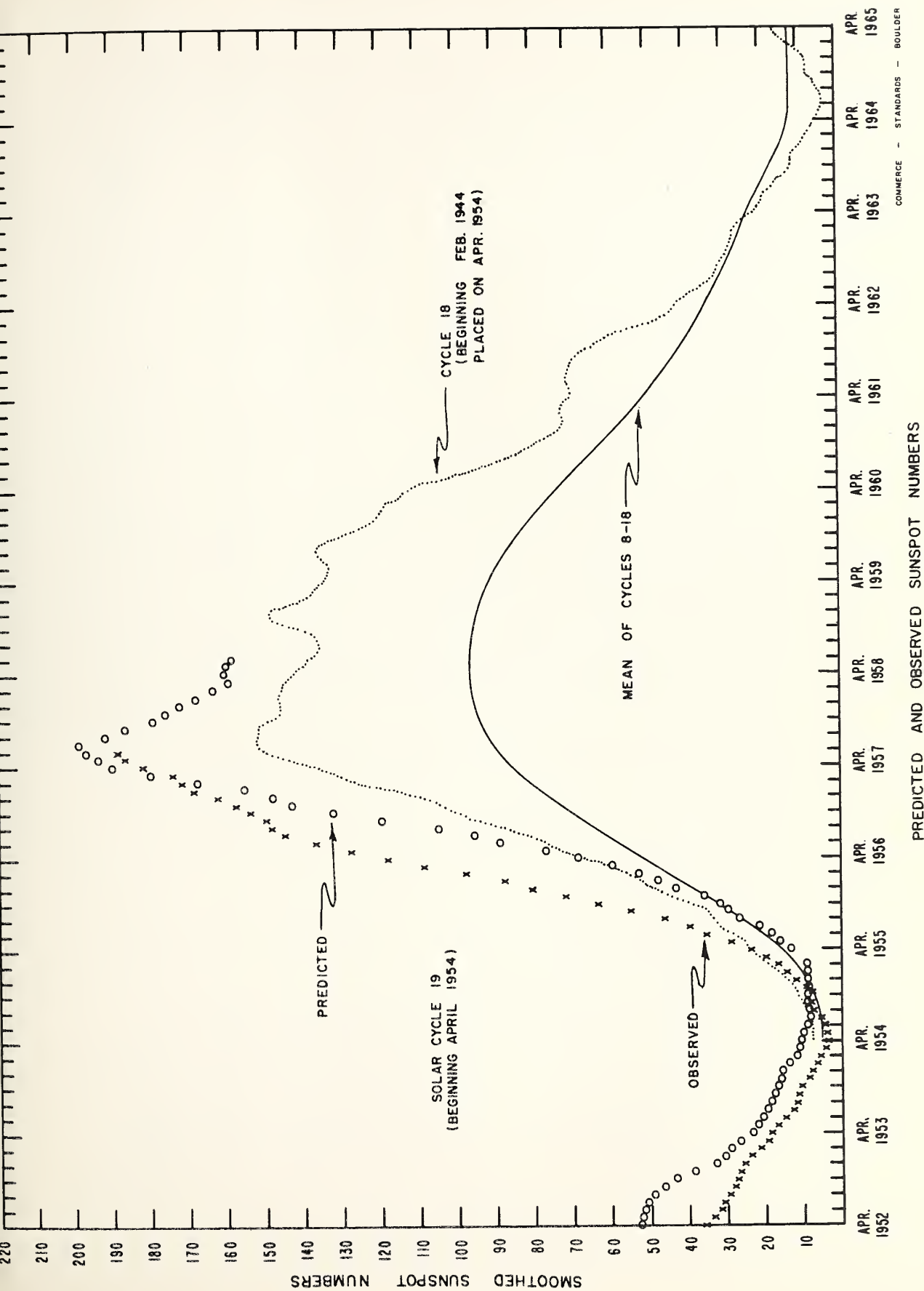
VII ALERT PERIODS AND SPECIAL WORLD INTERVALS

A table gives the Alert Periods and Special World Intervals (SWI) as designated by the IGY World Warning Agency at Ft. Belvoir, Va. For each day of the Alert or SWI are given the number of flares of importance two or greater reported promptly to the IGY World Warning Agency and the magnetic activity index A_{Be} observed at the IGY World Warning Agency.

DAILY SOLAR INDICES

Nov. 1957	American Relative Sunspot Numbers R_A'
1	241
2	234
3	198
4	243
5	200
6	202
7	167
8	170
9	214
10	229
11	208
12	199
13	199
14	191
15	176
16	164
17	150
18	148
19	157
20	165
21	188
22	235
23	226
24	190
25	163
26	132
27	173
28	196
29	180
30	201
Mean:	191.3

Dec. 1957	Zürich Provisional Relative Sunspot Numbers R_Z	Daily Values Solar Flux at 2800 Mc, Ottawa, Canada Flux
1	216	295
2	206	270
3	218	283
4	225	278
5	258	273
6	220	271
7	164	234
8	187	242
9	137	229
10	143	210
11	150	211
12	153	209
13	155	222
14	164	228
15	170	236
16	189	252
17	205	278
18	227	291
19	249	293
20	284	333
21	298	348
22	302	365
23	330	377
24	345	370
25	357	---
26	366	356
27	269	342
28	260	317
29	275	282
30	274	276
31	255	280
Mean:	233.9	281.7



CALCIUM PLAGE AND SUNSPOT REGIONS

DECEMBER 1957

CMP Dec. 1957	Lat	McMath Plage Number	Return of Region	Calcium Plage Data		Sunspot Data	
				CMP Values Area	History, Age	CMP Values Area Count	History
01.1	S13	4293	New	(1200) (3.5)	b / l 1	(340) (4)	b - l
02.5	S21	4272	4218	2000 3	l - l 4	40 1	l \ l
03.1	S06	4278	New	2800 2	l - l 1	60 3	l \ d
03.2	N20	4274	*	1000 2	l - l *		
03.7	N45	4281	4212	900 1.5	l - l 3		
03.7	S21	4288	4218	8000 3.5	l - l 4	1560 21	l - l
04.4	N16	4292	New	400 2	b / l 1	290 4	b ^ l
05.3	N39	4282	4220	400 1.5	l - d 3		
05.9	N30	4283	4220	500 1	l - d 3		
06.2	N17	4284	4228	800 1	l - d 8		
06.2	S26	4285	New	2700 2.5	l - l 1	220 15	l - d
06.2	S06	4286	4241	400 1	l - d 2		
06.6	N07	4287	New	1200 2	l - d 1	40 6	l - d
07.8	N07	4290	New	(400) (1.5)	l - l 1	50 7	l - l
08.1	S23	4291	4226	(500) (1)	l - d? 3		
08.2	N22	4289	4230	(400) (1)	l - d 2		
08.8	N26	4294	4230	4000 1	l / l 2	(70) (7)	l \ d
09.6	N16	4295	4230	(3500) (3)	l - l 2		
09.6	S18	4297	4236	4000 1	l - l 4	210 4	l - l
10.4	N30	4298	4235	(700) (1.5)	l - l 8		
10.7	S18	4300	4236	1600 3.5	l - l 4	40 1	b - d
10.7	S35	4301	New	2500 2.5	? - l 1		
11.1	N08	4296	4233	7000 3.5	l / l 2	690 12	l - l
12.6	S27	4302	4237	2200 3	l - l 4	140 2	b - d
13.1	S15	4303	4238	1400 3	l - l 5	50 1	b \ d
13.2	N27	4304	4234	2800 1.5	l - l 8		
14.0	N15	4305	4242	1900 2.5	l - l 1	100 2	b \ d
15.0	N10	4306	4242	500 2.5	l - l 1		
15.1	S08	4307	4243	1200 2.5	l - l 2		
15.9	N22	4309	4247	2000 2	l - l 7		
16.1	S14	4308	4243	800 2.5	l - l 2	120 10	b - l
16.7	S26	4310	4245	1200 2.5	l - l 3	20 1	l - d
17.8	S25	4311	New	800 2.5	l / l 1	140 2	b ^ d
17.9	N16	4312	4247	2900 2.5	l - l 7	50 4	b - d
19.0	S12	4313	New	7000 3	l - l 1	970 12	l - l
20.0	N18	4314	New	10,000 3.5	l - l 1	1360 37	l ^ l
20.8	S17	4315	4255	1200 1.5	l - l 3		
21.7	N24	4316	New	4700 3	l - l 1	240 3	l \ d
22.7	S16	4318	4257	2500 2	l - l 3	80 6	b - d
23.2	N21	4317	New	3500 3	l - l 1	680 38	l - l
24.2	N21	4321	New	4000 3	l - ++ 1	1160 13	l - l
24.5	S22	4319	4263	5000 2.5	l - l 5	780 6	l v l
24.8	N13	4320	New++	(200) (1)	l - d 1		
25.5	S21	4322	***	1800 2.5	l - l 5	140 1	
26.0	N28	4328	New++	6000 3	++ - l 1	1890 18	l - l
26.8	S30	4329	New++	500 1.5	l \ d 1		
26.9	S14	4323	4269	6500 2.5	l - l 2	720 14	b ^ l
26.9	N22	4324	4271	1300 2	l - l 6	140 5	b - d
27.4	N14	4325	4271	1500 1.5	l - l 6	540 12	l - l
28.2	S20	4327	New	1000 2.5	l - l 1	70 5	b - d
28.4	S04	4326	New	1300 3	l - l 1	110 3	l - l
28.4	N18	4330	4271	2100 2	l - d 6		
28.6	N05	4334	New	800 2.5	b / l 1	230 9	b \ d
29.8	N10	4331	New	(1500) (2.5)	l - l 1	(20) (1)	b - d
29.8	S18	4333	4272	(3800) (2.5)	l - l 5	320 13	b - l
30.3	S03	4332	4278	(900) (2.5)	l \ d 2		
31.3	S22	4335	4288	1500 2	l - l 5	50 1	l - d
31.3	S12	4336		6000 2.5	l - l	100 5	b \ d
31.8	N22	4337		4200 2.5	l - l	440 8	l - l

* 4229, 4231. Age 2,3.

** 4267, 4265.

+ Ephemeral.

++ Region 4321 is broken into 4321 and 4328;
later combined again and numbered 4328.

COMMERCE - STANDARDS - BOULDER

Note: Long gaps in McMath observations render identifications and disk
passage histories questionable in some cases.

CORONAL LINE EMISSION INDICES

DECEMBER 1957

CMP Dec. 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)			
	G6	G1	R6	R1	G6	G1	R6	R1	G6	G1	R6	R1	G6	G1	R6	R1
1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
2	117	143	x	x	139*	222	x	x	127*	184	41	80	68	90	21	33
3	168	200	60	92	178*	376	42	69	349*	450	58	89	119	210	48	60
4	x	x	x	x	x	x	x	x	107*	114	51	91	89	110	23	40
5	x	x	x	x	x	x	x	x	151	204	x	x	99	119	x	x
6	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
7	117	162	24	36	98	118	28	57	x	x	x	x	x	x	x	x
8	141	208	34	46	x	x	49	93	x	x	x	x	x	x	x	x
9	x	x	x	x	210	280	26	36	x	x	x	x	x	x	x	x
10	168	260	44	78	x	x	x	x	x	x	x	x	x	x	x	x
11	167	220	40	78	206	256	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	x	x	x	x	x	x	x	x
14	x	x	x	x	x	x	x	x	99	136	x	x	144	156	x	x
15	x	x	x	x	x	x	x	x	140	244	x	x	136	180	x	x
16	197	355	57	120	179	265	37	84	93	156	103a	188a	103	168	47a	79a
17	183	290	43	84	103	124	42	69	x	x	x	x	x	x	x	x
18	109	146	26	66	94*	164	54	107	x	x	x	x	x	x	x	x
19	198*	400	x	x	164	250	x	x	173	234	36	52	143	194	39	75
20	x	x	x	x	x	x	x	x	138	220	45	71	191	360	x	x
21	218*	330	x	x	149	222	x	x	x	x	x	x	x	x	x	x
22	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
23	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
24	x	x	x	x	x	x	x	x	173*	245	x	x	126*	193	54	68
25	x	x	x	x	x	x	x	x	106a	144a	x	x	141a*	200a	x	x
26	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
27	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
28	144	160	x	x	211	293	x	x	138	168	62	120	107	135	36	50
29	114	148	x	x	165	258	x	x	161*	235	38	75	91	151	25	30
30	121	158	88a	135a	205	252	102a	158a	239*	300	32	63	108	170	36	54
31	x	x	x	x	x	x	x	x	140*	180	34	60	105	170	18	30

* = yellow line observed.

a = index computed from low weight data.

x = no observations.

SOLAR FLARES

DECEMBER 1957

OBSERVATORY	DATE Dec. 1957	OBSERVED UNIVERSAL TIME		LOCATION		DURA- TION — MINUTES	IM- POR- TANCE	OBS. COND.	MEASUREMENTS			PROVISIONAL IONOSPHERIC EFFECT			
		START	END	APPROX. LAT.	APPROX. MER. DIST.				MCARTHUR PLAGE REGION	TIME — UT	MEAS. AREA Sq. Deg.		CORR. AREA Sq. Deg.	MAX. WIDTH H _g	MAX. INT. %
MITAKA	01	0417 E	0422 D	S15 E27	E27	5 D	1	1	0417	1.34	1.60	1.25	122	G-SWF	
	01	0417 E	0424 D	S12 E33	E33	7 D	1	1	0417	1.84	2.26	2.08	118		
	01	0424 E	0436 D	S14 E31	E31	12 D	1	1	0433	2.78	3.36	1.90	131		
	01	0532 E	0550 D	S15 E26	E26	18 D	2	1	0532	4.70	5.69	2.95	196		
	01	0807 E	0815 D	S30 E33	E33	8 D	1	3	0812			2.70			
	01	0827 E	0849 D	S17 W19	W19	22 D	1	3	0829			1.90			
	01	0854 E	0920 D	S11 W63	W63	22 D	1	2			4.00				
	01	0858 E	0930 D	S11 W57	W57	32	1	2							
	01	0900 E		S18 W22	W22	4269	16	2							
	01	0949 E	0955 D	S18 W22	W22	4269	6 D	1	2	0950	2.50	2.60			
WENDEL	01	1024 E	1055 D	S09 W15	W15	4279	31	2	1034	9.40	9.40			G-SWF	
	01	1027 E	1057 D	S11 W14	W14	4279	30	1			3.00	2.20			
	01	1029 E	1044 D	S17 W15	W15	4269	15	1	1029						
	01	1040 E	1144 D	S14 W73	W73	4257	64 D	1			4.00				
	01	1043 E	1141 D	S12 W80	W80	4257	58 D	2		6.00	9.60				
	01	1043 E	1141 D	S15 W73	W73	4257	58 D	3		3.00	4.50				
	01	1047 E	1118 D	S13 W80	W80	4257	31 D	16	1106	1.13	1.50	2.70	89		
	01	1315 E	1328 D	S30 E28	E28	4288	13	2	1318						
	01	1316 E	1333 D	S32 E25	E25	4288	17	1			3.00				
	01	1353 E	1413 D	S24 E64	E64	4285	20	2	1355	.68	.78		109		
USNRL	01	1550 E	1616 D	S16 W26	W26	4269	26	1			5.00			S-SWF	
	01	1630 E	1924 D	S19 W25	W25	4269	174	1							
	01	1630 E	1930 D	S18 W25	W25	4269	180	1		2.40					
	01	1632 E	1815 D	S18 W25	W25	4269	103 D	16	1647	2.72					
	01	1724 E	1908 D	S19 W23	W23	4269	44 D	2	1731	3.70					
	01	1928 E	2038 D	S22 E14	E14	4272	70	2	1944	6.60					
	01	1930 E	2040 D	S25 E15	E15	4272	70	16		5.40					
	01	1932 E	2036 D	S24 E13	E13	4272	64	1							
	02	0857 E	0903 D	S20 W37	W37	4269	6 D	3	0902	2.20	2.70				
	02	0906 E	0911 D	S24 E16	E16	4288	5	3	0907	2.20	2.40				
UCCLE	02	0916 E	1203 D	N27 E90	E90	4294	47 D	3		2.20	4.60			S-SWF	
	02	1009 E	1050 D	S31 E17	E17	4288	41	3	1023	4.50	5.00				
	02	1051 E	1105 D	S32 E16	E16	4288	14	1	1058	3.40	3.70				
	02	1025 E	1200 D	S19 W38	W38	4269	35	26	1104	11.30	14.10				
	02	1055 E	1150 D	S16 W33	W33	4269	55	2	1110	12.00	12.00				
	02	1058 E	1140 D	S17 W35	W35	4269	42	2	1103	8.00	10.20	2.83			
	02	1100 E	1139 D	S17 W37	W37	4269	39 D	1	1103	2.50	3.30				
	02	1102 E	1132 D	S18 W34	W34	4269	30 D	2	1101	8.70	11.00	1.84	86		
	02	1112 E	1145 D	N16 W35	W35	4271	33 D	16	1116						
	02	1131 E	1136 D	S24 E17	E17	4288	5	1	1133	3.40					
MITAKA	02	1145 E	1203 D	N25 W60	W60	4268	18 D	3	1153	4.50	5.30			SLOW S-SWF	
	03	0157 E	0203 D	S20 W42	W42	4269	6 D	16	0158	7.57	11.00	1.79	125		
	03	0830 E	0845 D	S19 W49	W49	4269	15 D	1	0835	1.80	2.80				
	03	0843 E		S19 W50	W50	4269	1	3							
	03	0845 E	0914 D	N16 W35	W35	4271	29	1	0900	3.00	3.00				
	03	0933 E		N16 W35	W35	4271	1	3	0935	2.10	2.10				
	03	0940 E	1051 D	S19 W50	W50	4269	71 D	16		3.00					
	03	1102 E	1128 D	S20 W50	W50	4269	26 D	2	1110	10.00	11.50				
	03	1212 E	1228 D	S20 W50	W50	4269	16 D	26							
	03	1317 E	1325 D	S19 W47	W47	4269	8 D	2	1325	3.36	5.35				
OTTAWA	03	1350 E		N13 W37	W37	4271	1	1	1354	1.86	2.41	PAGE	1		

SOLAR FLARES

DECEMBER 1957

OBSERVATORY	DATE Dec. 1957	OBSERVED TIME		LOCATION		DURA- TION — MINUTES	IM- POR- TANCE	OBS. COND.	MEASUREMENTS				PROVISIONAL IONOSPHERIC EFFECT	
		START	END	APPROX. LAT.	MER. DIST.				MONTH PLACE REGION	TIME — U T	MEAS. AREA Sq. Deg.	CORR. AREA Sq. Deg.		MAX. WIDTH H _e
ZURICH OTTAWA R O HERST HUANCAYO CLIMAX MT WILSON	03	1439	1445 D	S19 W64	4269	6 D	1	1	1440	1.91	2.00		Slow S-SMF	
	03	1459	1533	S19 E01	4288	34	1	1	1508	3.30	2.05			
	03	1505 E	1530	S19 W03	4268	25 D	1	1	1510		3.50		Slow S-SMF	
	03	1546	1625	S18 W51	4269	39	1	2						
	03	1631	1657	S18 W51	4269	26	1	2						
	03	1805	1840	S25 W05	4288	35	1	2	1819	2.20				
	03	1806	1826	S23 W05	4288	20	1	1						
	03	2128	2135	N15 W45	4271	7	1	1						
	MITAKA	04	0015	0038	S22 W03	4288	23	1	2	0015	3.71	3.93	1.89	128
	MITAKA	04	0241 E	0303	N13 W45	4271	22 D	2	2	0242	4.70	6.20	2.50	188
MITAKA ARCETRI ARCETRI UCCLE UCCLE ARCETRI CAPRI S R O HERST MEUDON HUANCAYO	04	0405	0414 D	S18 W04	4288	9 D	1	1	0405	5.67	6.00	1.60	107	
	04	0840 E	0935 D	S20 E80	4297	55 D	2	1					S-SMF	
	04	0857 E		S27 W11	4288		1	1						
	04	1000 E		S17 W61	4269		1	1						
	04	1047 E	1050	S13 W12	4288	3 D	1	3		2.20				
	04	1050	1149	S20 W08	4288	59	1	3	1111	3.40	6.20			
	04	1052	1202 D	S13 W02	4288	70 D	2	3	1111	6.00				
	04	1115 E	1155 D	S10 W10	4288	40 D	1	1	1238	1.50	3.40			
	04	1234 E	1244 D	N25 E62	4294	10 D	1	2	1236	1.30	3.20			
	04	1232 E	1245	N18 E70	4296	13 D	1	2						
TASHKENT SIMEIZ CAPRI S ARCETRI ZURICH ZURICH HUANCAYO HUANCAYO OTTAWA USNRL HUANCAYO USNRL OTTAWA	04	1235 E	1300	N18 E68	4296	25 D	1	5					S-SMF	
	04	1656	1704	S20 W18	4288	8	1	1						
	05	0548	0800	S17 W21	4288	132	26	1	0657	18.20	21.20	2.20		S-SMF
	05	0657 E	0810 D	S22 W21	4288	73 D	3	3	1027	2.50	4.00			
	05	1014 E	1042 D	N27 E47	4294	28 D	16	2	1039	3.40	5.40			
	05	1020 E	1105	N25 E45	4294	45 D	2	3	1347		1.00			
	05	1345 E	1425	N30 E52	4294	40 D	1	3	1428					
	05	1427	1430	S12 W62	4293	3	1	2						
	05	1532 E	1556	S16 E71	4297	24 D	1	2	1628	2.15	2.77			
	05	1623 E	1633	S25 W30	4288	10 D	1	3	1623	1.36	1.84			
MITAKA SYDNEY MITAKA TASHKENT KODAIKANAL WENDEL HUANCAYO MT WILSON MT WILSON MT WILSON	05	1623	1643	S27 W29	4288	20	1	2	1628	2.15	2.77		90	Slow S-SMF
	05	1633	1715	S27 W31	4288	1623	1	3	1623	1.36	1.84			
	05	1633	1717	S19 W29	4288	42	1	3	1638	3.06	4.03		107	Slow S-SMF
	05	1633		S21 W33	4288	44	1	1	1636	3.13	3.93			
	05	1633		S21 W31	4288		1	1						
	06	0025	0035 D	S34 E65	4301	10 D	1	1	0025	2.78	8.9	2.86		Slow S-SMF
	06	0345	0440	N16 E52	4296	55	2	1	0352	15.20	23.20	3.07	149	
	06	0349	0425	N15 E47	4296	36	2	1	0408	3.90	6.00	2.00	150	
	06	0401 E	0438	N16 E45	4296	37 D	16	2						
	06	0404 E	0423	N14 E44	4296	19 D	2	2						
MITAKA HUANCAYO MT WILSON MT WILSON MITAKA MITAKA	06	1250 E	1312 D	S14 W74	4293	22 D	16	2					S-SMF	
	06	1545	1552	S16 W63	4293	67	1	3						
	06	1845	1850	S15 W80	4293	5	1	1						
	06	1913	1924	S22 W50	4288	11	1	1						
	06	1958	2006	S32 W09	4285	8	1	1						
	07	0000	0030	S22 W45	4288	30	16	1	0332	5.67	8.03	2.33	120	
	07	0329	0341 D	S16 W49	4288	12 D	16	1	0458	1.84	2.32	1.24	115	
	07	0453 E	0503	S18 E31	4297	10 D	1	1	0532	2.78	3.50	2.50	165	
	07	0532 E	0544	S18 E30	4297	12 D	16	1				PAGE	2	

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OBSERVATORY	DATE Dec. 1957	OBSERVED UNIVERSAL TIME		LOCATION		DURA- TION — MINUTES	IM- POR- TANCE	ORI- COND.	MEASUREMENTS			PROVISIONAL IONOSPHERIC EFFECT
		START	END	APPROX. LAT.	APPROX. MER. DIST.				TIME — UT	MEAS. AREA Sq. Deg.	CORR. AREA Sq. Deg.	
ONDREJOV MENDEL MENDEL HYDERABAD CAPRI S HUANCAYO	07	0808	0821	S18 E32	4297	13	16	3	0811			
	07	0812 E	0829	S18 E30	4297	17 D	16				5.00	
	07	0831 E	1000	N16 E31	4296	89 D	1	2	0910	1.82	4.00	
	07	0859 E	0945	N15 E28	4296	46 D	1		0931	2.00	2.40	
	07	0908 E	0953 D	N20 E29	4296	45 D	1	3				
	07	1613 E	1628	N05 W01	4290	15 D	1	3				
	07	1633	1659	S14 W60	4288	26	1	3				
	08	0814	0904	N35 E21	4298	50	2	4		4.30	5.60	
	08	0839	0924 D	N16 E12	4296	45 D	1	4		2.70	2.80	
	08	1319	1330 D	N29 E00	4294	11 D	1	3		5.00		
ATHENS ATHENS UCCLE UCCLE UCCLE OTTAWA SAC PEAK	08	1319	1330 D	N08 W15	4290	11 D	1	3		5.00		
	08	1324	1332 D	S37 E42	4301	8 D	1	3	1330	2.50	2.70	
	08	1502 E		S16 W73	4288	16	1	1	1502	1.91	6.84	
	08	2142	2200	S15 W85	4293	18	1	2		1.80		17
	09	0201 E	0210	S14 E10	4297	9 D	16	2	0206	3.80	4.00	165
	09	0217 E	0225	S19 E08	4297	8 D	16	2	0222	3.80	4.10	183
	09	0542 E	0550	S14 W84	4288	8 D	16					
	09	0701 E	0805	S14 W75	4288	64 D	2	4		1.50	5.30	
	09	0909 E	0921	S12 W72	4288	12 D	1	2	0910			
	09	0952 E	0958	N08 W28	4290	6 D	1	3	0954			
MITAKA MITAKA TASHKENT ATHENS ONDREJOV ONDREJOV SAC PEAK MT WILSON HUANCAYO SAC PEAK MT WILSON	09	1740	1840 U	N07 W29	4290	60 D	16	2		5.10		22
	09	1743	1819	N07 W30	4290	36	16					
	09	1942 E	1953	N08 W75	4292	11 D	1	2				
	09	2220	2222 D	N27 W15	4294	2 D	1	2		2.40		16
	09	2220	2245	N30 W14	4294	25	1					
	10	0308	0320 D	N07 W33	4290	12 D	1	1	0313	3.71	4.45	120
	10	0327	0410 D	S13 E44	4303	43 D	16	1	0340	3.80	5.32	120
	10	0443	0455 D	S13 E43	4303	12 D	16	1	0443	5.67	7.94	134
	10	1002	1113	N08 W40	4290	71	16	2	1037	3.40	3.90	
	10	1004	1009	S33 W57	4285	5	16	2	1006	2.20	3.40	
MITAKA SINEIZ SYDNEY HYDERABAD ONDREJOV ONDREJOV ONDREJOV HUANCAYO CLIMAX SAC PEAK USNRL MT WILSON MT WILSON USNRL CLIMAX	10	1011	1025	N28 W22	4294	14	1	2	1015	2.20	2.50	
	10	1109	1118	S20 E90	4311	9	16	3	1112	2.20	4.40	
	11	0221	0242	S18 W10	4297	21 D	1	1	0221	3.80	4.03	120
	11	0814 E	0819 D	N08 E08	4296	5 D	1	2	0816	1.40	1.40	
	12	0255	0350	S32 W12	4302	55	2					
	12	0258 E	0313	S34 W10	4302	15 D	1	1	0258	3.04	3.68	
	12	1214 E	1226	S16 E85	4313	12 D	16	3	1218	1.60	7.80	
	12	1241	1259	N27 W50	4294	18	1	3	1246	5.40	5.40	
	12	1309 E	1320	S25 E62	4311	11 D	16	3	1313		2.60	
	12	1612 E	1633	S26 E69	4311	21 D	1	3				
CLIMAX SAC PEAK USNRL MT WILSON MT WILSON USNRL CLIMAX	12	1750	1838	N15 W41	4294	48	2	2	1754	8.20	7.46	18
	12	1757	1840	N17 W42	4294	43	26	2		9.00		97
	12	1757	1842	N15 W43	4294	45	26	2	1807	5.32		
	12	1816 E		N25 W40	4294	25	16					
	12	1859	1924	N25 W40	4294	25	1					
	12	1903	1938	N31 W30	4298	35	1	2	1907	1.81	2.54	82
	12	1957	2019 D	N27 W55	4294	22	2	1	2001	2.71	5.60	80
	12	2001	2023	N28 W54	4294	22	1		2015	3.60		3

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		START	END	APPROX. LAT.	MER. DIST.	MCARTH PLAGE REGION				TIME — UT	MEAS. AREA Sq. Deg.	CORR. AREA Sq. Deg.		MAX. WIDTH H _g
HUANCAYO	12	2050 E	2106	S15 E87		4313	16 D	1	1					
SYDNEY	13	0215 E	0300	N22 E90		4316	45 D							
TASHKENT	13	0450	0523	N28 W52		4294	33	16						
SYDNEY	13	0456	0525	N22 W55		4294	29	2						
USNRL	13	1430	1520	N11 W34		4296	50	16	3	1446	2.94	3.65	107	Slow S-SWF
HUANCAYO	13	1627	1633	N17 E90		4314	6	1	2					
USNRL	13	1951	2007	S14 E71		4313	16	1	2	1953	.79	2.54	69	
CAPRI S	14	1245 E	1305 D	N17 E75		4314	20 D	2	1	1245	2.00	9.00		Slow S-SWF
USNRL	14	1255 E	1450 D	N20 E80		4314	115 D	3	1	1257	7.11	35.90		
USNRL	15	1514	1526	N25 E73		4316	12	1	3	1518	.79	3.01		
HAWAII	15	1829	1838 D	N12 E61		4314	9 D	1	1	1832	1.20	2.70		
HAWAII	15	2002	2102	N12 E61		4314	60	1	1	2006	2.00	4.30	71	Slow S-SWF
HAWAII	15	2116	2156	N12 E61		4314	40	16	1	2130	4.10	9.20		
MITAKA	16	0213 E	0230	S33 E03		4310	17 D	1	2	0213	2.78	3.22	122	
MITAKA	16	0246	0257	S16 E54		4315	11	1	1	0250	1.84	3.18	100	
MITAKA	16	0409 E	0413	S25 E22		4311	4 D	1	1	0409	1.84	3.22	105	
MITAKA	16	0445	0450	N20 E52		4314	5	16	1	0445	5.67	9.64	131	
MITAKA	16	0610	0621	S25 E21		4311	11 D	1	1	0610	.89	1.08	96	
ONDREJOV	16	1125	1238	N18 E48		4314	73	26	3	1139				Slow S-SWF
KHARKOV	16	1127 E	1232	N14 E51		4314	65 D	3	2					
CAPRI S	16	1127	1238	N17 E52		4314	71	2	2	1142	4.00	6.40		
R O HERST	16	1143 E	1225	N16 E48		4314	42 D	2	3	1159	6.50	10.00	81	
ONDREJOV	16	1237 E	1318	S25 E19		4311	41 D	1	3	1253				
USNRL	16	1256 E	1306 D	S25 E17		4311	10 D	1	1	1256	1.70	1.96		
WENDEL	16	1301 E	1313 D	S25 E11		4311	12 D	16	1					
OTTAWA	16	1532	1607	N20 E33		4314	35	2	2	1535	3.89	6.00		
SAC PEAK	16	2135	2207	S23 E89		4318	32	16	2				13	
MITAKA	17	0042 E	0046 D	N14 E39		4314	4 D	1	1	0045	1.84	2.52	134	
ATHENS	17	0734 E	0908	N22 E44		4314	94 D	26	3					S-SWF
ARCETRI	17	0825 E	0956	N19 E40		4314	91 D	2	2	0843	4.00	5.60		
USNRL	17	1306	1340	N26 W10		4312	34	16	2	1314	2.84	3.24	99	
HUANCAYO	17	1531 E	1632 D	N17 E33		4314	61 D	2	1					Slow S-SWF
USNRL	17	1532	1634	N17 E33		4314	62	16	1	1543	2.04	2.58	97	
USNRL	17	1712	1727	N03 W90		4296	15	16	2	1714	2.16		89	
CLIMAX	17	1812	1829	N07 W90		4296	17	1		1817	4.30			
HYDERABAD	18	0444 E	0528	N17 E26		4314	44 D	1	2	0451	2.43	2.86	227	Slow S-SWF
MITAKA	18	0450	0519	N16 E26		4314	29	3	1	0458	15.20	17.80		Slow S-SWF
ABASTUMANI	18	0620	0625	N17 E22		4314		2						Slow S-SWF
HUANCAYO	18	1653	1729 D	S22 E73		4319	36 D	1	2					Slow S-SWF
HAWAII	18	2328	2334 D	N14 E16		4314	6 D	1	1	2328	3.40	3.70		
MITAKA	19	0320 E	0342	N16 E49		4317	22 D	1	2					
MITAKA	19	0340	0347	N19 E13		4314	7	1	2	0326	3.28	5.22	100	
ATHENS	19	0757 E	0801 D	N22 E17		4314	4 D	26	3	0341	.89	.98	100	
CAPRI S	19	0812 E	0958	N20 E10		4314	106 D	16	3	0923	10.70	12.00		S-SWF
ARCETRI	19	0813 E	0845	N19 E15		4314	32 D	2	3	0823	4.50	6.20		
MEUDON	19	0915 E	1015	N21 E16		4314	60 D	1	2	0915	5.80	2.00		
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		START	END	APPROX. LAT.	MER. DIST.	MG-MATH FLARE REGION				TIME — U T	MEAS. AREA Sq. Deg.	CORR. AREA Sq. Deg.	MAX. WIDTH H _g	
{ MEUDON ARCETRI SAC PEAK MITAKA	19	0916 E	1015	N14 E14		4314	59	16	2	0921	3.30	5.00		S-SWF
	19	0918 E	1000 D	N12 E13		4314	42 D	16	2	0920	1.90	3.60		
	19	1707 E	1735	S25 E78		4319	28	1	3	0920	2.78	8.06	1.64	
{ MITAKA HYDERABAD ARCETRI	20	0301 E	0315	N13 W02		4314	14 D	1	1	0308	3.80	3.95	1.65	S-SWF
	20	0543 E	0606	N15 E01		4314	23 D	16	1	0545	4.25	4.45	2.50	
	20	0828 E	0855 D	N15 E36		4317	27 D	1	1	0855	2.20	2.90		
{ ARCETRI WENDEL WENDEL	20	0850 E	0920	N19 W01		4314	30	16	2	0905	2.80	3.00		S-SWF
	20	0850 E	0930	N18 E01		4314	40 D	16	2	0905	7.00	12.00		
	20	0919 E	0939	N14 E34		4317	20	1			4.00			
{ SCHAUINS WENDEL CAPRI S	20	1022 E	1059	N16 W05		4314	37 D	2						S-SWF
	20	1027 E	1048	N15 W06		4314	21 D	2						
	20	1029 E	1048 D	N14 W11		4314	19 D	16	3	1035	4.00	4.20		
{ WENDEL CAPRI S ONDREJOV	20	1116 E	1140	N25 E60		4321	24	2			1.00	2.30		S-SWF
	20	1117 E	1130	S26 E60		4322	13 D	1	3	1122				
	20	1124 E	1130	S26 E65		4322	6 D	1	3	1127			2.40	
{ WENDEL WENDEL CAPRI S	20	1249 E	1308	N16 W02		4314	19 D	16				5.00		S-SWF
	20	1316 E	1341	N16 W03		4314	25	16			6.00			
	20	1343 E	1349 D	N22 E50		4321	6 D	16	3	1346	1.50	2.50		
{ WENDEL CAPRI S HAWAII	20	1344 E	1350	N24 E49		4321	6 D	1	1	2026	2.20	2.50		S-SWF
	20	2026	2032	N10 E27		4317	6	1	1	2112	2.10	2.20		
	20	2110	2122	S12 W17		4313	12	1	1					
{ MITAKA WENDEL WENDEL	21	0433 E	0450 D	N24 E42		4321	17 D	1	1	0438	2.78	4.50	2.39	149
	21	0851 E	0900	S21 E74		4323	9	1			4.00			
	21	0945 E	1009	S13 W21		4313	24 D	1			4.00			
{ WENDEL CAPRI S WENDEL	21	1036 E	1051	S18 E85		4323	15	1				4.00		S-SWF
	21	1210 E	1223 D	N25 E31		4321	13 D	1	2	1213	1.80	4.00		
	21	1210 E	1235	N26 E37		4321	25	1						
{ WENDEL AROSA WENDEL	21	1212	1225	N25 E36		4321	13	1				4.00		S-SWF
	21	1313	1355 D	N24 E41		4321	42 D	16				7.00		
	21	1314	1341	S26 E48		4322	27	16	2	1322	1.36	2.19		
{ ZURICH ZURICH USNRL	21	1320 E	1328	S12 W39		4313	8 D	1	2	1326		3.00		S-SWF
	21	1320 E	1342	S26 E47		4322	22 D	1	2	1323		4.00		
	21	1431	1450	S14 W23		4313	19	1	2	1433	.79	.88	1.00	
{ USNRL SAC PEAK USNRL	21	1458	1529	N29 E46		4324	31	1	3	1507	1.25	2.06		89
	21	1545	1610	S12 E75		4323	25	1	3	1548	3.20	4.33		18
	21	1546	1607 D	S20 E73		4323	21 D	26	3	1550	1.36	2.50		91
{ CLIMAX CLIMAX USNRL	21	1546	1610	S22 E77		4323	24	1	3	1616	.68	.91		124
	21	1614	1644	S19 W38		4313	30	1	3	1653	.79	2.10		72
	21	1650	1655 D	S14 E67		4323	5 D	1	3		2.50			16
{ SAC PEAK HUANCAYO HAWAII	21	1722	1750	N26 E58		4324	28	1	2	2048	4.40	7.40		17
	21	2045 E	2100	N24 E43		4321	15 D	1	2	2048	3.30	3.80		S-SWF
	21	2048 E	2056 D	N23 E47		4321	8 D	2	1	2104				
{ HAWAII HUANCAYO HAWAII	21	2100	2116 D	N17 W24		4314	16 D	1	2	2117	3.80			
	21	2102 E	2113	N14 W23		4314	11 D	1	2	2117	3.10			
	21	2110	2130	S23 E26		4319	20	1	3	2117				
{ SAC PEAK CLIMAX CLIMAX	21	2110	2134	S20 E37		4319	24	1	3	2117				S-SWF
	21	2110	2136	N31 E24		4317	8	1	1	2117				
	21	2128	2136	N31 E24		4317	8	1	1	2117				
{ MT WILSON SAC PEAK CLIMAX	21	2147	2210 D	SAC PEAK		4318	23 D	16	3	2206	4.50			22
	21	2150	2233 D	SAC PEAK		4318	43 D	2	1	2206	7.80			S-SWF
	21	2150	2233 D	SAC PEAK		4318	43 D	2	1	2206	7.80			
{ HAWAII	21	2156 E	2204 D	S14 E17		4318	8 D	1	1	2156	3.00	3.30	PAGE	5

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		START	END	APPROX. LAT.	APPROX. MER. DIST.	McMATH PLAGE REGION				TIME — UT	MEAS. AREA Sq. Deg.	CORR. AREA Sq. Deg.	
MT WILSON	21	2215 E	2221	N25	W02	4316	6 D	1					
MT WILSON	21	2215 E	2230	S14	E24	4318	15 D	1					
MT WILSON	21	2232 E	2300	N23	E51	4324	28	3					
HAWAII	21	2253 E	2254 D	N24	E52	4324	1 D	3					
SYDNEY	21	2308 E	2340	N23	E60	4324	32 D	2		2253	11.30	21.60	
MEUDON	22	1025	1055	N20	W30	4314							
WENDEL	22	1027	1101 D	N19	W29	4314	34 D	2					
CAPRI S	22	1031 E	1048	N19	W28	4314	17 D	1					
WENDEL	22	1031	1054 D	N28	E45	4324	23 D	1		1033	2.00	8.00	S-SWF
WENDEL	22	1057	1123	N27	E48	4324	26	2					
UCCLE	22	1336	1341	N24	E24	4321	5	1					
USNRL	22	1443	1518	S26	E34	4322	35	1		1337	2.40	2.50	
SAC PEAK	22	1605	1635	S15	E60	4323	30	1		1446	1.13	1.50	
SAC PEAK	22	1715	1820	N18	W29	4314	65	16					
CLIMAX	22	1727	1821	N19	W32	4314	54	1		1735	5.00		Slow S-SWF
MT WILSON	22	1734	1800	N17	W34	4314	26	1					
CLIMAX	22	1820	1836	N20	E19	4321	16	1		1826	2.40		
SAC PEAK	22	1820	1837	M21	E19	4321	17	1					
CLIMAX	22	1906	1915	S12	W53	4313	9	1		1909	2.20		16
HAWAII	22	2240 E	2332	N20	W34	4314	52 D	2		2244	4.10	5.40	S-SWF
MITAKA	22	2342 E	2400	N26	E41	4324	18 D	1		2342	1.84	2.76	
MITAKA	23	0028	0037	N18	W38	4314	9	2					
HAWAII	23	0028 E	0040	N19	W38	4314	12 D	1		0028	2.00	15.30	Slow S-SWF
HAWAII	23	0038	0048 D	N25	E40	4328	10 D	2		0040	3.90	2.90	
MITAKA	23	0039	0052	N26	E40	4328	13	26		0039	7.57	11.50	
MITAKA	23	0206 E	0210	N29	E40	4328	4	16					204
MITAKA	23	0247 E	0258	N29	E40	4328	11 D	1		0206	3.80	6.00	152
MITAKA	23	0342	0350	N20	W43	4314	8	1		0254	1.34	2.13	122
WENDEL	23	0941	0949 D	N20	E06	4321	8 D	1		0342	1.84	2.65	107
ONDREJOV	23	1201 E	1220	N18	E42	4325	6 D	1		0955		3.00	
USNRL	23	1344	1355	N24	W19	4317	19 D	1					2.40
USNRL	23	1355	1426	S29	E08	4319	11	1		1208			2.30
CAPRI S	23	1356 E	1407	N27	E08	4321	31	26		1347	1.02	1.13	124
USNRL	23	1411	1625	S26	E48	4329	14	2		1357	4.53	5.18	131
USNRL	23	1416	1433	N20	E02	4321	17	1		1358	4.30	4.70	
CAPRI S	23	1436	1507	N16	W46	4314	31	16		1424	3.29	5.30	76
USNRL	23	1437	1523	N19	W45	4314	46	16		1418	.74	.80	101
HUANCAYO	23	1530 E	1710 D	S30	E49	4329	100 D	16		1451	2.10	3.10	
HUANCAYO	23	1618	1737 D	S13	W59	4313	79 D	16		1440	2.38	3.71	114
USNRL	23	1633	1806	S13	W59	4313	93	1					
USNRL	23	1836 E	1916	N22	E22	4328	40	1		1640	1.48	2.80	78
HUANCAYO	23	2053 E	2100 D	N20	W80	4312	7 D	16		1836	.45	.53	109
USNRL	23	2054	2101 D	N22	W82	4312	7 D	2		2054	1.02	7.21	56
MITAKA	23	2358 E	2405	S19	E36	4323	7 D	1		2358	1.84	2.39	110
MITAKA	24	0003 E	0005	N30	E30	4328	2 D	1					
MITAKA	24	0221 E	0234	N21	E03	4321	13 D	1		0003	1.84	2.61	105
MITAKA	24	0411 E	0427	N21	E02	4321	16 D	16		0228	4.62	5.00	128
MITAKA	24	0441	0502	N17	W53	4314	21	16		0412	3.68	4.00	183
UCCLE	24	1009	1015	N17	E28	4325	6	1		0449	3.68	6.01	140
													PAGE 6

SOLAR FLARES

DECEMBER 1957

OBSERVATORY	DATE	OBSERVED UNIVERSAL TIME		LOCATION		DURATION — MINUTES	EM- POR- TANCE	OBS. COND.	MEASUREMENTS				PROVISIONAL IONOSPHERIC EFFECT		
		START	END	MAX. PHASE	APPROX. LAT. MER. DIST.				MC-MATH PLACE REGION	TIME — UT	MEAS. AREA Sq. Deg.	CORR. AREA Sq. Deg.		MAX. WIDTH H _g	MAX. INT. %
UCCLE HUANCAYO	24	1100 E	1119		S09 W58	4315	19	3						S-SWF	
	24	1530 E	1715 D	1543	S05 W54	4315	105 D	2							
	25	0048 E	0108	0055	S22 W13	4319	20 D	2	0048	5.67	6.12	1.52	128		
	25	0114 E	0145	0131	S08 W59	4315	31 D	2	0125	3.80	6.76	3.13	152		
	25	0138	0148		S25 W04	4322	10	2	0139	2.78	3.00	1.92	96		
	25	0158	0250 D	0203	S16 E01	4322	52 D	2	1	0202	11.50	11.80	2.03	192	
	25	0435 E	0437 D		S07 W59	4315	2 D	1	0435	2.43	4.69	1.50			
	25	0459 E	0533		N17 W59	4314	34 D	1	2	0506	1.22	2.53	1.80		
	25	0500 E	0536		N17 W62	4314	36 D	2	1	0510	4.94	9.30	2.93	204	
	25	0634 E	0705		S26 W12	4319	31 D	16	1					Slow S-SWF	
25	0903 E	0920		N18 W63	4314	17 D	1	1	0913	2.80	3.20	2.50			
25	0906 E	0930 D	0915	N19 W65	4314	24 D	1	3	0916	2.00	5.00				
25	0910 E	0929		N15 W68	4314	19 D	16	2							
CAPRI S	25	0946	0955 D	0950	N20 W70	4314	9 D	1	2						
UCCLE	25	0949	0954	0950	S05 W65	4315	5	1	2						
UCCLE	25	1009	1045	1023	N19 W65	4314	36	16	3	1023	7.00				
CAPRI S	25	1023 E	1036 D	1034	N15 W68	4314	13 D	1	3	1025	3.00				
UCCLE	25	1029	1039		S07 W64	4315	10	1	3	1034	1.50	2.10			
UCCLE	25	1048	1107		N23 W16	4321	19	1	3	1100	2.00	2.10			
UCCLE	25	1100	1107		S05 W65	4315	7	1	3	1103	1.70	2.20			
UCCLE	25	1142	1151		N28 W08	4321	9	1	3	1145	2.00	2.10			
UCCLE	25	1155	1204 D	1158	N30 E07	4328	9 D	1	3	1158	2.00	2.00			
AROSA	25	1156	1200 D		N29 E07	4328	4 D	1	3					111	
USNRL	25	1250	1316	1253	N18 W66	4314	3	1	2	1253	2.95	3.26			
AROSA	25	1251	1254		S05 E59	4332	7 D	1							
WENDEL	25	1251 E	1258		S08 W66	4315	4	1	2	1253	.85	3.00			93
USNRL	25	1252	1256		N23 W18	4321	6	1							
AROSA	25	1252	1304		N31 E10	4328	13 D	1							
AROSA	25	1251 E	1305		N30 E07	4328	13	1							
WENDEL	25	1315	1335		N27 W06	4321	20	16							
WENDEL	25	1327	1345 D		S28 E27	4327	18 D	1							
WENDEL	25	1404	1418 D		N17 E62	4331	14 D	16							
USNRL	25	1408 E	1456		N15 W67	4314	48 D	1	1	1416	1.36	3.61			
USNRL	25	1435	1450		S04 W70	4315	15	1	1	1440	1.19	3.39			
CAPRI S	25	1436 E	1442 D		S06 W73	4315	6 D	1	3	1440	2.00	5.20			
SAC PEAK	25	1605	1630	1607	N30 E06	4328	25	1	2	2.80				S-SWF	
SAC PEAK	25	1812	1900	1822	S07 W70	4315	48	16		4.70					
SAC PEAK	25	2041	2100	2051	N22 W03	4328	19	1	2	2051	2.20				
CLIMAX	25	2122	2137	2125	S18 E20	4323	15	1		2125	2.20				20
WENDEL ZURICH ATHENS ONDREJOV UCCLE UCCLE UCCLE UCCLE UCCLE MEUDON	26	0912	0944		S07 W78	4315	32	16	2					S-SWF	
	26	0914 E	0942		S05 W76	4315	28 D	1	3	0914	.60	7.00			
	26	0915	0950		S06 W77	4315	35	1							
	26	0920 E	0935		S07 W78	4315	15 D	16	3	0920	2.40	2.40			
	26	1011	1014	1012	N28 W20	4321	3	1	3						
	26	1031	1039		N17 E75	4337	8	1	2	1012	2.70	4.00			
	26	1043	1055	1046	N19 W75	4316	12	16	2	1035	2.00	2.00			
	26	1055	1105	1056	S25 W49	4319	10	1	2	1046	2.00	3.00			
	26	1119	1130	1123	N26 W10	4321	11	1	2	1056	2.00	3.00			
	26	1137	1146	1139	N17 W80	4314	9	1	3	1123	3.00	3.00			
26	1213	1246	1218	N25 W27	4321	33	1	3	1139		6.00				
												PAGE	7		

SOLAR FLARES

DECEMBER 1957

OBSERVATORY	DATE Dec. 1957	OBSERVED UNIVERSAL TIME		LOCATION		DURA- TION — MINUTES	IM- POR- TANCE	ORB. COND.	MEASUREMENTS			PROVISIONAL LONGPERIODIC EFFECT			
		START	END	LAT.	APPROX. MER. DIST.				MATH- PHASE REGION	TIME — U T	MEAS. AREA Sq. Deg.		CORR. AREA Sq. Deg.	MAX. WIDTH H ₀	MAX. INT. %
{ WEUDON WENDEL WEUDON WENDEL ONDREJOV CLIMAX CLIMAX SAC PEAK	26	1219	1250 D	N17 E75	4337	31 D	1	3					Slow S-SWF		
	26	1221 E	1240	N18 E72	4337	19 D	1								
	26	1258	1400	N13 W80	4314	62	16	3							
	26	1300 E	1328	N19 W82	4314	28 D	16								
	26	1324	1340	N17 W85	4314	26 D	16				5.90				
	26	1606	1616	N25 W35	4321	10	1				2.60				
	26	1751	1845	S27 W29	4319	54	2				5.20				
	26	1811 E	1850 D	S27 W28	4319	39 D	16	2							
	27	0204 E	0209 D	N25 W38	4321	5 D	16	1			5.67	7.77		3.07	120
	27	0818	0834	S26 W33	4319	16	16	3			0822	2.90			
{ ONDREJOV SIMEIZ ATHENS CABERRA AROSA HYDERABAD ONDREJOV WENDEL SCHAUINS SIMEIZ WENDEL ONDREJOV SIMEIZ WENDEL ONDREJOV AROSA ONDREJOV WENDEL SCHAUINS USNRL	27	0819	0909 D	S27 W35	4319	50 D	16	3			0822	2.60			
	27	0822	0853	S26 W33	4319	31	1	3			0822	3.40			
	27	0822	0853	S26 W33	4319	31	1								
	27	0846 E	0902	S25 W34	4319	16 D	1								
	27	0913 E	0926	N27 W59	4317	13 D	1	2			2.12	4.88	2.00		
	27	0914 E	0926	N29 W19	4324	12 D	16	3			0918	2.60			
	27	0916 E	0933	N28 W21	4324	17 D	16				7.00				
	27	0916 E	0938	N23 W18	4324	22 D	16								
	27	0919 E	0940 D	N29 W21	4324	21 D	16	3			0920	5.60	1.80		
	27	0916 E	0952	S18 W06	4323	36 D	2				10.00				
{ ONDREJOV SIMEIZ WENDEL ONDREJOV SIMEIZ WENDEL ONDREJOV AROSA ONDREJOV WENDEL SCHAUINS USNRL ONDREJOV ONDREJOV ONDREJOV WENDEL SCHAUINS AROSA SAC PEAK CLIMAX	27	0917	0938	S19 W05	4323	21	2	3			0918	3.50			
	27	0922	1005 D	S19 W05	4323	43 D	16	3			0925	4.30	2.40		
	27	0918	1000 D	S29 W07	4323	42 D	1	3			0925	4.00	2.40		
	27	0920	0930	S32 W04	4323	10	1	3			0925	4.10	2.40		
	27	1115	1129 D	N21 W52	4317	14 D	1	3			0933	4.10	1.60		
	27	1116	1152	N22 W50	4317	36	2	3			1122	3.00			
	27	1117 E	1135	N22 W50	4317	18 D	16								
	27	1117 E	1214	N19 W54	4317	57 D	1				7.00	4.00			
	27	1138 E	1201	N21 W55	4317	23 D	1				4.00				
	27	1303	1333	N25 W36	4321	30	1	2			1309	2.54	1.00	82	
{ ONDREJOV ONDREJOV ONDREJOV WENDEL SCHAUINS USNRL AROSA SAC PEAK CLIMAX USNRL USNRL MT WILSON USNRL SAC PEAK MT WILSON	27	1309 E	1316	N25 W37	4321	7 D	1	3			1310	2.00			
	27	1316 E	1321	N27 W43	4321	5 D	1	3			1317	2.00			
	27	1322	1341	N27 W43	4321	19	16	3			1323	2.60			
	27	1315	1336 D	S23 W42	4319	21 D	1					3.00			
	27	1320 E	1334	S22 W51	4319	14 D	1								
	27	1355	1443	N25 W18	4324	48	16	2			1359	2.54	109		
	27	1357	1415	N25 W14	4324	18	1								
	27	1607	1625	S23 W44	4319	18	1	3				3.00	18		
	27	1612	1620	S24 W43	4319	8	1					2.60			
	27	1613	1628	S13 W44	4322	15	16	2			1613	2.41	112		
{ USNRL MT WILSON USNRL USNRL SAC PEAK MT WILSON	27	1629	1752	S13 W44	4322	83	16	2			1614	1.58	96		
	27	2040	2040 D	N20 W40	4321	9	1				1638	3.12			
	27	2042	2050 D	N22 W38	4321	8 D	1	2			2042	1.36	105		
	27	2132	2147	S20 W13	4323	15	1	3				2.80	17		
	27	2136 E		S19 W14	4323		1								
	28	1556	1622	S25 E24	4335	26	1	2							
{ HUANCAYO USNRL MT WILSON AROSA	28	1602 E	1623 D	S23 E20	4335	21 D	1	2			1606	2.33	1.00	93	
	28	2229	2331	N25 W50	4321	62	2								
	29	0836 E	0840	S19 W35	4323	4 D	1						PAGE	8	

SOLAR FLARES

DECEMBER 1957

OBSERVATORY	DATE Dec. 1957	OBSERVED UNIVERSAL TIME		LOCATION			DURA- TION — MINUTES	IN- POR- TANCE	OBS. COND.	MEASUREMENTS				PROVISIONAL IONOSPHERIC EFFECT
		START	END	APPROX. LAT.	MER. DIST.	MC-MATH FLARE REGION				TIME — UT	MEAS. AREA Sq. Deg.	CORR. AREA Sq. Deg.	MAX. WIDTH H _g	
USNRL HUANCAYO	29	1430	1516	S07 W17		4326	46	1	2	1440	2.10	2.15		80
	29	1615	1622	N21 W61		4321	7	1	2					
{HAWAII MITAKA	30	0102	0117 D	N24 W60		4321	15 D	2	1	0106	5.40	12.30		
	30	0119 E	0126	N21 W67		4321	7 D	1	2	0122	1.34	3.35	3.26	96
WENDEL AROSA	30	1119	1137	N20 W48		4325	18	16				6.00		
	30	1150	1155	N26 W79		4321	5	1						
{USNRL HUANCAYO	30	1602	1705	S20 W50		4323	63	26	3	1609	3.61	6.15	2.00	134
	30	1604	1702 D	S20 W51		4323	58 D	2	2					
SAC PEAK USNRL	30	1605	1700	S20 W51		4323	55	16	2	1708	3.60	1.61		24
	30	1707	1736	S20 W50		4323	29	1	2		96			97
{HUANCAYO USNRL	30	1708 E	1724	S20 W50		4323	16 D	1	2					
	30	2016	2042	N21 E52		4338	26	1	1	2018	1.02	1.92		
{MITAKA HAWAII	31	0002	0051	S22 W12		4333	49	16	2	0002	9.47	10.00	1.79	149
	31	0017 E	0020 D	S23 W15		4333	3 D	16	2	0020	5.20	5.60		
MITAKA CLIMAX	31	0056	0106	N19 E50		4338	10	1	2	0056	1.84	3.35	1.44	131
	31	2128	2217	S18 E46		4340	49	1	2	2135	2.40			
{AROSA R O EDIN	31	1113	1128 D	S24 W16		4333	15 D	1						
	31	1122 E	1200	S22 W20		4333	38 D	1	1	1125	4.00	4.50	1.72	
{CAPRI S AROSA	31	1156 E	1215	S07 W14		4332	19 D	1	3	1200	2.00			
	31	1218 E	1232	S07 W15		4332	14 D	1						
AROSA AROSA	31	1346	1408	S20 W67		4323	22	1						
	31	1408	1435 D	S24 W17		4333	27 D	1						
{USNRL SAC PEAK	31	1411	1517	S24 W18		4333	68	1	1	1430	4.07	4.65		23
	31	1535	1610	S24 W19		4333	35	1	2	2.70				105
{USNRL CLIMAX	31	1538	1625	S24 W18		4333	47	16	2	1542	2.15	2.42	1.00	
	31	2059	2156	S25 W21		4333	57	1		2122	4.60			
													PAGE	9

COMMERCE — STANDARDS — BOULDER

* RATED AS IMPORTANCE 1- BY OTHER OBSERVATORIES

ANACAPRI SWEDISH
KODAIKANAL
KRASNAYA PAKHRA
ROYAL OBSERVATORY, EDINBURGH
GREENWICH ROYAL OBSERVATORY, HERSTMONCEUX
SACRAMENTO PEAK
SCHAUINSLAND
UNITED STATES NAVAL RESEARCH LABORATORY

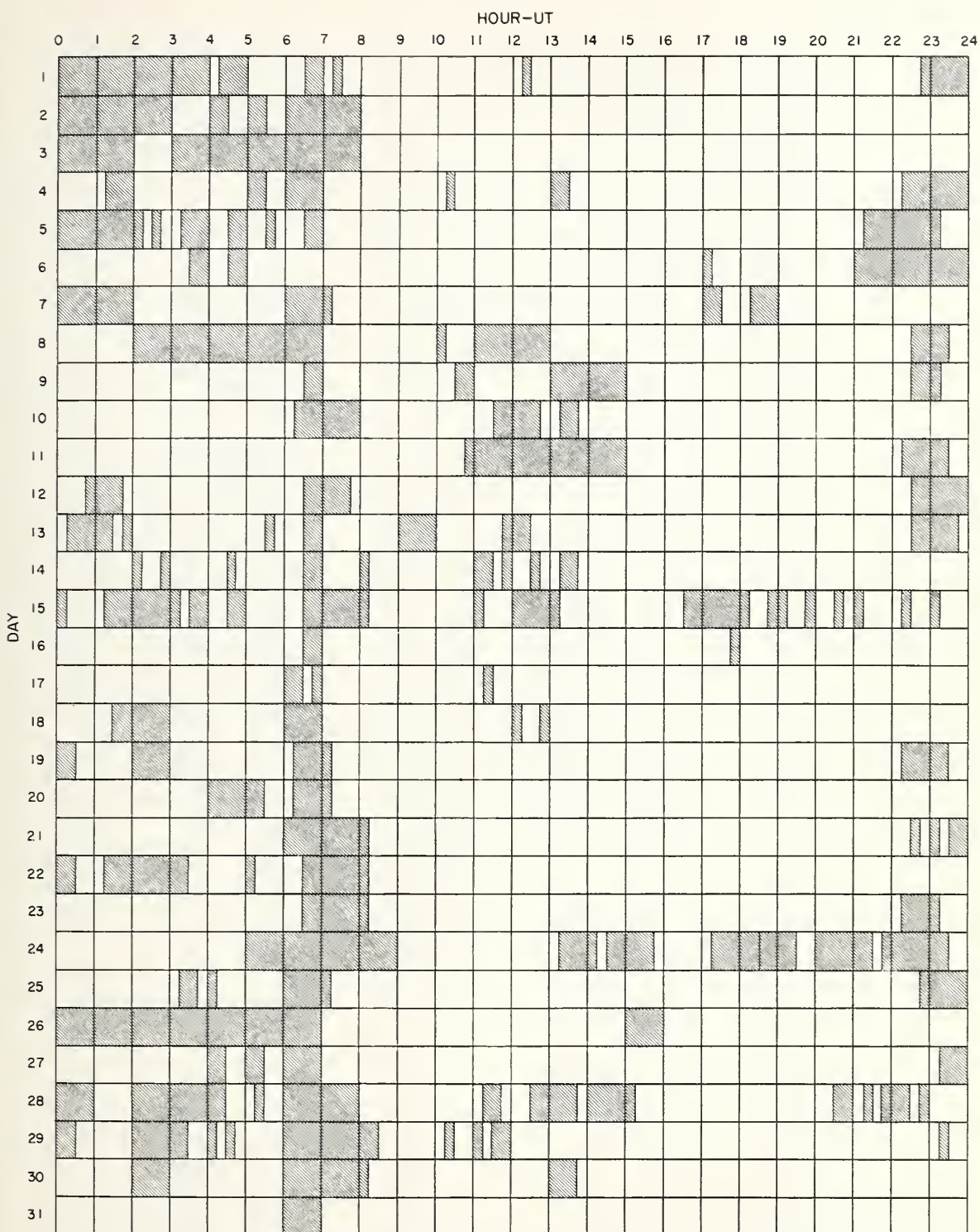
CAPRI S
KODAIKANAL
KRASNAYA
R O EDIN
R O HERST
SAC PEAK
SCHAUINS
USNRL

SAC PEAK: ALL VALUES IN MAX. INT. COLUMN ARE ARBITRARY UNITS (0-40),
NOT PERCENT OF CONTINUOUS SPECTRUM.

E — LESS THAN
D — GREATER THAN
U — APPROXIMATE
+ — PLUS
- — MINUS

INTERVALS OF NO FLARE PATROL OBSERVATIONS

DECEMBER 1957



Stations included:

Anacapri (Swedish)

Arcetri

Arosa

Athens

Climax

Dunsink

Greenwich Royal Observatory,

Herstmonceux

Hawaii

Huancayo

Kodaikanal

Meudon

Mitaka

Nizamia

Ondrejov

Ottawa

Royal Observatory, Edinburgh

Sacramento Peak

Simeis

Uccle

U.S. Naval Research Laboratory

Zurich

COMMERCE - STANDARDS - BOULDER

SUBFLARES NOTED AS FOLLOWS, DATE - UNIVERSAL TIME - COORDINATES

.NOVEMBER 1957

WENOEL	01	0917	E	S18	E38	USNRL	11	1602	S20	E41	
WENOEL	01	0932	E	S26	W01	CLIMAX	11	1813	S21	E20	
WENOEL	01	1052	E	S19	E57	CLIMAX	11	2004	N22	E20	
OTTAWA	01	1329	S24	W00	HAWAII	11	2004	N19	E21		
OTTAWA	01	1403	S15	E57	HAWAII	11	2108	N17	W02		
SAC PEAK	01	1617	S15	W45							
*SAC PEAK	01	1657	S18	E57	CAPRI S	12	1042	E	S10	W10	
*OTTAWA	01	1659	S14	E56	HUANCAYO	12	1542	E	S19	E19	
SAC PEAK	01	1807	N23	W70	USNRL	12	1558		S20	E09	
SAC PEAK	01	2032	S18	E55	USNRL	12	1715		S21	E09	
SAC PEAK	01	2110	S14	W45	*SAC PEAK	12	1915		S17	W90	
SAC PEAK	01	2130	S18	E52	HAWAII	12	2022		N23	W15	
SAC PEAK	01	2145	S14	W45	SAC PEAK	12	2035		S18	W85	
					HAWAII	12	2254		S22	W03	
*CAPRI S	02	1534	E	S17	W21						
						HYDERABAO	13	0323	S15	W80	
WENOEL	03	1023	E	N23	W37	ATHENS	13	0627	N18	W17	
WENOEL	03	1035	E	S15	W33	ATHENS	13	0629	N16	W14	
WENOEL	03	1107	E	S15	W34	OTTAWA	13	1337	S22	W02	
WENOEL	03	1130	E	S19	W33	USNRL	13	1338	S22	W04	
WENOEL	03	1149	E	S27	W33	*CAPRI S	13	1510	S17	W09	
SAC PEAK	03	1820	S15	W42	SAC PEAK	13	1855	S22	W05		
					*SAC PEAK	13	1952	S26	E15		
					*USNRL	13	1953	S25	E16		
WENOEL	04	0937	E	N27	E53						
WENOEL	04	1020	E	S23	W40	WENOEL	14	0804	E	S17	W10
*CLIMAX	04	1732	S25	W44	CAPRI S	14	0808	E	S19	W12	
*SAC PEAK	04	1745	E	S25	W45	WENOEL	14	0939	E	S14	W19
*CLIMAX	04	1946	N23	W57	WENOEL	14	1040	E	S20	W14	
CLIMAX	04	2133	N23	W57	WENOEL	14	1343	E	S07	E54	
UCCLE	05	1121	S15	E08	USNRL	15	1322	N08	W18		
USNRL	05	1231	S34	E80	USNRL	15	1332	S09	E45		
CLIMAX	05	2054	N24	W64	USNRL	15	1350	N30	E60		
HAWAII	05	2220	S20	W01	USNRL	15	1354	S18	W33		
					USNRL	15	1357	N06	W21		
UCCLE	06	1125	S15	W02	USNRL	15	1408	N14	W45		
OTTAWA	06	1354	N19	E35	SAC PEAK	15	1422	E	S17	W33	
USNRL	06	1527	S18	W09	USNRL	15	1507	S11	E37		
SAC PEAK	06	1547	N17	E35	USNRL	15	1538	N08	W26		
*SAC PEAK	06	1550	S26	W70	*SAC PEAK	15	1550	N07	W60		
OTTAWA	06	1554	N19	E34	USNRL	15	1610	N06	W20		
*SAC PEAK	06	1757	S25	W80	SAC PEAK	15	1745	N15	E28		
SAC PEAK	06	1820	S25	W80	SAC PEAK	15	1905	S18	W37		
CLIMAX	06	1841	N19	E66	USNRL	15	1926	S17	W36		
HAWAII	06	2018	S19	W80	USNRL	15	1926	N08	W28		
USNRL	06	2021	N18	E32	SAC PEAK	15	1927	E	N08	W27	
SAC PEAK	06	2022	N16	E32	USNRL	15	1946	S07	E37		
HAWAII	06	2024	N12	E33	USNRL	15	2038	N08	W28		
USNRL	06	2057	S30	E45							
SAC PEAK	06	2155	N17	E63							
					ATHENS	16	0730	E	N07	W32	
UCCLE	07	1124	N30	W03	WENOEL	16	0932	E	S04	E22	
USNRL	07	1548	N19	E52							
USNRL	07	1548	S34	E31	*ATHENS	17	0832	N28	E22		
USNRL	07	1559	S31	E30	*CAPRI S	17	0834	N29	E27		
SAC PEAK	07	1605	U	S34	E29	WENOEL	17	0943	E	S18	W66
USNRL	07	1617	E	S24	E90	*CAPRI S	17	1143	E	N29	E26
USNRL	07	1706	S25	E90	*CAPRI S	17	1240	E	N15	E02	
USNRL	07	1915	N36	W08	USNRL	17	1256	E	N15	E06	
SAC PEAK	07	1940	S25	E90	CAPRI S	17	1422	E	N29	E24	
USNRL	07	1942	S24	E90	USNRL	17	1436	N35	E32		
USNRL	07	1942	S19	W18	USNRL	17	1443	N12	E03		
USNRL	07	2044	S24	E90	USNRL	17	1455	N31	E30		
					USNRL	17	1547	N30	E30		
*CAPRI S	08	1013	E	S22	E73						
HUANCAYO	08	1632	E	S27	E16	ATHENS	18	0718	E	N28	E24
SAC PEAK	08	1810	N37	W17	*WENOEL	18	0855	E	N27	E24	
SAC PEAK	08	1955	N17	E37	UCCLE	18	0937	N16	E40		
CLIMAX	08	1959	N18	E38	UCCLE	18	1007	S27	E55		
*CLIMAX	08	2002	S26	E90	UCCLE	18	1040	N08	W60		
					WENOEL	18	1040	E	N08	W63	
WENOEL	09	1233	E	S32	E06	UCCLE	18	1045	S16	E75	
USNRL	09	1233	S34	E06	HUANCAYO	18	1535	E	N20	W77	
WENOEL	09	1242	E	N28	W29	SAC PEAK	18	1810	S16	W61	
*SAC PEAK	09	1510	S16	E65	SAC PEAK	18	1827	S22	W52		
*USNRL	09	1511	S15	E66	SAC PEAK	18	1830	N07	W67		
SAC PEAK	09	1537	N37	W28	SAC PEAK	18	2100	N15	E31		
USNRL	09	1539	N31	W27							
SAC PEAK	09	1605	N16	W88	SAC PEAK	19	1825	S16	E54		
SAC PEAK	09	1625	N06	E63	SAC PEAK	19	1840	S28	E90		
SAC PEAK	09	1630	S15	W50							
SAC PEAK	09	1735	N21	E37	WENOEL	20	1201	E	N19	E09	
SAC PEAK	09	1750	N20	E36	WENOEL	20	1255	E	N14	W42	
CLIMAX	09	1820	N24	E32	USNRL	20	1343	E	N12	E06	
SAC PEAK	09	1820	N22	E32	USNRL	20	1409	N13	W39		
SAC PEAK	09	1827	N20	E36	USNRL	20	1437	N15	E03		
CLIMAX	09	1844	S19	W47	OTTAWA	20	1443	N14	W41		
SAC PEAK	09	1845	S20	W48	USNRL	20	1446	N15	W42		
CLIMAX	09	2205	N21	E34	*SAC PEAK	20	1450	N14	W36		
SAC PEAK	09	2205	N20	E33	*USNRL	20	1451	N15	W38		
					SAC PEAK	20	1502	S09	W31		
WENOEL	10	1005	E	N06	E53	*USNRL	20	1503	N23	W09	
*CAPRI S	10	1010	E	S19	E35	USNRL	20	1503	S08	W33	
WENOEL	10	1153	E	N05	E52	OTTAWA	20	1504	S13	E43	
USNRL	10	1345	S20	E33	OTTAWA	20	1504	S09	W33		
OTTAWA	10	1448	S18	E34	USNRL	20	1505	S14	E42		
USNRL	10	1451	S20	E32	USNRL	20	1514	N14	W37		
SAC PEAK	10	1607	S20	W55	USNRL	20	1540	N18	E07		
SAC PEAK	10	1627	N07	E45	OTTAWA	20	1542	E	N18	E09	
SAC PEAK	10	1805	N20	E36	SAC PEAK	20	1615	N15	W43		
SAC PEAK	10	1807	S22	E32	USNRL	20	1618	N15	W42		
SAC PEAK	10	1837	E	N21	E35	USNRL	20	1704	N27	W10	
CLIMAX	10	1855	N21	E33	*SAC PEAK	20	1740	S16	E78		
CLIMAX	10	2020	N20	E34	SAC PEAK	20	1820	N17	E02		
SAC PEAK	10	2059	E	S22	E32	HAWAII	20	1820	N16	E03	
					SAC PEAK	20	1857	N18	E01		
USNRL	11	1520	S24	E35	USNRL	20	1900	N19	E02		

SUBFLARES NOTED AS FOLLOWS, DATE - UNIVERSAL TIME - COORDINATES

NOVEMBER 1957

USNRL	20	1954	N18 E08	*SAC PEAK	26	1700	S17 W39
SAC PEAK	20	2107	N08 E40	*USNRL	26	1702	S18 W40
				CLIMAX	26	1803	S17 00
WENOEL	21	0950 E	N20 W03	CLIMAX	26	2020	S17 00
WENOEL	21	1158 E	N16 W08	USNRL	26	2030	S18 W01
USNRL	21	1245	N20 W09	USNRL	26	2043	S15 W01
WENOEL	21	1323 E	N13 W52	SAC PEAK	26	2100	S10 W48
USNRL	21	1340	N11 W90	USNRL	26	2102	S09 W48
USNRL	21	1403	N16 W09	SAC PEAK	26	2130	S10 W48
SAC PEAK	21	1456	S14 E51	SAC PEAK	26	2202	S13 W43
USNRL	21	1548	N26 W36				
SAC PEAK	21	1609	N18 W06	WENDEL	27	1153 E	S10 W57
SAC PEAK	21	1611	S18 E52	WENOEL	27	1207 E	S21 E33
USNRL	21	1612	N18 W08	WENOEL	27	1253 E	S25 E68
SAC PEAK	21	1629	S11 E23	WENDEL	27	1351 E	S17 E72
USNRL	21	1631 E	S10 E23	USNRL	27	1359	S18 E72
SAC PEAK	21	1654	S19 E73	HUANCAYO	27	1532 E	S17 E69
USNRL	21	1658	S15 E70	SAC PEAK	27	1617	S18 E73
SAC PEAK	21	1721	N27 W23	HUANCAYO	27	1620	S17 E69
USNRL	21	1727	N27 W25	SAC PEAK	27	1630	S13 W25
SAC PEAK	21	1802	N19 W11	HUANCAYO	27	1632	S17 E69
USNRL	21	1802	N20 W12	*SAC PEAK	27	1700	S15 W16
SAC PEAK	21	1850	S16 E52	SAC PEAK	27	1717	S06 E75
SAC PEAK	21	1912	S12 E21	SAC PEAK	27	1725	S18 E73
USNRL	21	1915	S10 E20	SAC PEAK	27	1745	S15 W12
USNRL	21	1931	N26 E21	USNRL	27	1752 E	S12 W26
SAC PEAK	21	2155	S11 E10	USNRL	27	1752 E	S15 W11
				CLIMAX	27	1757	S20 E90
WENOEL	22	0953 E	S10 E13	SAC PEAK	27	1757	S20 E90
WENDEL	22	1039 E	S08 E11	USNRL	27	1800 E	S20 E90
WENOEL	22	1308 E	N10 E17	SAC PEAK	27	1825	S07 E75
*OTTAWA	22	1356 E	N12 E17	SAC PEAK	27	1842	S17 W54
				*USNRL	27	1918	S29 E10
UCCLE	23	0844 E	N28 W58	SAC PEAK	27	2007	S06 W75
UCCLE	23	0907 E	N21 W34	*SAC PEAK	27	2030	S14 W18
UCCLE	23	1027	N14 W85	SAC PEAK	27	2050	S20 E85
UCCLE	23	1033	N21 W34	SAC PEAK	27	2140	S06 E74
*WENOEL	23	1120 E	S14 E27				
WENDEL	23	1207 E	S10 W02	ATHENS	28	0814 E	N06 E61
WENOEL	23	1210 E	S11 W30	WENDEL	28	1357 E	S17 E16
WENOEL	23	1327 E	N24 W58	SAC PEAK	28	1510	S18 E15
WENOEL	23	1332 E	N19 W34	SAC PEAK	28	1640	S15 E64
WENOEL	23	1344 E	S10 E40	HUANCAYO	28	1641 E	S11 E61
SAC PEAK	23	1500 E	S10 E38	SAC PEAK	28	1647	S10 W40
*SAC PEAK	23	1610	S11 E38	SAC PEAK	28	1812	S21 E16
SAC PEAK	23	1650	S27 E63	SAC PEAK	28	1955	S23 E70
SAC PEAK	23	1720	N16 W41	HUANCAYO	28	1958	S21 E68
SAC PEAK	23	1730	S30 E64	*SAC PEAK	28	2035	S23 E68
SAC PEAK	23	1815	S11 E37	HAWAII	28	2112	S10 W28
SAC PEAK	23	1835	S27 E62	SAC PEAK	28	2120	S14 W27
SAC PEAK	23	2055	S16 E35	SAC PEAK	28	2135	S23 E68
SAC PEAK	23	2125	S13 E38				
SAC PEAK	23	2200	S30 E62	USNRL	29	1423	S13 E52
				USNRL	29	1455 E	S27 W14
WENOEL	24	1035 E	N20 W48	*SAC PEAK	29	1535	S15 E52
UCCLE	24	1038 E	S13 E37	*USNRL	29	1544	S13 E52
UCCLE	24	1039	S15 E31	USNRL	29	1635	S18 E01
*WENOEL	24	1135 E	S13 E22	*USNRL	29	1635	S17 W08
UCCLE	24	1139	N25 W50	*SAC PEAK	29	1635	S19 W09
UCCLE	24	1156	N27 W50	*SAC PEAK	29	1715	S14 E48
USNRL	24	1403	N15 W53	*USNRL	29	1738 E	S12 E49
SAC PEAK	24	1455	S15 E24	USNRL	29	2007	S12 E55
SAC PEAK	24	1455	S14 W13	CLIMAX	29	2042 E	S02 E46
SAC PEAK	24	1522	N34 W64	USNRL	29	2045	S03 E45
SAC PEAK	24	1522	N32 E61				
CLIMAX	24	1745	S26 E49	UCCLE	30	0914	S12 W55
SAC PEAK	24	1745	S26 E47	UCCLE	30	1145	S21 W35
SAC PEAK	24	1817	S12 E12	WENDEL	30	1332 E	S28 E75
SAC PEAK	24	1825	S16 E24	SAC PEAK	30	1627	S17 E37
SAC PEAK	24	2152	S26 E47	HUANCAYO	30	1628	S15 E37
				SAC PEAK	30	1822	N16 E02
ATHENS	25	0801	N13 W56	*CLIMAX	30	2115	S18 W11
SAC PEAK	25	1442	S14 W26	SAC PEAK	30	2157	S19 W17
SAC PEAK	25	1512	S16 E16				
*SAC PEAK	25	1547	S15 W01				
*SAC PEAK	25	1552	N15 W67				
SAC PEAK	25	1722	S16 W25				
SAC PEAK	25	1855	S16 E12				
SAC PEAK	25	1857	S20 E90				
SAC PEAK	25	1930	S15 E15				
CLIMAX	25	1931	S15 E15				
HAWAII	25	1932	S18 E12				
HUANCAYO	25	1932	S16 E15				
SAC PEAK	25	2012	S15 E15				
HUANCAYO	25	2013 E	S16 E15				
HAWAII	25	2014	S18 E12				
SAC PEAK	25	2120	S15 E13				
CLIMAX	25	2156	S16 E12				
SAC PEAK	25	2207	S15 E13				
HAWAII	25	2212	S18 E12				
*CAPRI S	26	0915 E	S32 E28				
WENOEL	26	0924 E	S18 E05				
WENDEL	26	1128 E	S16 W36				
WENOEL	26	1147 E	S13 W16				
ARCETRI	26	1241 E	N18 W01				
*WENOEL	26	1345 E	N23 W26				
SAC PEAK	26	1439 E	S20 E90				
*SAC PEAK	26	1445	S15 W13				
SAC PEAK	26	1505	S14 W20				
SAC PEAK	26	1525	S15 E03				
SAC PEAK	26	1525	S30 E26				
*OTTAWA	26	1527	S13 E04				
*OTTAWA	26	1528	S27 E26				
CLIMAX	26	1624	S17 W01				
SAC PEAK	26	1630	S16 E37				
*CLIMAX	26	1658	S16 W41				

* Rated as flare of importance ≥ 1 by other observatories (See CRPL-F 160 Part B).

SOLAR FLARES

NOVEMBER 1957

OBSERVATORY	DATE Nov. 1957	OBSERVED UNIVERSAL TIME		LOCATION			DURA- TION — MINUTES	DM. POR- TANCE	OBS. COND.	MEASUREMENTS				PROVISIONAL IONOSPHERIC EFFECT	
		START	END	APPROX. LAT.	MER. DIST.	MC-MATH PLAGE REGION				TIME — U T	MEAS. AREA Sq. Deg.	CORR. AREA Sq. Deg.	MAX. WIDTH H _a		MAX. INT. %
TASHKENT (UTRECHT)	02	0907	0954				47	2							
	02	0932 E	0941 D	S20 W16 S15 W25		4207 4207	9 D	26							
ABASTUMANI	06	0838 E				4207		2							S-SWF
MT WILSON	08	2001	2009	S23 E79		4237	8	1							S-SWF
MT WILSON	09	1755	1800	N20 E32		4230	5	1							
TASHKENT	10	0607	0624	S25 E61		4237	17	2							
TASHKENT	10	0657 E	0723	S25 E69		4237	26 D	2							
MT WILSON	10	1941	2148	S21 E30		4236	127	1							
TASHKENT	11	0400 E	0500	S21 E25		4236	60 D	16							
{ALMA ATA TASHKENT	11	0625	0649	S24 E52		4237	24	26							Slow S-SWF
	11	0633 E	0640	S24 E45		4237	7 D	16							
SYDNEY	15	0525 E	0600	N22 W35		4230	35 D	2							
SIMEIZ	16	0723	0755	N08 W34		4233	32	16							
SIMEIZ	16	0807	0820	N08 W34		4233	13	16							
MT WILSON	20	1737		S10 E70		4257		1							
SYDNEY	22	0405	0447	N25 W25		4246	42	2							S-SWF
MOSCOW	23	0752	0912	N25 W55		4246	80	3							S-SWF
SIMEIZ	24	0917		S13 E36		4263		2							
TASHKENT	24	1005 E	1020	S13 E53		4267	15 D	2							
MT WILSON	24	1818		S12 E13		4257		1							
MT WILSON	24	2025	2106	N18 W52		4246	41	1							
MT WILSON	26	2251	2305	S20 W05		4257	14	1							
MT WILSON	27	1805	1808	S27 W20		4264	3	1							
MT WILSON	27	1900	1959	S26 E05		4265	59	1							
MT WILSON	27	2034	2052	S15 W18		4263	18	1							
MT WILSON	28	1704		S13 E60		4272		1							Slow S-SWF
MT WILSON	28	2123	2142	S15 W28		4263	19	1							
MT WILSON	29	1729	1801	S16 E50		4272	32	1							Slow S-SWF

IONOSPHERIC EFFECTS OF SOLAR FLARES

(SHORT-WAVE RADIO FADEOUTS)

NOVEMBER 1957

Nov. 1957	Start UT	End UT	Type	Wide Spread Index	Importance	Observation Stations	Known Flare, UT CRPL-F 160B
01	0647	0709	S-SWF	1	1	NE	
01	1630	1730	G-SWF	3	1	MC, PR	1700E
02	0914	0940	S-SWF	5	2-	DA, HH, NE, PU, CW***	0907
05	0947	1015	S-SWF	4	1+	HH, NE, PU	
05	1207	1221	S-SWF	5	2+	BE, DA, HH, HU, NE, PR, PU, SW, CW***, RCA*	1205E
06	0833	0902	S-SWF	5	3-	DA, NE, PU, CW***	0835
07	1940	2000	S-SWF	5	2	BE, HU, MC, PR, WS	
08	1014	1030	S-SWF	1	1	NE	1014
08	1830	1915	Slow S-SWF	5	2-	BE, HU, MC, PR, WS	
08	2003	2018	S-SWF	5	1	BE, HU, MC, PR, WS	2001
08	2328	0122	S-SWF	1	3-	AN	
10	0607	0625	S-SWF	5	1	NE, OK	0607
10	0657	0718	S-SWF	5	1	NE, OK, PU, TO, CW+	0653E
11	0623	0648	Slow S-SWF	5	1	CA, NE, TO	0625
11	1417	1440	S-SWF	5	1+	BE, CR, HU, MC, NE, PR	1410
12	1835	1857	G-SWF	4	1	HU, MC, PR, WS	
12	1903	1920	G-SWF	4	1	AD, BE, HU, MC, WS	
13	0458	0513	S-SWF	3	1	CA, OK	
13	0834	0855	S-SWF	3	3?	HH, CW**	0812
14	0112	0212	G-SWF	3	1	PR, TO	
14	1415	1500	G-SWF	3	1	HU, MC, PR	
15	0527	0618	G-SWF	3	1-	AN, OK	0529
15	2338	2400	S-SWF	4	1-	AN, PR	
17	0538	0554	Slow S-SWF	1	1-	OK	0539E
17	1420	1430	S-SWF	1	1	NE	
18	0105	0123	S-SWF	4	1+	AN, TO	
18	0618	0653	Slow S-SWF	5	2	OK, TO, CW+	
20	0040	0138	Slow S-SWF	5	2	AD, CA, OK, TO	
20	1000	1050	S-SWF	1	3	NE	*
21	0210	0230	S-SWF	4	1+	AD, TO	*
21	1443	1525	Slow S-SWF	4	1	BE, MC, PR, WS	1435
21	1835	1938	Slow S-SWF	4	2+	BE, MC, PR, WS	
22	0406	0439	S-SWF	5	3-	CA, OK, TO, CW+	0409E
22	2238	2308	Slow S-SWF	3	1+	AD, AN	*
23	0757	0837	S-SWF	5	2	DA, HH, NE, PU, TO, CW***, CW++	0752
24	0901	0933	S-SWF	5	3-	DA, NE, PU, CW***	0848
24	1107	1123	S-SWF	4	1	DA, NE	
26	0908	0928	Slow S-SWF	5	2	NE, TO	0911
26	1232	1254	S-SWF	5	2	HH, NE, PU	
27	1704	1721	Slow S-SWF	5	1	BE, CR, MC, PR	1704
28	0350	0430	G-SWF	4	1+	AN, TO	
28	0552	0625	S-SWF	1	2-	TO	
28	1418	1445	Slow S-SWF	3	1	HU, PR	1418E
28	1700	1720	Slow S-SWF	3	1	HU, PR	1704
29	1720	1740	Slow S-SWF	3	1	HU, PR	1716E

* No known flare patrol at this time.

COMMERCE - STANDARDS - BOULDER

CA - Canberra, Australia.

CR - Cornell University, N.Y.

DA - Darmstadt, G.F.R.

HH - Heinrich Hertz Institute, Berlin.

NE - Nederhorst den Berg, Netherlands.

PU - Prague, Czech.

TO - Hiraizo Radio Wave Observatory, Japan.

CW** - Cable and Wireless, Somerton, England.

CW*** - Cable and Wireless, Brentwood, England.

CW - Cable and Wireless, Hongkong.

CW - Cable and Wireless, Singapore.

RCA* - RCA Communications, Inc., Riverhead, N.Y.

SOLAR RADIO EMISSION
OUTSTANDING OCCURRENCES
DECEMBER 1957

OTTAWA

2800 MC

Dec. 1957	Type*	Start UT Hrs:Mins	Duration Hrs:Mins	Maximum		Remarks
				Time UT Hrs:Mins	Peak Flux	
1	6 Complex	16 33	17	16 35	90	In sunrise.
	4 Post Increase		1 55		15	
1	3 Simple 3	19 30	1	19 45	12	
1	1 Simple 1	20 43.9	1	20 44.4	7	
3	3 Simple 3 A	13 10	3	13 17	20	
	2 Simple 2	13 41	3.5	13 42.5	46	
	1 Simple 1	13 50	1	13 50.3	7	
	3 Simple 3	15 00	20	15 06.5	20	
4	2 Simple 2	12 35.8	1.2	12 36.3	35	
4	2 Simple 2	15 21.3	1.5	15 21.8	12	
4	8 Group (2)	16 54	35			In sunrise.
	1 Simple 1	16 54	3	16 55.5	6	
	2 Simple 2	16 57.5	1.5	16 58	97	
	4 Post Increase		30		8	
5	2 Simple 2	16 23	1	16 23.5	10	
5	2 Simple 2	16 33	5	16 35	80	
	4 Post Increase		37		10	
5	1 Simple 1	19 35	1	19 35.5	7	
6	1 Simple 1	15 38.6	1	15 39	7	
7	1 Simple 1	15 11.4	1.5	15 12.1	5	
10	2 Simple 2	13 37.3	1.2	13 38	8	In sunrise.
12	6 Complex	17 57	12	18 03.9	94	
	4 Post Increase		27		15	
13	2 Simple 2	16 10.3	0.7	16 10.5	12	
13	2 Simple 2 f	18 23	0.7	18 23.3	22	
14	8 Group (8)	b12 35	>3 24.5			
	- Record incomplete	b12 35	> 45		1000*	
	2 Simple 2	13 46	5.5	13 48	72	
	6 Complex	13 56.5	9	14 01.5	21	
	2 Simple 2	14 08.5	12	14 10.5	31	
	2 Simple 2	14 22	8	14 25.5	9	
	2 Simple 2 f	14 51.5	10	14 53	12	
	1 Simple 1	15 28	3	15 29.5	3	
	2 Simple 2	15 43.5	16	15 48	84	
14	1 Simple 1	16 38	4	16 39	3	

SOLAR RADIO EMISSION
OUTSTANDING OCCURRENCES

OTTAWA

DECEMBER 1957

2800 MC

Dec. 1957	Type*	Start UT Hrs:Mins	Duration Hrs:Mins	Maximum		Remarks
				Time UT Hrs:Mins	Peak Flux	
16	1 Simple 1	16 44.5	3	16 46	6	
16	3 Simple 3 f	16 57.5	10	16 58.5	6	
16	2 Simple 2	17 14.7	1.5	17 15	14	
17	2 Simple 2	13 33.3	4	13 35	9	
17	8 Group (2)	15 30	54			
	2 Simple 2	15 30	9	15 32	72	
	3 Simple 3	15 39	45	15 57	9	
18	6 Complex	16 52	20	17 00.5	18	
18	1 Simple 1	18 07	3	18 08.5	6	
19	8 Group (2)	13 10.7	2.3			
	2 Simple 2	13 10.7	0.5	13 11	20	
	2 Simple 2	13 12	1	13 12.5	20	
19	2 Simple 2 f	17 09.5	5	17 10.9	56	
	4 Post Increase		25		8	
20	2 Simple 2	13 42.9	3	13 43.7	40	
20	2 Simple 2	14 57	1.5	14 57.2	17	
20	2 Simple 2	16 24.5	4	16 26.2	67	
	4 Post Increase A		9		8	
	1 Simple 1	16 30.5	1	16 31	4	
21	2 Simple 2 f	15 46	4	15 47	215	
	4 Post Increase		6		6	
21	2 Simple 2 f	16 14.4	0.8	16 14.7	48	
21	2 Simple 2	16 36.6	0.4	16 36.8	25	
21	1 Simple 1	17 23.5	5	17 25.1	7	
22	2 Simple 2	14 53	2.5	14 53.5	16	
22	3 Simple 3 A	15 55	1	16 12	14	
	8 Group (2)	16 07	23.7			
	2 Simple 2	16 07	4	16 08.3	26	
	6 Complex f	16 20.7	10	16 23	42	
22	3 Simple 3 A	17 10	>3 30	indet.	18	
	8 Group 2	17 16	25			
	2 Simple 2 f	17 16	9	17 18	224	
	2 Simple 2 f	17 32	9	17 35.2	160	
23	3 Simple 3 A	13 43	3	15 00	30	
	8 Group (4)	13 44	1 16			
	2 Simple 2 f	13 44	3	13 44.5	30	
	2 Simple 2 f	13 55.6	7	13 56.4	205	
	6 Complex	14 17	9	14 22.5	17	
	6 Complex f	14 37	23	14 47	155	

SOLAR RADIO EMISSION
OUTSTANDING OCCURRENCES
DECEMBER 1957

OTTAWA

2800 MC

Dec. 1957	Type*	Start UT Hrs:Mins	Duration Hrs:Mins	Maximum		Remarks
				Time UT Hrs:Mins	Peak Flux	
23	2 Simple 2	18 35.2	1.5	18 35.6	20	
24	2 Simple 2	13 20	2	13 21	10	
24	8 Group (2)	16 57.4	9.5			
	2 Simple 2	16 57.4	2.5	16 58.1	12	
	2 Simple 2	17 04.9	2	17 05.4	9	
24	1 Simple 1	18 11	4	18 12.3	6	
	2 Simple 2	20 04.2	3	20 05.2	28	
25	2 Simple 2	13 29.5	2	13 30	25	
25	2 Simple 2	13 39	1	13 39.3	8	
25	6 Complex	14 03.8	5	14 06	15	
25	2 Simple 2	16 06.5	2	16 07.5	18	
25	3 Simple 3 A	16 27	19	16 34	8	
	8 Group (2)	16 28	12			
	2 Simple 2	16 28	3	16 29.2	26	
	2 Simple 2 f	16 34	6	16 35	445	
25	6 Complex	18 15.6	7	18 18.3	185	
	4 Post Increase		23		10	
26	2 Simple 2	13 27.5	2.5	13 28	25	
26	2 Simple 2	16 06	2.5	16 06.3	39	
26	2 Simple 2	17 22.8	5	17 24	21	
26	2 Simple 2	18 15.2	3	18 16	19	
26	2 Simple 2	19 14.8	1	19 15	10	
27	3 Simple 3	13 53.5	10	13 55.5	16	
27	2 Simple 2	16 11.9	2.5	16 12.9	68	
28	2 Simple 2	19 45.2	1.5	19 45.5	35	
29	2 Simple 2	16 16.7	0.5	16 17	13	
29	1 Simple 1	17 49	0.7	17 49.2	4	
30	2 Simple 2	16 07	5	16 09	21	
	4 Post Increase		30		8	
30	6 Complex	17 05.5	5	17 08	26	
31	3 Simple 3 f	15 38.5	15	15 39.3	9	

* Maximum reached during this period.

COMMERCE - STANDARDS - BOULDER

OTTAWA

2800 MC

HOURS OF OBSERVATIONS: OCTOBER, NOVEMBER, DECEMBER 1957

OBSERVING PERIOD: October 1145 UT - 2155 UT (approx.)
 November 1225 UT - 2105 UT (approx.)
 December 1255 UT - 2100 UT (approx.)

with the following exceptions:

(1) Variations in time of start of observations:

Oct. 20	1520
Dec. 8	1630
Dec. 16	1550

(2) Variations in time of end of observations:

Oct. 19	1750
---------	------

(3) Records obscured by interference:

Oct. 2	1825 - 1845
3	1715 - 1730
	1825 - 1850
10	2000 - 2010
17	1850 - 1905
30	1820 - 1835
Nov. 7	2005 - 2020
27	1645 - 1710
	1800 - 1820
Dec. 5	1825 - 1840
19	1945 - 2015

SOLAR RADIO EMISSION

DAILY DATA
DECEMBER 1957

CORNELL

200 MC

Dec. 1957	Flux Density $10^{-22} \text{ W m}^{-2} (\text{c/s})^{-1}$			Variability 0 to 3			Observing Periods	
	Hours UT			Hours UT			Hours UT	
	12	15	18	12	15	18		
	15	18	21	15	18	21		
1	[[49	57]	--	[[1	1]	--	1320-1705	
2	[[24	24	35]	[[2	2	2]	1335-2105	
3	[[20	20	19]	[[2	2	1]	1340-2030	
4	[[17	[19	19]	[[2	[2	2]	1330-1430, 1555-1945	
5	[[23	24	25]	[[2	2	2]	1330-2040	
6	[[21	19	15]	[[2	2	1]	1330-2100	
7	[[12	13]	--	[[1	1]	--	1350-1700	
8	[[13	13]	--	[[0	1]	--	1330-1700	
9	[[11	11	11]	[[1	0	1]	1330-2105	
10	[[11	11	11]	[[0	0	1]	1330-1935	
11	[[10	12	12]]	[[1	1	0]]	1340-1910	
12	[[12	11	12]]	[[0	1	1]]	1430-2100	
13	[[13	12	12]]	[[1	1	1]]	1340-2000	
14	[[11	11]	--	[[1	0]	--	1330-1700	
15	[[18	20]	--	[[2	2]	--	1320-1700	
16	[[15	12	14]	[[2	1	1]	1340-2045	
17	[[19	33	50]	[[1	1	1]	1335-2105	
18	[[101	85	82]	[[1	2	1]	1345-2055	
19	[[119	114	93]]	[[2	2	1]]	1340-1850	
20	[[119	229	--	[[2	2	--	1340-1800	
21	[[93	127]]	--	[[2	3]]	--	1335-1700	
22	--	--	--	--	--	--		
23	--	48	39]]	--	1	1]]	1500-1610, 1620-1830	
24	--	[16	15]	--	[1	1]	1550-2130	
25	--	16	18]	--	1	1]	1510-2120	
26	[[20	20	33]	[[2	2	1]	1340-1555, 1615-2100	
27	--	[21	24]	--	[2	2]	1555-2100	
28	[[24	27]	--	[[2	2]	--	1350-1705	
29	[[45	41]	--	[[1	1]	--	1330-1700	
30	[[24	36	25]	[[1	1	1]	1340-2105	
31	[[16	16	15]	[[1	1	1]	1330-2100	

COMMERCE - STANDARDS - BOULDER

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SOLAR RADIO EMISSION
OUTSTANDING OCCURRENCES

CORNELL

DECEMBER 1957

200 MC

Dec. 1957	Type Ap.J	Start UT	Time of Maximum	Duration Minutes	Type IAU	Max. Flux Density $10^{-22} \text{ W m}^{-2} (\text{c/s})^{-1}$		Remarks
						Inst.	Smooth	
1	3	1605	1606.5	2.5	CA	>224	59	off-scale 1517.5-18 UT off-scale 1504.5-05 UT
2	2	1421		6	ECA			
7	3	1517.5		2	ECD	>54	>29	
8	3	1504.5		1.5	ECD	>54	>28	
9	2	1842.5		5.5	ECD	>54	>32	
10	2	1811	1827.5	2	CD	>54	25	off-scale 1759.5-1800 UT off-scale 2046.5-47.5 UT
12	2	1758		13.5	ECD	>54	>29	
	3	2046		2	CD	>54	>29	
13	3	1827.5		1	CD	>54	>28	
	3	1920		1	CD	>54	>28	
17	3	1621		.5	CA	>224	>102	off-scale 1622.5, 1623-23.5 UT off-scale 1635-37, 1638, 1638.5-39.5 UT
20	0	1433		194	E			
23	3	1622		2	CD	>224	>82	
25	8	1635		5	ECD	>224	>120	
	3	1815		3.5	ECD	>224	>124	
	3	1821.5	2017.5	3.5	ECD	>224	>124	off-scale 1816.5-17 UT off-scale 1823-23.5 UT
	2	2029		4	CD	>224	>136	
31	2	1752.5		2.5	CA	>54	>19	
	3	2017		1	ECA	>54	28	

SOLAR RADIO EMISSION

DAILY DATA
DECEMBER 1957

CORNELL

200 MC

Dec. 1957	Flux Density $10^{-22} \text{w m}^{-2}(\text{c/s})^{-1}$			Variability 0 to 3			Observing Periods
	Hours UT			Hours UT			Hours UT
	12 15	15 18	18 21	12 15	15 18	18 21	
1	[[49	57]	--	[[1	1]	--	1320-1705
2	[[24	24	35]	[[2	2	2]	1335-2105
3	[[20	20	19]	[[2	2	1]	1340-2030
4	[[17	[19	19]	[[2	[2	2]	1330-1430, 1555-1945
5	[[23	24	25]	[[2	2	2]	1330-2040
6	[[21	19	15]	[[2	2	1]	1330-2100
7	[[12	13]	--	[[1	1]	--	1350-1700
8	[[13	13]	--	[[0	1]	--	1330-1700
9	[[11	11	11]	[[1	0	1]	1330-2105
10	[[11	11	11]	[[0	0	1]	1330-1935
11	[[10	12	12]]	[[1	1	0]]	1340-1910
12	[[12	11	12]]	[[0	1	1]]	1430-2100
13	[[13	12	12]	[[1	1	1]	1340-2000
14	[[11	11]	--	[[1	0]	--	1330-1700
15	[[18	20]	--	[[2	2]	--	1320-1700
16	[[15	12	14]	[[2	1	1]	1340-2045
17	[[19	33	50]	[[1	1	1]	1335-2105
18	[[101	85	82]	[[1	2	1]	1345-2055
19	[[119	114	93]]	[[2	2	1]]	1340-1850
20	[[119	229	--	[[2	2	--	1340-1800
21	[[93	127]]	--	[[2	3]]	--	1335-1700
22	--	--	--	--	--	--	
23	--	48	39]]	--	1	1]]	1500-1610, 1620-1830
24	--	[16	15]	--	[1	1]	1550-2130
25	--	16	18]	--	1	1]	1510-2120
26	[[20	20	33]	[[2	2	1]	1340-1555, 1615-2100
27	--	[21	24]	--	[2	2]	1555-2100
28	[[24	27]	--	[[2	2]	--	1350-1705
29	[[45	41]	--	[[1	1]	--	1330-1700
30	[[24	36	25]	[[1	1	1]	1340-2105
31	[[16	16	15]	[[1	1	1]	1330-2100

COMMERCE - STANDARDS - BOULDER

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SOLAR RADIO EMISSION
OUTSTANDING OCCURRENCES

CORNELL

DECEMBER 1957

200 MC

Dec. 1957	Type Ap.J	Start UT	Time of Maximum	Duration Minutes	Type IAU	Max. Flux Density $10^{-22} \text{ W m}^{-2} (\text{c/s})^{-1}$		Remarks
						Inst.	Smooth	
1	3	1605	1606.5	2.5	CA	>224	59	off-scale 1517.5-18 UT off-scale 1504.5-05 UT
2	2	1421		6	ECA			
7	3	1517.5		2	ECD	>54	>29	
8	3	1504.5		1.5	ECD	>54	>28	
9	2	1842.5		5.5	ECD	>54	>32	
10	2	1811	1827.5	2	CD	>54	25	off-scale 1759.5-1800 UT off-scale 2046.5-47.5 UT
12	2	1758		13.5	ECD	>54	>29	
	3	2046		2	CD	>54	>29	
13	3	1827.5		1	CD	>54	>28	
	3	1920		1	CD	>54	>28	
17	3	1621	194	.5	CA	>224	>102	off-scale 1622.5, 1623-23.5 UT off-scale 1635-37, 1638, 1638.5-39.5 UT
20	0	1433			E			
23	3	1622		2	CD	>224	>82	
25	8	1635		5	ECD	>224	>120	
	3	1815		3.5	ECD	>224	>124	
	3	1821.5	2017.5	3.5	ECD	>224	>124	off-scale 1816.5-17 UT off-scale 1823-23.5 UT
	2	2029		4	CD	>224	>136	
31	2	1752.5		2.5	CA	>54	>19	
	3	2017		1	ECA	>54	28	

COMMERCE - STANDARDS - BOULDER

SOLAR RADIO EMISSION

DAILY DATA
NOVEMBER 1957

BOULDER

450 MC

Nov. 1957	Flux Density $10^{-22} \text{ W m}^{-2} (\text{c/s})^{-1}$						Variability 0 to 3						Observing Periods	
	Hours UT					Day	Hours UT					Day	Hours UT	
	0	12	15	18	21		0	12	15	18	21			
	3	15	18	21	24		3	15	18	21	24			
1	-	-	-	-	-	-	-	-	-	-	-	-	13.5-23.2,N1	
2	-	-	-	-	-	-	-	-	-	-	-	-	13.5-14.9,16.3-23.7	
3	-	-	-	-	-	-	-	-	-	-	-	-	13.5-23.7	
4	-	-	-	-	-	-	-	-	-	-	-	-	14.1-16.8,19.8-23.7	
5	-	-	-	-	-	-	-	-	-	-	-	-	13.6-23.7	
6	-	-	-	-	75	-	-	-	-	-	OS	-	21.3-23.6	
7	-	-	68	69	75	70	-	0	0	1	OS	0	13.7-23.6	
8	-	-	77	73	72	74	-	0	1	1	OS	1	13.7-23.6	
9	-	-	73	72	72	72	-	0	0	1	0	0	13.7-23.6	
10	-	-	71	72	73	72	-	0	0	0	0	0	13.8-23.6	
11	-	-	80	71	68	73	-	2	OS	0	OS	OS	13.8-23.6	
12	-	-	77	79	76	77	-	0	1	0	1S	OS	13.8-23.6	
13	-	-	72	72	73	72	-	0	0	0	OS	0	13.8-23.5	
14	-	-	76	73	72	74	-	0	0	0	OS	0	13.8-23.5	
15	-	-	72	71	74	72	-	0	0	0	OS	0	13.8-23.5	
16	-	-	75	75	-	74	-	-	OS	1	OS	OS	13.8-21.1,22.4-23.5	
17	-	-	73	72	72	72	-	0	0	0	OS	0	14.3-23.5	
18	-	-	80	70	71	73	-	0	OS	OS	OS	OS	13.9-23.4	
19	-	-	73	72	73	72	-	0	OS	OS	OS	OS	13.9-23.4	
20	-	-	73	76	73	73	-	OS	OS	OS	OS	OS	13.9-23.4	
21	-	-	80	74	71	75	-	0	OS	0	OS	OS	13.9-23.3	
22	-	-	78	69	75	73	-	0	1S	OS	OS	OS	14.0-23.3	
23	-	-	77	71	76	75	-	0	OS	0	OS	0	14.0-23.3	
24	-	-	79	121	70	92	-	0	2	3	1	1	14.0-23.3	
25	-	-	83	69	71	75	-	0	OS	2S	OS	OS	14.0-23.3	
26	-	-	86	80	82	82	-	OS	1S	OS	OS	OS	14.1-15.0,15.8-23.3	
27	-	-	81	78	-	79	-	0	2S	1S	OS	1S	14.1-23.3	
28	-	-	86	71	76	78	-	0	0	0	0	0	14.1-23.3	
29	-	-	90	101	105	96	-	0	1S	OS	OS	OS	14.1-23.3	
30	-	-	79	78	75	77	-	0	OS	0	0	0	14.6-23.3	
31														

COMMERCE - STANDARDS - BOULDER

Note 1. November 1 thru 2000 U.T. November 6, 1957, medians not measured, receiver unstable.

SOLAR RADIO EMISSION
OUTSTANDING OCCURRENCES
NOVEMBER 1957

BOULDER

450 MC

Nov. 1957	Type Ap.J	Start UT	Time of Maximum	Duration Minutes	Type IAU	Max. Flux Density $10^{-22} \text{ w m}^{-2} (\text{c/s})^{-1}$		Remarks
						Inst.	Smooth	
7	1	1340 B	1945.3	595 D	M	360	-	N2. S
7	3	1942.0	1942.2	00.3	ESD	470	-	
8	1	1340 B	1551.5	595 D	M	330	-	S
8	3	2002.7	2003.3	00.6	ECD	770	-	
11	4	1418	1418.0	222	ECD	2000	16	S
12	6	1345 B	1606.2	590 D	CA	280	14	S Burst 2103.1
18	0	1500	1539	77	CD	95	4	S
21	0	1505.1	1507.1	3.1	CD	140	9	S
22	3	1759.4	1759.8	00.9	ECD	420	-	
24	6	1400 B	1938.6	390 D	CA	140	17	S
24	2	1612.1	1614.1	3.1	ECD	1300	260	S
24	9A	1810	1819.1	22	CD	> 5900	1300	I
24	9B	1832	1834 X	54	CD	> 3600	360	I N3
25	6	1400 B	1954.5	560	CA	300	17	S
25	3	1940.7	1940.9	00.6	ESD	670	-	
25	3	2013.2	2013.5	00.4	ESD	680	-	
26	6	1405 B	1711.0	555 D	CA	450	17	S I 1500-1548
27	6	1405 B	2018.8	555 D	CA	320	15	S
27	2	1657	1707.3	14	CD	440	72	S
28	0	1405 B	1635	160 D	CA	100	23	
29	6	1405 B	1755.4	555 D	CA	480	38	S
30	1	1433 B	2213.9	522 D	M	170	-	S

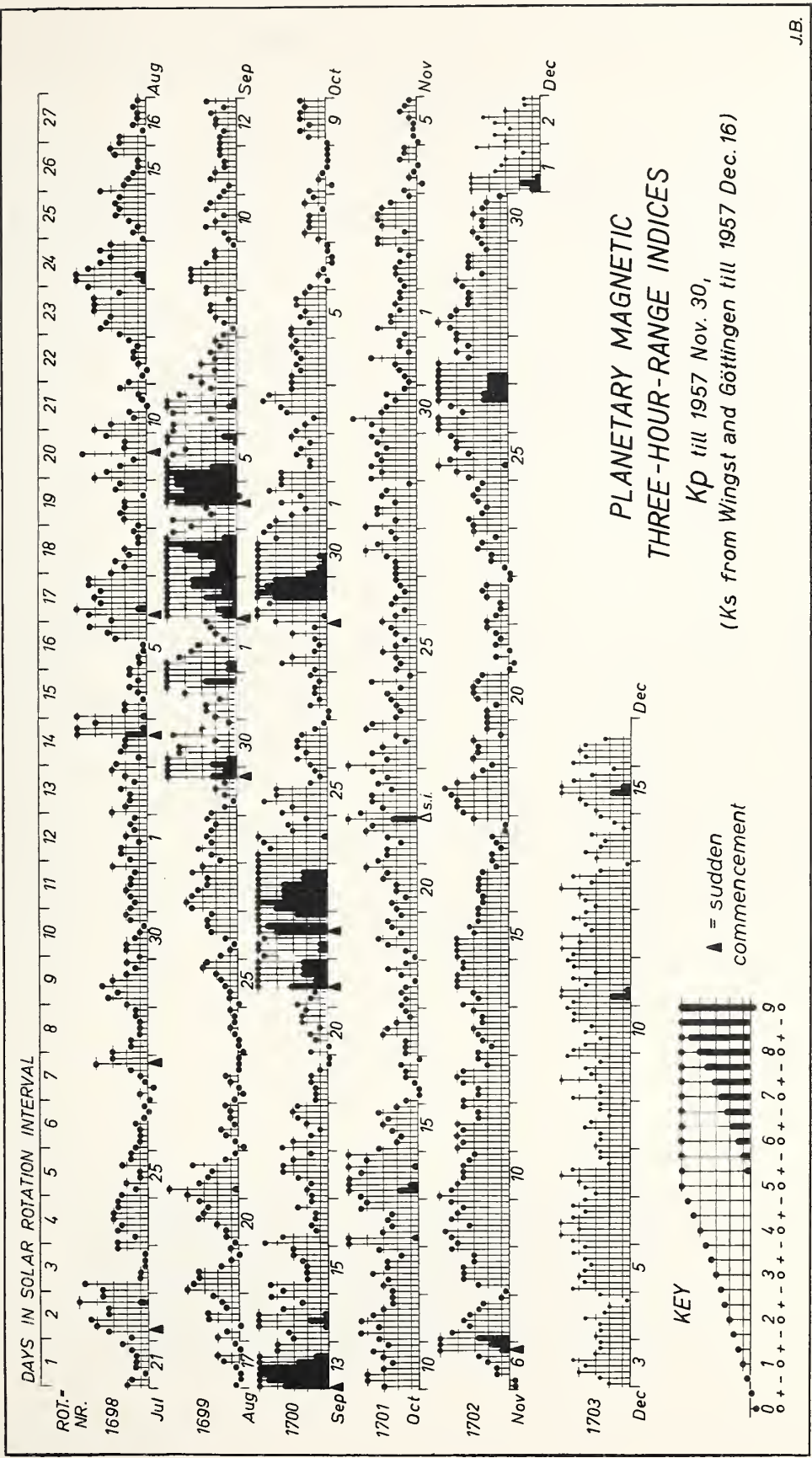
COMMERCE - STANDARDS - BOULDER

- Notes: 1. Interference may occasionally obscure or be mistaken for solar events.
 2. November 1, 1957 at 2041.5 very intense burst of type 3 (or ESD) duration approximately 2 minutes. Flux not measurable, receiver unstable.
 3. November 24 large burst at 1923.1.

GEOMAGNETIC ACTIVITY INDICES

NOVEMBER 1957

Nov. 1957	C	Values Kp								Sum	Ap	Final Selected Days
		Three hour Gr. interval										
		1	2	3	4	5	6	7	8			
1	0.4	1+	3+	2+	2+	2-	2o	2-	2-	16+	8	Five Quiet
2	0.4	1+	2-	2o	2o	2-	1o	2-	3+	15-	7	
3	0.7	3+	1+	3o	3+	3+	3o	2+	1o	21-	13	
4	0.1	1+	0o	1o	1-	0+	2-	1+	1+	8-	4	
5	0.2	0+	1-	1-	1-	1o	2-	1+	1o	7+	4	
6	1.3	0o	0o	1+	1+	2o	3-	6-	6+	19+	24	17
7	1.2	7o	4+	3+	4-	3+	3-	2+	1o	28-	31	21
8	1.5	1-	3-	4-	4-	4-	3o	3o	4+	25-	18	22
9	1.3	4o	4+	5-	3+	4+	4o	4-	4+	33-	29	
10	1.2	5o	4+	4o	4-	4-	4-	3+	3o	31-	26	
11	1.1	4o	4-	4o	4-	4o	3-	3-	4-	28+	21	Five Disturbed
12	1.0	4-	3-	3-	4-	4o	4-	2o	3-	25o	17	
13	0.8	3-	2-	2+	3-	3o	2+	2+	3o	20o	11	
14	1.1	4-	3-	3o	4o	4o	4o	4-	4-	29-	22	
15	1.0	4o	4o	4o	4o	3o	3+	3-	3-	28-	21	
16	0.6	3-	2+	2+	3-	3-	3-	2+	1+	19o	10	25
17	0.2	2-	2-	1o	1+	2-	1-	1-	3o	12-	6	26
18	1.2	4-	4o	4o	4+	5-	4o	3o	2+	30o	25	27
19	0.6	2-	3o	3-	3-	3o	1o	2o	2o	18o	10	28
20	0.7	2o	2o	1+	3-	3o	3o	3-	2+	19o	10	
21	0.2	0+	0o	1+	0+	1+	1o	1+	2o	8-	4	Ten Quiet
22	0.2	2o	1+	1o	1o	2o	2+	2o	0+	12o	6	
23	0.4	0+	1-	2-	2-	3-	2+	1+	3o	14-	7	
24	0.8	3o	3+	2+	2o	3-	3o	3-	2+	21+	12	
25	1.3	3+	4o	5+	4+	3+	4o	4o	4+	33-	30	
26	1.8	5o	5o	5o	4-	4+	7-	7-	6+	43-	64	1
27	1.5	6+	6+	5o	5o	3+	4o	3+	4o	37+	47	2
28	1.2	4o	4+	5o	4+	4o	3+	3+	3+	32-	28	4
29	0.9	4-	4o	2+	3+	3+	3+	2o	2+	24+	16	5
30	0.6	3-	3o	2+	2+	3o	2+	2o	1o	19-	10	17
												19
												21
												22
												23
												30
Mean:	0.85									Mean:	18	



CRPL RADIO PROPAGATION QUALITY FIGURES AND FORECASTS
NORTH ATLANTIC
NOVEMBER 1957

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

() represent disturbed values.

CRPL RADIO PROPAGATION QUALITY FIGURES AND FORECASTS

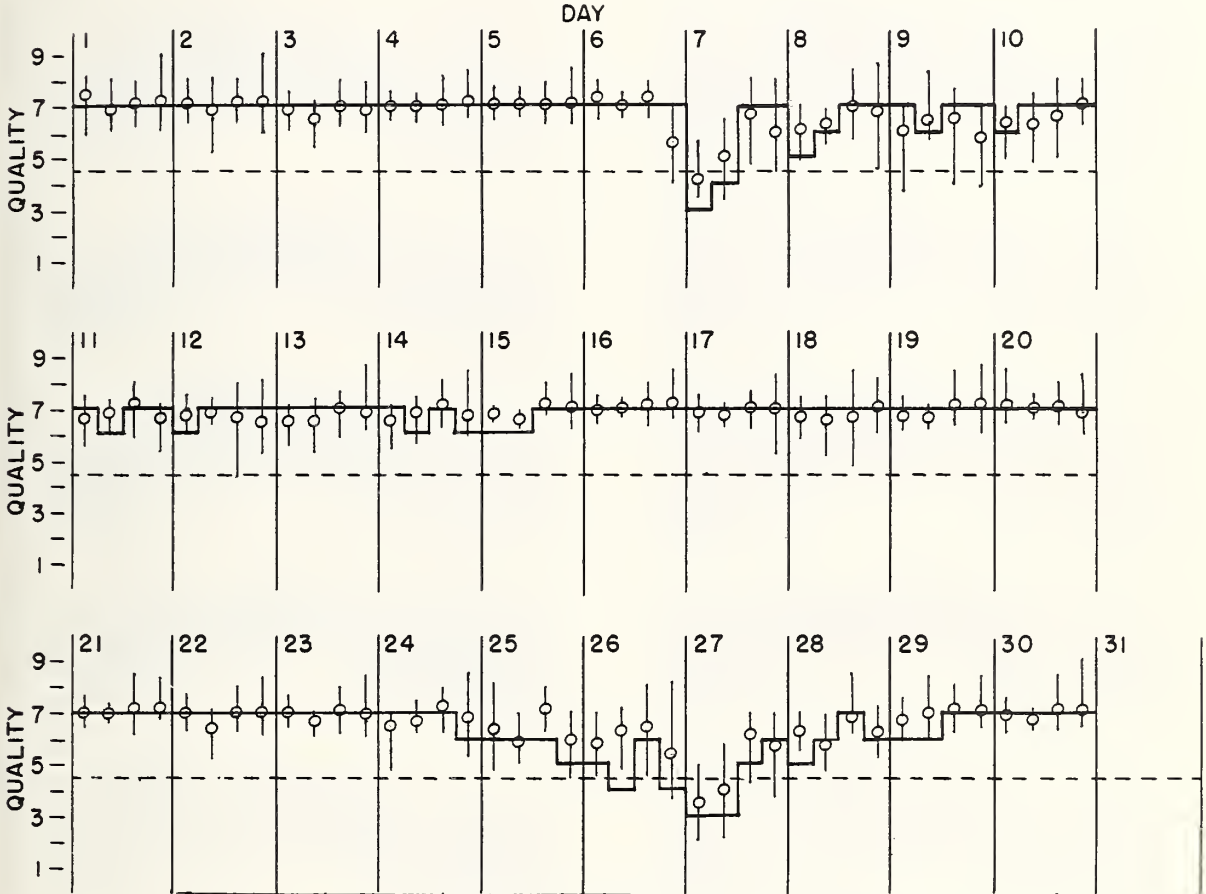
NORTH ATLANTIC

NOVEMBER 1957

— Short-term forecast

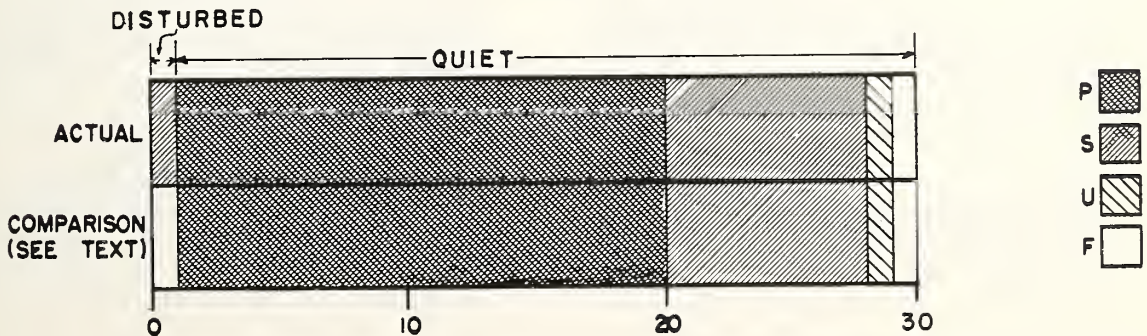
o Quality figure

| Range of reports



OUTCOME OF ADVANCED FORECASTS

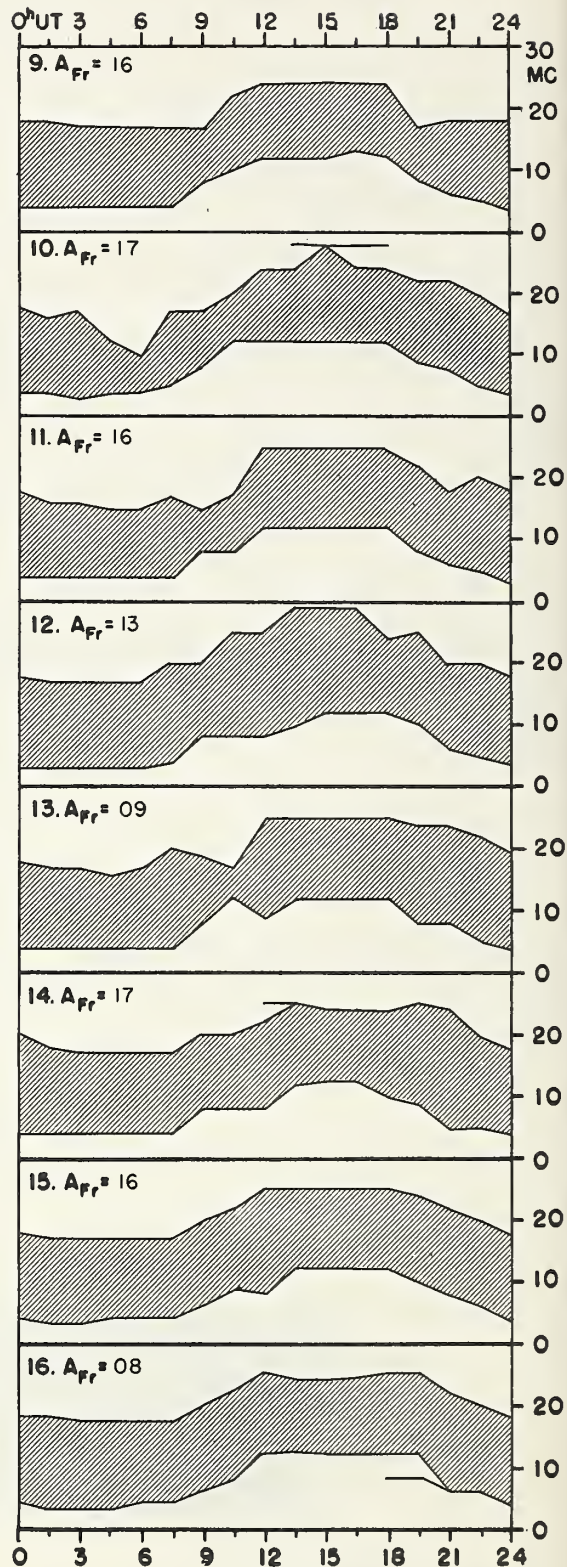
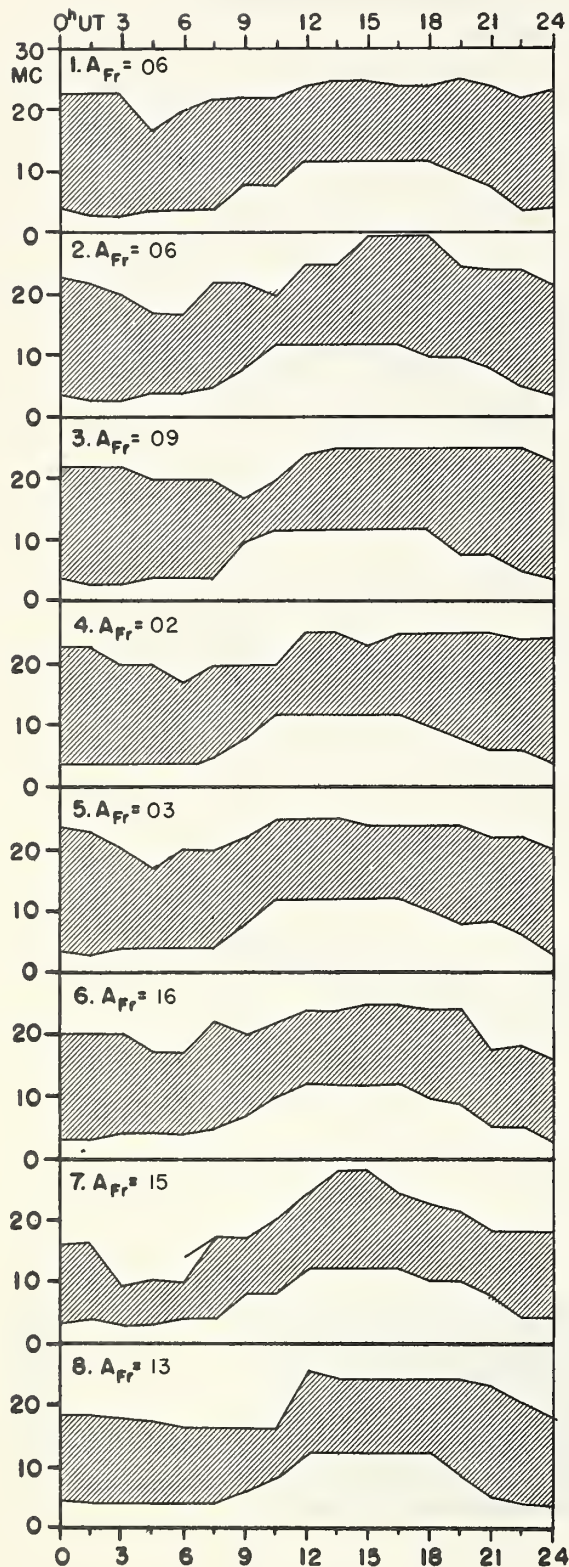
1 TO 4 DAYS AHEAD



COMMERCE - STANDARDS - BOULDER

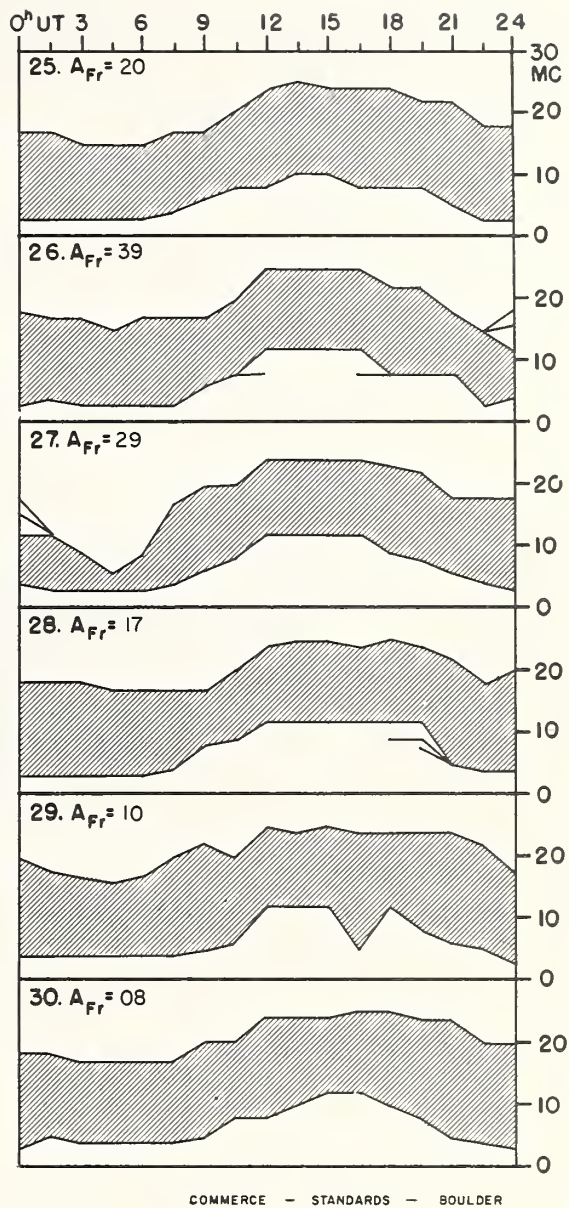
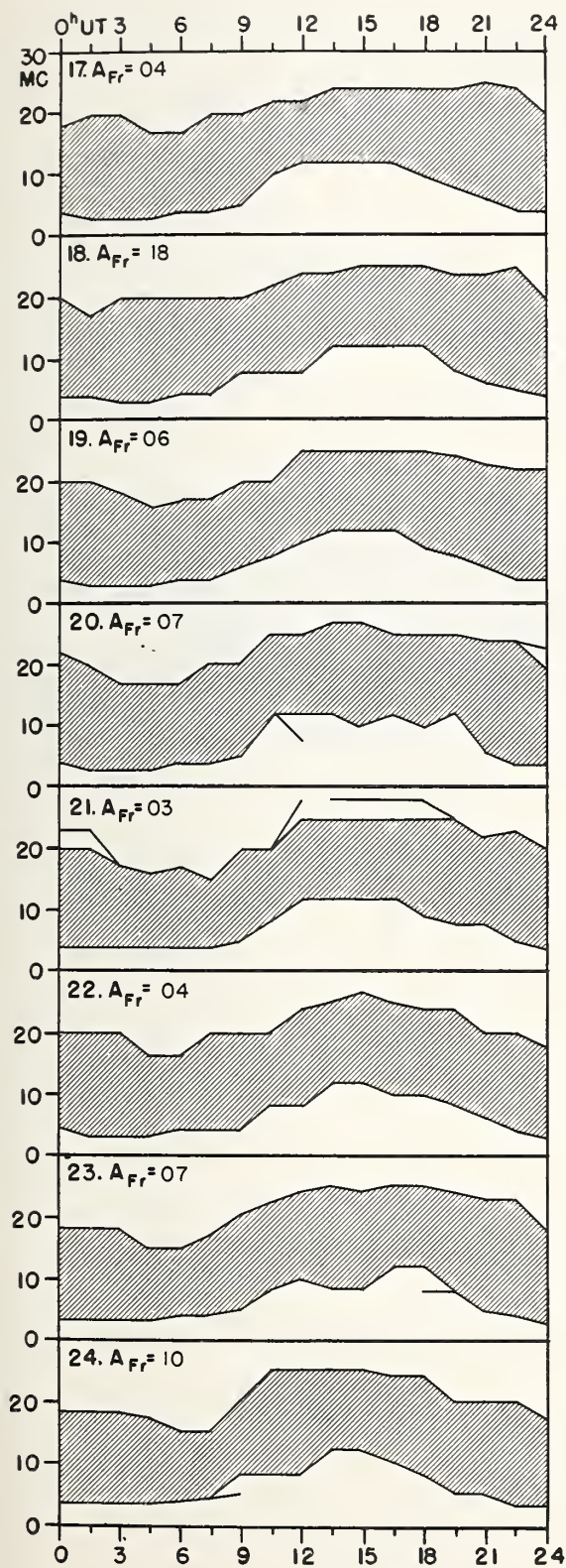
USEFUL FREQUENCY RANGES -- NORTH ATLANTIC PATH

NOVEMBER 1957



COMMERCE - STANDARDS - BOULDER

NOVEMBER 1957



Adapted from Observations by Deutsches Bundespost

CRPL RADIO PROPAGATION QUALITY FIGURES AND FORECASTS

NORTH PACIFIC

NOVEMBER 1957

Nov. 1957	North Pacific 8-hourly quality figures			Short-term fore- casts issued at			Whole day index	Advance forecasts (Jp reports) for whole day; issued in advance by:			Geomag- netic K _{S1}	
	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	6	7	7	6	6	7	6	7		2	2
2	7	7	6	7	7	7	7	7	6		1	2
3	7	6	7	6	5	7	7	7	6		3	(4)
4	6	7	7	6	6	6	7	7	6		0	0
5	6	6	7	7	6	6	6	7	6		0	0
6	6	7	6	7	6	6	6	6	7		0	3
7	6	6	7	6	5	6	6	6	7		(4)	3
8	7	6	6	6	5	6	6	6	7		(4)	(4)
9	6	6	6	6	6	6	6	6	6		(4)	(4)
10	6	6	6	6	6	6	6	6	6		(4)	(4)
11	6	6	6	6	6	6	6	6	6		(4)	3
12	6	6	6	6	6	6	6	6	6		3	3
13	6	7	7	6	7	6	7	6	7		2	3
14	6	6	7	7	7	7	6	6	7		3	(4)
15	6	7	7	6	6	6	6	6	7		(4)	2
16	6	6	7	7	6	6	7	6	6		2	2
17	6	6	7	6	6	6	7	6	6		0	1
18	6	5	7	6	6	6	6	6	6		(4)	(4)
19	7	6	7	6	6	6	7	6	6		2	2
20	6	6	6	7	6	6	6	6	6		1	2
21	6	6	6	6	6	6	7	6	6		0	1
22	6	6	6	6	6	6	6	7	6		0	1
23	6	6	6	6	6	6	6	6	7		1	2
24	7	7	7	7	7	6	7	6	7		2	2
25	6	6	7	6	5	6	6	6	7		(4)	(4)
26	6	6	6	5	6	4	6	6	7		(4)	(6)
27	4	5	6	5	4	6	5	5	6		(6)	(4)
28	5	5	6	6	5	6	6	5	6		(4)	(4)
29	6	6	6	5	5	6	6	6	6		2	2
30	7	6	7	6	6	6	7	6	6		2	2
Score: Quiet Periods P 16 19 15 19 13												
S 13 11 14 11 17												
U 0 0 0 0 0												
F 0 0 1 0 0												
Disturbed Periods P 0 0 0 0 0												
S 1 0 0 0 0												
U 0 0 0 0 0												
F 0 0 0 0 0												

() represent disturbed values.

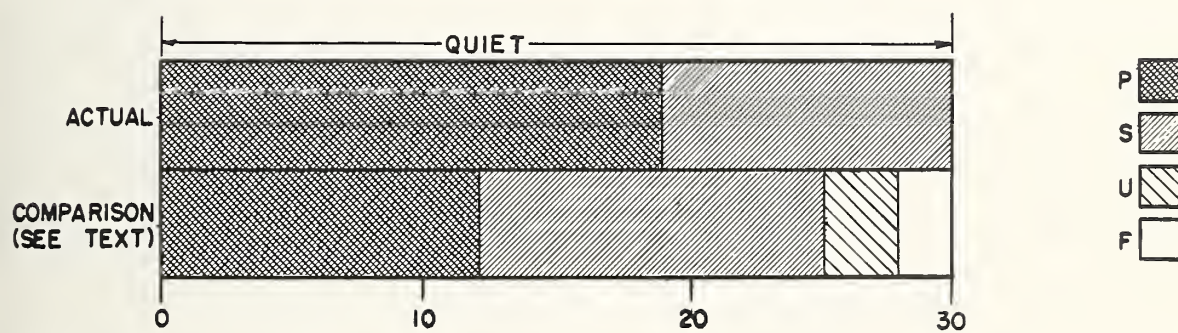
CRPL RADIO PROPAGATION QUALITY FIGURES AND FORECASTS

NORTH PACIFIC

NOVEMBER 1957

OUTCOME OF ADVANCED FORECASTS

1 TO 4 DAYS AHEAD



COMMERCE - STANDARDS - BOULDER

ALERT PERIODS AND SPECIAL WORLD INTERVALS

Alert Issued Ends 1600 UT 1600 UT	SWI	A _{Be} On Days of Alert Period (SWI Underlined)	Number of Flares of IMP \geq 2 Reported Promptly on Days of Alert Period
1957			
Dec 15-Dec 21		15-08-16-09-17-15-09	0-1-2-2-1-3-1
Dec 26-Dec 29		13-05-05-05	0-2-1-0

