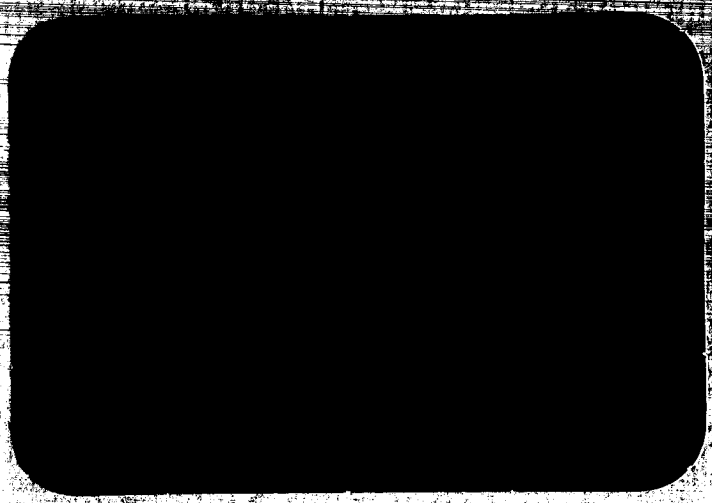

National Aeronautics and Space Administration

HOUSTON, TEXAS

Manned Spacecraft Center

NASA

SOLAR ACTIVITY CATALOGUE
VOLUME 2
CATALOGUE OF SOLAR ACTIVITY DURING 1957

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CATALOGUE OF SOLAR ACTIVITY FOR THE YEAR 1957

INTRODUCTION

The data compiled in this volume of the catalogue covers the Greenwich year 1957. This covers synodic rotations of the sun 1383 through 1394; and parts of rotation 1382 which commenced on December 27.07, 1956, and rotation 1395 which started on December 16.63, 1957.

The solar activity data have been arranged in eight tables, or catalogues:

I. Catalogue of Major Solar Flares and Related Terrestrial Effects
II. Catalogue of Important Sunspot Groups
III. Catalogue of Important Plage Regions
IV. Catalogue of Outstanding Solar Radio Emissions
V. Catalogue of Geomagnetic Storms
VI. Catalogue of Important Solar-Terrestrial Effects
VII. Catalogue of Balloon Flights
VIII. Chronological Catalogue of Major Solar Events

There is a considerable amount of duplication between the different catalogues. This has been done to keep cross references at a minimum without making the number of columns unwieldy. Each of these catalogues is described in detail in the subsequent sections and in the description of the tables. The data have been obtained from many sources. These are listed in Table 2.7, of references, pages 2.11 - 2.13.

This work has been carried out at LTV Astronautics Division under NASA Contract NAS 9-2469. Dr. Helen Dodson-Prince and Miss E. Ruth Hedeman prepared the data for the Chronological Catalogue (Table VIII). In addition, they have made valuable contributions to the other tables through discussions and data contributions. Their work was supported by the Office of Naval Research.

We wish to express our appreciation to Dr. Howard for use of the Mt. Wilson daily work sheets of sunspot magnetic classifications. Miss Virginia Lincoln at the National Bureau of Standards, Central Radio Propogation Laboratory, has made valuable suggestions and data at the World Data Center A (airglow and ionospheric) available. Many of the authors listed in the reference table have generously supplied reprints of their papers and in some cases have made unpublished data available. Other scientists throughout the world have made valuable contributions through discussions and helpful suggestions during the period when many of the data were being obtained and the idea of a solar activity catalogue was generated.

1. Major Solar Flares During 1957

The IAU Quarterly Bulletin (reference 63) lists 3831 solar flares with importance ranging from 1 to 3+. Only 1374 of these flares were reported during the first six months of the year (before the start of the IGY) and 2457 during the second six months. During the similar periods of 1958, 2038 and 2232 flares were reported respectively. It is important to note that during the first six months of 1957 there was no flare patrol of the sun 31.1 per cent of the time while during the second six months the hours of no patrol had decreased to approximately 4.5 per cent of the time. During the corresponding periods of 1958 the hours of no patrol were 4.6 and 4.5 per cent of the time, respectively.

Month	Patrol by Months		Number Major Flares				
	Total Hours	Percent Complete	2+	3	3+	IAU 2+,3,3+	McM 2+,3,3+
Jan.	401.5	55.3	0	8	3	11	9
Feb.	402.5	59.9	0	2	0	2	2
Mar.	482.0	64.7	1	1	0	2	1
Apr.	473.0	65.6	0	6	0	6	5
May	577.0	77.5	0	0	0	0	0
June	650.5	90.3	2	7	0	9	3
Total 1st 6 mos.	2986.5	68.9	3	24	3	30	20
July	730.0	98.1	4	6	1	11	6
Aug.	732.0	98.3	4	5	2	11	7
Sept.	710.0	98.6	5	17	2	24	14
Oct.	657.0	88.3	1	7	1	9	4
Nov.	669.0	92.3	2	5	2	9	2
Dec.	661.0	88.8	4	7	0	11	5
Total 2nd 6 mos.	4159.0	95.5	20	47	8	75	38
Total 1957	7145.5	82.2	23	71	11	105	58

TABLE 2.1

Flare Patrol Hours and Major Flares During 1957

The number of hours and per cent of total time of flare patrol for each month, together with the number of major flares reported in the IAU Bulletin (reference 63), is given in Table 2.1. The McMath-Hulbert working list of flares (reference 12, second six months, and unpublished data for the first six months) reduced 10 of the IAU major flares reported during the first six months and 37 reported during the second six months to minor flare importance. The last column of Table 2.1 shows the number of 2+, 3, and 3+ flares in the McMath working list by months. In addition, the working list gives three flares with importance 2+, reported by a single observatory, two in July and one in November. These did not meet the catalogue requirement for major flare status, but are shown in Table 2.IB. The flares during the year 1957 that were reduced to minor flare status are listed in Table 2.IA.

2. Sunspots During 1957

Solar activity as indicated by the relative number of sunspot groups reached an all time high during 1957, with the highest relative sunspot number on September 21, of 334 and a monthly mean of 253.8 for October. Mt. Wilson observed 855 sunspot groups with a central meridian passage during 1957; 80 of these sunspot groups crossed the central meridian during October the month of solar maximum. The Royal Greenwich Observatory observed 624 sunspot groups that lasted for two or more days. In addition, they reported 164 groups that were seen on one day only for a total of 788 spot groups (reference 61).

Our catalogue of Important Sunspot Groups During 1957 lists 120 groups. This includes: 109 spot groups that during disk passage had a maximum area greater than 500 millionths of the visible solar hemisphere as reported in reference 61. Sixty-nine of these large spot groups did not produce a single major flare during disk passage. The remaining 40 large spots produced 89 of the major flares as shown in Table 2.2.

Number of Large Spot Groups	Number of Major Flares Each	Total Number of Major Flares
69	0	0
20	1	20
9	2	18
2	3	6
3	4	12
3	5	15
3	6	18
109		89

TABLE 2.2
Major Flare Distribution Among Large Sunspot Groups

Nine small spot groups produced one major flare each, one small group produced two major flares, and one produced three. It was not possible to associate sunspot groups with the two remaining major flares.

Twenty spot groups were given an average magnetic classification of γ or $\beta\gamma$ during disk passage by the Mt. Wilson Solar Observatory (reference 66, denoted by M in our catalogue). Of these, 19 also had a maximum area greater than 500 millionths during disk passage. Six of the L.M. spots did not produce a major flare during disk passage. The remaining 13 produced 42 major flares as shown in Table 2.3.

L.M. Spot Groups	Number of Major Flares Each	Total Number of Major Flares
6	0	0
4	1	4
2	2	4
1	3	3
1	4	4
3	5	15
2	6	12
19		42

TABLE 2.3
Major Flare Distribution
Among Large Magnetically Complex Sunspot Groups

One spot group in our catalogue classified as a γ spot had a maximum area of 427 millionths (a mean area of 306) and did not produce a major flare.

3. Important Plage Regions During 1957

Our catalogue of 77 important plage regions includes:

3.1 All plages that produced one or more major solar flares (F)

3.2 Plages that had a central meridian area of 10,000 millionths of the visible solar hemisphere (L)

3.3 Plages that during disk passage had an average brightness of 3.5 or greater (B)

3.4 Plages that produced 30 or more flares of importance 1 or greater during disk passage (N)

We find that 104 of the major flares were associated with 49 plage regions as shown in Table 2.4. It was not possible to associate one major flare (No. 34) with a plage region. This flare reported by Moscow with importance 3 at S.10, E.43 is not included in the McMath-Hulbert working list.

Number of Plage Regions	Number of Major Flares Each	Total Number of Major Flares
28	1	28
8	2	16
5	3	15
2	4	8
2	5	10
3	6	18
1	9	9
49		104

TABLE 2.4
Major Flare Distribution
Among Plage Regions

We find 8 plages that satisfy the L, B, N conditions. Three of these plages did not produce major flares, the other 5 produced 22. Thirty-five plages produced 30 or more flares of importance equal to or greater than one, and all but 7 produced at least one major flare. In fact, the 28 flare productive plages produced 80 of the 105 major flares.

Age in Rotations	1	2	3	4	5	6	7	8	9	Total
No Plage Regions	15	11	10	6	1	3	2	0	1	49
Major Flares	23	28	29	9	6	6	2	0	1	104
All Flares	384	432	421	323	83	73	55	0	24	1795

TABLE 2.5
Flares Associated with Plage Regions

We find that plages in the first, second and third rotations produced a total of 80 of the major flares almost equally divided. These 49 plage regions produced nearly 44% of all flares reported during 1957 (1795 of the 3831 reported).

4. Important Radio Emissions from the Sun During 1957

We have limited this portion of the catalogue to spectral observations Type II (slow drift) and Type IV (broad band continuum) and radio emissions at discrete frequencies between 167 Mc/s and 9400 Mc/s.

During 1957 the Harvard Radio Astronomy Station, at Fort Davis, Texas, operated on a sweep frequency range from 100-580 Mc/s. The normal operating times were approximately 1345-2400 UT during the winter months and 1230-0145 UT during the summer (reference 38). During 1957 the spectral observations of the solar radio emissions with the Dapto radio spectrograph (CSIRO, Sydney, Australia) operated in the frequency range 40-210 Mc/s. The normal observing times were approximately 2300-0800 during the winter months and 2200-0700 in the summer. With only the Harvard and Sydney stations patrolling the sun, we have a period between 0800 and approximately 1400 during the winter months and 0700 and 1230 in the summer with no spectral observations.

In order to fill this approximate six hour gap, we have included Type IV emissions derived from single frequency observations by a number of scientists for the complete 24 hour Greenwich day. We find a total of eleven Type IV emissions derived for the six-hour period and 41 for the normal observing times of the two sweep frequencies stations. During that same period Harvard (reference 38) and Sydney observed only 23 emissions of Type IV. A summary is shown in Table 2.6 where the distribution of the Type II and Type IV spectral emissions are given for the Greenwich day in three-hour intervals.

	0-3	3-6	6-9	9-12	12-15	15-18	18-21	21-24	Total
Type II	11	13	2	0	7	10	10	10	63
Type IV Har.& Syd.	3	3	0	0	5	4	6	2	23
Type IV Derived	8	3	9	6	10	6	6	4	52
All Type IV	11	6	9	6	15	10	12	6	75
Type IV Har.or Syd. & derived	2	1	0	0	3	3	6	2	17
Normal Obs. Time	Syd				Har				

TABLE 2.6
Distribution of Type II and Type IV
Spectral Emissions During the Greenwich Day

The first row indicated as Type IV gives the number of Type IV emissions reported by the Harvard station and/or Sydney. The second row gives the number of Type IV's not observed on sweep frequency but derived from discrete frequency data; the third row gives the number of all Type IV's. The last row gives the number of Type IV's observed on sweep frequency and also derived from discrete frequency data.

It is interesting to note that of the 52 cases of derived Type IV's 28 of them occurred when neither the Harvard nor the Sydney station was observing the sun. Eleven of these occurred in the normal non-observing time between approximately 0700 and 1300.

A total of 63 Type II (slow drive) bursts were recorded at either Harvard or Sydney radio stations. Their distribution in the three-hour intervals is shown on the first line of Table 2.6.

Data for the fixed-frequency observations have been obtained from the IAU Quarterly Bulletins of Solar Activity (reference 63) and the Tokyo Astronomical Observatory Bulletin (reference 68). The IAU Bulletin did not report the time of maximum flux until the start of the IGY, July 1957.

The radio patrol of the sun was very incomplete during the first quarter of 1957, as shown on Figure 2.IV-1 and on Table 2.IV-i. Observations were made by ten observatories at a total of 15 frequencies, ranging from 9400 Mc/s to 81 Mc/s. With the exception of 200 Mc/s and 600 Mc/s, the sun was under observation only about 25% of the time at any given frequency. The patrol at 200 and 600 Mc/s covered approximately 58% of the Greenwich day. There was a slight improvement during the second quarter as shown on Table 2.IV-i. With the start of the IGY in July 1957 the number of solar radio observatories was increased to 24 observing at a total of 31 frequencies ranging from 9500 Mc/s to 67 Mc/s, with nearly complete coverage of the Greenwich day at several frequencies. This is shown on Fig.2.IV-2 for the fourth quarter. The coverage for the third quarter is essentially the same as the fourth quarter as shown in Table 2.IV-ii.

5. Geomagnetic Storm During 1957

A comprehensive search of the literature fails to reveal a universal list of geomagnetic storms or agreement on starting times. In the case of moderately severe and severe sudden commencement storms the variation of starting times reported by the magnetic observatories seldom differ by more than a few minutes; on the other hand, some observatories will report a storm duration of two or more days, while others may report two or more storms during the period. In the case of geomagnetic storms with a gradual beginning the start times may differ by several hours. The catalogue of geomagnetic storms has been limited to those storms that reached a planetary three-hour index K_p of 5 or greater. We have included, in some cases, a probable solar flare association. In each of these cases the storm-flare association has been given in the scientific literature as indicated in the reference or source column of the table.

6. Solar-Terrestrial Effects During 1957

This portion of the catalogue is limited to shortwave radio fadeouts (SWF) selected geomagnetic storms, solar flare effects (SFE), polar-cap absorptions, and Forbush decreases.

6.1 Short Wave Radio Fadeouts

In the case of the SWF we have included those of importance 3 or greater that lasted for 30 minutes or more, and those that occurred at the time of a major flare, irrespective of their importance or duration.

6.2 Geomagnetic Storms

In general, the geomagnetic storms listed in this portion of the catalogue are limited to those that have been classified as moderately severe (K_p = 6 or 7) and severe (K_p = 8 or 9). A few moderate storms (K_p = 5) have been included if in the literature they have been associated with a flare (irrespective of the flare importance) or a polar-cap absorption.

6.3 Solar Flare Effects

Solar flare effects (SFE) (magnetic crochets) have been taken from reference 4. They are limited to those that were unmistakable or definitely SFE's.

6.4 Polar-Cap Absorptions

A number of papers in the scientific literature have discussed polar-cap absorption and their correlation with solar flares, solar radio emissions, geomagnetic storm and other terrestrial effects. There is, in general, good agreement between the different investigators, although the choice of the flare responsible for the PCA is, in some cases, not unique. These are cases when two or more flares of importance 2 or greater take place within the acceptable time limit.

6.5 Forbush Decreases

The list of Forbush Decreases given in the catalogue is probably the most questionable of all of the data. A number of Japanese physicists have published lists of cosmic ray storms (Forbush decreases) that they have associated with geomagnetic storms (references 27, 33). These cosmic ray storms have been estimated from a number of high latitude neutron monitor stations, but starting times have not been given except for a t in hours from the start of the sudden commencement to the start of the main phase decrease.

7. Catalogue of Balloon Flights

One hundred forty balloon flights were reported to the IGY World Data Center A for cosmic rays for the first six months of the IGY (second six months of 1957). Fifty-four of these flights were made in the USSR and 86 by free world scientists. Thirty-four of the USSR flights and 72 of the free world flights were made within four days after a major solar. In fact, there was at least one balloon flight at altitude, and in some cases several within four days after all but five (Flares No. 40, 77, 86, 90, and 91) of the major flares during the second six months of 1957. In several cases balloons were at altitude at the time of the major flare, or were launched within 24 hours after the start of the flare. A search of the literature reveals only two balloon flights within four days of a major flare (flares number 11, and 22) during the first six months of 1957.

8. Chronological Catalogue of Major Solar Events During 1957

This table summarized many of the data contained in Tables I through VI of the catalogue. However, Tables I through VI give many events and more detailed data than was possible in Table VIII. In Table VIII flares were limited to those of importance 3 or 3+ in the McMath-Hulbert working list (references 12 and unpublished data) and those of lower importance that were unquestionably associated with a flare effect.

The criteria for inclusion as a major event (indicated by an asterisk) are as follow:

8.1 Flares of importance 3 or 3+ in the McMath-Hulbert working list (reference 9).

8.2 Short-wave fades of importance 3 or 3+ that lasted for 30 minutes or more.

8.3 10 cm. radio emissions with a peak flux of 500 or more (units of 10^{-22} Wm^{-2} $(c/s)^{-1}$)

8.4 Plage regions that were the sources of 30 or more flares (of all importances) during disk passage.

8.5 Sunspot groups that had a mean area of 1000 millionth of the visible solar hemisphere, based on Mt. Wilson data, or had a γ or $\beta\gamma$ magnetic classification during disk passage.

8.6 Dynamic spectral emissions includes outstanding Type I and Type III bursts reported in the IAU Bulletin, and all Type II and Type IV bursts included in the Maxwell, Hughes and Thompson Catalogue of Type II and Type IV Solar Radio Bursts (reference 38).

8.7 Polar-cap absorptions included in Bailey's catalogue (reference 2) and those weak events generally reported in the literature from Riometer recordings.

In addition to these major events, the catalogue includes:

8.8 200 Mc/s radio emissions that occurred at the time of other solar events.

8.9 Radio emissions at other frequencies unquestionably associated with other solar events.

8.10 Geomagnetic storms

8.11 All events of lower importance that are definitely or reasonably associated with one or more of the major events.

8.12 Notes and comments concerning some of the solar-terrestrial events are given as footnotes on the appropriate pages.

TABLE 2.7 SOURCES AND REFERENCES SOLAR ACTIVITY CATALOGUE 1957

						SOLAR PHENOMENA			RADIO EMISSIONS			SOLAR-TERRESTRIAL EFFECTS					
Ref. No.	Author	Publication	Vol.	Year	Pages	Plage	Sun Spots	Flares	II	IV	Single Freq.	S.W.F.	P.C.A.	Forbush Decrease	Geomag. Storms	Kp	S.F.E
1	Afanas'yeva	Geomag. Aeronomy	2	1962	426 - 431										(X)		
2	Bailey	Planet. Space Sci.	12	1964	495 - 541								(X)				
3	Bailey	J. Phys. Soc. Japan Supp. AI	17	1962	106 - 112			X				X	(X)				
4	Bartels, Roman, & Veldkamp	IAGA Bulletin	12.i	1961	134 - 136 210 - 217 203 - 204										(X)	(X)	(X)
5	Bartels & Veldkamp	J. Geophys. Res.	62 63	1957 1958	475, 629 243, 547										(X) (X)	 X	 X
6	Bartels	IAGA Bulletin	18	1962	107 - 112 178 - 179										(X)	(X)	
7	Besprozvannaya	J. Phys. Soc. Japan Supp. AI	17	1962	146 - 149								(X)				
8	Boorman, et. al.	M.N. Royal Astron. Soc.	123	1961	87 - 96			X	X								
9	Collins, Jelly & Matthews	Can. J. Phys.	39	1961	35 - 52								(X)				
10	De Feiter, et. al.	Planet. Space Sci.	2	1961	223 - 227			(X)							(X)	X	
11	Dodson & Hedeman	J. Geophys. Res.	65	1960	123 - 131			(X)									
12	Dodson & Hedeman	I.G.Y. Solar Act Report	R 12	1960				(X)									
13	Dodson & Hedeman	Plage Catalogue	To be published			(X)	X										
14.	Dodson & Hedeman	Astrophys. J.	128	1958	636 - 645			X									(X)
15.	Dodson & Hedeman	Planet. Space Sci.	12	1964	393 - 418			X	X	X		(X)			X		
16.	Dvoryashin, et. al.	Soviet Astron. A.J.	5	1961	311 - 325			X		X			X		(X)		
17.	Eleman	Arkiv Astronomi	3	1962	37 - 49			X									(X)
18.	Ellison, Ed.	Annals, I.G.Y.	23	1962	266 pages		(X)										
19.	Ellison, Ed.	Annals, I.G.Y.	21, 22	1961		(X)	(X)	(X)									
20.	Fedchenko	Geomag., Aeronomy	1	1961	310 - 316									(X)			
21.	Finch & Laurie	The Observatory	78	1958	40 - 42		X								(X)		
22.	HaKura & Goh	J. Radio Res. Lab. Japan	6	1959	633 - 650					X	X		X		(X)		
23.	Haurwitz	J. Geophys. Res.	67	1962	2979 - 2982			X							(X)		
24.	Jelly & Collins	Can. J. Phys.	40	1962	706 - 718								(X)				
25.	Jenkins & Paghis	Can. J. Phys.	41	1963	1056 - 1075			X					(X)				
26.	Kahle	U. Alaska Geophys. Report	R129	1962	68 pages			X	X	X		X	(X)		X		
27.	Kamiya	J. Geomag. Geoel. Japan	13	1961	33 - 41			X		(X)				X			
28.	Knapp	J. Geophys. Res.	66	1961	2053 - 2085										(X)		
29.	Khocholava	Geomag. Aeronomy	2	1962	90 - 96	X		X		X			(X)	X	X		
30.	Khocholava	Geomag. Aeronomy	3	1963	735 - 740	X		X		X			(X)	X	X		

TABLE 2.7 1957 (CONTINUED)

Ref. No.	Author	Publication	Vol.	Year	Pages	SOLAR PHENOMENA			RADIO EMISSIONS			SOLAR-TERRESTRIAL EFFECTS					
						Plage	Sun Spots	Flares	II	IV	Single Freq.	S.W.F.	P.C.A.	Forbush Decrease	Geomag. Storms	Kp	S.F.E.
31.	Leinbach	U. Alaska Geophys. Rep.	R127	1962	230 pages								(X)				
32.	Lockwood	J. Geophys. Res.	65	1960	3859 - 3880			X						(X)			
33.	Maeda, et. al.	Ann. Geophys.	18	1962	305 - 333			X			X	X		X	(X)		
34.	Malitson	NASA - TR	R169	1963	109 - 117			X		X			(X)		X		
35.	Matres & Pick	Ann. Astrophys.	25	1962	293 - 300		X	(X)									
36.	Matsushita	J. Geophys. Res.	67	1962	3753 - 3771										(X)		
37.	Maxwell, Thompson, & Garmire	Planet. Space Sci.	1	1959	325 - 332				(X)						X		
38.	Maxwell, Hughes, & Thompson	J. Geophys. Res.	68	1963	1347 - 1354			X	(X)	(X)							
39.	McLean	Australian J. Phys.	12	1959	404 - 417					(X)						X	
40.	Noyes	J. Phys. Soc. Japan, Supp. A2	17	1962	275 - 280	X	X	X					(X)				
41.	Obayashi & Hakura	J. Geophys. Res.	65	1960	3143 - 3148			X		X			(X)		X		
42.	Obayashi & Hakura	Rep. Ionosphere. Space. Res. Japan	14	1960	1 - 40					X			X		(X)		
43.	Ohman, Ed.	Ann. I.G.Y.	5	1958	249 - 300	X	X	X	X	X	X						
44.	Pick-Gutmann	Ann. Astrophys.	24	1961	183 - 210					(X)	X						
45.	Piggott & Shapley	Antartic Res. Geophys.	7	1962	111 - 126								(X)				
46.	Pisharoty & Srivastava	J. Geophys. Res.	67	1962	2189 - 2192										(X)		
47.	Reid & Leinbach	J. Geophys. Res.	64	1959	1801 - 1805			X					(X)				
48.	Sano	J. Geomag. Geoel, Japan	14	1962	1 - 15										(X)		
49.	Sarabhai & Pai	J. Phys. Soc. Japan, Supp. A2	17	1962	286 - 289			X					(X)		X		
50.	Shapley & Lincoln Compil.	Ann. I.G.Y. Solar Activity	16	1962	1 - 127			(X)	X	X	X	X		X	(X)	(X)	
51.	Simpson, Ed.	Ann. I.G.Y. Cosmic-Rays	27, 28														
52.	Sinno	J. Geomag. Geoel, Japan	13	1961	1 - 10			X		X			X		(X)		
53.	Thompson & Maxwell	Planet Space Sci.	2	1960	104 - 109			X		(X)			X				
54.	Waldmeier	Pub. Eigeniss, Sternwarte Zurich	11	19--	31 - 59		(X)										
55.	Warwick, C.	I.G.Y. Solar Activity Rep.	R 17	1962				(X)									
56.	Warwick, C., & Haurwitz	J. Geophys. Res.	67	1962	1312 - 1332			X			X		(X)				
57.	Weiss	Australian J. Phys.	16	1963	240 - 271			X	(X)								
58.		Atomic Energy of Canada, Deep River	Weekly Reports Neutron Monitor											X			

TABLE 2.7 1957 (CONTINUED)

Ref. No.	Author	Publication	Vol.	Year	Pages	SOLAR PHENOMENA			RADIO EMISSIONS			SOLAR-TERRESTRIAL EFFECTS					
						Plage	Sun Spots	Flares	II	IV	Single Freq.	S.W.F.	P.C.A.	Forbush Decrease	Geomag. Storms	Kp	S.F.E.
59.	CRPL	Solar, Geophysical Data Part B - 1957	150 - 161			⊗		⊗			⊗	⊗			⊗	⊗	
60.	CSIRO	Spectral Observations							⊗	⊗							
61.	Greenwich Obs.	Photoheliographic Results	26	1961	C89 - C184		⊗										
62.	High Altitude Obs.	Weekly Solar Bulletin						X							X		
63.	IAU Quarterly Bulletin	Solar Activity	117 - 120					⊗	⊗	⊗	⊗						
64.	I.G.Y. WDC-A	Aurora, Instrumental	1, 2, 3										⊗				
65.	Mt. Wilson Obs.	Microfilm		1957			⊗										
66.	Mt. Wilson Sunspot Mag. Class	P. Astron. Soc. Pacific	69	1957	272, 360, 471, 580		⊗										
			70	1958	116, 214		⊗										
67.	Principal Magnetic Storms	J. Geophys. Res.	62	1957	320, 480, 634												
			63	1958	249												
68.	Tokyo Astronomical Obs.	Quarterly Solar Bulletin	9			⊗	⊗	⊗			⊗						
69.	U.S. Naval Obs.	Daily Sunspot Bulletin		1957			X										

TABLE I. CATALOGUE OF MAJOR SOLAR FLARES DURING 1957

The meaning of the various columns and a description of the data contained in Table I - Catalogue of Major Solar Flares, are given below.

A major flare is defined as a flare which has been reported with importance 3 or 3+ by at least one solar observatory, or with importance 2+ by at least two observatories and published in the Quarterly Bulletin of the IAU (reference 63).

Column 1 Major Flare Serial Number.

Column 2 Solar Event Serial Number. This is the event number assigned to the solar or terrestrial event in the Chronological Catalogue, Table VIII.

Column 3 Greenwich Date of the Flare.

Column 4 Beginning of the Flare U.T. This is the earliest time reported in the IAU Bulletin. If the observatory reported that the start of the flare was observed, the fact is indicated by underlining the start time.

Column 5 End Time U.T. This is the latest reported end time in the IAU Bulletin. If the end of the flare was observed, the end time is underlined.

Column 6 Time of Maximum. Since different observatories often report different maximum times for the same flare, the time (or in a few cases, times) entered in this column has been taken from the McMath-Hulbert working list of flares for the second six months and unpublished data for the first six months. In general, the tabulated time is the arithmetic mean of the reported times of maximum for all observations that covered the principal maximum of the flare. If a second time is given, there is an indication that a secondary maximum may have occurred as indicated by two well developed phases or that several observers reported them as two separate flares.

Column 7 Position. The heliographic position given in the catalogue are arithmetic means of the values reported in the IAU Bulletin. A reported value is excluded in deriving the mean if the value deviates by a large amount from the other reported positions.

Column 8 Plage Number. This is the serial number of the McMath plage in which the flare occurred.

Column 9 Active Region. This is the serial number assigned to active regions by the Meudon Observatory in the IAU Quarterly Bulletin. The numbering starts with one at the beginning of each quarter. It will be noted that there is not always a one to one correspondence between the plage and the active region, a plage may cover two or more regions.

Column 10 Mt. Wilson Serial Number of Sunspot Group Where the Flare Occurred. Occasionally a flare occurs between two groups and two spot numbers are recorded.

Column 11 Greenwich Serial Number of the Spot Group.

Column 12 Flare Importance. This is the maximum importance reported for the flare in the IAU Quarterly Bulletin.

Column 13 No. Rep./No. Max. This column gives the number of observatories reporting the flare in the IAU Bulletin and the number that reported it with the maximum importance. Occasionally an observer reports the same flare two or more times. These separate reports are all considered in the selection of the start, end, and maximum times use in Columns 4, 5, and 6. But only once for the number of reports. The number of observers reporting the flare with the importance shown in Column 12 is indicated by the second number in this column. **(See Note Page 2.I-iv.)**

Column 14 This column gives the importance assigned to the flare in the McMath-Hulbert Observatory working list of flares (reference 12), for the second six months and unpublished data for the first six months. The method that was used to arrive at the value is described in that reference.

FLARE AREA SQUARE DEGREES

Reported areas of flares, in square degrees, frequently vary over a wide range. These differences are due to the methods used by the observer, different times at which the estimate, or measurement was made, and other factors. In order to give the tabulation of this parameter as much value as possible, we have given:

Column 15 The range of areas reported in the IAU Quarterly Bulletin: Smallest area and largest area.

Column 16 Number of Observatories Reporting an Area

Column 17 The Arithmetic Mean of the Reported Values

RELATED FLARE ACTIVITY

Column 18 Other Flares. This column lists the number of minor and major flares associated with the active region during disk passage (IAU active region reference 63) before and after the major flare.

Column 19 This column gives the heliographic longitude (or cental meridian distance) of the first flare associated with the region and the importance of the first flare. For example: E90/2 indicates that the first flare occurred at E90, and at least one observatory reported it with an importance 2.

Column 20 Short Wave Radio Fadeouts (S.W.F.). Short wave radio fadeouts associated with major flares are listed with the following notation: Beginning/Duration in munutes/ importance. Complete data for S.W.F.'s of importance ≥ 3 that lasted 30 minutes or more are given in Table VI, Catalogue of Solar-Terrestrial Effects.

Column 21 Solar Radio Emissions at 10 cm. Peak flux reported at approximately 10 cm. wave length. (The frequencies may be 2800, 2980, or 3000 Mc/s.) Detailed data for important solar radio emissions are given in Table IV, Catalogue of Solar Radio Emissions. The information given in Columns 21-23 is limited to an indication of the radio activity of the region at the time of the flare.

Column 22 Peak flux reported at 1.5 m. wave length (200 Mc/s). If the peak flux was reported as greater than the recorded flux, the recorded flux has been underlined. When the flux given in Columns 20 or 21 represents a smoothed flux (peak flux not reported), the value is enclosed in a bracket.

Column 23 Emissions at Other Wave Lengths. The notation cm. in this column indicates that emissions are reported (and given in Table IV at one or more frequencies greater than 600 Mc/s (except approximately 3000 Mc/s). Similarly, the notation m. indicates that emissions are reported at frequencies less than 600 Mc/s (except 200 Mc/s) and detailed data are given in Table IV.

Column 24 Dynamic Spectral Emissions. The notation II or IV in this column indicates that emissions of Type II (slow drift), or broad band continuum, Type IV, are reported by either the Sweep Frequency Observatory at Sydney, Australia, or the Harvard College Radio Observatory at Fort Davis, Texas.

If no spectral observations are reported, but a broad band continuum, Type IV, has been derived from discrete frequency observations by one or more of several investigators, the symbol has been enclosed in a bracke - (IV). (Detailed data are given in Table IV.)

SOLAR TERRESTRIAL EFFECTS

Column 25 Polar-Cap Absorption. Polar-cap absorptions reported within a reasonable time after a major flare (generally between one and seven hours) are listed. The data in this column are limited to: month/Greenwich day/beginning time U.T./absorption in db. Additional data, including references, are given in Table VI, Catalogue of Solar-Terrestrial Effects.

Column 26 Geomagnetic Storms. Geomagnetic storms with a maximum Kp $\geq 5-$ reported by three or more observatories within a reasonable time after the major flare (generally between twelve and seventy two hours). The data in this column are limited to: Month/Greenwich day/onset time, U.T./type/degree of activity/maximum reported Kp. Additional data, including: references, duration, number of reports, etc. are given in the Catalogue of Geomagnetic Storms, Table V, and the Catalogue of Solar-Terrestrial Effects, Table VI.

NOTE:

Normalized flare data[1] for the period July 1955 through June 1957 have just become available (6 January 1964). The normalized flare importances combined with the previously published data for the IGY[2] (July 1957 through December 1958) cover 48 of the 84 months of the 19th Solar Cycle when the sun was reasonably active and most of the major flares were reported.

Since the method used by Warwick (described in detail in (2)) to arrive at a normalized flare importance is different from the method used to derive the McMath-Hulbert working list of flares (reference 12), we feel that both the McMath-Hulbert and the Warwick flare importances will be valuable in the study of flares and flare induced phenomena and have inserted the Warwick importances between Columns 13 and 14 in the Catalogue of Major Flares (Volume 2, Table I) for 1957.

We find three cases where flares reported in the IAU Bulletin, and the McMath-Hulbert working list are recorded as two or more separate flares in the Warwick list as shown below:

Date	Major Flare Serial No.	McM Serial No.	CSW Serial No.	Importance CSW	McM	IAU
8-28	45	710	1360	3	3	3+
			1362	3		
			1363	3		
			1367	3		
9-18	70	1068	2191	2-	3+	3+
			2192	3+		
11-24	93	1982	4180	3-	3	3+
			4181	3		

A comparison of the flare times and heliographic portions is shown on Page 2.I-vi.

(1) Warwick, Constance S., Normalized Solar Flare Data July 1955 through June 1957, IGY Solar Activity Report Series, No. 29, Nov. 1964.

(2) Warwick, Constance S., National Bureau of Sciences List of IGY Flares with Normalized Values of Importance and Area, IGY Solar Activity Report Series, No. 17, May 1962.

MAJOR FLARE NO. 45

	Table I	McMath	C. S. Warwick			
Ser. No.	45	710	1360	1362	1363	1367
Beg.	0810	0913	0810	0915 (0841)	0847	1133 (1110)
End	1404	1404	0839	1059 (1115)	1047	1331 (1345)
Max.	0955	0925 0955	0824	1002	0925	1123
Position	S31 E33	S31 E33	S30 E32	S30 E33	---- ----	S34 E32

MAJOR FLARE NO. 70

	Table I	McMath		C. S. Warwick	
Ser. No.	70	1068		2191	2192
Beg.	1658	1722	1818	1722 (1658)	1818
End	2110	1818	2110	1843 (1927)	2029
Max.	1840	1740	1840	1702	1840
Position	N23 E08	N23 E08	N20 E03	N23 E09	N20 E03

MAJOR FLARE NO. 93

	Table I	McMath		C. S. Warwick	
Ser. No.	93	1982		4180	4181
Beg.	0848	0848	1100	0848	0900
End	1202	1100	1202	1108	1109
Max.	0911	0911	1109	0911	0912
Position	S14 E37	S14 E47	S12 E55	S14 E37	S11 E38

Table Ii (cont.)

CSW Serial No.	Date	Beg. UT	End UT	Max. UT	Position		Importance CSW	IAU	McM
	Oct.								
2760	5	1253	1256		N45	W90	2+	2	2
3175	18	2357	2550*		S22	W03	2+		0
3207	19	1916	2006	1925	S25	W21	2+		1C
	Nov.								
4132	22	0055	0105	*---	S25	E90	2+		0
	Dec.								
5131	28	2229	2331	2230	N25	W50	3-	2	2
5150	30	0102	0126	0106	N24	W59	3-	2,1	1+

* Not in CRPL-F or IAU

TABLE Ii CSW FLARES IMPORTANCE 2+ OR 3- NOT INCLUDED IN TABLE I

CSW Serial No.	Date	Beg. UT	End UT	Max. UT	Position		Importance CSW	IAU	McM
	Jan.								
3515	5	0116	0200	0116	N17	W31	2+	2	
3516		0157	0240	0157	S24	E61	3-		1B
3530	6	0712	0728	----	N26	W71	2+	2+	2
3538		2025	2115	2030	S23	E38	2+	2,1+	
3540	7	0400	0435	0407	N20	W90	2+	2	
3549	7	1830	1840	----	N20	W65	2+		1B
3645	20	1850	2015	1920	N14	E14	3-		1B
3663	22	0454	0619	0459	N15	E05	2+	2	
3707	24	1638	1653	----	S28	W80	3-	2,2	
3732	27	0830	1100	----	N13	W70	2+	2	
	Feb.								
3747	1	1525	1740	1618	N21	W32	2+	2,2+,1	
3830	13	0044	0110	0046	S24	E26	2+	2	
3899	25	0937	0954	0945	S24	W80	2+		1B
3909	26	0108	0150	0120	N33	E28	2+	2	
	Apr.								
4273	6	1144	1153	1145	N24	W90	2+		1B
4290	8	0333	0340	0336	S23	E50	2+	1	
4354	12	1850	2010	1916	S25	W73	3	2,2+,2	
4381	15	1410	1430	----	N25	E90	2+	2	
4394	17	0338	0400	0344	S16	E80	2+	2,2	
4411		2220	2255	2245	N27	E69	2+	1+	
4425	18	2025	2150	2033	N32	E56	2+	2	
	June								
5004	1	2329	2356	2344	S25	W44	2+	2-	
5462	22	1335	1445	1415	S20	E38	2+	1+	
5512	24	2040	2102	2050	N07	E73	2+	2-	
	July								
651	28	1346	1458	1403	S23	W76	2+	2,2, 2,1+,1	2
	Aug.								
1349	27	2347	2405	2352	N24	W85	2+	2	2
1502	31	2035	----	----	N14	W10	2+	2	1
	Sept.								
1701	5	2116	2200	2125	N08	E74	3-	1,2	1
2063	15	0426	0450	0428	N12	W53	2+	2	2
2209	19	0400	0500		N24	W10	2+		0
2335	22	2006	2014	2008	N10,16	E59	3-	2	1+

The times enclosed in brackets for the Warwick flares 1362, 1367, and 2191 are the first beginnings and last endings as recorded in that list.

Comparing the flare importances in Columns IAU, CSW, and McM (Table I) we find that 21 of the major flares reduced to minor flare status (1, 1+, 2- or 2) in the Warwick list have a major flare status in the McMath-Hulbert working list, although some were reduced in importance (from 3+ to 3, or 3 to 2+). Six of the major flares that retained that status in the Warwick list were reduced to minor flares in the McMath-Hulbert working list. Forty-one of the major flares in Table I were reduced to minor flares in both the Warwick and the McMath-Hulbert lists. The Warwick list includes 36 flares with importance 2+, or 3- and one flare with importance 3. These are given in Table 1-i. We have included the CSW Serial Number; Date; Beginning, End, and Maximum Time; Position; CSW Importance; all importances reported in the IAU Quarterly Bulletin; Remarks.

The notation 1A or 1B in the remarks column indicates that the flare is included in Table 1-B or 1-C. The symbol "0" indicates that the flare is not listed in the IAU Bulletin.

TABLE I. CATALOGUE OF MAJOR SOLAR FLARES DURING 19

Serial No.	Event No.	MAJOR FLARE Gr. Day	Beg. UT	End UT	Max. UT	Position	SOLAR REGION Plage No.	Region No.	Sunspot Number Mt. W.	Sunspot Number Greenwich	FLARE IMPORTANCE IAU	No. Rep./No. Max.	CSW	$M^C M.$	FLARE AREA Range	No. Re
1	4	Jan. 06	1038	1403	1128	S21 E40	3813	11	12068	17814	3+	6/1	2+	3	26-32	5
2		07	1311	1422	1358	N17 W62	3808	4	12054	17803	3	5/2	1	2+	10-30	3
3		08	1324	1455	1339	N17 W71	3808	4	12054	17803	3-	6/1	2+	2+	10-40	6
4		14	0020	0044	0030	S24 E70	3820	15	12085	17829	3	1/1	3-	1	16	1
5	9	20	1100	1417	1119	S30 W18	3820	15	12085	17829	3	10/2	2+	3	10-38	5
6		23	0144	0251	0201	S25 W52	3820	15	12085	17829	3	2/1	2-	1	3-20	2
7		23	2310	2358	2314	N17 W17	3823	19	12089	17833	3+	1/1	3-	3+	32	1
8		24	0247	0342	0250	N16 W26	3823	19	12089	17833	3	3/1	2+	2+	18-19	2
9	12	24	1225	1354	1241	N16 W31	3823	19	12089	17833	3	4/1	2+	3	2-15	4
10		25	0520	0537	0526	S22 W89	3820	15	12085	17829	3	1/1	3-	3	16	1
11	17	31	0358	0550	0436	N24 E05	3830	30	12114	17850	3+	1/1	3-	3+	25	1
12		Feb. 08	0832	0915	0836	S12 E06	3843	37	12122	17860	3	1/1	2+	3	-	-
13	26	28	0005	0420	0014	N18 W35	3863	51	12154	17884	3	2/1	3	3	10-20	2
14		Mar. 13	1414	1633	1435	S19 E40	3888	72	12191	17911	2+	9/2	2-	2+	5-16	5
15		29	1025	1400	1115	S15 W40	3899	84	12216	17927	3-	5/1	2	2	1-12	5
16		Apr. 02	1002	1012	-	S08 W90	3899	1	12216	17927	3	1/1	3-	3	-	-
17	40	03	0825	1026	0835	S14 W60	3907	5	12235	17935	3	4/2	3-	3	-	-
18		08	0616	0830	0622	S19 W02	3916	18	12259	17956	3	6/1	2	2	6-15	4
19	50	11	1722	1850	1738	S23 E04	3923	20	12254 12258	17954	3	2/1	2+	2+	7	1
20	54	16	1040	1300	1105	N30 E85	3941	34	12285	17976	3	10/2	2+	3	3-20	6
21	55	17	1006	1118	1022	N29 E76	3941	34	12285	17976	3	6/2	2-	3	4-19	6
22		June 03	1040	1202	1047	S18 W18	3996	81	12368	18043	3	6/1	2	2	5-22	3
23		15	0730	0840	0743	S18 E62	4022	99	12407	18067	3-	9/1	2	2	6-35	7
24		19	0609	0811	0640	S38 E24	4021	100	12409	18068	3	7/1	1+	2	3-12	5
25	82	19	1609	1649	1613	N20 E45	4024	103	12415	18071	2+	4/2	2+	2	7-16	3
26		24	0724	0820	0739	N25 W27	4024	103	12415	18071	3	5/1	2-	2	7-20	4
27		24	0838	0929	0850	N22 W14	4024	103	12417	18073	3	5/2	2+	2+	2-13	5
28		28	0658	0950	0722	N10 E27	4039	107	12434	18084	3	9/1	2	2+	5-12	8
29		30	0814	0915	0828	S28 E60	4044	112	12449	18092	3	10/1	1+	2	5-14	9
30		30	0924	1332	1025	N09 W03	4039	107	12434	18084	2+	12/6	2-	2+	5-24	11
31		July 02	0705	0805	-	N09 W30	4039	2	12434	18084	2+	2/2	1	2+	13	1
32	92	03	0712 0830	0830 1145	0745 0840	N14 W40 N10 W42	4039 4039	2	12434	18084	3+	17/4	3-	3+	3-100	12
33		04	1134	1154	-	N12 E39	4048	11	12456	18096	3	1/1	1	3	24	1
34		04	1154	1213	-	S10 E43	-	-	-	-	3	1/1	1+	-	25	1
35		08	0521	0802	0538	N14 W41	4046	8	12451	18094	2+	9/2	2-	2	3-14	6
36		21	0633	0750	0658	N30 E15	4065	30	12491	18121	2+	10/3	1+	2	3-14	8
37	103	21	1320	1442	1337	N29 E12	4065	30	12491	18121	3	7/1	2-	2	5-8	5
38	108	22	0953	1150	-	N15 E51	4075	33	12503	18128 18139	3	1/1	3-	3	53	1
39		22	1240	1505	1303	S23 E07	4070	31	12496	18122	3	9/1	1	2	2-15	9
40	109	24	1712 1801	1801 2025	1737 1828	S24 W27	4070	31	12496	18122	3	4/2	2+	3	15-23	2
41		27	0637	0820	0703	S24 W61	4070	31	12496	18122	2+	9/2	1+	2	3-20	7

57 WITH ASSOCIATED PHENOMENA AND SELECTED EFFECTS

SQ. DEG.	RELATED FLARE ACTIVITY			S.W.F.	RADIO EMISSIONS				POLAR CAP ABS.	GEOMAGNETIC STORM
p. Mean	Minor/Major Before	After	First Flare Pos./Imp.	Beg./Dur./Imp.	Peak Flux 10 cm.	1.5 m.	Other Wave Lengths	Dynamic II & IV	Gr. Day / Beg. UT / Abs. db	Gr. Day / Beg. UT / Type / Int. / Max. Kp
28	6/0	13/0	E81/1		-	-	m			
19	21/0	5/1	E65/1		(160)	-	-			
19	25/1	1/0	E65/1	1330/30/2	(65)	-	m			
16	0/0	30/3	E70/3		-	-	-			
20	16/1	14/2	E70/3	1113/13/1+	184	-	m		Jan. 20/1500/4.1	Jan. 21/1255/sc/s/9-
12	23/2	7/1	E70/3		-	-	cm			
32	11/0	14/2	E50/1		-	-	m			
19	11/1	14/1	E50/1	0240/20/2	-	-	cm			
8	13/2	12/0	E50/1	1235/35/2	250	200	m			
16	30/3	0/0	E70/3	0528/20/1	-	-	cm			
25	0/0	2/0	E05/3+	0356/84/1	234	-	cm	II		
-	0/0	1/0	E06/3		-	35	m			
15	2/0	1/0	E23/2-	0020/110/1+	-	240	m	II,IV		
10	6/0	5/0	E67/1+		-	-	-			
7	23/0	6/1	E73/1	1024/131/3	(84)	-	m			
-	29/1	0/0	E73/1		-	-	cm,m			
-	12/0	12/0	E40/1	0833/35/2	-	10	cm,m	(IV)	April 03/1330/3.9	
10	5/0	1/0	E90/1	0612/48/2	-	-	cm			
7	25/0	3/0	E90/1	1731/64/3	(135)	-	m			
11	1/0	34/1	E90/2	1044/76/3	1670	800	cm,m	(IV)		Apr. 17/1136/sc/s/8-
10	2/1	33/0	E90/2	1004/79/3	-	-	cm			
11	16/0	13/0	E29/1+	1045/20/2+	(250)	250	m	(IV)		
15	3/0	3/0	E90/1	0735/30/2	38	-	cm			
8	29/0	25/0	E90/2	0615/41/2-	-	-	cm			
10	5/0	27/2	E57/1	1608/44/3	(2325)	260	m	II,(IV)		
11	17/1	13/1	E57/1		-	-	-			
8	17/2	13/0	E57/1	0849/28/3-	-	400	μ	(IV)		
9	17/0	25/3	E75/1	0708/20/2-	-	1500	cm,m	(IV)		June 30/0528/sc/s/8+
8	7/0	15/0	E87/1		-	-	-			
12	24/1	18/2	E75/1		119	-	m	(IV)		July 02/0857/sc/s/8o
13	35/2	7/1	E75/1	0709/17/1	-	-	cm			
31	42/3	0/0	E75/1	0729/61/2+ 0830/44/3	585 600	3400	cm,m	(IV)	July 03/1000/9.2	04/2342/sc/ms/7+
24	6/0	10/0	E88/1		-	200	-			
25					-	-	-			
8	20/0	7/0	E74/1	0536/24/1+	359	-	cm,m			
8	18/0	17/1	E85/1+	0547/60/3	536	-	cm,m			
7	19/1	16/0	E85/1+	1335/45/2+	(850)	300	m	(IV)		
53	9/0	15/0	E85/2		-	250	m			
8	8/0	18/2	E58/1		-	340	m			
19	18/1	8/1	E58/1	1727/113/3 1759/81/3-	(1080)	200	cm,m	IV	24/2015/2	
8	20/2	6/0	E58/1		-	180	m			

Serial No.	Event No.	MAJOR FLARE Gr. Day	Beg. UT	End UT	Max. UT	Position	SOLAR REGION Plage No.	Region No.	Sunspot Mt. W.	Number Greenwich	FLARE IMPORTANCE IAU	No. Rep. / No. Max.	CSW	$M^cM.$	FLARE AREA Range	No. R
42		Aug. 08	1116	1257	1134	N27 W57	4083	45	12516	18141	2+	11/4	2-	2+	4-17	9
43		21	0745	0844	0756	N24 E20	4112	66	12563	18171	3	8/2	1+	2+	3-12	7
44		23	1126	1300	1154	N16 W17	4112	66	12563	18171	3	7/1	2-	2	6-18	5
45	125	28	0810	1404	0955	S31 E33	4125	73	12579	18181	3+	11/2	3	3	4-52	8
46	126	28	2010	2048	2024	S28 E30	4125	73	12579	18181	3	4/1	2+	2+	2-11	2
47		29	0545	0715	0555	N24 E35	4124	74	12580	18182	2+	8/2	1+	2	2-10	7
48		29	1031	1201	1052	S25 E20	4125	73	12579	18181	3	11/1	2-	2	3-9	7
49		30	0620	0804	0600	N26 E22	4124	74	12580	18182	2+	9/2	1+	2	2-22	7
50		31	0521	1048	0727	S32 W02	4125	73	12579	18181	3	10/1	1+	2+	5-21	10
51	132	31	1257	1557	1312	N25 W02	4124	74	12580	18182	3+	8/1	3-	3	7-13	6
52		31	1338	1455	1353	N12 W02	4124	75	12581	18183	2+	7/3	2	2+	3-5	4
53	135	Sept. 01	0946	1030	0952	N12 W09	4124	75	12581	18183	3	6/1	2-	2	4-11	3
54		01	1255	1437	1302	N14 W15	4124	75	12581	18183	3	10/1	2-	2+	2-12	8
55		02	1045	1610	1112	S31 W36	4125	73	12579	18181	2+	7/2	1+	2+	3-13	6
56	138b	02	1313	1830	1316	S34 W36	4125	73	12579	18181	3	4/1	1+	2+	6-16	4
57		03	0647	1127	0850	N15 W38	4124	75	12581	18183	3	6/1	2-	2	2-10	5
58	142	03	1412	1727	1429	N23 W30	4124	74	12580	18182	3	13/6	3-	3	7-20	8
59		06	0751	0900	0803	N23 W66	4124	74	12580	18182	3	11/1	2	2	6-45	8
60		09	0755	0855	0813	N12 E22	4134	80	12596	18194	3	9/1	2-	2	4-17	6
61	146	10	0223	0300	0250	N14 E16	4134	80	12596	18194	3	1/1	2+	3	12	1
62		10	0702	1030	0833	S17 E16	4141	81	12606	18197	3	12/1	1	2	2-9	10
63	148	11	0236	0722	0300	N13 W02	4134	80	12596	18194	3	5/2	3-	3	7-23	3
64	150	12	0703	0740	0713	N09 W15	4134	80	12596	18194	3	7/1	1+	2	2-11	6
65	152	12	1510	1638	1516	N11 W18	4134	80	12596	18194	3	8/1	2-	2	3-8	6
66		16	1451	1709	1459	N08 E48	4152	93	12623	18211	2+	9/3	2	2+	6-10	6
67		17	0416	0945	0807	N23 E28	4151	91	12622	18209	2+	8/2	1+	2+	4-19	5
68		18	0624	0720	0633	N23 E13	4151	91	12622	18209	2+	6/2	2-	2	1-22	4
69	160	18	1026	1613	1325	N23 E10	4151	91	12622	18209	3	12/3	2-	3	3-13	10
70	161	18	1658	2110	1840	N23 E08	4151	91	12622	18209	3+	6/4	2-, 3+	3+	11-33	4
71	162	19	0350	0555	0410	N23 E02	4151	91	12622	18209	3+	5/1	3+	3	7-52	5
72		19	0744	1200	0800	N23 E01	4151	91	12622	18209	2+	12/2	2-	2	3-16	10
73		21	0518	1325	0614	N09 W01	4152	94	12634	18216	3	10/1	1	1	4-20	7
74	168	21	1330	1510	1335	N10 W06	4152	94	12634	18216	3	11/3	2	3	2-20	8
75	173	26	1907	2345	1952	N22 E15	4159	98	12636	18223	3	6/4	3-	3	19-24	3
76	176	30	1657	1750	1706	N25 W37	4159	98	12636	18223	3	5/3	3-	3	12-14	2
77	179	Oct. 09	0340	0500	0355	S38 W14	4173	21	12669	18247	3	3/1	2-	2	5-22	2
78	181	13	0534	0641	0539	N12 E40	4186	34	12687	18260	2+	3/2	2+	2+	6-23	3
79	185	16	0152	0202	0152	S25 E21	4189	38	12689	18262	3	1/1	3	3	15	1
80		16	0413	0500	0425	S26 E20	4189	38	12689	18262	3	4/1	2-	2	3-32	4
81		19	0603	0920	0639	S24 W25	4189	38	12689	18262	3	8/2	2-	2+	11-20	6
82	190	20	1637	1804	1642	S26 W45	4189	38	12689	18262	3+	2/1	3+	3+	20-40	2
83		21	1212	1314	1218	S25 W52	4189	38	12689	18262	3	3/1	1+	1+	4-19	3
84		23	0621	0645	-	S27 W77	4189	38	12689	18262	3	2/1	3	1+	11-13	2

(1)

2.1-2

(CONTINUED)

SQ. DEG.	RELATED FLARE ACTIVITY			S.W.F.	RADIO EMISSIONS				POLAR CAP ABS.	GEOMAGNETIC STORM
p. Mean	Minor/Major Before	After	First Flare Pos./Imp.	Beg./Dur./Imp.	Peak Flux 10 cm.	1.5 m.	Other Wave Lengths	Dynamic II & IV	Gr. Day / Beg. UT / Abs. db	Gr. Day / Beg. UT / Type / Int. / Max. Kp
8	31/0	6/0	E86/2-	1119/51/2	-	350	cm,m		Aug. 09/1600/3.1	
8	16/0	23/1	E73/1		-	150	m			
11	23/1	16/0	E73/1		-	-	cm			
19	17/0	32/5	E87/1	0917/138/3	1192	-	cm	(IV)		
7	18/1	31/4	E87/1	2020/18/2+	(760)	450	m	II	29/0000/3.2	Aug. 29/1920/sc/ms/7-
6	13/0	32/4	E90/1	0542/48/3-	362	-	cm			
5	21/2	28/3	E87/1	1039/16/1+	-	550	cm,m		29/1300/9	31/1812/sc/ms/7o
8	20/1	25/3	E90/1	0620/40/2	-	-	cm,m			
11	34/3	15/2	E87/1		569	1600	cm,m	(IV)		
10	26/2	19/2	E90/1	1303/184/3+	(3900)	1200	cm,m	IV	31/1500/5	Sept. 02/0314/sc/s/9-
4	13/0	38/3	E90/1+		-	1600	m			
7	20/1	31/2	E90/1+	0950/40/2	605	2000	cm,m			
6	21/2	30/1	E90/1+		(204)	-	m			
8	39/4	10/1	E87/1		-	-	m		Sept. 2/1700/7.2	04/1300/sc/s/9.
10	40/5	9/0	E87/1		-	1200	cm,m	(IV)		03/1233/-/s/9-
6	33/3	18/0	E90/1+		341	140	cm			
14	36/3	9/1	E90/1	1420/103/3	(1350)	320	cm,m	(IV)		
16	42/4	3/0	E90/1	0800/60/2-	430	-	cm			
10	18/0	17/4	E87/1		270	-	cm			
12	18/1	17/3	E87/1		349	-	cm			
6	0/0	40/0	E18/3		-	253	cm,m			
17	20/2	15/2	E87/1	0244/100/3	-	520	cm,m	IV		12/2154/sc/s/9- 13/0046/sc/s/9-
7	22/3	13/1	E87/1	0702/32/3-	443	1880	cm,m	II	12/1200/1.5	
6	23/4	12/0	E87/1	1513/39/2+	(850)	1050	cm,m	II,IV		
8	16/0	26/0	E73/2	1458/22/1+	320	300	cm,m			
9	17/0	52/5	E90/?	0411/49/2+	427	390	cm			
8	27/1	42/4	E90/?	0630/20/1+	-	118	cm			
9	30/2	39/3	E90/?	1030/104/3	-	500	m			
25	30/3	39/2	E90/?	1730/43/3+	(275)	356	m	IV		21/1005/sc/ms/7+
22	34/4	35/1	E90/?	0359/54/3	1410	1420	cm	IV		
10	35/5	34/0	E90/?	0800/35/2	-	-	m			
8	0/0	10/1	W02/3		-	-	cm			
9	10/1	0/0	W02/3	1330/60/3-	(785)	1800	cm,m	IV	21/1700/5.1	22/1344/sc/s/9- 23/0235/sc/s/9-
23	4/0	10/1	E90/1	1925/100/2+	-	384	m	IV	26/2315/2	29/0016/sc/s/9-
13	9/1	5/0	E90/1	1700/40/3	(120)	-	-			
14	5/0	4/0	E47/1		366	-	cm	II		
13	5/0	8/0	E90/?	0541/25/1	-	-	cm			
15	26/0	55/5	E90/1	0150/20/2+	-	-	cm			
12	26/1	55/4	E90/1	0417/30/2	435	-	cm			
16	51/2	30/3	E90/1	0620/55/1+	-	46	cm			Oct.
30	58/3	23/2	E90/1	1639/156/3+	(4000)	-	m	II,IV	21/0630/5	21/2241/sc/ms/7-
9	62/4	19/1	E90/1	1215/35/2	306	-	-			
12	70/5	11/0	E90/1	0620/32/2	-	-	cm			

2.1-2

(D)

Serial No.	Event No.	MAJOR FLARE Gr. Day	Beg. UT	End UT	Max. UT	Position		SOLAR REGION Plage No.	Region No.	Sunspot Mt. W.	Number Greenwich	FLARE IMPORTANCE IAU	No. Rep./ No. Max.	CSW	M_cM.	FLARE AREA Range.	No. Re
85		Oct. 27	1300	1310	-	S23	E01	4203	52	12718	18287	3	1/1	1-	1	2	1
86		Nov. 02	0904	0955	0918	S21	W16	4207	61	12732	18300	2+	8/2	1	2	6-14	6
87	206	05	1205	1257	1207	S24	W54	4207	61	12732	18300	3	5/1	2-	2	2-21	4
88	208	06	0834	0900	0841	S28	W67	4207	61	12732	18300	2+	9/2	2-	2	2-19	7
89		10	0606	0735	0623	S25	E65	4237	79	12768	18327	3	4/1	2+	2	8-50	4
90		13	0800	0925	-	N19	W18	4230	74	12763	18326	3	5/1	2	2	2-13	4
91	213	15	0517	0636	0537	N18	W45	4230	74	12763	18326	3	3/1	2-	1+	5-20	3
92	218	23	0750	0925	0804	N26	W54	4246	83	12779	18338	3	10/1	2+	2	4-18	8
93	219	24	0848	1202	0911	S14	E37	4263	92	12788	18353	3+	7/1	3-, 3	3	5-62	7
94	224	29	0045	0600	0213	N41	E63	4282	104	No Spots	-	3+	1, 1	3+	3+	34	1
95		Dec. 02	1025	1200	1107	S17	W34	4269	96	12800	18357	2+	8/2	2-	2+	3-14	7
96		03	1035	1430	1110	S19	W49	4269	96	12800	18357	2+	4/2	1	2	5-11	2
97		05	0548	0812	0657	S20	W19	4288	103	12808	18361	3	4/1	2	2+	5-21	4
98		12	0249	0407	0314	S33	W09	4301	116	12840	18385	3	2/1	2-	2	4-17	2
99	234	12	1750	1859	1806	N15	W41	4295	1112	12832	18377	2+	4/2	2+	2+	7-9	3
100	236	14	1245	1450	-	N18	E78	4314	126	12855	18398	3	2/1	3-	2+	9-36	2
101		16	1125	1238	1140	N17	E50	4314	126	12855	18398	3	9/1	2-	2	6-28	6
102		18	0408	0550	0500	N17	E26	4314	126	12855	18398	3	4/1	2-	2	3-18	4
103		18	0605	0712	0624	N17	E20	4314	126	12855	18398	3	2/1	2	2	14-17	2
104	238	19	0757	1015	0801	N20	E13	4314	126	12855	18398	2+	4/2	2+	2+	5-12	4
105		21	2232	2400	2251	N24	E50	4321	136	12874	18408	3	3/1	3-	2	13-22	2

TABLE IA. IAU MAJOR FLARES (TABLE I.) 1957, REDUCED TO IMPORTANCE ≤ 2 IN THE McMATH WORKING LIST

Serial No.	M_cM Serial	Date	Beg. UT	Position		Importance IAU	M_cM	Obs. Reporting Max. Importance	Other Importances Reported
		Jan							
4	-	14	0020	S24	E70	3	1	Sydney	
6	-	23	0144	S25	W52	3	1	Sydney	1
		Mar							
15	-	29	1025	S15	W40	3-	2	Capri F.	2+,2,2,2
		Apr							
18	-	08	0616	S19	W02	3	2	Kharkov	2+,2,2,2,2,1
		June							
22	-	03	1040	S18	W18	3	2	Wendelstein	2+,2,2,2,2
23	-	15	0730	S18	E62	3-	2	Meudon	2+,2,2,2,2,2,2,2
24	-	19	0600	S28	E24	3	2	Istanbul	2,2,2,2,1+,1
25	-	19	1609	N20	E45	2+	2	Capri S & Capri F.	2,2
26	-	24	0724	N25	W27	3	2	Istanbul	2+,2,2,1
29	-	30	0814	S28	E60	3	2	Uccle	2,2,2,2,1+,1+,1+,1+,1
		July							
35	105	08	0521	N14	W41	2+	2	Abastumani and Tachkent	2,2,2,1+,1+,1,1,?
36	236	21	0633	N30	E15	2+	2	Abastumani, Moscow & Utrecht	2,2,2,2,2,1+,1
37	242	21	1320	N29	E12	3	2	Kharkov	2,2,2,2,2,1
39	275	22	1240	S23	E07	3	2	Nizmir	2,2,2,2,2,1+,1+,1
41	346	27	0637	S24	W61	2+	2	Istanbul & Utrecht	2,2,2,2,2,1+,1
		Aug.							
44	628	23	1126	N16	W17	3	2	Uccle	2+,2,2,2,1+,1+
47	716	29	0545	N24	E35	2+	2	Abastamani & Mitaka	2,2,1+,1+,1+,1
48	723	29	1031	S25	E20	3	2	Arcetri	2+,2,2,2,2,1+,1+,1+,1+,1
49	737	30	0620	N26	E22	2+	2	Abastumani & Istanbul	2,2,2,2,2,1+,1
		Sept.							
53	787	01	0946	N12	W09	3	2	Uccle	2,2,2,1+,1
57	818	03	0647	N15	W38	3	2	Moscow	2+,2,2,1,1
59	867	06	0751	N23	W66	3	2	Moscow	2+,2+,2+,2,2,2,2,2,2,1+
60	900	09	0755	N12	E22	3	2	Kharkov	2+,2,2,2,2,2,2,1+
62	909	10	0702	S17	E16	3	2	Nizmir	2,2,2-,1+,1+,1+,1+,1+,1+,1,1,1
64	944	12	0703	N09	W15	3	2	Istanbul	2,2,1+,1+,1+,1
65	953	12	1510	N11	W18	3	2	Ondrejov	2+,2,2,2,2,2-,1+,1
68	1061	18	0624	N23	E13	2+	2	Crimee & Istanbul	2,1+,1+,1
72	1079	19	0744	N23	E01	2+	2	Moscow & Wendelstein	2,2,2,2,2,2,2,2,1+,1+,1
73	1116	21	0518	N09	W01	3	1	Abastumani	2,2,2,1+,1+,1+,1+,1,1
		Oct.							
77	1368	09	0340	S38	W14	3	2	Mitaka	2,1+
80	1498	16	0413	S26	E20	3	2	Mitaka	2,2,1
83	1582	21	1212	S25	W52	3	1+	Wendelstein	1+,1+,1
84	1606	23	0621	S27	W77	3	1+	Mitaka	1+
85	1694	27	1300	S23	E01	3	1	Zurich	
		Nov.							
86	1785	02	0904	S21	W16	2+	2	Moscow & Utrecht	2,2,2,2,1+,1
87	1810	05	1205	S24	W54	3	2	Kharkov	2,1+,1,1
88	1815	06	0834	S28	W67	2+	2	Kiev Ko. Kiev Ky	2,2,2,2,1+,1,1
89	1841	10	0606	S25	E65	3	2	Abastumani	2,2,2
90	1880	13	0800	N19	W18	3	2	Capri F.	2,2,1+,1
91	1890	15	0517	N18	W45	3	1+	Sydney	1+,1+
92	1967	23	0750	N26	W54	3	2	Moscow	2+,2+,2,2,2,2,2,2,1

2.1-3 (1)

:ONTINUED)

). DEG.	RELATED FLARE ACTIVITY			S.W.F.	RADIO EMISSIONS				POLAR CAP ABS.	GEOMAGNETIC STORMS
Mean	Minor Before	Major After	First Flare Pos./Imp.	Beg./Dur./Imp.	Peak Flux 10 cm.	Peak Flux 1.5 m.	Other Wave Lengths	Dynamic II & IV	Gr. Day / Beg. UT / Abs. db	Gr. Day / Beg. UT / Type / Int. / Max. Kp
2	5/0	7/0	E85/1		-	-	m			
10	31/0	16/2	E87/1+	0914/26/2-	-	432	cm			
8	43/1	4/1	E87/1+	1207/14/2+	(550)	38000	cm,m	(IV)		Nov. 06/1821/sc/ms/7o
9	43/2	4/0	E87/1+	0833/29/3-	572	-	cm			
22	5/0	12/0	E86/1+	0607/18/1	-	-	cm,m			
8	8.0	5/1	E75/1	0834/21/3	-	-	-			
15	10/1	3/0	E75/1	0527/51/1-	537	-	cm,m			
11	21/0	5/0	E68/1	0757/40/2	560	1800	cm	(IV)		
22	6.0	29/0	E75/1	0901/32/3-	998	50000	cm,m	(IV)		26/0155/sc/ms/7- 26/1454/g,ms/7-
34	0/0	0/0	E63/3+		-	-	cm	II		Dec. 01/0336/sc/ms/6-
9	15/0	11/1	E58/1		-	-	cm			
8	19.1	7/0	E58.1		-	-	m			
14	31/0	12/0	E90/1		375	-	cm			
11	3/0	0/0	E75/1		-	-	-			
8	5/0	0/0	E71/2+	1802/28/1	(94)	54	-	II		
23	2.0	37/4	E90/1	1233/67/3	-	5900	cm,m	(IV)		
14	7/1	32/3	E90/1	1129/33/1+	366	50000	cm,m	(IV)		
11	11/2	28/2	E90/1	0500/15/1+	409	-	cm			
21	11/3	28/1	E90/1	0620/30/2	-	3500	cm			
9	13/4	26/0	E90.1	0757/23/3	-	950	cm,m	II, (IV)		
18	5/0	25/0	E69/1+	2235/65/3+	556	-	cm			

TABLE IA. (CONTINUED)

Serial No.	M^{c}M Serial	Date	Beg. UT	Position	Importance IAU	Importance M^{c}M	Obs. Reporting Max. Importance	Other Importances Reported
		Dec.						
96	2135	03	1035	S19 W49	2+	2	Uccle & Nera	2,1+
98	2231	12	0249	S33 W09	3	2	Sydney	1
101	2270	16	1125	N17 E50	3	2	Kharkov	2+,2+,2,2,2,2,1+,1+
102	2281	18	0408	N17 E26	3	2	Mitaka	2,2,1
103	2282	18	0605	N17 E20	3	2	Sydney	2
105	2326	21	2232	N24 E50	3	2	Honolulu	2.2

TABLE IB. FLARES REPORTED BY ONLY ONE OBSERVATORY - IAU IMPORTANCE 2+

M^{c}M Serial No.	Date	Beg. UT	End UT	Max. UT	Position	Plage No.	Observatory
	Jan.						
	05	0157	0240	0157	S24 E61	3813	Mitaka
	07	1830	1840	-	N20 W65	3808	McMath
	11	0730	0857	0800	S24 W25	3813	Istanbul
	20	1850	2015	1920	N14 E14	3823	Sac. Peak
	Feb.						
	25	0937	0954	0945	S24 W80	3855	Herstmonceux
	Apr.						
	06	1144	1153	1145	N24 W90	3909	Crimee
	July						
209	18	0852	1134	0916	S09 E19	4066	Moscow
279	22	1403	1410	-	N28 E02	4063	Moscow
	Sept.						
1158	23	1211	1340	1242	N09 W44	4152	Kiev Ko
	Nov.						
2001	25	0717	0743	-	N23 W55	4247	Athens

TABLE IC IMPORTANCE 2+ FLARES NOT LISTED AS MAJOR FLARES

Date	Beg. UT	End UT	Max. UT	Position	Importance IAU Max.	Importance By Others	Importance M^{c}M	Total Sta. Reported	Plage No.	Range	Area No. Rept.	Mean
Jan.												
08	1006	1142	-	S20 E14	2+	2	2+	2	3813	9-20	2	15
July												
03	0544	0610	0545	N09 E14	2+	1	2+	2	4046	3	1	3
Oct.												
19	1916	2006	1925	S25 W21	2+	2	2+	2	4189	21	1	21

2.1-3 (2)

TABLE II. CATALOGUE OF IMPORTANT SUNSPOT GROUPS DURING 1957

This catalogue will list all sunspot groups that, during disk passage, meet one or more of the following requirements:

(a) All sunspot groups with a maximum area, during disk passage, equal to or greater than 500 millionth of the solar hemisphere, as recorded in the Royal Greenwich Observatory Bulletin No. 26 Photoheliographic Results, 1957 (reference 61).

(b) All sunspot groups that have a γ or $\beta\gamma$ magnetic classification as reported by Mt. Wilson Observatory in Reference 66.

(c) All sunspot groups associated with the major solar flares catalogued in Table I.

The column headings together with any necessary explanations follow:

Column 1 Catalogue Serial Number.

Column 2 Mt. Wilson Sunspot Number.

Column 3 Greenwich Sunspot Number. In a few cases the identification of a Mt. Wilson spot with a Greenwich spot was difficult and may be subject to change. Occasionally two Mt. Wilson groups correspond to one Greenwich group and vice versa. The associations given in this catalogue were obtained by studying microfilm of the Mt. Wilson sunspot drawings, the Zurich maps and spot positions given in reference 54 with the daily spot data given in reference 61.

Column 4 Catalogue Classification from a, b, or c Above. A sunspot with a maximum area greater than 500 millionth is designated in this column by the letter L. If the entry is due to the magnetic classification, the letter M is used. If the sunspot groups are associated with a major flare, the flare serial number or numbers are used. There will be cases where all three symbols may appear in the column, as well as more than one major flare.

Column 5 McMath Plage Number.

Column 6 Sunspot Mean Latitude During Disk Passage.

Column 7 Sunspot Mean Longitude During Disk Passage.

Column 8 Time of Central Meridian Passage. This date is given to the nearest one-hundredth of a day if the group crossed the central meridian. If the spot was last seen east of the central meridian or was first seen west of the central meridian, the CMP time is estimated and given to the nearest tenth of a day.

Column 9 Spots in the Plage. We have given the Mt. Wilson numbers for all sunspots in the plage during disk passage, these are from McMath-Hulbert unpublished data.

Column 10 Plage Catalogue Serial Numbers. If the plage is included in the Table III catalogue, detailed data for the sunpots listed in Column 9 are given in that table.

Column 11 Maximum Area. This is the corrected area given in the Greenwich Report. The first number gives the area of the umbra, the second number is the area of the whole spots that make up the group. Both values are expressed in units of millionth of the solar hemisphere.

Column 12 Position of the Maximum Area.

Column 13 Greenwich Day of Maximum Area.

Column 14 This is the time interval in days from the date of maximum area to the date of the flare (when applicable). A negative number indicates that the flare occurred after the spot group had attained the maximum area.

Column 15 Mean Area. This is the corrected value given in the Greenwich general catalogue of sunspots. The first number is the mean umbra area, the second number gives the corrected mean area for the whole spots.

Column 16 Mean Magnetic Class. The value given in reference 66 is used. (The symbols are defined on page 2.II-9)

Column 17 Mean Magnetic Strength. The values in units of 100 Gauss have been taken from reference 66.

Column 18-23 give the values on flare day when applicable: (18) flare day; (19) Corrected area; (20) Zurich classification; (21) Magnetic classification; (22) Magnetic field strength, and (23) Position. If more than one major flare occurred in the spot the flare day and flare day data are given in successive lines corresponding to the flare serial numbers given in Column 4.

Column 24 Disk Passage Data. The five lines in this column give the following data:

Top Line - The left hand number gives the date on which the sunspot was first seen; the right hand number gives the date on which the sunspot was last seen. These data have been taken from the three references 65, 61, and/or 34.

Second line - The left hand number gives the longitude from the central meridian where the spot was first seen; the right hand number gives the longitude distance from the central meridian where the spot was last seen.

Third line - This line gives the Zurich classification of the spot for each day (on which a classification was made) during disk passage as recorded in reference 54. (An explanation of the classification is given on page 2.II-9.

Fourth line - The Mt. Wilson magnetic classification of the sunspot on each day that a classification was made during disk passage. If the classification is an estimate, the symbol is enclosed in brackets. The data for this line are taken from a microfilm of Mt. Wilson daily work sheets. (Reference 63).

Last line - This gives the magnetic field strength in units of 100 gauss for each day on which the field strength was measured and shown on the Mt. Wilson daily sunspot maps. The values given on this line are the maximum values shown on the map.

Column 25 Recurrent Spots. If the sunspot group is the return of a previous group determined by Mt. Wilson and/or Greenwich, the serial number, or numbers, of the groups during the previous rotation or rotations are given. The top numbers give the Greenwich sequence, the bottom numbers give the Mt. Wilson sequence.

Column 26 Remarks. A general description of the spot group adapted from reference 61 is given.

POSITION DATA									MAXIMUM AREA					SUNSPOT MEAN DATA				MAJOR			
Serial No.	Sunspot Number MT.W.	Green.	Category	McM Plage	Lat.	Long.	C.M.P.	All Spots in Plage	Plage Serial No. Table III	Umb.	Whole Spot	Position	Gr. Day	Flare ΔT	Area Umb.	Whole Spot	Mt. Wilson Mag. Cl. H	Gr. Day	Area Umb.	Whole Spot	Zuri Cla
15	12216	17927	15, L 16	3899	S14	264	March 26.32	12221 12216 12230	11	181	1447	S14 E50	March 22.42	-7 -10	171	1133	$\ell\beta p\ell$ 34	29 Apr. 02	149 -	991 -	E D
16	12225	17934	L	3908	N28	268	26.06	12225 12231 12239	-	100	639	N28 W62	31.41		34	241	$d\beta\ell$ 5				
17	12235	17935	17, L	3907	S15	219	29.79	12232 12235 12228	12	91	734	S16 W72	April 04.39	+1	38	240	$d\beta\ell$ 14	03	110	682	E
18	12238	17943	L	3914	S23	131	April 05.41	12250 12238	-	84	562	S23 E13	04.39		34	201	$\ell\beta\ell$ 23				
19	12245	17952	L	3919	N21	127	05.74	12245	-	139	815	N21 W45	09.11		60	351	$d\beta p\ell$ 22				
20	12254 12258	17954	19, L	3923	S22	43	12.12	12254 12258	14	115	937	S23 W70	17.58	+6	112	665	$\ell\alpha p\ell$ 33 $d\beta$ 14	11	97	544	E
21	12259	17956	18	3916	S27	106	07.30	12259 12262 12241	13	46	369	S26 W40	10.58	+2	35	237	$d\beta p$ 12	8	52	270	D
22	12261	17958	L	3920	N26	111	07.00	12261	-	62	516	N26 W57	11.34		49	332	$d\beta\ell$ 18				
23	12285	17976	20, L, M 21	3941	S16	261	22.87	12285	15	128	1000	N28 E66	17.58	+1 0	70	432	$\ell\beta\gamma d$ (20)	16 17	- 128	- 1000	- E
24	12297	17988	L	3953	S17	193	27.99	12297	-	79	502	S18 E47	24.30		57	338	$\beta p\ell$ 14				
25	12299	17990	L	3956	S05	166	30.04	12299	-	68	560	S04 E64	25.35		43	245	$\ell\beta p\ell$ 20				
26	12315	18004	L	3969	S25	117	May 03.76	12315	-	91	499	S25 W20	May 05.32		69	376	$d\beta p\ell$ 18				
27	12318	18006	L, M	3972	S28	23	10.86	12318	16	178	1270	S28 W17	12.34		175	1057	$\ell\beta\gamma\ell$ 23				
28	12324	18008	L, M	3974	N12	16	11.36	12324 12326	17	237	1713	N11 W30	13.54		216	1415	$\ell\beta\gamma\ell$ 30				

2.2-2

TANT SUNSPOTS DURING 1957

LARE DAY DATA				DISK PASSAGE DATA	RETURN SEQUENCE	GREENWICH DESCRIPTION
ch ss	Mag. Class.	H	Position	Days Seen, Positions Seen, Zurich Class., Mag. Class., Magnetic Strength	Greenwich and/or MT.W.	
	-	-	N18 W62	Dec. 27 — Jan. 8 W67 E79 - G G E E F F F F F F F (X) $\beta\gamma$ $\beta\gamma$ $(\beta\gamma)$ $(\beta\gamma)$ $\beta\gamma$ $\beta\gamma$ $(\beta\gamma)$ - - βp - (βp) - 9 16 - - 34 33 - - - 31 - -		A large stream, of which the intermediate spots grow and gradually coalesce with the leader to form a large composite spot, which is the only surviving component at the limb.
	(βp)	-	N18 W75			
βp		14	S24 E41	Jan. 3 — Jan. 14 W59 E77 H H H H H J J J C C C A (X) - - βo - X $\beta\gamma$ $(\beta\gamma)$ (β) - (α) (X) - - - 14 - - 8 - - - - -	12016	A composite spot, slowly disintegrating. After a few days, other small spots appear, forming a stream. The whole group is dying out as it reaches the limb.
				Jan. 4 — Jan. 15 W77 E69 A A C D E E E E E D D - - - βp - (β) β (β) (β) - (β) (β) (X) - - 13 - - 15 - - - - - -		A small spot when first see, developing into a stream led by a fairly stable regular spot. The intermediate spots become the largest component, but do not survive to the west limb.
αp		24	S27 E60	Jan. 13 — Jan. 25 W83 E68 H H H H H H H H H H H J - - αp (αp) αp αp βp (βp) - αp (αp) - - (αp) - - 24 - 26 17 15 - - 29 - - - -	12048	A composite spot, which by January 22 divides into two and begins to die out.
		-	S27 W21			
		-	S27 W53			
(αp)		-	S27 W83			
-		-	N16 W25	Jan. 16 — Jan. 27 W68 E74 H H H H H H H H H H H H αp αp αp (αp) - βp (αp) - - β - - 23 31 33 - - 33 - - - - - -	12040	A regular spot until January 22, when other spots begin to appear and coalesce with it to form a large composite structure.
-		-	N16 W27			
-		-	N16 W33			
				Jan. 18 — Jan. 30 W81 E80 D D E E E E E D D D C C J βp (β) - β (β) - - (β) - - - - - -		A cluster, soon becoming a stream of three fairly stable spots.
X		4	N14 E 0	Jan. 27 — Feb. 5 W72 E54 A C D C C C C C J J - - - - (X) $\beta\gamma$ (βp) αp (αp) (αp) - - - - - 4 - 11 - -		A stream, with a brief maximum on January 29.
-		-	S22 W08	Feb. 3 — Feb. 13 W81 E57 A B D D D C C A C A A (X) βp (β) (βf) (β) - βp βp - αp (αp) - 11 - - - - 3 2 - 4 -		A small stream of changing spots.
				Feb. 14 — Feb. 25 W79 E60 A B A A A A B C E E G - βp βp (β) - - x - βp (βp) - (β) (αf) 3 4 - - - - - 6 - - - -		Intermittent. A few small spots until February 16 (Mt. Wilson 12143); on February 20, new spots appear (Mt. Wilson 12150) and the whole quickly develops into a bi-polar group.
				Feb. 13 — Feb. 25 W84 E78 A B D D E E E E E E D D - - β βp (β) βp (β) β - βp (βp) - (β) (αf) - 4 12 - 13 - 15 - 7 - - - -		A stream, undergoing considerable changes. The leader eventually becomes a regular spot.
-		-	N14 W37	Feb. 22 — Mar. 2 W70 E36 A D E G G E E E - (X) - (βp) βp (βp) (βp) - - - - - - 27 - - - - -		A few small spots, rapidly developing into a bi-polar group. On February 27 other spots appear to form a stream, which appears to be declining as it passes from view.
				Feb. 24 — Mar. 6 W78 E50 A E E E E E E E D D - (β) β (β) βp - - - βp βp (βp) (X) - 21 - 17 - - - 23 19 - -		A stream of normal type.
βp		22	S21 E30	Mar. 10 — Mar. 22 W81 E76 A D D E E E E E E C D C - βp $\beta\gamma$ (β) βp (βp) βp - - βp (βp) βp (αp) - 5 26 - 22 - 23 - - 18 - 17 - -		A stream, growing rapidly from a few tiny spots first seen on March 10. The leader at first divides but by March 20 becomes a regular spot. The follower also undergoes changes and is dying out when the group reaches the limb.
				Mar. 18 — Mar. 29 W80 E65 D E E E E E E D D D C - βp (αp) βp (βp) (βp) βp (βp) βp (βp) αp (αp) (αp) 19 - 21 - - 26 - 15 - 5 - -		A stream, in which the three principal components are regular spots. The whole group is dying out as it reaches the limb.

2.2-1

(2)

TABLE II CATALOGUE OF IMPOR

Serial No.	Sunspot Number MT.W.	Green.	Category	McM Plage	Lat.	Long.	C.M.P.	All Spots in Plage	Plage Serial No. Table III	MAXIMUM AREA Umb.	Whole Spot	Position	Gr. Day	Flare ΔT	SUNSPOT MEAN DATA Area Umb.	Whole Spot	Mt. Wilson Mag. Cl.	H	MAJOR F Gr. Day	Area Umb.	Whole Spot	Zuri Cla
1	12054	17803	2.L,M 3	3808	N19	272	Jan. 02.74	12054	2	293	2089	N18 W62	Jan. 07.46	0 -1	228	1351	$\ell\beta\gamma\ell$	35	Jan. 07 08	293 384	2089 1747	F F
2	12068	17814	1, L	3813	S24	183	09.55	12079 12066 12074 12075 12068 12080 12076 12081	1	135	979	S23 E79	03.41	-3	57	368	$\ell\beta p\ell$	13	06	85	508	H
3	12075	17816	L	3813	S16	184	09.44	Same as 2		96	540	S15 E02	09.28		59	354	$d\beta\ell$	15				
4	12085	17829	4, L 5 6 10	3820	S27	61	18.77	12086 12096 12085 12087 12107 12099	3	94	636	S27 E17	17.43	+3 -3 -6 -8	96	496	$\ell\alpha p\ell$	29	14 20 23 25	89 123 87 43	409 557 523 276	H H H -
5	12089	17833	7, L 8 9	3823	N17	18	22.05	12089 12093 12094	4	203	1581	N16 W55	26.28	+3 +2 +2	126	778	$\ell\alpha p\ell$	34	23 24 24	126 152 152	820 844 844	H H H
6	12095	17838	L	3824	S16	344	24.62	12095	-	103	742	S17 E56	20.30		70	458	$\ell\beta$	15				
7	12114	17850	11, L	3830	N15	257	31.20	12109 12110 12114 12113	5	52	504	N15 E23	29.37	-2	26	160	$d\alpha p\ell$	10	31	32	183	C
8	12122	17860	12	3843	S21	159	Feb. 07.65	12121 12122 12123	7	63	211	S22 E02	Feb. 07.44	-1	21	104	$d\beta p\ell$	10	Feb. 08	32	194	C
9	12143 12150	17875	L	3856	N08	10	18.99	12140 12143 12150	-	148	729	N08 W58	23.30		37	209	$d\beta pd$ $d\beta p\ell$	2 20				
10	12144	17877	L	3855	S22	7	19.25	12139 12144	-	88	688	S22 W01	19.38		65	458	$d\beta p\ell$	16				
11	12154	17884	13, L	3863	N14	289	25.17	12157 12154 12152	9	95	512	N14 E12	24.31	-4	59	348	$d\beta pd$	27	28	76	455	E
12	12159	17887	L	3866	N32	248	28.26	12159	-	132	935	N33 W26	March 02.35		88	640	$d\beta p\ell$	22				
13	12191	17911	14, L	3888	S21	41	March 15.97	12202 12207 12191 12204	10	111	783	S21 W06	16.46	+3	86	522	$\ell\beta p\ell$	26	Mar. 13	91	582	C
14	12213	17924	L	3897	S17	301	23.52	12213 12214	-	86	502	S16 E14	22.42		55	329	$\ell\beta p\ell$	23				

(Continued)

FLARE DAY DATA				DISK PASSAGE DATA	RETURN SEQUENCE	GREENWICH DESCRIPTION
ch Mag. s Class.		H	Position	Days Seen, Positions Seen, Zurich Class., Mag. Class., Magnetic Strength	Greenwich and/or MT.W.	
βp	28	S14	W40	Mar. 20 — Apr. 1 E76 — W82 E E E E E E E E E E E E D βp (β) (β) βp (βp) βp (βp) βp (βp) βp (βp) (βp) (αf) 17 - - 31 - 31 - 33 - 28 - - -		A large, fairly stable stream of normal type.
(αf)	-		-			
				Mar. 21 — Apr. 1 E65 — W72 A B B B B B B A D D C - - - - - βp (X) βf (β) βγ (X) (X) - - - - - 3 - 5 - 11 - - -		A few tiny spots, which develop into a stream of normal type by the time they reach the limb. Zurich class for period 3/21 through 3/24 probably Mt. Wilson 12219, Greenwich 17928.
(β)	-	S16	W55	Mar. 24 — Apr. 4 E76 — W70 A A B A B A B A D E E E - - - - (X) αp β (X) (β) βp (β) (β) - - - - - 2 2 - - 15 - -		Intermittent. At first a few small variable spots. On April 1, a composite cluster appears.
				Mar. 30 — Apr. 11 E77 — W77 C D C B C E E D D C C C - (X) (β) (β) βf (βf) βf (β) βp (β) (β) βf β (α) - - - 13 - 24 - 17 - - 3 faint -		A pair of composite spots, developing from one or two small spots when first seen at the east limb.
				Apr. 2 — Apr. 12 E31 — W80 - A A C C C D E E D βγ o βp (β) βp (β) (β) βp βf (βf) (X) 3 - 8 - 9 - - 23 17 - -		A pair of small spots.
(αp)	-	S21	E06	Apr. 5 — Apr. 18 E86 — W76 - H E E E E E E E E E E E E (α) αp (αp) (αp) αp αp (αp) αp (αp) - αp - - - - 19 - - 29 30 - 32 - - 21 - - - - αf (X) (X) β β (β) βf (β) - βf - - -	17911	A regular spot when first seen on April 5 (Mt. Wilson 12254). On April 7 other spots begin to appear immediately south of it (Mt. Wilson 12258) and by April 15, the group becomes a stream led by a regular spot.
(β)	-			- 12 - - 12 17 - 13 - - 15 - - -	12191	
(X)		E26	W13	Apr. 7 — Apr. 13 W00 — W79 C D D D D C - (X) (X) βp β (β) α (α) - - 13 10 - Faint -		A cluster of spots, developing rapidly from a single spot on April 7.
				Apr. 8 — Apr. 13 E19 — W77 B D D D D - (X) β βp (β) β (α) - 19 18 - 9 -		A bi-polar group, developing rapidly from one or two small spots first seen on April 8.
-	-	-	-			
-	-	N28	E66	Apr. 17 — Apr. 28 E66 — W65 E E E E E D D C C J A A - - (X) - (X) - - βγ (β) βγ (β) - - - - - - - - 13 - 5 - -	17934	A composite spot, slowly breaking up and dying out.
					12225	
				Apr. 22 — May 3 E76 — W78 A B D E E E E D C C C C - - βf (βf) βγ (βp) (βp) βp βp (βp) βγ β - - 9 - 14 - - 12 13 - 5 5		A stream, in which the leader becomes a composite spot and is the last to survive.
				Apr. 24 — May 5 E79 — W71 C D D D D D D D C J C A βp (β) β (βp) (βp) βp βp (βp) βp (βp) (βp) (αp) 15 - 21 - - 16 15 - 11 - - -		A bi-polar group, which becomes a stream of normal type. The group is dying out as it reaches the limb.
				May 2 — May 9 E18 — W70 A D E E E G G G βf (β) (β) (βp) βp - - β 9 - - - 19 - - 8		A stream of normal type, appearing suddenly near the central meridian. From May 7, only the leader and follower are left.
				May 4 — May 17 E78 — W76 - D E E E F F F F F F F E G (X) (β) βp - - βγ - - - (βγ) - βγ (βp) (αf) - - 23 - - 24 - - - - - 18 - -		A long stream of normal type, in which the spots following the leader assume regular outline. As the group approaches the limb it is led by a pair of regular spots.
				May 5 — May 17 E78 — W79 - E F F F F F F F F F E - (X) βp - - βγ - - - (βγ) - βγ (βγ) (X) - 15 - - 29 - - - - - 30 - -	12281	A large stream, led by regular spot. The intermediate spots coalesce and form an elongated composite spot, which however, breaks up again as it approaches the limb.

2.2-2-

POSITION DATA									MAXIMUM AREA						SUNSPOT MEAN DATA				MAJO
Serial No.	Sunspot Number MT.W.	Green.	Category	McM Plage	Lat.	Long.	C.M.P.	All Spots in Plage	Plage Serial No. Table III	Umb.	Whole Spot	Position		Gr. Day	Flare ΔT	Area Umb.	Whole Spot	Mt. Wilson Mag. Cl.	H	Gr. Day	Area Umb.	Whole Spot	Zur Cl
44	12417	18073	27, L, M	4024	N21	174	June 22.87	12415 12417	25	245	1231	N21	E72	June 17.33	-7	170	921	ℓβγℓ	39	June 24	180	900	F
45	12426	18078	L	4030	S21	143	25.21	12426 12435	26	341	2334	S21	E11	24.32		317	2016	ℓβpℓ	37				
46	12434	18084	28, L 30 31 32	4039	N11	76	30.23	12433 12434 12445	27	109	606	N11	E39	27.36	-1 -3 -5 -8	92	537	ℓαpℓ	35	28 30 July 02 03	83 89 121 108	442 606 600 500	G G H H
47	12443	18087	L	4043	S12	61	July 02.24	12443	28	143	840	S12	E65	27.36		131	693	ℓβpℓ	33				
48	12449	18092	29, L, M	4044	S29	8	05.39	12449	29	271	1836	S30	E65	30.31	0	184	1354	ℓγℓ	35	June 30	271	1836	E
49	12451	18094	35	4046	N13	7	05.51	12453 12447 12451	30	72	486	N13	E36	July 02.78	-6	44	242	ℓβγℓ	19	July 08	21	141	D
50	12456	18096	33	4048	N13	338	07.69	12456	31	37	285	N13	E79	01.67	-3	25	137	ℓβfd	13	04	48	268	D
51	12462	18099	L	4051	S11	303	10.28	12462	32	102	596	S12	E65	05.35		46	288	ℓβd	26				
52	12473	18106	L, M	4061	S32	246	14.60	12473	33	111	769	S32	W22	16.29		74	530	dγℓ	25				
53	12491	18121	36, L 37	4065	N30	144	22.32	12489 12494 12481 12487 12491 12511	34	119	563	N31	E09	21.60	0 0	64	288	ℓβfℓ	23	21 21	119 119	563 563	H H
54	12494	18131	L	4065	N12	186	19.20	Same as 53		44	707	N13	W80	25.36		28	150	dβℓ	4				
55	12496	18122	39,L 40 41	4070	S23	139	22.71	12507 12496	36	111	568	S23	W08	23.33	+1 -1 -4	74	428	ℓβpℓ	29	22 24 27	90 81 48	443 504 308	C E J
56	12500	18127	L	4073	N32	32	24.05	12500	-	107	544	N32	W17	25.36		53	304	dβpℓ	20				
57	12503	18128	38, L	4075	N10	97	25.89	12503 12520	35	181	1256	N10	E47	22.31	0	122	784	ℓβf	26	22	181	1256	I
		18139	L		N14	92	26.2			93	821	N13	W81	Aug. 01.30		25	150						
58	12513	18136	L	4082	S28	15	Aug. 01.10	12513 12525 12514	37	95	507	S27	W54	05.33		58	308	ℓαpℓ	26				

2.2-4. 0

(Continued)

FLARE DAY DATA				DISK PASSAGE DATA	RETURN SEQUENCE	GREENWICH DESCRIPTION
ch ss	Mag. Class.	H	Position	Days Seen, Positions Seen, Zurich Class., Mag. Class., Magnetic Strength	Greenwich and/or MT.W.	
				May 11 — May 22 E81 — W64 C D D E E E E E D C C J - - β - βf (βγ) βγ (βf) (βf) (βf) (αf) (αf) - - - - 16 - 22 - - - - -		A long stream, in which the follower, a regular spot, is the most stable member and alone remains by May 21.
				May 14 — May 18 W24 — W77 A B C E D - βf (βf) βf (βf) - 9 - 21 -		A bi-polar group, forming near the west limb.
				May 18 — May 30 E82 — W82 C C C C C J J J J J J J - (αp) (αp) (αp) (αp) (αp) - βp (βp) (αp) αp (αp) αp (αp) - - - - - - 22 - - 17 - 15 -	17987 12296	A regular spot with some companions until May 24.
				May 21 — June 2 E77 — W77 - H G G G H H G G G H H H (α) (α) - βp (βp) (αp) βp (βp) βp αp (αp) αp (αp) - - - 31 - - 34 - 32 31 - 29 -		A stable regular spot, with a few tiny companions on May 28.
				May 24 — May 31 E09 — W78 - - A A A B D - βf βp (βγ) βγ (β) βp βf (βf) 10 14 - 6 - 6 - -		A variable group until May 29. On the next day a stream of normal type takes its place.
				May 24 — June 4 E70 — W71 J J J J J H H H H H J J αp (αp) (αp) αp (X) βp βγ γ γ (γ) β (X) 15 - - 16 - 13 14 6 15 - 15 -		A regular spot until May 28, after which it begins to break up.
				May 29 — June 10 E81 — W79 - G H H H H H H H H C C - (α) αp (αp) βp (βp) βp (βp) βp (βp) βp αp (αp) (αp) (αp) - 15 - 24 - 30 - 23 - 16 - - - -		A slowly-diminishing regular spot with a few variable companions until June 7.
βf	14	S18	W17	May 30 — June 8 E34 — W83 A C E E E E C C C - βp β βf (β) βγ (βγ) βγ (βγ) β (α) 8 13 14 - 14 - 12 - 6 -		A stream, growing on the disk, in which the intermediate spots become the largest component. The whole group is dying out as it approaches the limb.
				June 2 — June 14 E76 — W80 C E E E E G G G H H H H - (X) βp (βp) βp (βp) βp (βp) (βp) βp αp (αp) (αp) (αp) - - 17 - 22 - 27 - - 30 30 - - -		A composite spot, splitting into two parts; the leading portion becomes a stable regular spot while the following part soon breaks up and dies out.
				June 2 — June 9 E18 — W81 A B B C D D D - - βp βp β (β) βf (β) (α) - 2 10 14 - 16 - -		A compact stream forming on the central meridian.
				June 8 — June 13 W15 — W79 A B D E G - (X) (X) βp βp (β) (β) - - 12 12 - -		One or two small spots, growing rapidly into a composite structure as the group approaches the limb.
				June 8 — June 20 E76 — W77 - E E F F F F F F E E E D (X) (β) βp βp (βp) βγ βγ βγ βγ (βγ) βγ βγ (X) - - 16 16 - 23 24 22 19 - 18 7 -		A stream, led by a large composite spot which is breaking up and diminishing as it approaches the limb.
αp	22	N15	E58	June 13 — June 25 E83 — W75 C C C C D D D D D D C C - (X) αp αp αp (αp) αp αp αp αp αp αp (αp) (αp) - 13 22 26 - 19 18 18 19 19 20 - -		A stream in which the follower, a regular spot, is the only stable member.
βf	23	S37	E23	June 14 — June 28 E81 — W76 - C E F F F F F F F F G G G - (α) βp βp (βp) βp βf β β βf βf (β) (β) β (αf) (αf) - 12 20 - 26 23 24 22 27 25 - - 14 - -		At first a bi-polar group. On June 18 intermediate spots appear to form a stream consisting of a leading regular spot followed by two large composite spots.
αp (αp)	27 -	N16 N16	E30 W36	June 15 — June 27 E84 — W70 - J J J J J J J J J J J J (αp) αp (αp) αp αp αp αp αp βp (αp) (αp) αp (αp) - 14 - 25 27 29 20 20 30 - - 22 -		A close pair of spots, soon becoming regular in outline and slowly diminishing.

2.2-3

(2)

TABLE II 1957

Serial No.	Sunspot Number MT.W.	Green.	Category	McM Plage	Lat.	Long.	C.M.P.	All Spots in Plage	Plage Serial No. Table III	MAXIMUM AREA Umb.	Whole Spot	Position	Gr. Day	Flare	SUNSPOT MEAN DATA Area Umb.	Whole Spot	Mt. Wilson Mag. Cl.	H	MAJOR F Gr. Day	Area Umb.	Whole Spot	Zur Cla
29	12330	18013	L	3979	S11	297	May 17.40	12330 12331 12351 12332	18	97	559	N11 E50	May 13.54		58	341	ℓβfℓ	23				
30	12333	18016	L	3982	S17	360	12.6	12333	-	89	712	S17 W77	18.32		56	351	dβfℓ	20				
31	12346	18025	L	3984	S10	204	24.40	12354 12345 12346	-	79	508	S11 E65	19.38		50	266	ℓαpℓ	16				
32	12353	18032	L	3991	N22	161	27.61	12353	-	97	508	N22 E28	25.44		90	472	ℓαpℓ	35				
33	12356	18037	L	3987	N22	194	25.18	12347 12356	19	109	721	N25 W78	31.31		43	263	dβℓ	13				
34	12357	18035	M	3993	S23	133	29.78	12363 12357	-	59	427	S24 W20	31.31		48	306	ℓγℓ	15				
35	12365	18041	L	3997	S17	59	June 04.37	12376 12365 12377 12379	-	73	553	S17 E10	June 02.55		67	428	ℓβpℓ	30				
36	12368	18043	22, L, M	3996	S17	86	02.31	12360 12368	20	112	787	S18 W17	03.64	0	55	364	dβγℓ	13	June 03	112	787	E
37	12373	18049	L	4002	S18	7	08.29	12378 12398 12373 12410 12389	-	121	671	S18 E46	04.64		90	540	ℓβpℓ	30				
38	12375	18050	L	4001	N10	74	03.30	12375	-	77	550	N10 W81	09.37		41	288	dβℓ	15				
39	12383	18055	L	4003	S13	18	07.50	12383 12385 12382 12396	-	51	764	S30 W78	13.30		44	410	dβℓ	11				
40	12387	18057	L, M	4011	N32	283	14.60	12411 12387	21	172	1487	N32 E68	09.37		133	1007	ℓβγℓ	23				
41	12407	18067	23, L	4022	S16	218	19.56	12403 12406 12407	23	104	500	S15 E15	18.32	+3	67	346	ℓαpℓ	26	15	59	329	C
42	12409	18068	24, L	4021	S37	197	21.11	12409	24	328	2049	S38 W18	22.54	+3	244	1499	ℓβℓ	27	19	256	1393	F
43	12415	18071	25, L 26	4024	N16	186	21.96	12415 12417	25	167	1062	N16 E74	16.55	-3 -8	161	844	ℓαpℓ	26	19 24	171 163	931 768	J J

(Continued)

R FLARE DAY DATA				DISK PASSAGE DATA	RETURN SEQUENCE	GREENWICH DESCRIPTION
ich Class.	Mag. Class.	H	Position	Days Seen, Positions Seen, Zurich Class., Mag. Class., Magnetic Strength	Greenwich and/or MT.W.	
($\beta\gamma$)	-	N21	W17	June 16 — June 29 E80 — W85 - F F F F F F F F G G G G - β_p β β_p β β $\beta\gamma$ $\beta\gamma$ $\beta\gamma$ ($\beta\gamma$) (β) βf (βf) (βf) (αf) 26 - 38 32 32 32 35 29 - - 21 - -		A large regular spot with a composite structure immediately south of it which breaks up and disappears by June 28. Maximum area 1231 on both June 17 and 18. On June 18, umbra area was 288.
				June 19 — July 1 E76 — W79 E E F F F F F F F F E E β_p β β β β (β_p) (β_p) β_p (β_p) β_p (β_p) (β_p) (β) 20 23 29 28 25 - - 36 - 34 - - -		A large typical bi-polar group.
α_p	29	N11	E26	June 24 — July 6 E78 — W84 H G G G G G G G H H H H - (α_p) (α_p) β_p (β_p) α_p (α_p) β_p (X) (X) γ α (α) (X) - - 29 - 32 - 34 - - 18 12 - -	18050	A regular spot, with a number of small unstable companions until July 2.
β_p	34	N11	W01			
(X)	-	N10	W26			
γ	18	N10	W40			
				June 26 — July 8 E76 — W82 - G G G G G G G G G G G - (X) (β_p) β_p (β_p) β_p (β_p) (β_p) β_p β_p (β_p) β_p β_p (α_p) - - 20 - 31 - - 33 33 - 21 17 -		A large stable regular spot with one or two small following companions.
γ	16	S30	E65	June 29 — July 11 E77 — W76 E E E E E E E E E E E E - (X) γ (γ) (γ) γ γ γ γ $\beta\gamma$ ($\beta\gamma$) βf (β) (β) - 16 - - 30 34 - 27 26 - 29 - -	18055	A large composite spot undergoing little change until July 5, after which it begins to diminish in area and becomes elongated.
(βf)	-	N13	W35	June 29 — July 11 E77 — W73 - B D D D D D D D D C B - (α_p) βf (β) (β) β_p β (βf) βf βf (βf) βf α (α) - 11 - - 12 17 - 18 20 - 7 3 -		A stream of normal type, developing rapidly in a few days and then breaking up and dying out before reaching the limb.
βf	14	N13	E40	July 1 — July 12 E79 — W62 - D D D D C B B C C A A (X) (β) βf βf (β) βf βf (β) βf α_p (α_p) (α) - - 10 14 - 7 6 - 8 11 - -		A group of small variable spots.
				July 4 — July 15 E77 — W63 E E E E E E E E D D D C β_p (β) β_p β_p (β_p) β_p β (β) β (βf) βf βf 14 - 15 20 - 26 17 - 20 - 17 4		A stream of three small regular spots, which die out as they approach the limb.
				July 10 — July 20 E54 — W77 A C H H H H H H H H H (X) (β) γ (γ) γ γ γ γ (γ) γ (γ) - - 13 - 25 21 18 17 - 15 -		A large composite spot, developing rapidly from a tiny spot first seen on July 10.
βf	18	N31	E09	July 16 — July 28 E76 — W76 J J J H H H H H C J J J - βf βf (βf) βf βf βf $\beta\gamma$ $\beta\gamma$ βf βf βf βf (αf) 16 21 - 24 26 18 14 15 10 10 12 12 -		A regular spot, of which the umbra is crossed by a bright bridge until July 19, after which the spot becomes composite and slowly diminishes.
βf	18	N31	E09	July 16 — July 25 E57 — W80 A B A A - - A C B - α α (α) (α) - - β_p β β (X) 3 3 - - - - 18 5 4 -		A group forming near the west limb immediately south of Group 18109, to which it finally becomes attached.
$\beta\gamma$	29	S23	E04	July 16 — July 28 E82 — W72 - G G G G G G E E D D J J (α) β_p (β_p) β_p β_p β_p $\beta\gamma$ $\beta\gamma$ $\beta\gamma$ γ γ β_p (X) - 17 - 26 26 28 29 23 19 19 12 7 -	18078	A regular spot with a number of variable companions.
$\beta\gamma$	19	S23	W20			
β_p	7	S23	W65		12426	
				July 19 — July 30 E61 — W82 C C C C D E E E C C C - β β β_p βf β β $\beta\gamma$ β_p β_p β_p (β_p) (α_p) 3 2 9 17 14 17 18 21 16 16 - -		A stream of normal type, developing from a pair of small spots first seen on July 19.
$\beta\gamma$	18	N10	E47	July 19 — Aug. 1 E84 — W73 - E E E E F F F G G G G G - α β_p β_p $\beta\gamma$ β_p β_p β_p β_p β_p β_p β_p $\beta\gamma$ ($\beta\gamma$) (X) - 17 18 18 22 24 23 26 24 26 25 16 - -	18097	A stream, led by a large composite spot which is the most stable member. A group forming near the west limb.
				July 26 — Aug. 6 E70 — W64 J J J H H H H H H H J J α_p α_p β_p α_p α_p β_p α_p α_p α_p α_p α_p (α_p) 14 16 17 23 23 24 26 25 26 18 12 -		A regular spot, with some northern companions from August 2 onwards.

2.2-4 (2)

POSITION DATA										MAXIMUM AREA					SUNSPOT MEAN DATA				MAJO
Serial No.	Sunspot Number MT.W.	Green.	Category	McM Plage	Lat.	Long.	C.M.P.	All Spots in Plage	Plage Serial No. Table III	Umb.	Whole Spot	Position	Gr. Day	Flare ΔT	Area Umb.	Whole Spot	Mt. Wilson Mag. Cl.	H	Gr. Day
73	12633	18219	L	4155	S23	83	Sept. 19.4	12633 12630	-	84	567	S24 W65	Sept. 24.33		35	217	dβl	17	
74	12634	18216	73, L, M 74	4152	N10	60	21.21	12623 12634	46	129	849	N10 W29	23.47	+2 +2	91	519	dβγl	31	Sept. 21 21
75	12635	18217	L, M	4159	N15	341	27.12	12640 12635 12636 12642 12662 12644	47	128	847	N15 E47	23.47		96	608	lβγl	25	
76	12636	18223	75 76	4159	N20	338	27.42	12649 12652 12656		47	264	N19 E52	23.47	-3 -7	40	221	lαpl	30	26 30
77	12648	18229	L	4162	N16	294	30.75	12648 12663 12673 12661	48	138	1333	N16 E44	27.36		130	904	lβpl	30	
78	12654	18236	L	4165	N27	269	Oct. 02.62	12654	49	157	945	N27 W10	Oct. 03.48		96	533	lβpl	25	
79	12659	18239	L	4167	S22	247	04.31	12659 12674 12668	-	137	612	S23 E26	02.38		122	547	lαpl	32	
80	12665	18240	L	4175	S16	225	05.94	12664 12665	-	76	666	S14 E70	Sept. 30.65		65	374	lβp	18	
81	12669	18247	77	4173	S40	194	08.33	12669	51	24	282	S41 W15	Oct. 09.52	0	22	142	dβfd	11	Oct. 09
82	12670 12676	18245	L	4172	N13	203	07.60	12670 12679 12676 12680	50	96	628	N13 W25	09.52		49	282	dαpd dβl	4 16	
83	12675	18252	L	4179	N20	158	11.05	12675	52	171	964	N20 E33	08.46		126	672	lβpl	28	
84	12684	18258	L	4185	S17	104	15.11	12684	53	147	1042	S18 E22	13.38		97	682	lβpl	16	
85	12687	18260	78	4186	N10	10	16.41	12692 12687 12705 12695 12702 12721	54	49	249	N10 E40	13.38	0	24	117	dβd	13	13
86	12689	18262	79, L 80 81 82 83 84	4189	S24	70	17.70	12689 12694 12696	55	454	2480	S24 E14	16.67	0 0 -3 -4 -5 -7	345	2074	lβfl	29	16 16 19 20 21 23

Continued)

FLARE DAY DATA				DISK PASSAGE DATA	RETURN SEQUENCE	GREENWICH DESCRIPTION
Mag. Class.	H	Position		Days Seen, Positions Seen, Zurich Class., Mag. Class., Magnetic Strength	Greenwich and/or MT.W.	
				July 27 — Aug. 8 W73 E74 - H H H H H H E E H H H H (X) α α α α γ γ γ γ γ α (α) (α) - 15 24 25 24 28 26 28 28 22 21 - -	18092, 18055	A moderate-sized composite spot.
					12449	
βρ	• 16	N27 W50		July 28 — Aug. 10 W80 E81 - - E E E E E E E E E E E C (α) βρ βρ βρ βρ βγ βγ βρ βγ βρ βρ βρ (βρ) (βρ) - 13 19 21 19 21 23 24 17 18 22 16 - -		A stream of normal type, in which the leader is the most stable component.
	•					
				Aug. 10 — Aug. 18 W88 E19 A A A A A D D C - αρ β - - β βf βf (β) (β) 2 4 - - 2 7 14 - -		Intermittent. A tiny spot on August 10 and 11 (Mt. Wilson 12547). On August 14, a new group appears (Mt. Wilson 12554) and is growing as it passes from view.
(β)	-	N17 E05		Aug. 16 — Aug. 27 W73 E73 C E E E E E E E E G G G βρ βρ βρ βρ βρ (β) βγ βγ βρ βγ βγ βρ 14 17 19 22 26 - 22 22 25 17 16 -		A group of composite spots which soon develop into a stream of normal type. The rear component is dying out as the group reaches the limb.
βγ	22	N18 W20			12503	
				Aug. 21 — Sept. 2 W78 E75 - C C D D D D D C C D D - α βf βρ βρ βρ βρ (βρ) βρ βρ βρ βf (βf) (βf) - 15 16 17 16 14 - 14 17 12 14 - -		A pair of small regular spots until August 26. On the next day more spots appear to form a stream which undergoes changes from day to day.
	•					
γ	18	S29 E36		Aug. 25 — Sept. 6 W73 E74 D E E E E G G G G G H H H (X) γ (γ) γ γ γ α (α) α α α (α) (α) - 18 - 18 21 22 25 - 24 28 26 - -	18137, 18092, 18055	A composite spot, preceded by a few companions. By August 30, it has become regular in outline and alone remains by September 3.
γ	18	S29 E36				
γ	21	S29 E26				
α	25	S29 E00			12514, 12449	
α	24	S30 W30				
α	24	S30 W30				
βγ	24	N25 E33		Aug. 25 — Sept. 7 W79 E82 - E E E E E E F F F F E E - (X) βγ (ξ) βγ βγ βγ βγ (βγ) βγ βγ β) β) (ξ) (β) (X) - 16 - 22 24 24 24 - 19 16 20 - - -	18141	A group consisting of three composite spots which gradually extend longitudinally. After September 4, it begins to diminish rapidly.
βγ	24	N25 E20				
βγ	24	N25 E04				
βγ	16	N24 W45			12516	
(β)	-	N25 W70				At first a small regular spot, which slowly changes into a composite spot. After August 30, there is a rapid increase in area.
βγ	17	N13 E01		Aug. 25 — Sept. 6 W79 E83 - D D C C D E E F F F F E (α) βf (βρ) βρ βρ βρ βγ (βγ) βγ βγ βγ (βγ) (β) - 22 - 19 19 17 17 - 19 21 16 - -		A composite structure, developing from a small spot first seen on August 26. By September 2, the leading portion is changing into a regular spot and is the sole survivor at the limb.
(βρ)	-	N13 W08				
(βρ)	-	N13 W08				
βρ	19	N14 W41				
βγ	25	N11 E22		Sept. 4 — Sept. 17 W77 E88 - E E E E E E E E E E D C - X βf βρ βγ βγ βγ (βγ) βγ (βγ) βγ βγ βγ (X) (α) 15 17 17 20 26 25 - 22 - 19 14 12 - -		A large stream which, although decreasing in area, undergoes very little change throughout its passage. Two small regular spots, one at the rear and one in the centre of the group, retain their identity throughout.
(βγ)	-	N11 E05				
βγ	22	N11 W04				
(βγ)	-	N11 W22				
(βγ)	-	N11 W22				
				Sept. 4 — Sept. 12 W65 E31 B C E E E E E E E βf β βf β β βρ (βρ) βρ (β) 3 10 9 15 21 20 - 18 -		A stream, developing rapidly from a tiny spot.
	•					
				Sept. 7 — Sept. 16 W79 E44 A D E E E G G J J - βρ βρ βγ (βρ) βγ (βρ) βρ αρ αρ (αρ) 13 17 19 - 19 - 15 14 13 -		A stream, growing rapidly from a small spot. The leader, which is composite structure, alone remains by September 14.
	•					
(β)	-	S16 E13		Sept. 8 — Sept. 17 W75 E44 A C E E E E G G G G β β (β) βρ (βρ) β β βf (β) (X) 2 14 - 25 - 26 26 24 - -		A rapidly growing stream until September 13. On the next day the intermediate spots have disappeared, leaving two regular spots.
(βγ)	-	N23 E28		Sept. 13 — Sept. 26 W82 E75 B C E E E F F F F F F F E - βρ βf βρ βf (βγ) βγ (βγ) βγ βρ βγ βγ βρ (βρ) (X) 10 15 24 26 - 35 - 34 28 28 29 18 - -		A few small spots, rapidly growing into a large stream of normal type. The leader, a large regular spot, is the most stable component. The follower develops into a large composite spot by September 20, but begins to break up as the group approaches the limb.
βγ	35	N23 E13				
βγ	35	N23 E13				
βγ	35	N23 E13				
(βγ)	-	N23 W01				
(βγ)	-	N23 W01				
βρ	18	N10 E48		Sept. 14 — Sept. 25 W77 E75 D E E E E E E G G H H H β βρ βρ (βρ) βρ (βρ) βγ βγ βγ αρ αρ (αρ) 8 19 18 - 28 - 26 24 25 25 20 -		A stream, in which the leader, a regular spot, becomes composite in structure by September 20. The following part breaks up and dies out by September 23.

9.2-5 (2)

POSITION DATA										MAXIMUM AREA					SUNSPOT MEAN DATA				MAJOR
Serial No.	Sunspot Number MT.W.	Green.	Category	McM Plage	Lat.	Long.	C.M.P.	All Spots in Plage	Plage Serial No. Table III	Umb.	Whole Spot	Position	Gr. Day	Flare ΔT	Area Umb.	Whole Spot	Mt. Wilson Mag. Cl. H		Gr. Day
59	12514	18137	L, M	4082	S30	356	Aug. 02.49	12514		163	1092	S30 W14	Aug. 03.65		126	845	$\ell_\gamma\ell$	28	
60	12516	18141	42, L	4083	N26	331	04.42	12516	38	131	775	N27 W50	08.32	0	102	629	$\ell\beta p\ell$	23	Aug. 08
61	12547 12554	18161	L	4093	S14	231	11.98	12544 12534 12547 12554	-	31	683	S15 W75	17.53		14	150	$d\beta d$ $d\beta f\ell$	2 13	
62	12563	18171	43, L 44	4112	N17	99	21.95	12562 12563 12567 12582 12583	39	183	1113	N17 E16	20.62	-1 -3	126	800	$\ell\beta p\ell$	26	21 23
63	12573	18177	L	4117	S24	30	27.21	12573	-	95	650	S25 W52	31.40		56	347	$\ell\beta p\ell$	16	
64	12579	18181	45, L, M 46 48 50 55 56	4125	S29	335	31.33	12587 12588 12578 12579	41	171	807	S29 E26	29.31	+1 +1 0 -2 -4 -4	101	601	$\ell_\gamma\ell$	28	28 28 29 31 Sept. 02 02
65	12580	18182	47, L, M 49 51 58 59	4124	N25	329	31.83	12585 12580	42	383	1726	N25 E33	29.31	0 -1 -2 -5 -8	210	1313	$\ell\beta\gamma\ell$	23	Aug. 29 30 31 Sept. 03 06
66	12581	18183	52, L, M	4124	N14	333	31.50	12581		46	987	N14 W79	Sept. 06.32	+6	61	459	$\ell\beta_\gamma$ (	20	Aug. 31
		18185	53 54 57		N17	326	Sept. 01.06	12586 12590		70	740	N17 W02	01.28	+5 +5 +3	54	348			Sept. 01 01 03
67	12596	18194	60, L, M 61 63 64 65	4134	N11	194	11.01	12614 12610 12596 12611	43	190	1365	N11 E61	06.32	-3 -4 -5 -6 -6	136	850	$\ell\beta\gamma\ell$	26	09 10 11 12 12
68	12597	18191	L	4136	S24	249	06.84	12597	-	195	1635	S24 W60	11.42		106	775	$d\beta\ell$	20	
69	12601	18195	L	4138	S13	202	10.43	12601	-	99	676	S13 E00	10.46		56	351	$d\beta p\ell$	18	
70	12606	18197	62, L	4141	S16	187	11.58	12606	44	216	1063	S16 W25	13.42	+3	129	715	$d\beta\ell$	26	10
71	12622	18209	67, L, M 68 69 70 71 72	4151	N23	85	19.30	12637 12632 12622	45	411	2214	N24 W13	20.36	+3 +2 +2 +2 +1 +1	262	1530	$d\beta_\gamma\ell$	36	17 18 18 18 19 19
72	12623	18211	66,L	4152	N09	76	19.98	12623 12634	46	182	1178	N10 E48	16.32	0	150	1020	$\ell\beta p\ell$	30	16

(Continued)

R FLARE DAY DATA				DISK PASSAGE DATA	RETURN SEQUENCE	GREENWICH DESCRIPTION
urich Class	Mag. Class.	H	Position	Days Seen, Positions Seen, Zurich Class., Mag. Class., Magnetic Strength	Greenwich and/or MT.W.	
				Sept. 20 — Sept. 25 W14 — W77 A A B C D J (X) βf βp βp βf (αf) - 3 18 14 13 -		A few growing spots.
E βγ	26	N11	W03	Sept. 19 — Sept. 27 E28 — W85 A B E E E E G G - - β βγ βγ βγ βγ βp (βp) (X) - 11 26 26 31 21 15 - -		A stream of rapid growth and decline.
E βγ	26	N11	W03			
				Sept. 20 — Oct. 3 E85 — W80 - E E E E E E E E E E E D C (X) βγ βp βγ βp βγ βf βp (βf) (βf) (βf) βγ βγ (βf) - 12 20 20 24 24 25 35 - - 20 15 - -		A stream of normal type, in which the rear component becomes a large composite spot which is the first to die out.
αp	25	N20	E14	Sept. 21 — Oct. 3 E77 — W79 J J C J J C C C C C C C C αp βp βp αp αp αp αp (αp) (αp) αp αp αp αp 12 23 25 27 24 25 30 - - 16 17 14 -	12581	A stable regular spot, with occasional companions.
αp	16	N20	W42			
				Sept. 24 — Oct. 6 E83 — W75 - H H E E E E E E H H H H (X) βp βp βp (βp) (βp) βp βp βp - αp αp (αp) - 22 30 25 - - 27 26 25 - 15 15 -		A large composite spot which slowly becomes elongated as its area diminishes.
				Sept. 27 — Oct. 8 E71 — W78 B D D D E E G G G G G H βp (βp) (βp) βp βp βp - βp βp βp βp (αp) 13 - - 22 19 22 - 23 25 24 20 -		A stream in which the leader, a large regular spot, is the only stable component.
				Sept. 28 — Oct. 10 E76 — W80 H H H H H H H H H H H H H (αp) (αp) αp αp αp - αp αp αp αp αp (αp) (αp) - - 26 30 28 - 29 32 28 24 17 - -	18191 12597	A stable regular spot, with a small companion from September 30 to October 4.
				Sept. 29 — Oct. 11 E80 — W71 - J C C C C D C C C C B A (α) βp βp βp - β β βp βp βp βp (β) - - 16 19 18 - 10 15 14 11 8 5 - -		A stream, led by a regular spot until October 3; after this the whole breaks up before reaching the limb.
βf	4	S41	W15	Oct. 2 — Oct. 13 E72 — W61 - B C B C C C C B B B B (β) - βp βf βf βf βf βf (βf) - (β) - - - 5 9 12 9 3 4 - - - -		A few small spots which coalesce into an elongated structure for a day or two and then break up again and die out.
				Oct. 1 — Oct. 13 E76 — W77 - A A B A B D E E E E E D (α) (αp) - αp αp βp βf βf βf (β) - βp - - - - 5 3 12 13 9 17 - - 13 -	18192, 18156	A small spot until October 5 (Mt. Wilson 12670). On the next day other spots appear (Mt. Wilson 12676) to form a group consisting of two fair-sized composite spots.
				Oct. 5 — Oct. 16 E74 — W61 C D E E E E E E G G G G βf β βp βp βp (βp) - βp - (βp) (βp) (β) 8 16 21 21 28 - - 24 - - - -		A stream of normal type, in which the leader is a stable regular spot and the follower a composite spot. The latter is slowly dying out as it approaches the limb.
				Oct. 9 — Oct. 20 E74 — W69 B C E E E E E E E E D C β (βp) - βγ - (βp) (βp) βp βp βp βp - - - - 17 - - - 16 14 13 12 -		A stream, led by a regular spot. After October 12, intermediate spots join up with leader and follower to form a composite structure. After October 17, the group begins to die out.
-	-	N10	E40	Oct. 10 — Oct. 19 E76 — W40 B B C D C C C B B A (X) - βf - (β) (βf) α (X) (X) - - - 8 - - - 14 - - -	18211	A group of small unstable spots.
βf	29	S24	E14	Oct. 10 — Oct. 24 E82 — W82 - E E F F F F F F F F F E E - (X) - βp - (βf) (βf) βf βf βf βf - - (βf) (βf) (X) - - 15 - - - 29 24 27 27 - - - - -	18219 12633	A stream, in which the intermediate and follower spot after October 14 join together to form a large composite spot, while the leader slowly dies out.
βf	29	S24	E14			
βf	27	S24	W22			
-	-	S24	W35			
-	-	S24	W49			
(βf)	-	S24	W76			

2II-6 (2)

POSITION DATA									MAXIMUM AREA					SUNSPOT MEAN DATA					MAJOR FL				
Serial No.	Sunspot Number MT.W.	Green.	Category	McM Plage	Lat.	Long.	C.M.P.	All Spots in Plage	Plage Serial No. Table III	Umb.	Whole Spot	Position	Gr. Day	Flare ΔT	Area Umb.	Whole Spot	Mt. Wilson Mag. Cl.	H	Gr. Day	Area Umb.	Whole Spot	Zurich Class	
87	12698	18269	L	4188	N26	68	Oct. 17.84	12685 12688 12698	-	101	695	N27 W73	Oct. 23.45		33	199	dβl	13					
88	12716	18283	L	4197	N13	323	25.78	12707 12722 12710 12716 12735	56	73	584	N13 W58	29.42		39	253	βpl	16					
89	12717	18284	L	4201	S22	322	25.89	12717 12724 12736	-	111	774	S23 E75	20.42		60	393	lβpl	15					
90	12718	18287	85,L	4203	S12	301	27.50	12718 12728	57	84	703	S12 W25	29.42		75	510	lβpl	17	Oct. 27	81	590	G	
91	12730	18299	L	4207	S15	243	31.86	12752 12730	58	87	523	S15 E59	27.45		51	342	lβd	17					
92	12732	18300	86, L, M 87 88	4207	S24	240	Nov. 01.12	12732 12734		177	1181	S27 E35	29.42	-4 -7 -8	106	765	lγl	20	Nov. 02 05 06	131 59 33	845 405 400	H H B	
93	12733	18292	L	4202	N21	298	Oct. 27.67	12725 12733 12719 12720	-	185	1404	N21 W22	29.42		102	654	dβpl	22					
94	12738	18304	L	4208	N26	241	Nov. 01.02	12729 12738	-	179	904	N25 W45	Nov. 04.46		94	543	dβl	8					
95	12745	18312	L	4218	S17	173	06.18	12744 12745 12749	59	68	758	S17 W71	11.53		80	549	lβpl	16					
96	12763	18326	90, L 91	4230	N19	89	12.56	12762 12772 12763	60	93	804	N20 E80	06.35	-7 -9	41	290	lβl	16	13 15	31 24	226 145	C J	
97	12767	18333	L	4233	N08	72	13.88	12767 12775	-	194	1149	N08 W46	18.36		76	472	dβl	19					
98	12768	18327	89	4237	S22	59	14.81	12776 12773 12768	61	31	310	S23 E57	10.51	0	22	181	lαd	10	10	31	310	H	
99	12774	18332	L	4236	S20	84	12.97	12774	-	100	593	S19 W18	14.30		66	416	dβl	21					
100	12792	18354	L	4245	S26	13	18.3	12792	-	85	526	S26 W65	23.40		58	324	dxl	(10)					
101	12779	18338	92, L	4246	N28	353	19.82	12779 12790	62	87	706	N27 W47	23.40	0	56	381	lβpl	18	23	87	706	E	

2.II-7 (1)

57 (Continued)

MAJOR FLARE DAY DATA					DISK PASSAGE DATA	RETURN SEQUENCE	GREENWICH DESCRIPTION
e	Zurich Class	Mag. Class.	H	Position	Days Seen, Positions Seen, Zurich Class., Mag. Class., Magnetic Strength	Greenwich and/or MT.W.	
					Nov. 15 — Nov. 26 E72 — W72 J C C C D D D D D J J J - (X) βp βρ β βp (βρ) (βρ) (β,ρ) βρ (αρ) (X) - - 2 14 16 21 - - - - - -		A stream, in which the leader is the only stable member.
					Nov. 19 — Dec. 1 E84 — W75 - J H H H H G G H H H H J βρ βf (βf) (βf) (βf) βf βf βf βf (αf) αf (αf) (αf) 15 14 - - - - - 19 21 - 22 - -	18308	A regular spot, with a few close companions from November 22.
G	(αρ)	-	S15	E28	Nov. 21 — Dec. 2 E72 — W79 H G G G G G E E E D C C (α) (X) (X) (αρ) αρ βρ βρ (βρ) βγ (βγ) αρ (αρ) - - - - - 22 18 - 17 - 4 -		A regular spot followed by some small variable spots.
E	(β)	-	S19	W40	Nov. 25 — Dec. 5 E60 — W77 B C C D E E E E E E E βρ βp βρ (βp) βf (β) βf (β) βf - - - 12 16 - 21 - 22 - 22 - -		A bi-polar group, developing from a few small spots first seen on November 25. By December 1, the leader has become a large composite spot and alone remains at the west limb.
E	βf	22	S18	W50			
E	-	-	S17	W28	Nov. 27 — Dec. 9 E78 — W80 E E E E E E E E E E E E - γ (γ) γ (γ) γ (γ) γ - - γ (γ) (γ) (γ) 16 - 21 - 17 - 16 - - 13 - - -	18312 12749 12745	A large composite spot followed by a few small companions. On December 1, it begins to break up and the leading nucleus becomes a stable regular spot.
					Nov. 28 — Dec. 6 E31 — W77 A C D D D E E D D - βp (βp) (βp) (βp) βp - - (βp) - 12 - - - 18 - - -		A bi-polar group, in which the leader is the most stable member.
					Dec. 3 — Dec. 7 W32 — W79 A C D D - β - - (β) (αf) - - - - -		A small group, forming near the west limb.
B	-	-	N17	W31	Dec. 3 — Dec. 13 E82 — W45 - D D D C C B B A B B X - - βp (βp) βf β αf αf - - - - - 7 - 9 9 - 3 - -	18332	A stream of small changing spots.
			Not Seen		Dec. 6 — Dec. 10 E64 — E11 A B A B B βp (β) - (β) - 6 - - - -		One or two small spots.
					Dec. 13 — Dec. 24 E76 — W68 H E E E E G G G G G G G βρ - - - βp βρ (βρ) βρ βρ βρ βp (βρ) 18 - - - 30 34 - 35 33 27 24 -		A stable regular spot, followed by a composite spot which is slowly diminishing during transit.
E	-	-	N19	E77	Dec. 14 — Dec. 26 E77 — W78 E E E E E E E E E E G G - - - - γ γ (γ) βγ βγ βγ βγ βγ (βγ) X - - - 18 23 - 21 18 16 18 10 - -		A large cluster of spots, in which the rear portion becomes a large composite spot while the leading nuclei diminish and become two small regulars.
E	-	-	N18	E50			
E	γ	23	N17	E21			
E	γ	23	N17	E21			
E	(γ)	-	N17	E08			
					Dec. 15 — Dec. 26 E76 — W69 D D D D D D C C J J J J - - βp βp (β) βp βρ βp βp αp (αρ) (αρ) - - 21 23 - 16 16 16 16 10 - -		A long stream, in which the leader, a regular spot, is the only survivor by December 25.
					Dec. 17 — Dec. 28 E70 — W72 J C C E E E E E E D C - (αρ) βp (βp) βp βf β β βp (βp) (βp) (βp) (X) - 23 - 15 16 15 13 17 - - - -		A composite spot, followed by a few small companions until December 20. On the next day the group consists of two composite spots which are joined together for a day or two and then begin to separate and die out.
					Dec. 18 — Dec. 30 E76 — W78 - - C C J J J J C C C C J β (β) β β β β β (βf) (βf) (βf) β (βf) (αf) 14 - 17 22 21 20 14 - - - 10 - -		A composite spot, followed by a small fairly stable regular spot.
E	βρ	23	N23	E44	Dec. 18 — Dec. 31 E78 — W78 - E E E E E F F F F E F E - (βp) (β) βp βp βp β βγ (β) (β) (β) βp βp (βf) (α) - - 19 23 20 27 19 - - - 15 15 - -		A stream of normal type.

2.II-8 (2)

POSITION DATA									MAXIMUM AREA					SUNSPOT MEAN DATA					
Serial No.	Sunspot Number MT.W.	Green.	Category	M^C M Plage	Lat.	Long.	C.M.P.	All Spots in Plage	Plage Serial No. Table III	Umb.	Whole Spot	Position	Gr. Day	Flare ΔT	Area Umb.	Whole Spot	Mt. Wilson Mag. Cl. H	Gr. Day	Area Umb.	Wh Sp
							Nov.						Nov.							
102	12781	18345	L	4247	N17	337	21.04	12780 12781	63	127	500	N17 W31	23.40		47	270	~~$\beta\rho\ell$~~	20		
103	12784	18349	L	4257	S13	276	25.72	12784	-	112	511	S13 E42	22.50		69	386	$\ell\beta\ell$	21		
104	12788	18353	93. L	4263	S15	263	26.70	12787 12788 12796	65	86	551	S15 W24	28.57	+4	66	398	$\ell\beta\rho\ell$	21	Nov. 24	79	36
105	12800	18357	95, L 96	4269	S18	222	29.79	12800 12810	66	319	1644	S18 W60	Dec. 04.44	+2 +1	140	858	$d\beta\rho\ell$	21	Dec. 02 03	198 290	149 137
106	12808	18361	97, L, M	4288	S17	176	Dec. 03.30	12808 12815 12827 12828	67	147	1295	S18 E52	Nov. 29.43	-6	106	856	$\ell\gamma\ell$	20	05	55	50
107	12814	18365	L	4271	N15	210	Nov. 30.67	12823 12805 12814	-	68	580	N15 W64	Dec. 05.52		62	399	$d\beta\rho\ell$	17			
108	12830	18374	L	4293	S13	205	Dec. 01.00	12830	-	49	502	S14 W71	06.42		25	216	$d\beta\ell$	(15)			
109	12832	18377	99	4295	N18	89	09.87	12832	69	23	151	N18 E56	05.52	-7	14	81	$\ell\beta d$	9	12	1	
110	12840	18385	98	4301	S34	70	11.30	12840	70	6	51	S34 E52	07.29		4	26	βd	5	12		
111	12851	18395	L	4313	S15	329	19.00	12851 12861 12862	72	178	979	S15 E34	16.40		139	828	$\ell\beta\rho\ell$	36			
112	12855	18398	100, L, M 101 102 103 104	4314	N18	313	20.20	12855 12863	73	171	1434	N17 E08	19.40	+5 +3 +1 +1 0	128	939	$\ell\beta\gamma\ell$	22	14 16 18 18 19	53 193 180 180 171	7 8 12 12 14
113	12865	18400	L	4316	N23	299	21.39	12865	-	95	581	N23 E51	17.39		49	269	$\ell\beta\rho\ell$	22			
114	12868	18401	L	4317	N15	279	22.76	12868 12867 12866	-	77	724	N15 W07	23.28		67	456	$\ell\beta\rho\ell$	22			
115	12869	18407	L	4319	S26	257	24.42	12870 12869 12890 12877	74	127	933	S25 E26	22.30		81	636	$\ell\beta\ell$	21			
116	12874	18408	105, L	4321	N23	255	24.58	12874	75	175	1507	N23 W35	27.28	+6	170	1170	$\ell\beta\rho\ell$	27	21	180	12

2.II-8 (1)

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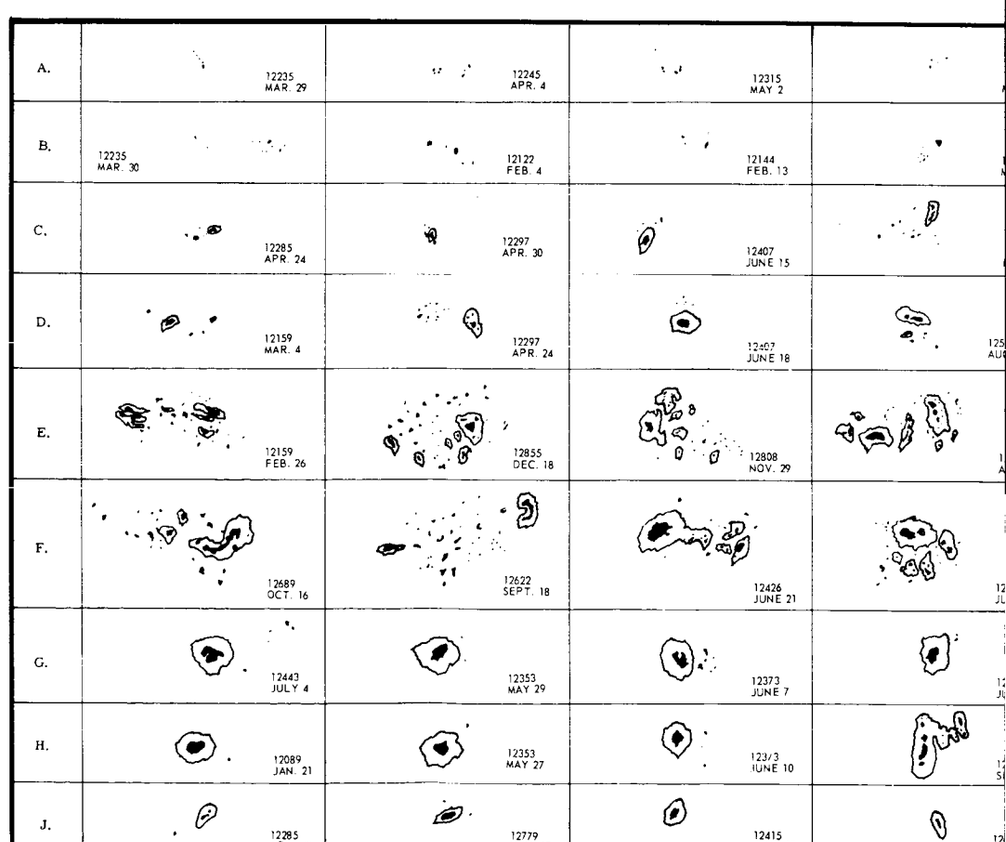
ARE DAY DATA				DISK PASSAGE DATA	RETURN SEQUENCE	GREENWICH DESCRIPTION
Mag. Class.	H	Position		Days Seen, Positions Seen, Zurich Class., Mag. Class., Magnetic Strength	Greenwich and/or MT.W.	
				Oct. 13 — Oct. 24 E60 — W86 A A C C C C D D D D - - (X) (β) βp βf βp βp - - βf βf X - - - 3 11 14 13 - - - - -		A stream of small spots until October 20, after which the group grows fairly rapidly as it approaches the limb.
				Oct. 20 — Oct. 31 E74 — W78 B B C D D D C E E D C C - - (β) βf βγ (β) (βp) (βp) (βp) βp (βp) - - - - 11 8 - - - - 17 - -		A stream of small changing spots until October 26, after which the group consists of two composite spots.
				Oct. 20 — Oct. 31 E79 — W78 C D D E E D D D D D D B - - (β) β βp (β) (β) (β) (β) αp (αp) - - - - 15 13 - - - - 15 - -		A group of spots which join together to form a composite spot on October 24 but which soon breaks up again.
(βp)	-	S12	W02	Oct. 22 — Nov. 1 E66 — W67 G G G G G G E H H H H (βp) βp βp (βp) (βp) (βp) (βp) βp (X) - (αp) - 17 19 - - - - 18 - - -		A composite spot, with one or two small companions.
				Oct. 25 — Nov. 6 E78 — W70 - D E E E G G G G G G G B (βp) (β) (βf) (βf) βf (βf) - (βf) - - (βp) (βp) -		A stream in which the follower, a regular spot, is the most stable member. This, however, begins to break up on November 2 into a number of small spots before dying out.
-	-	S24	W15	Oct. 25 — Nov. 6 E81 — W66 - E E E E G G G H H H H B	18239, 18191	A large composite spot, which by November 3 begins to break up and is dying out as it passes from view.
(γ)	-	S24	W55	(X) (X) (X) (X) γ (γ) - (γ) - - (γ) (γ) (γ)		
(γ)	-	S25	W68	- - - - 21 - - - - - - - -		
				Oct. 26 — Nov. 3 E22 — W85 B D E E E E G G - (β) (β) (βp) βp (βp) - (βp) - - - - - 22 - - - - -		Intermittent. A tiny spot on October 23. On October 26, a pair of small spots appear which grow rapidly into a bi-polar group.
				Oct. 28 — Nov. 7 E48 — W78 A B D E E E E E E E - (β) βf (βf) - (βp) - - (β) (βp) β (∝) - 9 - - - - - - - 4 -		A stream undergoing minor changes.
				Oct. 30 — Nov. 11 E81 — W63 - D E E E G G G G G G G G (X) - (βp) - - (βp) (βp) βp αp αp αp αp (αp) - - - - - - - 3 17 14 13 8 -		A stream in which both the leader and follower become regular spots and alone remain by November 7. On November 9, the follower begins to change into a composite spot.
-	-	N18	W07	Nov. 6 — Nov. 18 E80 — W70 - H H H H D C C J J J J A βp βf β βγ β β ? - - - βf βf (αf) 11 13 15 15 17 16 14 - - - 4 2 -		A stream of normal type. Only the leader and follower remain by November 15.
-	-	N19	W36	Nov. 10 — Nov. 20 E46 — W81 A B B D D E E E E E - βp βp (βp) - - - βγ βγ β (β) (αf) 4 2 - - - - 15 20 16 - -		A small spot until November 12. On the next day other spots appear and these rapidly develop into a bi-polar group.
∝	6	S23	E57	Nov. 8 — Nov. 17 E79 — W37 - H H G G H B B B A (X) ∝ ∝ ∝ ∝ - - - ∝ - - 11 7 6 11 - - - 2 -	18262, 18219	A composite spot, which breaks up and dies out rapidly after November 13.
					12689. 12633	
				Nov. 9 — Nov. 18 E47 — W76 A B E E E E E D C J - βγ βf βf - - - αp (αp) (αp) - 11 18 19 - - - 22 - -		A stream of rapid growth until November 12. The leader, a regular spot, is the only survivor by November 17.
				Nov. 21 — Nov. 24 W43 — W80 A C D - - (X) (X) (X) - - - -		A small group forming near the west limb.
(β)	-	N27	W47	Nov. 14 — Nov. 25 E72 — W76 J J J J C C D E E E C C - - αp βp βγ βp βp (β) (β) (β) (βp) (αp) - - 19 18 7 13 15 - - - - -		A regular spot until November 16, after which other spots appear to form a cluster.

Serial No.	Sunspot Number MT.W.	Green.	Category	McM Plage	Lat.	Long.	C.M.P.	All Spots in Plage	Plage Serial No. Table III	Umb.	Whole Spot	Position		Gr. Day
	POSITION DATA									MAXIMUM AREA				
117	12878	18411	L	4328	N26	240	Dec. 25.70	12898 12878	76	181	1024	N26	E57	Dec. 21.29
118	12882	18413	L	4323	S19	227	26.76	12906 12892 12882 12884 12886	77	84	591	S20	W28	24.50
119	12894	18419	L	4315	S05	309	20.50	12894 12873 12864	-	118	829	S06	W75	26.26
120	12885	18415	L	4325	N14	218	27.45	12885	-	87	540	N15	E67	22.30

ZURICH CLASSIFICATION OF SU



2.11-90

TABLE II 1957 (Continued)

Flare ΔT	SUNSPOT MEAN DATA: Area Umb.	Area Whole Spot	Mt. Wilson Mag. Cl.	H	MAJOR FLARE DAY DATA: Gr. Day	Area Umb.	Area Whole Spot	Zurich Class	Mag. Class.	H	Position	DISK PASSAGE: Days Seen, Positions Seen, Mag. Class., Magnetic Str
	128	862	ℓβρℓ	29								Dec. 19 E78 - E E E E E E E (X) βρ βρ βρ βρ βρ (βρ) (β - 15 21 24 29 18 - -
	55	392	ℓβℓ	14								Dec. 20 E85 - C C E E E E E (X) αρ αρ γ β (β) (β) (β - 15 13 18 12 - - -
	82	518	αβℓ	(15)								Dec. 24 Dec. 26 W54 W75 J D D βρ (β) (αf) 6 - -
	69	414	ℓαρℓ	29								Dec. 21 E81 - H H H H H H H αρ αρ αρ αρ (αρ) (αρ) (αρ) (22 26 29 14 - - -

NSPOTS

MT. W

12368 MAY 30	Sunspot composed of a small single spot or a very small group of spots, mostly of short duration, concentrated in a region of 2-3 Sq. Deg. with no systematic structure of the group. The spots are without penumbra.
2225 AR. 27	A bipolar group of spots without penumbra, the long axis of which is diretced roughly E-W, concentration of spots on the E & W ends.
12368 MAY 31	Bipolar group like B but with at least one main spot with penumbra.
73 G. 27	Bipolar group, the largest spots having penumbra.
2580 UG. 28	Large bipolar group showing a complicated structure. The two major spots each having a penumbra. Numerous small spots between the major spots. Group at least 10° distance in longitude.
417 UNE 20	Very large bipolar or complex group. Dimension in longitude at least 15°.
2434 UNE 28	Large bipolar group, without small spots between the two major spots. Dimension in longitude at least 10°.
9648 EPT. 26	Unipolar spot with penumbra, sometimes with complicated structure. Diameter > 2.5°.
536 EPT. 22	Umipolar spot with penumbra, round shape, Diameter <2.5°.

DATA	RETURN SEQUENCE	GREENWICH DESCRIPTION
), Zurich Class., ength	Greenwich and/or MT.W.	
Dec. 31 W71 G G H H H) (αρ) αρ αρ (αρ) (αρ) – 18 12 – –		A composite spot, followed by some variable companions.
Jan. 1, 1958 W76 D D D B B) β β (β) (β) (β) 12 6 – – –	18357 12800	A large composite spot which begins to break up by December 28 and is dying out as it passes from view. A group forming near the west limb.
Jan. 2 W78 H H H J - αρ (αρ) αρ (αρ) (αρ) 10 – 17 – –	18365 12814	A regular spot, of which the umbra divides into three parts for a few days.

ILSON MAGNETIC CLASSIFICATION OF SUNSPOTS

I. UNIPOLAR SPOTS

- α - The flocculi is farily symmetrically distributed on the preceding and following sides of the center of the group.
- αp - The center of the group precedes that of the surrounding flocculi.
- αf - The center of the group follows that of the surrounding flocculi.

II. BIPOLAR SPOTS

- β - Both members are of approximately equal area.
- βp - The header is the principal member.
- βf - The trailer is the principal member.
- $\beta\gamma$ - The trailer and header are accompanied by small components of opposite polarities.

III. Multipolar spots

- γ - Irregularly arranged spots of opposite polarities which cannot be classified as bipolar spots.

2. II-9 (3)

TABLE III. CATALOGUE OF PLAGE DATA FOR 1957

The data in this catalogue include plage regions associated with major solar flares, plages with a cental meridian passage area equal to or greater than 10,000 millionths of the solar hemisphere, plages with an average brightness equal to or greater than 3.5 during disk passage, and plages where 30 or more flares of all importance equal to or greater than 1, during disk passage. The categories are indicated in column 4 by the sumbols L = large, B = bright, and N = 30 or more flares. These data were obtained from the McMath-Hulbert unpublished plage catalogue. (Ref. 13)

Column 1 Catalogue Serial Number.

Column 2 McMath Plage Number.

Column 3 The Major Flare or Flares Serial Numbers and/or Plage Category.

Column 4 Mean Longitude During Disk Passage.

Column 5 Mean Latitude During Disk Passage.

Column 6 Greenwich Date of Central Meridian Passage.

Column 7 Life in Rotations.

Column 8 Date First Seen.

Column 9 Number of Days Seen.

Column 10 Average Maximum Area.

Column 11 Intensity. Three regions are used, E/C/W, where:
E = E90° to E45°
C = E45° to W45°
W = W45° to W90°
The intensity is estimated on a scale of 1 = faint to 5 = very bright.

Column 12 Number of Flares During Disk Passage E/C/W
E = E90° to E45°
C = E45° to W45°
W = W45° to W90°

Column 13 Total Number of Flares During Disk Passage.

Column 14 Life Histories. If the plage region is the return of a plage or plages from the previous rotation or rotations, the McMath plage numbers are given in the return sequence.

ASSOCIATED SUNSPOTS - COLUMNS 15-18

Column 15 Mt. Wilson Sunspot Numbers of All Spots Covered by the Plage

Column 16 Mt. Wilson Mean Magnetic Classification of the Spots

Column 17 Field Strength in Units of 100 gauss. A bracket indicates an estimated value.

Column 18 Days Seen.

TABLE III. 1957 (CONTINUED)

IDENTIFICATION				PLAGE POSITION					DISK PASSAGE PLAGE DATA					LIFE HISTORY	ASSOCIATED SUNSPOTS			
Serial No.	$M^{C}M$ Plage No.	Major Flare Ser. No.	Category	Mean Long.	Mean Lat.	Date C.M.P.	Life Rotations	1st Seen	Days Seen	Average Max. Area	Intensity E/C/W	No. Flares E/C/W	Total Flares	Plage No.'s Previous Rotations	No. Wil. No.	Mag. Class	Intensity 100 Gauss	Days Seen
17	3974		L,B,N	28	N13	May 11.5	2	May 05	>12	10000	3.5/3.5/4	4/34/3	41	3932	12324 12326	$\ell\beta\gamma\ell$ $d\alpha pd$	30 (2)	May 5-17 6-6
18	3979		B		S16	17.5	4.1	--	>10	7000	3.5/3.5/2.5	4/14/4	22	Part of 3940 Part of 3847 - 3861 Part New Part New	12330 12331 12351 12332	$\ell\beta f\ell$ $\ell\beta pd$ dxd $\ell\alpha p\ell$	23 7 (2) 13	13-22 13-17 21-21 13-24
19	3987		N	196	N18	25	2	--	>10	6000	x/3/3	5/6/24	35	3966	12347 12356	$d\beta pd$ $d\beta\ell$	18 13	19-29 24-31
20	3996	22	N	97	S22	June 1.5	1	--	>12	5500	3/3/2.5	2/24/10	36	New	12360 12368	$\ell\alpha p\ell$ $d\beta\gamma\ell$	23 13	June 26-7 30-8
21	4011		L,B	285	N30	14.5	1	June 08	14	11000	3.5/3.5/3	5/11/1	17	New	12411 12387	$d\alpha fd$ $\ell\beta\gamma\ell$	2 23	15-15 7-20
22	4018		L		S18	18.5	2	12	--	11000	3/2.5/2.5	5/22/1	26	3984	12397 12402 12420	$\ell\alpha d$ $\ell\beta d$ $d\beta\ell$	11 9 17	11-19 12-20 17-24
23	4022	23			S15	19.5	7	1	13	5500	3/3/2	4/3/0	7	3984 3947* 3907 (See No. 12) *Old and dying plage has a resurgence at WLP	12403 12406 12407	$\ell\beta d$ $\ell\beta p\ell$ $\ell\alpha p\ell$	4 13 26	12-19 13-24 13-25
24	4021	24	B,N	199	S35	21	2	14	13	7000	3.5/3/3.5	25/26/2	53	3986	12409	$\ell\beta\ell$	27	14-28
25	4024	25,26,27	B,N	179	N18	22.5	2	15	>12	9000	3.5/3.5/3.5	9/38/17	64	3989 3991 In position of 3958	12415 12417	$\ell\alpha p\ell$ $\ell\beta\gamma\ell$	26 39	15-27 15-29
26	4030		B	139	S20	25.5	2	18	---	9000	3.5/3.5/3.5	8/10/10	28	3993 New in position of 3962	12426 12435	$\ell\beta p\ell$ $d\alpha pd$	37 3	18-1 25-26
27	4039	28,30,31, 32	B,N	79	N12	30	2	24	13	6000	4/4/3	10/33/0	43	4001	12433 12434 12445	$\ell\beta d$ $\ell\alpha p\ell$ $d\beta d$	7 35 2	24-2 24-6 27-28
28	4043		B		S12	July 02	1	23	>12	5000	4/3.5/3	1/17/2	20	New	12443	$\ell\beta p\ell$	33	26-8
29	4044	29	B	13	S27	05	1	28	14	9000	3.5/3.5/3.5	11/10/5	26	Mostly new	12449	$\ell\gamma\ell$	35	28-11
30	4046	35	N	20	N12	4.5	4	28	13	5000	3.5/3/3	5/33/23	61	3999 3974 3932	12453 12447 12451	$d\beta\ell$ $\ell\alpha p\ell$ $\ell\beta f\ell$	17 21 19	30-9 28-10 29-11
31	4048	33	B		N14	8	1	July 01	13	6000	3.5/3.5/3	7/8/1	16	New	12456	$\ell\beta fd$	13	July 1-12
32	4051		B		S13	10	4	04	13	4000	3.5/3.5/3	1/3/0	4	4009,3979 (See No. 18)	12462	$\ell\beta d$	26	4-15
33	4061		B	247	S32	14.5	1	10	11	1800	-/3.5/3.5	-/13/1	14		12473	$d\gamma\ell$	25	10-20
34	4065	36,37,	L,B,N	168	N21	20.5	4.3	12	16	17000	4/3.5/3	13/49/12	74	4023 4987 (See No. 19) 4024 (See No. 25) 4028 4000 4029 Part of 3991 in position of 3958	12489 12494 12481 12487 12491 12511	$d\alpha d$ $d\beta\ell$ $\ell\beta f\ell$ $\ell\beta fd$ $\ell\beta f\ell$ $d\beta pd$	3 4 30 15 23 4	15-22 16-25 12-27 14-24 15-28 24-25
35	4075	38	B,N	95	N16	26	3	19	14	4000	3.5/3.5/3.5	15/18/21	54	4039 (See No. 27)	12520 12503	$d\alpha d$ $\ell\beta p\ell$	(1) 26	31-31 19-1
36	4070	39,40,41	N	148	S21	22	3	15	14	7000	2/3/2	1/20/10	31	4030 (See No. 26)	12507 12496	dxd $\ell\beta p\ell$	(1) 29	21-22 17-28

TABLE III. CATALOGUE OF IMPORTANT PLAGES DURING 1957

	IDENTIFICATION			PLAGE POSITION					DISK PASSAGE PLAGE DATA					LIFE HISTORY	ASSOCIATED SUNSPOTS			
Serial No.	McM Plage No.	Major Flare Ser. No.	Category	Mean Long.	Mean Lat.	Date C.M.P.	Life Rotations	1st Seen	Days Seen	Average Max. Area	Intensity E/C/W	No. Flares E/C/W	Total Flares	Plage No.'s Previous Rotations	Mt. Wil. No.	Mag. Class	Intensity 100 Gauss	Days Seen
1	3813	1	L.B	183	S22	Jan. 9.5	3	Jan. 02	15	19000	3.5/3/3.5	6/19/2	27	3788 | 3755 3757	12079	dβ	2	Jan. 8-9
															12066	ℓβp	15	1-9
															12074	dβd	10	6-9
															12075	dβℓ	15	6-15
															12068	ℓβpℓ	13	2-14
															12080	dβfd	5	8-9
															12076	dβℓ	6	6-15
															12081	dβℓ	(4)	14-16
2	3808	2,3	B	275	N20	2.5	1	--	13	5000	x/4/3.5	5/12/11	28	New	12054	ℓβγℓ	35	Dec. 27-8
3	3820	4,5,6,10	N	58	S28	19	6	--	13	9000	3/3/2	2/25/9	36	3794 | 3767 3770 3772 |3729 | 3686 3689 | 3641 3642 3797	12086	dβd	3	Jan. 14-19
															12096	dβ	2	18-22
															12085	ℓαpℓ	29	14-25
															12087	d×d	(2)	14-15
															12107	d×ℓ	(3)	25-25
															12099	dαp	9	19-25
4	3823	7,8,9	L,B,N	5	N20	23	3	15	>12	16000	3.5/3.5/3	4/31/2	37	3801 3774	12089	ℓαpℓ	34	15-25
															12093	ℓβℓ	(20)	16-25
															12094	dβd	5	17-22
5	3830	11		273	N20	30	2	23	14	8500	3/3/3	2/4/0	6	3808	12109	d×d	(5)	25-25
															12110	αd	(2)	25-25
															12113	d×d	10	31-5
															12114	dαpℓ	10	31-5
6	3838		L	44	S20	Feb. 05	4	29	14	11500	3.5/3/2.5	0/7/1	8	3813 3788 | 3755 3757	12117	αpd	5	31-6
															12118	αpd	5	31-5
															12119	ℓαpℓ	28	31-10
															12133	d×d	(2)	10-10
7	3843	12		145	S18	08	1	Feb. 01	13	7500	3/3/2.5	1/9/4	14	New	12121	dβℓ	13	Feb. 2-13
															12122	dβpℓ	10	3-13
															12123	dαpd	5	3-10
8	3844		B	117	S26	10.5	1	04	13	7000	3/3.5/3.5	1/7/1	9	New	12124	ℓβpℓ	35	4-16
9	3863	13		291	N18	25	3	19	3	3500	3/3/3	0/3/1	4	3830 3808	12157	dαα	2	24-26
															12154	dβpd	27	22-27
															12152	dβpd	3	21-22
10	3888	14		11	S22	Mar. 16	1,(6)	Mar. 09	14	5000	3/3/3	3/5/4	12	3853 3822 3800 3773 3743 resurgence of an old plage 3857	12202	dαd	(1)	Mar. 13-15
															12207	d×d	(1)	15-15
															12191	ℓβpℓ	26	10-21
															12204	dαd	2	14-15
11	3899	15,16	B,N	262	S15	26.5	1	--	>11	8500	3/3.5/3.5	5/22/4	31	New	12221	d×d	(2)	22-27
															12216	ℓβpℓ	34	19-1
															12230	dβd	1	27-28
12	3907	17		209	S13	30.5	6	23	>11	5200	3/3.5/x	0/8/17	25	3872 3838 3813 (See No.1) Resurgence	12232	dαpd	2	27-29
															12235	dβℓ	14	28-4
															12228	d×d	(2)	26-26
13	3916	18		104	S24	Apr. 7.5	3.9	Apr. 01	13	5500	3/3/3	2/19/3	24	3881 3847 Part of 3884 3849 3820 (See No. 3)	12259	dβℓ	12	Apr. 7-13
															12262	d×d	(2)	8-8
															12241	ℓβpd	14	1-12
14	3923	19	N	38	S23	12.5	7	--	>11	6000	x/3.5/x	21/16/4	41	3888 (See No. 10)	12254	ℓαpℓ	33	5-15
															12258	dβ	14	6-15
15	3941	20,21	N	259	N28	23	2	15	15	9000	3/3/2.5	13/19/4	36	3900 3908	12285	ℓβγd	(20)	19-27
16	3972		L,B,N	21	S28	May 11	2	May 04	13	10000	3.5/3.5/3.5	14/23/5	42	3939	12318	ℓβγℓ	23	May 3-17

TABLE III 1957 (CONTINUED)

	IDENTIFICATION			PLAGE POSITION					DISK PASSAGE PLAGE DATA					LIFE HISTORY	ASSOCIATED SUNSPOTS			
Serial No.	McM Plage No.	Major Flare Ser. No	Category	Mean Long.	Mean Lat.	Date C.M.P.	Life Rotations	1st Seen	Days Seen	Average Max. Area	Intensity E/C/W	No. Flares E/C/W	Total Flares	Plage No.'s Previous Rotations	Mt. Wil. No.	Mag. Class	Intensity 100 Gauss	Days Seen
37	4082		B,N	9	S28	Aug. 1.5	2	July 26	14	7600	2.5/3.5/3.5	5/41/9	55	4044 (See No. 29)	12513 12525 12514	$l\alpha p l$ $d\beta f l$ $l\gamma l$	26 7 28	26-6 Aug. 2-7 27-8
38	4083	42	B,N	330	N23	4.5	2	28	14	5000	3.5/3.5/3.5	4/27/11	42	4057	12516	$l\beta p l$	23	28-10
39	4112	43,44	L,B,N	92	N14	22.5	4	Aug. 15	14	22000	3.5/3.5/3.5	8/19/16	43	4075 (See No. 35) 4078	12562 12563 12567 12582 12583	$l\alpha d$ $l\beta p l$ $d\alpha p d$ $d\times d$ $d\times d$	12 26 (1) (2) (2)	15-20 15-27 17-18 26-26 26-26
40	4122		B		N12	29	2	23	13	4500	3.5/3.5/3.5	14/8/1	23	4092	12577	$l\beta f l$	15	23-4
41	4125	45,46,48, 50,55,56	B,N	353	S27	30	3	23	14	8000	3.5/3.5/3	8/46/7	61	4082 (See No. 37)	12587 12588 12578 12579	$d\times d$ $d\alpha d$ $d\times d$ $l\gamma l$	1 2 (2) 28	28-31 29-31 24-3 24-6
42	4124	47,49,51, 52,53,54, 57,58,59	L,B,N	333	N22	31.5	3,2	25	14	21000	3.5/4/3.5	14/70/26	110	4083 (See No. 38) 4084 4048 4095 4096	12585 12580 12581 12586 12590	$d\beta p l$ $l\beta\gamma l$ $l\beta\gamma l$ $d\alpha f d$ $d\beta d$	17 23 20 5 3	27-5 25-7 25-6 27-2 31-31
43	4134	60,61,63, 64,65	B,N	207	N12	Sept. 10	2	Sept. 03	14	9000	3.5/3.5/3.5	9/22/8	39	4098 Mostly new & Part of 4065 4023 3987 (See No. 19) 4024 (See No. 25) 4100 4028 4000 4029 Part of 3991	12614 12610 12596 12611	$d\beta d$ $d\alpha d$ $l\beta\gamma l$ $d\beta d$	(1) 2 26 (1)	Sept. 11-11 9-9 3-17 9-9
44	4141	62	N	188	S17	11.5	1	06	12	3000	1/3/2.5	0/40/4	44	New	12606	$d\beta l$	26	8-17
45	4151	67,68,69, 70,71,72,	B,N	89	N19	19	5	--	>12	7800	3.5/4/3	13/62/8	83	4112 (See No. 39)	12637 12632 12622	$d\beta p d$ $d\beta p d$ $d\beta\gamma l$	6 5 36	21-23 20-22 13-26
46	4152	66,73,74,	B,N	69	N11	20.5	2	13	14	6000	3.5/4/3.5	16/35/4	55	4114	12623 12634	$l\beta p l$ $d\beta\gamma l$	30 31	13-25 20-27
47	4159	75,76	L,N		N20	28	4,3	20	15	19000	3.5/3/3	13/40/10	63	4124 (See No. 42)	12640 12635 12636 12642 12662 12644 12649 12652 12656	$l\alpha p d$ $l\beta\gamma l$ $l\alpha p l$ $d\beta p d$ $d\times d$ $l\beta d$ $d\alpha d$ $d\beta l$ $d\times d$	4 25 30 26 (2) 20 (1) 13 (1)	21-28 20-2 20-2 22-2 29-29 22-2 24 24 25-4 27-27
48	4162		B	290	N17	Oct. 01	2	23	15	6000	3.5/3.5/3	12/7/0	19	4145	12648 12663 12673 12661	$l\beta p l$ $d\times d$ $d\times d$ $d\alpha d$	30 4 (1) (2)	23-6 29-30 Oct. 4-6 28-28
49	4165		B		N28	2.5	1	26	14	3600	3.5/3.5/3.5	0/12/2	14	New	12654	$l\beta p l$	25	26-7
50	4172		N	204	N14	7.5	3	Oct. 01	14	7500	2/3/2.5	1/19/10	30	4134 (See No. 43)	12670 12679 12676 12680	$d\alpha p d$ $d\beta d$ $d\beta l$ $d\beta d$	4 7 16 7	1-6 7-10 6-12 7-10
51	4173	77		198	S40	8	1	02	11	5200	x/3/3	5/7/5	17	New	12669	$d\beta f d$	11	1-12

TABLE III 1957 (CONTINUED)

IDENTIFICATION				PLAGE POSITION					DISK PASSAGE PLAGE DATA					LIFE HISTORY	ASSOCIATED SUNSPOTS			
Serial No.	McM Plage No.	Major Flare Ser. No.	Category	Mean Long.	Mean Lat.	Date C.M.P.	Life Rotations	1st Seen	Days Seen	Average Max. Area	Intensity E/C/W	No. Flares E/C/W	Total Flares	Plage No.'s Previous Rotations	Mt. Wil. No.	Mag. Class	Intensity 100 Gauss	Days Seen
52	4179		B	158	N18	Oct. 11	3	Oct. 04	>12	5000	4/3.5/3	10/3/1	14	4142 4101	12675	$\ell\beta\rho\ell$	28	Oct. 4-16
53	4185		B		S17	15	1	09	13	4000	3.5/3.5/3.5	6/13/0	19	New	12684	$\ell\beta\rho\ell$	16	9-19
54	4186	78			N10	17.5	3	10	14	8500	3/2.5/2	10/14/2	26	4152 (See No. 46)	12692	$d\beta d$	2	12-16
															12687	$d\beta d$	13	10-18
															12705	$d\alpha d$	2	17-17
															12695	$d\times d$	(2)	12-16
															12702	$d\beta d$	9	15-19
															12721	$d\alpha f\ell$	2	23-24
55	4189	79,80,81, 82,83,84	L,B,N	73	S25	17.5	2	10	14	18000	3.5/3.5/3.5	17/54/21	92	4155 In position of 4120	12689	$\ell f\ell$	29	10-24
															12694	$\ell\times\ell$	17	12-24
															12696	$\ell\beta pd$	15	12-19
56	4197		L,N	327	N20	25.2	5	18	14	12500	3.5/2.5/2.5	10/30/2	42	4159 (See No. 47)	12707	$\ell\beta\ell$	13	18-30
															12722	$d\beta d$	6	23-28
															12710	$\ell\beta\rho\ell$	17	19-30
															12716	$\beta\rho\ell$	16	22-30
															12735	$d\times\ell$	(2)	27-27
57	4203	85	B		S13	28	1	21	13	5000	3.5/3.5/3	2/11/0	13	New	12718	$\ell\beta\rho\ell$	17	22-1
															12728	$d\alpha d$	(2)	25-25
58	4207	86,87,88	L,N		S18	31.5	3	25	13	18000	3/3.5/3	11/31/12	54	4167 4136	12752	$d\times d$	(2)	Nov. 4-4
														4175 4147	12730	$\ell\beta f\ell$	17	25-5
															12732	$\ell\gamma\ell$	20	25-6
															12734	$d\alpha d$	2	26-1
59	4218		B		S17	Nov. 06	3	30	14	6600	3/3.5/3.5	4/4/9	17	4177 4141 (See No. 44)	12744	$\ell\alpha\rho\ell$	15	30-11
															12745	$\ell\beta\rho\ell$	16	30-11
															12749	$\ell\beta\rho\ell$	20	1-12
60	4230	90,91	L.B		N18	12	1	Nov. 05	13	11000	3.5/3.5/3	6/9/1	16	New	12762	$\ell\beta pd$	19	5-12
															12772	$d\beta\rho\ell$	8	9-17
															12763	$\ell\beta\ell$	16	5-18
61	4237	89			S21	14.5	3	08	13	8000	3/2.5/2	6/11/0	17	4189 (See No. 55)	12776	$d\alpha pd$	2	11-16
															12773	$d\beta d$	4	9-12
															12768	$\ell\alpha d$	10	8-16
62	4246	92	B		N26	20	1	≤15	≥12	7000	3/3.5/3.5	1/21/6	28	New	12779	$\ell\beta\rho\ell$	18	16-25
															12790	$d\times\ell$	(10)	21-24
63	4247		B		N15	21	6	15	13	5200	3.5/3.5/3.5	0/22/5	27	4197 (See No. 56)	12780	$\ell\alpha pd$	14	16-23
															12781	$\beta\rho\ell$	20	16-26
64	4255		B		S15	24	2	17	≥11	5500	3.5/3.5/3	4/8/0	12	4203	12783	$d\beta d$	9	18-28
65	4263	93	B,N		S15	27	4	20	13	8500	4/3.5/2.5	6/29/3	38	4207 (See No. 58)	12787	$\ell\alpha pd$	(10)	20-26
															12788	$\ell\beta\rho\ell$	21	20-2
															12796	$d\alpha d$	2	23-30
66	4269	95,96,	B		S18	29.5	1	24	12	5000	3/3.5/4	1/12/14	27	New	12800	$d\beta\rho\ell$	21	24-3
														in region of 4210	12810	$d\times d$	(2)	27-27
67	4288	97	B,N		S20	Dec. 3.5	4	27	13	7000	3.5/3.5/3.5	11/27/6	44	4218 (See No. 59)	12808	$\ell\gamma\ell$	20	26-10
															12815	$d\beta d$	8	29-3
															12827	$d\alpha\ell$	3	Dec. 2-10
															12828	$d\times d$	(2)	2-2
68	4282	94			N39	5	2	28	≥7	1000	1.5/1.5/x	0/0/0	1	4220	No Spots			

TABLE III 1957 (CONTINUED)

	IDENTIFICATION		PLAGE POSITION					DISK PASSAGE PLAGE DATA					LIFE HISTORY	ASSOCIATED SUNSPOTS			
Serial No.	McM Plage No.	Major Flare Ser. No. / Category	Mean Long.	Mean Lat.	Date C.M.P.	Life Rotations	1st Seen	Days Seen	Average Max. Area	Intensity E/C/W	No. Flares E/C/W	Total Flares	Plage No.'s Previous Rotations	Mt. Wil. No.	Mag. Class	Intensity 100 Gauss	Days Seen
69	4295	99		N15	Dec. 9.5	2	Dec. 03	13	4000	2/3/2	1/6/0	7	4230	12832	$\ell\beta d$	9	Dec. 3-11
70	4301	98		S35	10.5	1	06	11	2000	2/2.5/1	3/2/0	5	New	12840	βd	5	6-9
71	4296	B		N08	11	2	04	13	8500	3/3.5/3.5	0/11/2	13	4233	12837	$\ell\beta p d$	5	6-7
														12838	$\beta p \ell$	22	6-13
														12845	$d\beta f \ell$	17	10-17
														12852	$d\beta d$	(1)	13-13
72	4313	L		S14	19	1	12	14	11000	3.5/3/2.5	4/8/1	13	New	12851	$\ell\beta p \ell$	36	12-24
														12861	dxd	(1)	17-17
														12862	$d\beta d$	2	17-20
73	4314	100,101,102,B,N 103,104		N17	20	1	13	14	8500	4/3.5/3	10/23/10	43	New	12855	$\ell\beta\gamma\ell$	22	13-26
														12863	αd	(2)	17-17
74	4319	L		S22	24	5	17	13	14000	2.5/3/3	7/12/5	24	4263 (See No. 65)	12870	$\ell\alpha p d$	11	17-28
														12869	$\ell\beta\ell$	21	17-30
														12890	$d\alpha p d$	(1)	23-23
														12877	$d\beta\ell$	18	19-30
75	4321	105 L,N		N22	24	1	18	14	12000	3/3/3	4/24/12	40	New	12874	$\ell\beta p \ell$	27	18-31
76	4328	L		N28	26	1	19	13	15000	3/3/3	1/12/0	13	New	12898	$d\beta f\ell$	16	25-31
														12878	$\ell\beta p \ell$	29	19-31
77	4323	L		S14	27	2	20	13	10000	3.5/3/3	10/9/2	21	4269	12906	$d\alpha d$	(2)	28-28
														12892	$d\alpha p d$	4	23-23
														12882	$\ell\beta\ell$	14	20-1
														12884	$d\alpha d$	(2)	21-21
														12886	$d\alpha d$	(10)	21-26

TABLE IV. CATALOGUE OF IMPORTANT RADIO EMISSIONS FROM THE SUN DURING 1957

This table will include all important radio emissions from the sun that occur within an acceptable time of:

(a) The major flares reported in Table I.

(b) Events listed in Table VIII (Solar Activity Chronological Catalogue) that had important solar radio emission associations. This will include outstanding emissions (peak flux ≥ 500) at 2800 Mc/s or 200 Mc/s even though, only a sub flare, a minor flare, or no flare was reported at the time of the emission.

(c) All reported spectral emissions of the Type II (slow drift bursts) and Type IV (broad band continuum).

Due to the period from approximately 0600 UT to 1300 UT when there is no sweep frequency patrol of the sun, we have included data from studies by Pick-Gutman (reference 44). Hakura and Goh, (reference 22) and others who have used radio emissions at single frequencies in both the meter and centimeter wave lengths to derive probable spectral emissions of the Type IV.

In order to make this phase of the catalogue as completed and useful as possible, we have included emissions for a wide range of frequencies from 9500 Mc/s to 167 Mc/s, and whenever significant fluxes were reported at low frequencies data are also included. These single frequency data have been taken from reference 63.

Normal observing hours of the solar radio observatories in both the discrete and sweep frequency programs are shown on page 2.IV-v.

All fluxes at single frequencies are reported in units of 10^{-22} Wm^{-2} $(c/s)^{-1}$.

The following symbols, singly or in groups (reference 43), illustrated on page 2.IV-iv are used to describe single frequency reports of outstanding occurrences:

S = simple rise and fall of intensity.

C = complex variation of intensity.

A = appears to be part of general activity.

D = distinct from (apparently superposed 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 of rise of activity.

ECD = a complex distinct disturbance with very sharp rise.

CD = complex disturbance of moderately sharp rise.

Not all emissions reported in reference 63 at the time of the flare are included in the catalogue, and no general minimum flux has been used as a cutoff point. Occasionally more than one report at a given frequency is included.

In general the peak flux, if reported, is given. If the peak flux is not available, the smoothed flux is used, and indicated by enclosing the value in a bracket ( ).

If the peak flux is greater than the reported value, the recorded flux has been underlined.

A list of the observatories, their identification code, and normal operating times for each of the four quarters during 1957 is given on page 2.IV-v. Figures 2.IV-1 and 2.IV-2 show the observatories and normal operating times for the first and fourth quarters of 1957, respectively.

Table IV is arranged in three general columns.

(a) FLARE, if any, associated with the radio emission.

(b) RADIO EMISSIONS OF THE SPECTRAL TYPE

(c) RADIO EMISSIONS AT SINGLE FREQUENCIES

The column headings together with any necessary explanations follows:

FLARE DATA - (Columns 1 through 7)

Column 1 Date.

Column 2 Beginning Time UT. If the start of the flare was observed, the time is underlined.

Column 3 End Time UT. When the end of the flare was observed the time is underlined.

Column 4 Maximum Time UT. This value has been taken from reference 12 for the second six months of 1957 and unpublished data for the first six months.

Column 5 Heliographic Position. The position of the flare is taken as the arithmetic mean of the values reported in the IAU Bulletin.

Column 6 Importance. The method used for major flares has already been described in connection with Table I. The minor flares are reported as 2+, 2, 1+, 1 as the highest importance given reference 63, subflares are denoted with importance 1-. In a number of cases it will be noted that the flare importance given in this column will be greater than the importance given for the same flare in Table VIII, this difference in values is discussed in some detail in the description of Table I.

Column 7 Flare and/or Event Serial Number. These are the serial numbers of the major flare in Table 2.I or the event number in the chronological catalogue Table 2.VIII, for the purpose of cross reference.

SPECTRAL EMISSIONS

Outstanding spectral emissions of Types I, II, III and IV are given in Table VIII. The entries in this table will be limited to emissions of Type II and Type IV reported by CSIRO Sydney (Syd) and/or the Harvard Radio Astronomy Observatory (Har) at Fort Davis, Texas.

We have also included spectal emissions of the Type IV that have been derived by Pick-Gutman (Ref. 44) or Hakura and Goh (Ref. 22) from single frequency observations. These derived Type IV emissions are particularly useful for the time period from approximately 0600 to 1300 UT when neither the Harvard nor the CSIRO sweep frequency observatories are in the sun light.

TYPE II SLOW DRIFT BURSTS (Columns 8 through 12)

Column 8 Beginning Time UT.

Column 9 End Time UT.

Column 10 Intensity.

Column 11 Frequency Range.

Column 12 Observatory or reference.

TYPE IV BROAD BAND CONTINUUM (Columns 13 through 17)

Column 13 Beginning Time.

Column 14 End Time.

Column 15 Intensity.

Column 16 Frequency Range.

Column 17 Observatory or reference.

RADIO EMISSIONS AT SINGLE OR DISCRETE FREQUENCIES (columns 18 through 24)

Selected frequencies between 9500 Mc/s and 167 Mc/s associated in time with the major solar flares, solar-terrestrial events, or spectral emissions are tabulated in a descending order of frequency with the following data.

Column 18 Frequency.

Column 19 Type.

Column 20 Beginning Time.

Column 21 End Time.

Column 22 Time of Peak Flux (No times of peak flux are reported during the first six months of 1957)

Column 23 Peak Flux (or smoothed flux)

Column 24 Observatory.

CLASSIFICATION OF SINGLE-FREQUENCY SOLAR RADIO BURSTS AND ENHANCEMENTS

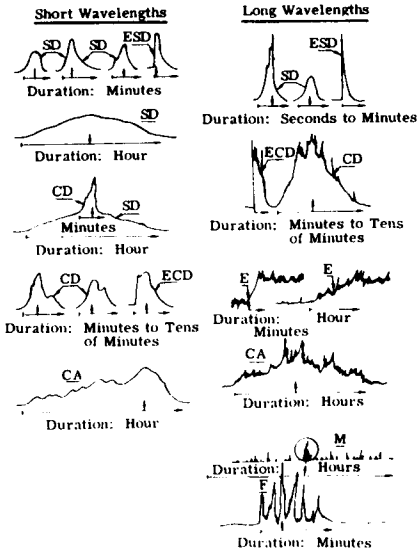
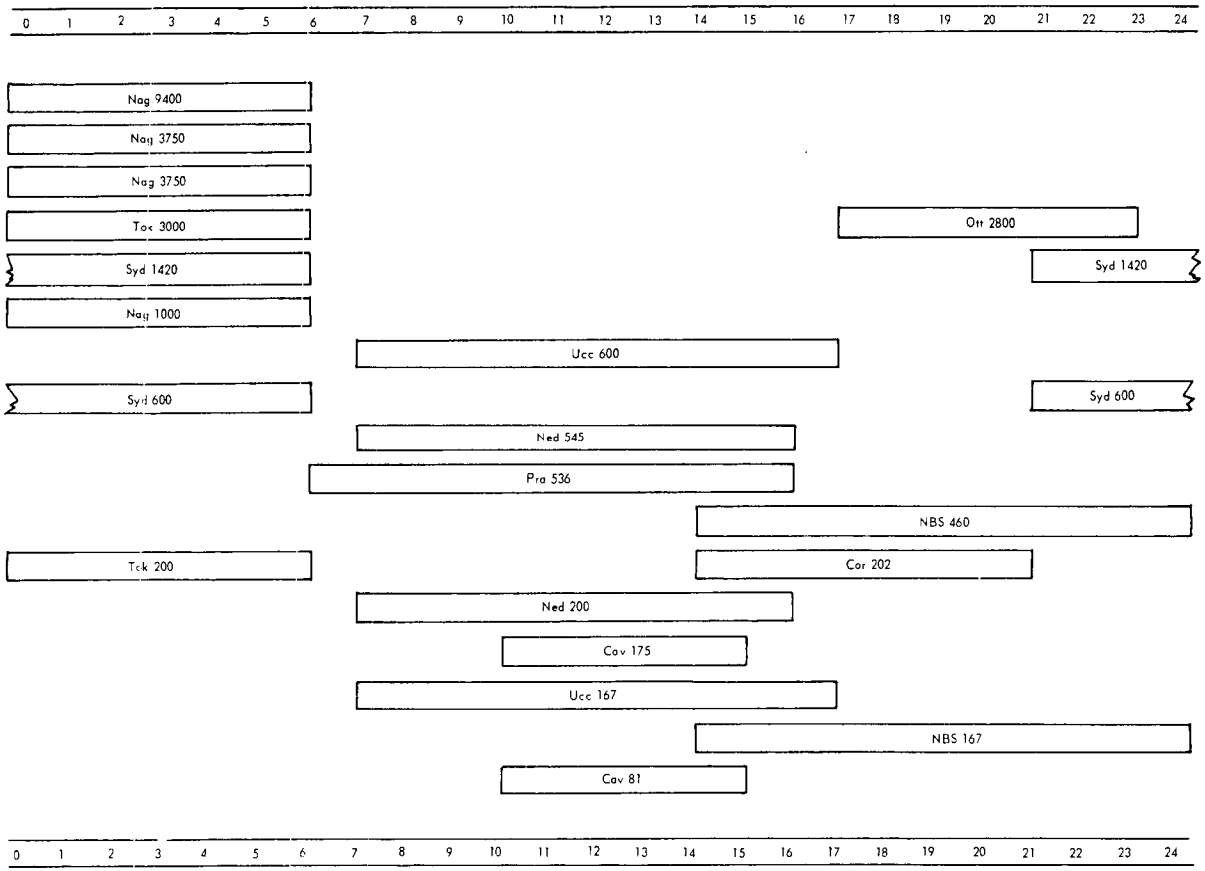


FIGURE 2.IV-1 SOLAR RADIO OBSERVATORIES NORMAL OBSERVING TIME DURING THE FIRST QUARTER 1957



SOLAR RADIO OBSERVATORIES, SYMBOLS, FREQUENCY & NORMAL OPERATING TIMES DURING 1957

Name of Observatory	Location	Code	Frequency	OPERATING TIME U.T. (hrs) 1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Tokyo Astronomical Observatory	Mitake, Tokyo	Tok	9500		23-09	23-09	23-06
			3000	00-06	00-06	00-06	00-06
			200	00-06	23-07	23-07	23-07
			100			00-06	00-06
			67			00-06	00-06
Research Institute of Atmospherics	Nagoyu University, Toyakowa	Nag	9400	00-06	23-08	23-08	23-06
			4000			00-04	00-04
			3750	00-06	23-08	23-08	23-06
			2000		23-08	23-08	23-06
			1000	00-06	23-08	23-08	23-06
Radio Astronomy Section P.T.T., The Hague, Netherlands	Nederhorst	Ned	2980		07-16	05-18	08-15
			545	07-16	07-16	05-18	08-15
			250			09-12	09-12
			200	07-16	07-16	05-18	08-15
Astronomical Institute of the Czechoslovak Academy of Sciences, Ondrajov	Prague	Pra	536	06-16	06-16	05-18	08-14
			231				08-14
Cornell University, Ithaca, New York, U.S.A.	Ithaca	Cor	202	14-21	14-21	12-21	13-20
National Bureau of Standards CRPL, Boulder, Colorado	Boulder	NBS	470				14-23
			460	14-24	14-24	12-24	
			167	14-24	14-24	12-24	14-23
Observatory Royal de Belgique, Bruxelles, Belgium	Uccle	Ucc	600	07-17	06-18	06-18	08-15
			167	07-17	06-18	06-18	08-15
Hiraiso Radio Wave Observatory Nakaminto-Shi Ibaraki-ken		Hir	200			00-09	21-09
Astrophysikalisches Observatory Potsdam Tremsdorf b, Germany		AOP	231			09-15	08-14
			23			09-15	08-14
Institute for Toretisk Astrefysikk Universitetet Blinderm, Oslo, Norway	Oslo	Osl	200			03-21	07-15
Radio Physics Laboratory, Sydney Australia	Sydney	Syd	1420	21-06	00-06	00-06	21-07
			600	21-06	00-06	00-06	21-07
			Spectrum 40 - 240		22-07	22-07	23-08
Cavendish Laboratory Cambridge, England		Cav	175	10-15	10-15	09-15	09-15
			81	10-15	10-15	09-15	09-15
Heinrich Hertz Institute Adlershof, Germany	Berlin	HHI	9400		07-18	07-18	06-15
			3000			07-18	06-15
			2900			07-18	
			2000			07-18	
			1500		07-18	07-18	06-15
National Research Council Ottawa, Canada	Ottawa	Ott	2800	12-23	12-23	10-24	12-21
Jodrell Bank Experimental Station England		Jod	3000			06-18	06-18
			200			06-18	06-18
			80			06-18	06-18
Harvard Radio Astronomy Station Fort Davis, Texas, U.S.A.	Fort Davis	Har	Spectrum 100 - 580		12-02	12-02	14-00
I.R.S.A.C., D.S. Bukavu,	Belgian Congo	IRS	169			06-15	06-15
Chalmers Institute of Technology	Gothenbury, Sweden	CIT	150			03-18	06-15
Observatoire de Paris, Mendon, Nancay Field Station		Nay	Strip-Scan 169		11-13	11-13	11-13
Paramaribo		Par	545		11-21	11-21	11-21
			200		11-21	11-21	11-21
Hollandia		Hol	545			21-08	21-08
			200			21-08	21-08
National Committee for I.G.Y., Nizmir WDC, P O Vatutenki Moscow 17, USSR							
	Byurakan	Bju	209			06-09	06-09
	Gorky	Gor	9375			06-12	06-09
			3000			06-12	06-09
			206			06-12	06-12
	Kislovadsk	Kis	178			09-12	09-12
Krasnaya Pakhra	Moscow	Mos	600			06-12	09-12
			208			06-12	09-12
	Simferopal	Sim	210			09-12	
	Abastumani	Aba	209				09-12
	Simeis	Sis	207				12-13
	Simferopal	Sim	208				09-12
	Cracow	Cra	810				09-12

FIGURE 2.IV-2 SOLAR RADIO OBSERVATORIES NORMAL OBSERVING TIMES DURING THE FOURTH QUARTER 1957

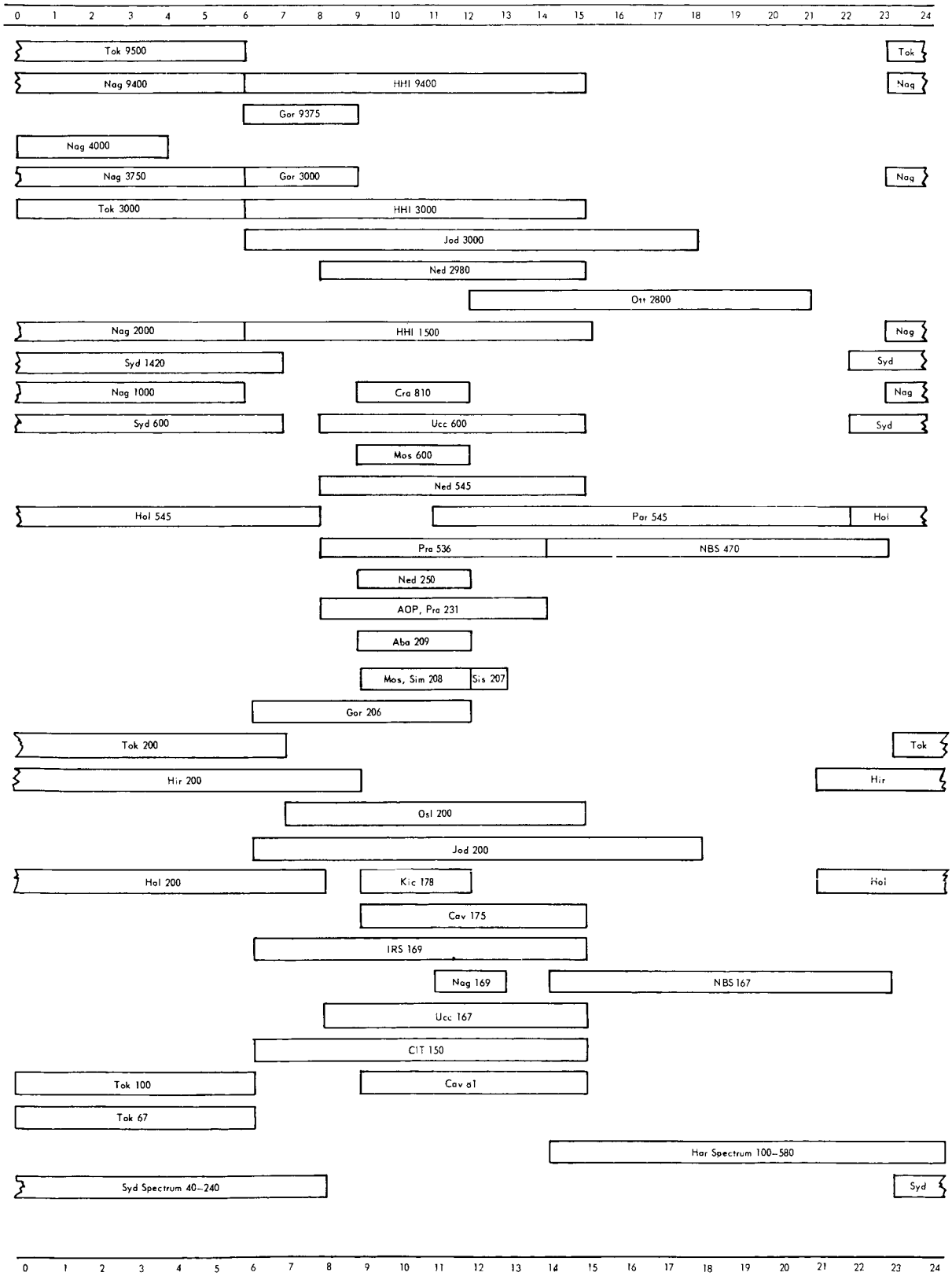


TABLE IV CATALOGUE OF

FLARE								SPECTRAL OBSERVATIONS TYPE			
Gr. Day	Beg. UT	End UT	Max. UT	Position	Imp.	Flare Serial No.	Event No.	Beg. UT	End UT	Max. Int.	Freq. Range
Jan. 5	No Flare Patrol between ~~1500 Jan. 4 to 0110~~ on Jan. 5										
6	1038	1443	1128	S21 E38	3+	1	4				
6	No Flare Patrol						5	1703	1712	3+	580-100
7	1311	1422	1358	N17 W62	3	2					
7	No Flare Patrol						7	1733.7	1738	3+	580 - 10
8	1324	1455	1339	N17 W71	3-	3					
23	0144	0251	0201	S25 W52	3	6					
23	2310	2358	2314	N17 W17	3+	7					
24	0247	0342	0250	N16 W26	3	8					
24	1225	1354	1241	N16 W31	3	9	12				
24	No Flare Patrol 1600 to 2400						14	2326 2328 2328	2329 2329 221	- 3 -	- 145-100 -
25	0520	0537	0526	S22 W89	3	10					
28	No Flare Patrol 1500 - 2400						15	2351 2348	2352 2354	3 -	135-10 -
31	0358	0550	0436	N24 E05	3+	11	17	0407	0424	-	-
Feb. 8	1550	1615	1555	S28 E38	2		19	1551	1555	3+	580-10
12	No Flare Patrol 1500 - 1800						20	1546	15??	3	165-10
21*	1605	2205	1930	N20 W33	3+		24	2008	2012	2	155-10
28	0005	0420	0057	N18 W35	3	13	26	0009 0017	0026 0020	- 3+	- 140-1
Mar. 1	No Flare Reported						27	0035	0059		
26	No Flare Reported						33	0412	0416	3	-
26	No Flare Reported							1327	1329	-	-
29	1025	1400	1115	S15 W40	3-	15					
Apr. 2	0255	0444	0256	S16 W46	2		38				
2	1002	1012	—	S08 W90	3	16					
2	1959	2120	—	N25 W90	1		39				
3	0825	1026	0835	S14 W60	3	17	40				

*This flare was reported by Sac. Peak without importance. The 3+ has been assigned by McMath. It may have produced the series of radio emissions and the type II burst.

2.III-1 .0

	SPECTRAL OBSERVATIONS TYPE IV					SINGLE FREQUENCY RADIO EMISSIONS						
ns.	Beg. UT	End UT	Max. Int.	Freq. Range	Obsev. Ref.	Freq.	Type	Beg. UT	End UT	Max. UT	Flux	Obs.
yd						No Other Radio Frequency Emissions						
yd						9400	CD	0342	0343.4	-	(343)	Nag
						3000	CD	0341	0346.2	-	440	Tok
						1000	CD	0341	0342.6	-	326	Nag
						200	CD	0341	0342.5	-	360	Tok
						3750	CD	0616	0621.1		(133)	Nag
d						1000	CD	0619	0624		(18)	Nag
						2800	CA	1730	1746	-	(135)	Ott
						460	M	1717	1728	-	150	NBS
						167	CD	1726	1739	-	270	NBS
r,38	1856				44	2800	SD	1856	1919	-	(525)	Ott
						167	CD	1858	1913	-	1600	NBS
r,38						200	CD	1358	1410	-	1500	Ned
						167	CD	1359	1405	-	1500	NBS
	1039		A		44	9400	CD	1938	1246	-	(1262)	HHI
	1047				52	2980	CD	1037	1127	-	1670	Ned
						2800	CD	1040	1134	-	(1650)	Ott
						600	CD	1044	1104	-	400	Ucc
						545	CD	1046	1103	-	1100	Ned
						200	CD	1047	1103	-	800	Ned
						9400	CD	1000	1115	-	348	HHI
r,38						2800	CA	1844	1849	-	(142)	Ott
						460	SD	1847	1847.9	-	260	NBS
						200	CD	1843	1851.5	-	75	Cor
r,38	2011	2055	2	580-100	Har, 38	2800	CD	2006	2125	-	(6000)	Ott
	2006				44	460	CD	2014	2056	-	608	NBS
	2032				37	200	CD	2033	2058	-	159	Cor
r,38	1305		A		44	2980	CD	1304	1310	-	550	Ned
						2800	SD	1305	1312	-	(385)	Ott
						1500	CD	1305	1330	-	(451)	HHI
						600	E	1306	1318	-	110	Ucc
						200	CD	1305	1311	-	800	Ned
r,38						9400	SD	2328	2329.8	-	(180)	Nag
r,38	1838				44	2800	SD	1838	1848	-	(410)	Ott
26,38						200	CD	0007	0012.5	-	1400	Tok
r,38												
r						No Other Radio Frequency Emissions						
r	1253		B		44	2800	CD	1253	1304	-	(270)	Ott
						460	SD	1255	1258.5	-	180	NBS
	1042		B		44	2800	CD	1042	1103	-	(250)	Ott
						600	CD	1047	1122	-	300	Ucc
						545	CD	1046	1104	-	800	Ned
						200	CD	1047	1103.5	-	250	Ned
	0859		B		44	2980	SD	0859	0909	-	350	Ned
						2980	SD	0917	0927	-	610	Ned
						536	CD	0902	1022	-	334	Pra
						200	CD	0907	1017	-	800	Ned
						169	CA	0903	0919	-	135	Ucc
r,38						2980	SD	1325	1329	-	670	Ned
						2800	SD	1327	1335	-	(725)	Ott
						200	CD	1330	1334	-	250	Ned
						9500	CD	0739	0744	-	604	Tok
						2980	SD	0738	0743	-	38	Ned
						9500	CD	0613	0730.5	-	539	Tok
2638	1609		B		44	2800	SA	1609	1619	-	(2325)	Ott
	1614				52	545	CD	1610	1655	-	400	Ned
						460	CD	1609	1613.2	-	2600	NBS
						200	CD	1615	1618	-	260	Ned
	0231				34, 44	9500	CD	0232	0250	-	1470	Tok
						9400	CD	0235	0241.5	-	(721)	Nag
						3000	CD	0231	0252.5	-	570	Tok
	0846				44	600	CA	0846	0854	-	186	Ucc
	0847				52	536	CD	0848	0914	-	343	Pra
						200	CD	0847	0848	-	400	Ned

(2) 2.IV-[redacted]2

TABLE IV

FLARE									SPECTRAL OBSERVATIONS TYPE II				
Gr. Day	Beg. UT	End UT	Max. UT	Position		Imp.	Flare Serial No.	Event No.	Beg. UT	End UT	Max. Int.	Freq. Range	C
April 05	No Flare Patrol from 0000 - 0200							43	0004	0013	-	-	
08	0342	0359	—	S23	E50	2		47	0347	0353	-	-	
08	0616	0830	0622	S19	W02	3	18						
09									0532	0544	-	-	
11	1722	1850	1738	S23	E04	3	19						
12	1850	2010	1920	S25	W73	2+		51	1904.7	1916	3	200-100	
15	1410	1430	—	N25	E90	2		52	1400.6	1408	3	200-100	
16	1040	1300	1105	N28	E85	3	20	54					
17	1006	1118	1022	N29	E72	3	21	55					
17	1851			S18	E73	1-		57	1846	1852	3	230-100	
17	No Flare Patrol							58	2032	2039	3	180-100	
18	1310	1353	1323	S16	E64	2		59	1304	1312	3	220-100	
May 09	2325	2338	—	S22	W90	1-		64	2329.1	2334	3	300-100	
14	1840	1850	—	N09	W50	1		67	1840.6	1843	3	200-100	
19	No Flare Patrol 1700 May 18 to 0400 May 19							68	0007.5	0014	2	250-170	Ha
21	1900	1935	1908	S12	E63	1		70	1915	1918	3	165-100	
29	No Flare Reported								1424	1426			
June 01	1252	1338	1256	S28	W35	2			1255.4	1303	-	-	
03	1040	1202	1047	S18	W18	3	22	77					
04	0859	0940	0902	S17	W27	2							
05	1326	1433	1329	S17	W43	2			1328.9	1333	3+	540-100	
15	0730	0840	0743	S18	E62	3-	22						
19	0609	0811	0640	S38	E24	3	24						
19	1609	1649	1613	N20	E45	2+	25	82	1615	1620	3	210-100	
22	0236	0257	—	N23	E12	2		85					
24	0838	0929	0850	N22	W14	3	27						

2.III-2 O

MPORTANT RADIO EMISSIONS DURING 1957

II	SPECTRAL OBSERVATIONS TYPE IV					SINGLE FREQUENCY RADIO EMISSIONS						
Obs.	Beg. UT	End UT	Max. Int.	Freq. Range	Obsev. Ref.	Freq.	Type	Beg. UT	End UT	Max. UT	Flux	Obs.
	0050				44	9400	CD	0054	0109	-	(255)	Nag
						3000	CD	0050	0148	-	501	Tok
						200	CD	0054	0059	-	120	Tok
						169	CD	1016	1025	-	70	Ucc
						81	M	1020	1033	-	150	Cav
						81	CD	1050	1103	-	20	Cav
					Har.							
Har, 38	1711	2000	3	580-100	38	2800	SD	1702	1712	-	(700)	Ott
	1702				44	200	CD	1703	1947	-	159	Cor
						167	CD	1706	1856	-	6300	NBS
						2800	SA	1346	1353	-	(160)	Ott
						536	SD	1336	1336.5		65	Pra
						536	SD	1339	1339.5		85	Pra
						536	SD	1341	1341.5		65	Pra
Har, 38	1729				44	2800	SA	1729	1744	-	(211)	Ott
						460	CD	1733	1856	-	1300	NBS
						167	CD	1734	1906	-	5600	NBS
						2800	CD	1339	1345	-	(65)	Ott
						545	CD	1332	1340	-	200	Ned
						536	CD	1333	1343	-	175	Pra
						3750	CD	0145	0146.5	-	(98)	Nag
						167	CD	2313	2355	-	2100	NBS
						9400	CD	0249	0306	-	(319)	Nag
						3750	CD	0249	0256.5	-	(113)	Nag
						2980	-	1233	1245	-	250	Ned
						536	CD	1229	1327	-	235	Pra
						200	CD	1324	1325	-	550	Ned
						200	CD	1332	1334	-	500	Ned
						200	CD	1341	1342.5	-	600	Ned
Har 38 Syd												
						9400	SD	0519	0520.5	-	(23)	Nag
Har, 38 Syd												
Syd						9400	SD	0407	0407.3	-	(41)	Nag
						3000	CD	0400	0600	-	234	Tok
Har, 38						2800	SD	1550	1556	-	(865)	Ott
						460	CD	1551	1554	-	1400	NBS
						200	CD	1552	1557	-	74	Cor
Har, 38						167	SD	1546	1547.9	-	510	NBS
Har, 38						200	SD	1630	1630.5		80	Ned
						167	CD	1827	2244		460	NBS
						167	SD	2037	2038	-	1400	NBS
Syd	0001				52	600	CD	0001	0142	-	100	Syd
Har, 38	0029	0126	1		Syd	200	CD	0012	0052	-	240	Tok
						167	CD	0001	0030	-	640	NBS
Syd						3000	CD	0038	0047.4		220	Tok
Syd						No other Radio Frequency Emission						
Har, 38						No other Radio Frequency Emission						
						2980	CD	1024	1028	-	84	Ned
						545	CD	1024	1025	-	160	Ned
	0301				44	9400	CD	0302	0350	-	(240)	Nag
						3000	CD	0301	0401	-	800	Tok
						200	CA	0250	0330	-	630	Tok
						1500	SD	1036	1038	-	(129)	HHI
						536	SD	1035	1039.5	-	300	Pra
	1955				44	2800	SD	1955	2018	-	(176)	Ott
						200	CD	1954	1957	-	159	Cor
	0826		A		44	9400	CD	0828	1445	-	(632)	HHI
	0826				34	1500	CD	0829	0907	-	(383)	HHI
						545	CD	0830	0930	-	1600	Ned
						200	CD	0826	0936	-	10	Ned

2.III-1 (2)

TABLE IV

FLARE								SPECTRAL OBSERVATIONS TYPE I			
Gr. Day	Beg. UT	End UT	Max. UT	Position	Imp.	Flare Serial No.	Event No.	Beg. UT	End UT	Max. Int.	Freq. Range
June 27	2322	2418	2335	N20 W62	1		88				
	~~2330~~	~~2427~~	2335	N14 E32	1		88				
28	0658	0950	0722	N10 E27	3	28					
28	1223	1315	1225	N12 E21	2						
30	0924	1332	1025	N09 W03	2+	29					
July 02	No Flare Reported						90				
02	0705	0805	—	N09 W30	2+	31					
03*	0712	0880	0745	N14 W40	3+	32	92				
	0830	1145	0840	N10 W42	3+	32	92				
04	1134	1154		N12 E39	3	33					
08	0521	0802	0538	N14 W41	2+	35					
15											
16	1742	2008	1804	S33 W28	1+		98				
17	0112	0148	0116	N11 E30	2		99	0125	0131	2	

*This great flare has a double response with two distinct radio emission times, one starting at 0722, the other at 0831.

2. IV-3

SPECTRAL OBSERVATIONS TYPE IV					SINGLE FREQUENCY RADIO EMISSIONS						
Beg. UT	End UT	Max. Int.	Freq. Range	Obsev. Ref.	Freq.	Type	Beg. UT	End UT	Max. UT	Flux	Obs.
					9500	CD	0632.8	0634.3	0633.2	820	Tok
					9500	CD	0659.8	0703.8	0700.3	916	Tok
					9400	ESD	0633	0635	0633.2	(279)	Nag
					9400	CD	0654	0708	0701	(504)	HHI
					2980	SD	0659.5	0703.5	-	536	Ned
					169	ESA	0657	0658	-	225	Ucc
1321		A		44	2800	SD	1334.5	1342.5	1335.9	(850)	Ott
					600	ECD	1332	1346	-	366	Ucc
					545	FD	1351.5	1357	-	1300	Ned
					536	CD	1331.5	1543	-	362	Pra
					450	ECD	1328	1336	1330.5	1300	NBS
					450	ESD	1336	1342	1338.9	57000	NBS
					450	CD	1342	1358	1355.7	33000	NBS
					231	F	1334	1340	1339	550	AOP
					231	SA	1346	1405	1358	550	AOP
					200	CA	1333.5	1339.5	1334	300	Osl
1513	1523	3	580-200	Har, 38	2800	SD	1506	1509	1506.5	(29)	Ott
					201	ECA	1534.5	1535.5	1535	70	Cor
					169	ESA	1534	1535	-	243	Ucc
					2800	SD	1742.7	1747.7	1743.3	(165)	Ott
					545	SD	1743	1745	-	60	Ned
					201	CD	1742	1750		70	Cor
					169	ESA	1747	1748	-	243	Ucc
2243	2315	3	580-300	Har, 38	9400	CD	2243.5	2247.5	2243.7	(30)	Nag
					450	CD	2228	2252	2243.4	26000	NBS
					450	CD	2303	2313	2306.6	12000	NBS
					200	CD	2314	2314.5	-	250	Hol
					600	CD	0950	0953	-	162	Ucc
					600	ESD	1007	1010	1007	120	Mos
					545	CD	1008	1010	-	550	Ned
					536	CD	1006	1014.5	1010.5	357	Pra
					231	SD	1333	1334	1333.5	550	AOP
					200	CD	1331.5	1333.5	1333	340	Osl
					169	ECA	1332	1335	-	243	Ucc
					169	-	1334	1337	-	243	Ucc
1801				26, 34, 44	9400	SD	1730	1748	1736	(336)	HHI
1802	1915	3	580-100	Har, 27, 38	2980	CD	1801.5	1926.5	-	1275	Ned
1813				52	2800	CA	1628	2108	1828.5	(1080)	Ott
					545	CD	1801	1931	-	1200	Ned
					450	CD	1803	1917	1830.8	1700	NBS
					600	-	1851	1930	-	240	Ucc
					167	CD	1810	1849	1832	1000	NBS
					231	CA	0735	-	1012	180	AOP
					169	CD	0725	1030	-	95	IRS
1409	1459	2	270-100	Har, 38	9400	SD	1409	1420	1412	(295)	HHI
					9400	SD	1437	1456	1448	(293)	HHI
					169	CA	1408	1425	-	240	Ucc
					169	CA	1438	1505	-	240	Ucc
					9400	CD	1435.5	1443	1436	(355)	HHI
					536	CD	1436	1441.5	1437	200	Pra
					450	ECD	1435.4	1438.4	1435.9	2800	NBS
					231	ECD	1435	1440.5	1435.5	350	AOP
					200	FCD	1435	1441	1438	470	Osl
					167	CD	1434.5	1440	1436.2	5600	NBS
1720				27	2800	CD	1720.5	1727	1721.1	(90)	Ott
					450	ECD	1720.9	1725.9	1722.9	340	NBS
					200	CA	1720	1727	1723.5	190	Osl
					167	ECD	1720	1726	1721.2	5700	NBS
					2800	CD	1902	1905.5	1904.5	(44)	Ott
					450	ECD	1903	1908	1905	250	NBS
					200	SD	1902	1905.5	1905	800	Osl
					167	ECD	1901.8	1907.8	1904.4	7000	NBS
					9500	SD	0229.3	0230.3	0229.7	409	Tok
					3000	SD	0229.2	0231	0229.5	255	Tok
					600	CD	0427	0427.5	0427	61	Syd
					200	SD	0425.5	0426	-	240	Tok
					9400	CD	1117	1207	1124	(535)	HHI
					231	CD	1129	1147	-	350	AOP
					231	SD	1150.8	1154	1151.6	260	AOP
					169	CDF	1138	1140	-	189	Ucc

TABLE IV

FLARE									SPECTRAL OBSERVATIONS TYPE II				
Gr. Day	Beg. UT	End UT	Max. UT	Position		Imp.	Flare Serial No.	Event No.	Beg. UT	End UT	Max. Int.	Freq. Range	O
July 21	0633	0750	0658	N30	E15	2+	36	102					
21	1320	1442	1337	N29	E12	3	37	103					
21	1517	1526	—	S25	E09	1+							
21	1737	1752	1745	N22	W12	1		105	1746.4	1752	3	200-100	H
21	2215	2302	—	N20	W15	1-		106					
22	0953	1150		N15	E51	3	38	108					
22	1240	1505	1303	S23	E07	3	39						
24	1712	2025	1811	S24	W27	3	40	109					
27	0637	0820	0703	S24	W61	2+	41						
Aug. 01	1352	1437	1420	S35	E04	1		111					
02	1432	1446	1436	N26	E32	2		112	1437.9	1442	3	210-100	H
03	1721	1735	1723	N26	E17	1+		114	1723.4	1729	3	160-100	H
05	1900	1954	1905	N26	W08	1+		115	1906.8	1910.3	3	165-100	H
06	No Flare Reported							116	0234	0246.2	2		S
06	0423	0433	0426	N25	W22	1-		117	0431	0438	2		S
08	1116	1257	1134	N27	W57	2+	42						

I	SPECTRAL OBSERVATIONS TYPE IV					SINGLE FREQUENCY RADIO EMISSIONS						
Obs.	Beg. UT	End UT	Max. Int.	Freq. Range	Obsev. Ref.	Freq.	Type	Beg. UT	End UT	Max. UT	Flux	Obs.
	2408				44	9500	CD	2352	2808		600	Tok
						3000	CD	2408	2818		504	Tok
						1420	CD	2357	2405.2	-	239	Syd
						460	CD	2346	2620		610	NBS
						200	CD	2330	2330.7		250	Tok
	0707		B		44	9500	CD	0707	0742.2	-	622	Tok
	0716	0826	3		27	536	CD	0707	0834	-	280	Pra
	0717				52	200	CD	0717	0827	-	350	Ned
						200	CD	0717	0732	-	1500	Tok
						200	CA	0730	0800	-	750	Tok
	1222		B		44	2800	SD	1222	1237	-	(355)	Ott
						545	CD	1223	1231	-	600	Ned
						536	CD	1221	1339	-	400	Pra
						460	CD	1222	1345	-	1200	NBS
						200	CD	1220	1234	-	350	Ned
	0945				44	2980	SD	0953	1002.5	-	119	Ned
						600	SA	0952	1007	-	90	Ucc
						545	CD	0955	1005		90	Ned
						169	SA	1006	1101		135	Ucc
	0015				44	9500	SD	0015	0036	0016.5	1106	Tok
						3750	SD	0015	0018	0016.3	(305)	Nag
						3000	CD	0015	0038	0016.5	630	Tok
						2800	SD	0015	0021	0017	(180)	Ott
						200	CA	0030	0105	0047	400	Tok
						9500	CD	0706.7	0746.5	0712	519	Tok
						2000	F	0721.6	0726.6	0724.8	251	Nag
	0832		B		44	9500	SD	0733	-	0742	710	Tok
	0832				16, 26, 34	9400	CD	0729	0930	0841	(2380)	HHI
	0849	0914	3		27	9375	CD	0725	0800	-	600	Gor
	0837				52	3000	CD	0733	0803	-	285	Gor
						2980	CD	0726.5	0757.5	-	585	Ned
						2000	CD-ECD	0726	0816	0809.5	(1690)	Nag
						1000	F-CD	0723	0823	0809.7	(7570)	Nag
						600	FD	0722	0800		113	Ucc
						231	CA	0750	0830	0810	700	AOP
						9500	CD	0831	-	-	1030	Tok
						9400	CD	0831.5	0851.5	0841	(2960)	Nag
						9375	CD	0833	0852	-	2320	Gor
						3750	CD	0832	0857	0843.1	(763)	Nag
						2000	ECD	0831	0851	0839.6	928	Nag
						1000	F	0836.7	0856.7	0840.4	(8200)	Nag
						600	ECD	0824	0846	-	312	Ucc
						600	-	0833	0945	-	324	Ucc
						545	CD	0805	0819.5	-	850	Ned
						545	CD	0832	0932	-	5200	Ned
						231	CA	0849	0920	0902	600	AOP
						231	CD	0901	0905	-	1200	AOP
						210	CD	0835	1030	0903	560	Sim
						200	CD	0802.5	0804	-	300	Ned
						200	CD	0835	0905	0837.5	550	Hir
						200	SD	0836.5	0841	0837.5	920	Osl
						200	CD	0837	0841	-	3400	Ned
						178	ECD	0836	0840	0838	1368	Kis
						178	CD	0852	1040	0911	1026	Kis
						169	ECD	0834	0843	-	400	Ucc
						169	-	0848	0916	-	400	Ucc
						231	CD	1114	1114.5	1114.6	400	AOP
						9500	CD	0537	0541.5	0538.7	511	Tok
						3000	CD	0536.7	0550	0539	359	Tok
						3000	CD	0607.3	0610	0608.7	307	Tok
						545	CD	0535.5	0539	-	2900	Ned
						545	CD	0607.5	0609		500	Ned
						536	CD	0606	0611 5	0608	275	Pra
						169	ESD	0537	0538		90	Ucc
	2019				44	2800	CA	2019	2137	2043	(300)	Ott
						167	CD	2016	2047	2036	60	NBS
	1801	1825	3	580-100	Har, 27, 38	9400	CD	1740	1827	1748	(627)	HHI
	1739		A		44	2800	CA	1739	1811	1757.3	(350)	Ott
	1753				52	545	CD	1751	1809	-	1000	Ned
						200	CD	1753	1825	-	850	Ned
						167	ECD	1754	1826	1818	1700	NBS
Syd						3000	CD	0114.5	0118	0115	269	Tok
						2000	ECD	0114	0116	0115.3	34	Nag
						1000	CD	0114	0118	0115.5	(24)	Nag
						200	CD	0113.8	0115.6	0114.5	900	Tok
						200	ECD	0118	0120	-	390	Hir
						167	ECD	0113.9	0115.9	0114	1200	NBS

2.IV-3

TABLE IV

FLARE								SPECTRAL OBSERVATIONS TYPE II			
Gr. Day	Beg. UT	End UT	Max. UT	Position		Imp.	Flare Serial No.	Event No.	Beg. UT	End UT	Max. Int.	Freq. Range
Sept. 02	0409	0445	0412	N14	W58	1+		137	0423	0431	2	
~~02~~	~~1257~~	~~1346~~	~~1303~~	~~N10~~	~~W26~~	~~2~~		~~138 a~~				
02	1313	1830	1351	S34	W36	3	56	138 b				
03	0037	0116	0049	N24	W24	1		140	0035.8	0041	3	580-100
03	1412	1727	1429	N23	W30	3	58	142				
06	0751	0900	0803	N23	W66	3	59					
08	1627	1634	—	S13	E25	1-		145	1632.3	1638	3	190-100
09	0755	0855	0813	N12	E22	3	60					
10	0223	0300	0250	N14	E16	3	61					
11	0140	0200	0142	N15	E90	1-		147	0150	0200.5	2	
11	0236	0722	0300	N13	W02	3	63	148				
12	0703	0740	0713	N09	W15	3	64	150	0712	0721	-	-
12	1510	1638	1516	N11	W18	3	65	152	1516	1628	3+	580-10

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	SPECTRAL OBSERVATIONS TYPE IV					SINGLE FREQUENCY RADIO EMISSIONS						
bs.	Beg. UT	End UT	Max. Int.	Freq. Range	Obsev. Ref.	Freq.	Type	Beg. UT	End UT	Max. UT	Flux	Obs.
r,26,38						9500	CD	0126.8	0129.8	0128.5	1689	Tok
						9400	ECD	0125.5	0129.5	0127.1	(1840)	Nag
						3750	ECD	0126	0130	0127.4	(1700)	Nag
						3000	CD	0126.7	0129.2	0127.5	1400	Tok
						2000	SD	0127	0130	0128.6	(550)	Nag
						200	CD	0127	0128	0127	1000	Hir
						167	ECD	0127.1	0136.1	0127.9	1200	NBS
						231	CD	0812	0832	0822	140	AOP
						200	CD	0820	0827	-	150	Ned
						169	CD	0820	0824	-	110	Ucc
						1500	SD	1147	1152	1149.5	(113)	HHI
						600	ESD	1229	1229.5	-	190	Ucc
	0920		B		44	9400	CD	0915	1147	0950	(693)	HHI
	0920				16, 26, 34	2980	CD	0943	1023	-	1192	Ned
	0930		3		27, 52	1500	CD	0900	1340	1001	(692)	HHI
r,26,38						2800	SD	2017.7	2022.7	2019.5	(760)	Ott
						450	ECD	2017.4	2021.4	2017.9	7100	NBS
						201	ECD	2022	2027	2024.5	450	Cor
						167	ECD	2021	2025	2023.6	5700	NBS
						9400	ECD	0550	0553	0551.2	(305)	Nag
						3000	CD	0550.5	0555	0552	362	Tok
						9400	CD	1036	1050	1038	(298)	HHI
						231	F	1037	1048	1043	550	AOP
						210	CD	1039	1044	1040	224	Sim
						200	CD	1039	1044	-	230	Ned
						9400	CD	0622	0638	0625	(112)	Nag
						169	ESA	0704	0705	-	200	Ucc
r,26,38	2209				44	9400	ECD	2209.5	2216.5	2213	1170	Nag
	2212	2243	3	580-100	Har. 38	3750	ECD	2209	2217	2213.1	(538)	Nag
	2214				37	2800	SD	2210	2220	2213.7	(480)	Ott
						2000	ECD	2210	2216	2213.7	(619)	Nag
						1000	ECD-F	2211	2243	2213	(433)	Nag
						600	CD	2214	2240	2215	315	Syd
						450	ECD	2211.9	2219.9	2214.6	1900	NBS
						450	CD	2220	2515	2235	420	NBS
						167	ECD	2213.7	2221.7	2215.2	5000	NBS
						167	CD	2223	2240	2233	810	NBS
	0548				34, 44	9500	CD	0546.7	0547.3	0548.3	696	Tok
						3000	CD	0545.5	0549	0549	569	Tok
						2980	CD	0548	0600	-	426	Ned
						1000	ECD-CA	0548	0728	0549	(285)	Nag
						600	CA	0557	0730	0654	455	Syd
						545	CD	0548	0730	-	4000	Ned
						200	CA	0540	0640	0615	830	Tok
						200	CD	0548	0552	0549.5	1600	Tok
						169	CA	0548	0552	-	350	Ucc
	1301	1600	3	580-100	Har. 38	9400	CD	1302	1552	-	(900)	HHI
	1302		B		44	2800	SD	1301	1406	1315.5	(3900)	Ott
	1302				16, 26, 34	450	CA	1300	1600	1338	14000	NBS
	1303				27	231	CD	1303	1318	1307	1400	AOP
	1309				52	200	ECD	1300	1315	1310	200	Jod
						200	CD	1303	1316	-	1200	Ned
						200	CD	1320	1420	-	1200	Ned
						169	CA	1303	1315	-	300	Ucc
						169	-	1315	1317	-	300	Ucc
						231	CA	1331	1341	1337	1200	AOP
						231	CD	1341	1354	-	1400	AOP
						231	CA	1354	1430	1416	1600	AOP
						169	SA	1342	1404	-	300	Ucc
						9400	CD	0948	1013	0950	(545)	HHI
						9375	CA	0949	0958	0950	783	Gor
						3000	SD	0949	0952	0950	332	Gor
						2980	CD	0949	0956	-	605	Ned
						536	ECD	0949	0958	0950	505	Pra
						231	CD	0950	0957.9	-	1600	AOP
						206	F	0949	0958	0954	590	Gor
						200	ECD	0945	0955	0950	200	Jod
						200	CD	0949	0955	-	2000	Ned
						200	ECD	0952.5	0955	0954.5	650	Osl
						169	ECA	0950	0952	-	330	Ucc
						2800	CD	1256	1309	1301	(204)	Ott
						169	CAF	1253	1255	-	330	Ucc
						169	CAF	1323	1327	-	180	Ucc

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TABLE IV

FLARE								SPECTRAL OBSERVATIONS TYPE II				
Gr. Day	Beg. UT	End UT	Max. UT	Position	Imp.	Flare Serial No.	Event No.	Beg. UT	End UT	Max. Int.	Freq. Range	C
Aug. 10	0125	0142	0129	N26 W71	1		121	0129.4	0133.8	3	330-100	H
21	0745	0844	0756	N24 E20	3	43						
23	1126	1300	1154	N16 W17	3	44						
28	0913	1404	0955	S31 E33	3+	45	125					
28	2010	2405	2024	S29 E30	3	46	126	2021.9	2026	3	330-100	H
29	0545	0715	0555	N24 E35	2+	47						
29	1031	1201	1052	S25 E20	3	48						
30	0620	0804	0600	N26 E22	2+	49						
30	No Flare Reported						130	2213.7	2217	3	300-100	H
31	0521	1048	0727	S32 W02	3	50						
31	1257	1557	1312	N25 W02	3+	51	132					
31	1338	1455	1353	N12 W02	2+	52						
Sept. 01	0946	1030	0952	N12 W09	3	53	135					
01	1225	1437	1302	N14 W15	3	54						

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	SPECTRAL OBSERVATIONS TYPE IV					SINGLE FREQUENCY RADIO EMISSIONS						
Obs.	Beg. UT	End UT	Max. Int.	Freq. Range	Obsev. Ref.	Freq.	Type	Beg. UT	End UT	Max. UT	Flux	Obs.
Syd						9500	CD	0412	0452	0419	501	Tok
						3000	CD	0411	0424.5	0420	437	Tok
						2000	CD	0410	0430	0419	(23)	Nag
						1000	CD	0408	0416	0416	20	Nag
	1257		A		44	9400	SD	1255	1336	1302	(333)	HHI
	1257				34	2980	CD	1257	1342	-	429	Ned
						2800	SD	1258	1304	1300	(56)	Ott
						600	ECA	1258	1302	-	150	Ucc
						536	CA	1256	1610	1300	240	Pra
						231	SA	1300	1502	1324	700	AOP
						169	CA	1311	1329	-	540	Ucc
						81	CD	1256	1436	-	(1300)	Cor
	1310				16, 26	2800	SD	1317.3	1321.3	1319	(30)	Ott
					27, 52	2800	SD	1321	1326.5	1324	(40)	Ott
						600	SA	1339	1353	-	102	Ucc
						169	-	1331	1415	-	540	Ucc
Har,38	0038				44	9400	CD	0033	0051	0045	(600)	Nag
					-	3000	CD	0035	0052.5	0037	462	Tok
						1000	CD	0034	0042	0041	534	Nag
						545	CD	0038	0039.5	-	300	Hol
						450	ECD	0036	0041.9	0036	4500	NBS
						200	CD	0038	0050	0039	420	Tok
						167	CD	0038.7	0040.5	0039.4	4500	NBS
	1417				16, 44	9400	SD	1415	1537	1423	(515)	HHI
						2800	SD	1417	1442	1424	(1350)	Ott
						1500	SD	1420	1440	1425	(509)	HHI
						545	CD	1444	1444.5	-	700	Ned
						450	CD	1424	1431	1428	400	NBS
						231	ECD	1455.2	1456	1455.4	320	AOP
						167	ESD	1455.1	1455.9	1455.2	3700	NBS
						9500	CD	0801	0804.8	0801.5	751	Tok
						9400	SD	0756	0850	0818	(588)	HHI
						9375	ECD	0758	0800	0758	730	Gor
						3750	CD	0753	0805	0802	(365)	Nag
						3000	SD	0751	0804	0800	430	Gor
						2980	CD	0753	0805	-	380	Ned
						2000	CD-F	0756	0819	0815	270	Nag
Har,38						200	CD	1630.5	1632.5	-	180	Ned
						167	CD	1634	1636.3	1635	980	NBS
						9400	SD	0756	0825	0814	(318)	HHI
						2980	SD	0801	0803	-	267	Ned
						2980	SD	0808	0820	-	270	Ned
						9500	SD	0226	0231	0228	481	Tok
						3000	SD	0223	0258	0228	349	Tok
Syd						9500	SD	0141.3	0142.3	0141.5	453	Tok
						3000	SD	0141.2	0142.2	0141.5	376	Tok
						2000	CD	0141	0142.5	0141.9	20	Nag
	0244				16, 44	9500	CA	0247	0457	0305	584	Tok
	0305	0722	3		Syd	3750	CA	0243	0413	0304	(373)	Nag
	0331				27	3000	CA	0244	0359	0300.7	1110	Tok
	0300				52	2000	CA	0243	0353	0304	(564)	Nag
						1420	CA	0244	0350	0304	604	Syd
						1000	M	0235	0345	0320	(8200)	Nag
						545	CD	0255	0348	-	30000	Hol
						200	CD	0300	0325	0308	520	Tok
Har 26						9500	ECD	0708	0714	0709	697	Tok
						9400	CD	0707	0721	0709	(450)	HHI
						2980	CD	0708	0715	-	443	Ned
						545	CD	0709	0720	-	300	Ned
						536	CD	0705	0727.5	0712	530	Pra
						208	FD	0709	0714	0713	366	Mos
						200	CD	0708	0714	0709	1880	Hir
Har,38	1515	2025	3	580-100	Har, 27, 38	9400	CD	1514	1525	1516	(1150)	HHI
	1500				16, 34, 44	2980	CD	1515	1526	-	1220	Ned
	1516				37	2800	SD	1514	1532	1515	(850)	Ott
						1500	CD	1515	1543.5	1516	(627)	HHI
						600	-	1516	1800	-	430	Ucc
						536	CD	1513	1644.5	-	700	Pra
						450	ECD	1515	2030	1528	7500	NBS
						201	ECD	1515	1728	-	440	Cor
						200	CD	1515	1645	1528	1050	Osl
						167	ECD	1515	1526	1519	2400	NBS
						81	CD	1519	1531	-	350	Cav

TABLE IV

FLARE								SPECTRAL OBSERVATIONS TYPE II			
Gr. Day	Beg. UT	End UT	Max. UT	Position	Imp.	Flare Serial No.	Event No.	Beg. UT	End UT	Max. Int.	Freq. Range
Sept. 12	2145	2222	2150	S17 W76	1		153	2150.4	2153	3	300-100
13	1410	1508	1422	N09 W32	2		155				
15	2030	2110	2042	N11 W64	2		158	2044.5	2049	3	250-100
16	1451	1709	1459	N08 E48	2+	66					
16	2242	2304	2245	N11 W77	1+		159	2248.6	2254	3	220-100
17	0416	0945	0807	N23 E28	2+	67					
18	0624	0720	0633	N23 E13	2+	68					
18	1658	2110	1740 1840	N23 E08	3+	70	161				
19	0350	0555	0410	N23 E02	3+	71	162				
19	0744	1200	0800	N23 E01	2+	72					
20	2117	2222	2123	N07 W14	2		165	2120.9	2123	3	330-10
21	1330	1510	1335	N10 W06	3	74	168				
22	1248	1458	—	N07 W37	2+						
24	0224	0307	0227	N15 E91	1-		171	0212	0226		
24	0507	0522	0513	N15 E90	1+		172	0504	0507		
26	1832	1850	1836	S26 E29	1						

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Obs.	SPECTRAL OBSERVATIONS TYPE IV					SINGLE FREQUENCY RADIO EMISSIONS						
	Beg. UT	End UT	Max. Int.	Freq. Range	Obsev. Ref.	Freq.	Type	Beg. UT	End UT	Max. UT	Flux	Obs.
	1927	2015	3	580-100	Har, 38	450	CA	1915	2430	2028	450	NBS
	1948				16, 27	201	ECD	1920	2047	-	384	Cor
	1926				52	167	ECD	1926.3	1927.1	1926.8	2000	NBS
						167	CA	1927	2435	2200	4000	NBS
						2800	CD	1700	1706	1702	(120)	Ott
						2800	CD	1705.5	1708.5	1706.3	(77)	Ott
Syd						9500	CD	0345	0435	0335	499	Tok
						9500	CD	0536	0549	0538	538	Tok
						3000	CD	0535.3	0543	0536.5	800	Tok
	2150				44	9500	CD	2151	2201	2153	1230	Tok
						2800	SD	2150	2300	2153	(1000)	Ott
						1420	SD	2152	2155.5	2153	421	Syd
						600	CD	2152	2156.2	2154	316	Syd
						450	ECD	2151.7	2152.7	2152.1	5200	NBS
						9500	ECD	0151.8	0160.3	0152	701	Tok
						9400	ECD	0151.8	0154.8	0152.1	(166)	Nag
						2000	CD	0151.9	0154.9	0152.8	92	Nag
						1000	F	0151.9	0152.9	0152.8	305	Nag
						9500	CD	0421	0436	0424	687	Tok
						3000	CD	0421	0441	0427	435	Tok
						1420	M	0424	0427	0427	258	Syd
	2141				44	9500	CA	2142	2348	2203	1134	Tok
						9400	CD	2200	2307	2203	(420)	Nag
						3750	CD	2158	2206	2203	(410)	Nag
						9500	CA	0615	0705	0643	631	Tok
						9400	SD	0634	0657	0636	(42)	Nag
						209	CA	0627	0631.5	0631	46	Bju
	0237				44	9400	F	0238	0256	0241.4	(490)	Nag
						3750	F	0238	0256	0254.4	(478)	Nag
						3000	CA	0239	0319	0254	1100	Tok
						2000	F	0248	0258	0255	(339)	Nag
						1420	F	0251	0259	0255	252	Syd
						545	CD	0253	0318	-	300	Hol
						200	SD	0248	0349	-	2000	Hir
Har,38	1636				16, 26, 34, 44	2800	CD	1644	1735	1651	(4000)	Ott
	1651	2013	3	580-100	Har, 38	450	CD	1647	1730	1656	14000	NBS
	1646				27, 52	167	ECD	1646	1815	1700	3700	NBS
Har,38						9500	ECD	2145	2151.3	2146	1042	Tok
						9500	CA	2159	2251	2230	577	Tok
						2800	SD	2145	2150	2145.8	(230)	Ott
						1420	SD	2146	2150	2146	300	Syd
						450	ECD	2144.9	2145.4	2145	1300	NBS
						2980	SD	1211.5	1214.5	-	306	Ned
						9400	ECD	0622.4	0627.9	0623.4	(765)	Nag
						3750	ECD	0622.4	0627.9	0623.4	(1640)	Nag
						2000	ESD	0622.5	0627	0623.6	(405)	Nag
Syd						2000	SD	2217	2219	2217.9	(75)	Nag
Syd						1420	CD	2213	2219	2213	183	Syd
						600	F	2218	2230.5	2219	98	Syd
						545	CD	2219	2320	-	120	Hol
						450	ECD	2217.1	2218.4	2217.8	1100	NBS
						167	ECD	2212	2237.4	2214	1600	NBS
Syd						9500	CD	2323	2340	2327	495	Tok
Syd												
	1504				44	9400	CD	1502.5	1506	1504	(283)	HHI
						1500	SD	1502	1507	1503.3	(165)	HHI
						450	CD	1503	1504.2	1503.6	570	NBS
						200	ESD	1501.5	1507.5	1503	130	Osl
						169	ECD	1503	1507	-	150	Ucc
	0754				44	9400	SD	0754	0825	0758	(355)	HHI
						9375	ESD	0757	0806	0804	596	Gor
						2980	CD	0754	0770	-	314	Ned
						536	CD	0755	0814	0758	230	Pra
						200	CD	0754.5	0804.5	-	300	Ned
ar,38						167	ECD	2119.1	2120.6	2120	2800	NBS
						9400	SD	0913	0951	0921	(325)	HHI
						206	ECD	0923	0926	-	374	Gor
						206	EDF	0928	1300	0944	432	Gor

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FLARE								SPECTRAL OBSERVATIONS TYPE II			
Gr. Day	Beg. UT	End UT	Max. UT	Position		Imp.	Flare Serial No.	Event No.	Beg. UT	End UT	Max. Int.	Freq. Range
Sept. 26	1907	2345	1952	N22	E15	3	75	173				
30	1657	1750	1706	N25	W37	3	76	176				
Oct. 09	0340	0500	0355	S38	W14	3	77	179	0402	0422	-	-
13	0534	0641	0539	N12	E40	2+	78	181				
15	No Flare Patrol between 2000 and 2400											
16	0152	0202	0152	S25	E21	3	79	185				
16	0413	0500	0425	S26	E20	3	80					
18	No Flare Patrol between 2000 and 2300											
19	0603	0920	0639	S24	W25	3	81					
20	No Flare Patrol between 0000 and 0300											
20	1637	1804	1642	S26	W45	3+	82	190	1650.9	1658	3+	350-100
20	No Flare Patrol between 1200 and 2215								2148.7	2150	3	190-100
21	1212	1314	1218	S25	W52	3	83					
23	0621	0645	—	S27	W77	3	84					
23	2222	2236	—	S18	W79	1		195	2204 2226	2205 2227	1 1	
24	2314 2339	2326 2406	2319 2240	N15 N27	W42 W44	1- 1		196 197	2310 2341	2315 2358	1 1	
25	1500	1612	1505	N12	E03	2						
26	0753	0833	0803	N12	W10	2						
31	No Flare Reported							203	2119	2121	3	210-130
Nov. 02	0904	0955	0918	S21	W16	2+	86					

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SPECTRAL OBSERVATIONS TYPE IV						SINGLE FREQUENCY RADIO EMISSIONS						
Obs.	Beg. UT	End UT	Max. Int.	Freq. Range	Obsev. Ref.	Freq.	Type	Beg. UT	End UT	Max. UT	Flux	Obs.
Har,38	2145				44	9500	CD	2146	2156	2154	860	Tok
						9400	CD	2153.7	2157.7	2153.7	(380)	Nag
						2800	CD	2145	2200	2154	(105)	Ott
						1420	SD	2154	2155.5	2154	278	Syd
						600	CD	2149	2156.5	2150	178	Syd
						200	CD	2151.7	2153.7	2152	2500	Hir
						167	ECD	2148.7	2152.7	2151.8	3200	NBS
						167	CD	2153	2415	2321	320	NBS
	1418				44	9400	CD	1415	1450	1418	(542)	HHI
	1419	1606	3	580-400	Har, 27, 38	1500	CD	1415	1455	1420	(266)	HHI
						545	CD	1414	1418	-	240	Ned
						545	CA	1418	1608	-	5500	Ned
						536	ECD	1412	1627.5	-	605	Pra
						450	CD	1427	1611	1454	6500	NBS
						200	CD	1417.5	1419	1418	225	Osl
						167	ECD	1417	1418.4	1417.9	1700	NBS
Har,38						2800	SD	2041	2046	2042	(365)	Ott
						450	ECD	2041	2056	2042	800	NBS
						200	CD	2041	2043	2042	750	Hir
						167	ECD	2044.7	2047.2	2045.9	3000	NBS
						9400	SD	1520	1545	1521	(724)	HHI
						2800	SD	1519	1525	1521	(260)	Ott
						450	ECD	1520.2	1521.6	1520.2	320	NBS
						200	CD	1549.5	1551.5	-	300	Ned
						167	ECD	1549.6	1550.9	1550.1	3500	NBS
Har, 38						9400	ESD	2243	2246	2244.4	452	Nag
						3750	ESD	2243	2246.5	2244.7	(476)	Nag
						2800	SD	2244	2249	2245	(425)	Ott
						2000	ESD	2243.8	2246.8	2245	(320)	Nag
						545	CD	2244	2245	-	300	Hol
						167	ECD	2248.5	2251.2	2249.4	3500	NBS
						9500	CD	0440	0450	0443	776	Tok
						3000	CD	0440.5	0445.3	0441	427	Tok
						200	CD	0440.3	0442	0441.2	390	Tok
						9500	SD	0631	0711	0632	551	Tok
	1804				44	2800	CD	1821	1901	1825	(275)	Ott
	1810	2428	3	580-100	Har, 38	450	CD	1807	1910	1823	980	NBS
	1805					450	ECD	1910	1930	1915	2000	NBS
						201	E	1808	2302	-	356	Cor
						167	CA	1820	2450	2100	2000	NBS
	0400				16, 44	9400	CD	0359	0419	0406	(1240)	Nag
	0427	0730	3		Syd	3750	CD	0359	0410	0406	(1080)	Nag
						3000	CD	0401	0411	0406	1410	Tok
						2000	CD	0402	0410	0406	(254)	Nag
						1000	F	0405	0416	0409	305	Nag
						200	CA	0408	0638	0510	580	Tok
						200	CD	0411.5	0413	0411.8	1420	Tok
						169	CAM	0754	0759	-	370	Ucc
						169	CAM	0828	0834	-	370	Ucc
						169	CAM	0845	0858	-	340	Ucc
Har 26, 38						9500	ECD	2119	2155	2120	887	Tok
						545	CD	2122	2127.5	-	300	Hol
						450	ECD	2119	2126	2119	1000	NBS
						167	FD	2120.2	2123.3	2121.3	3500	NBS
	1331				16,34, 44	9400	CD	1330	1437	1336	(1095)	HHI
	1330	1345	3	300-100	Har, 38, 52	2800	CD	1330	1344.5	1337	(785)	Ott
						1500	CD	1330	1401	1336	(432)	HHI
						450	CD	1331	1346	1336	600	NBS
						231	CD	1330	1340.3	-	1800	AOP
						231	SA	1340	1346.7	1346	1800	AOP
						200	CD	1330	1347	-	550	Ned
						200	MCA	1330	1347	1331	1250	Osl
						200	ESD	1338	1341	1339	200	Jod
						167	ECD	1330	1339	1334	4000	NBS
						81	SD	1330	1339	-	(300)	Cav
	1249				44	9400	CD	1252	1341	1301	(958)	HHI
						2800	CD	1253	1308	1256	(275)	Ott
						1500	CD	1252	1215	1256	(297)	HHI
						450	ECD	1254.3	1256.3	1255.3	540	NBS
						450	CA	1256	1307	1303	340	NBS
						200	SD	1254.3	1254.6	-	360	Ned
Syd												
Syd												
	1836				34, 44	2800	SD	1836	2236	-	(57)	Ott
						2800	CD	1836	1841	1836	(22)	Ott

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TABLE IV

FLARE								SPECTRAL OBSERVATIONS TYPE				
Gr. Day	Beg. UT	End UT	Max. UT	Position	Imp.	Flare Serial No.	Event No.	Beg. UT	End UT	Max. Int.	Freq. Range	
Nov. 04	No Flare Reported						204	2240	2242			
05	1205	1257	1207	S24 W54	3	87						
06	No Flare Reported						207	0424	0434			
06	0834	0900	0841	S28 W67	2+	88						
10	0606	0735	0623	S25 E65	3	89						
13	0457	0511	0458	S25 E27	1		211	0502	0505			
15	0517	0636	0537	N18 W45	3	91						
20	No Flare Reported						216	0050.5	0052			
22	0404	0446	0409	N31 W28	2+		217	0410.5	0427	-	-	
23	0750	0925	0804	N26 W54	3	92						
24	0848	1202	0911	S14 E37	3+	93						
24	No Flare Reported						221					
25	No Flare Reported						222	0416	0430			
29	0045	0600	0213	N41 E63	3+	94	224	0059	0103	-	-	
Dec. 05	0548	0812	0657	S20 W19	3	97						
06	0347	0443	0353	N16 E45	2		229	0400	0419			
12	1750	1859	1806	N15 W41	2+	99	234	1809	1814	3	135-1	
13	No Flare Reported											
14	1245	1450	—	N18 E78	3	100						
16	1125	1238	1140	N17 E50	3	101						

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	SPECTRAL OBSERVATIONS TYPE IV					SINGLE FREQUENCY RADIO EMISSIONS						
Obs.	Beg. UT	End UT	Max. Int.	Freq. Range	Obsev. Ref.	Freq.	Type	Beg. UT	End UT	Max. UT	Flux	Obs.
	0736				44	1420	CD	0736	0751	0741	626	Syd
	0735				16, 27	600	CD	0737	0752	0745	579	Syd
						545	CD	0735	0804	-	300	Hol
						231	CD	0745	0759	0754	6200	AOP
						200	CD	0735	0806	-	208	Hol
						9400	SD	0454	0544	0501	(19)	Nag
						3000	CD	0442	0522	0456	409	Tok
						600	CD	0419	0421.8	0419	48	Syd
						9500	ECD	0621	0628	0624	694	Tok
						3750	CD	0620	0626	0622.9	(120)	Nag
						1000	F	0608	0610	0609.2	(170)	Nag
						200	ESD	0553.3	0553.7	-	3500	Tok
Syd	0916				44	1500	CD	0805	0812.5	0804.5	(316)	HHI
						600	ECD, CD	0815	0823	0822	192	Mos
						536	CD	0801	0845	0813	410	Pra
						200	CD	0804	0825	-	950	Hol
						169	ECA	0804	0815	-	810	Ucc
Syd						9400	ECD	0545	0548	0545.4	(870)	Nag
						3750	SD	0544	0547	0545.3	(357)	Nag
						2000	SD	0544	0547	0545.5	(154)	Nag
						1000	ESD	0544	0547	0545.4	(1600)	Nag
						600	CD	0545	0546.5	0545	523	Syd
						545	CD	0543	0545	-	300	Hol
						200	CD	0543.5	0545	-	100	Hol
						200	CD	0545	0547	0545.4	3000	Tok
						9500	CD	2243	2332	2250	653	Tok
						9500	ESD	2333	2333.5	2333	589	Tok
						9500	SD	2345.7	2349.7	2347	807	Tok
						3000	CD	2345	2350	2346.3	556	Tok
	1543	2337	3	580 - 100	Har, 38	2800	SD	1555	1655	1612	(14)	Ott
						2800	SD	1607	1611	1608.3	(26)	Ott
						2800	CD	1621	1631	1623	(42)	Ott
						450	ECD	1602	1614	1612	1200	NBS
						450	ECD	1622	1631	1624	2000	NBS
	1712	1808	3		27	2800	SD	1716	1725	1718	(224)	Ott
						450	ECD	1716	1748	1720	3700	NBS
						200	CD	1716	1720	-	500	Par
	2235				44	9500	CD	2235	2308	2240	1023	Tok
						1420	CD	2236	2242	2240	952	Syd
						600	CD	2230	2330	2240	623	Syd
						545	CD	2235	2258	-	2000	Hol
						450	ECD	2234.3	2238.9	2236.3	4700	NBS
						450	CD	2239	2250	2242	3900	NBS
						200	CD	2235	2244	-	550	Hol
	1437	1520	3	580-100	Har, 38	2980	CD	1441	1451	-	602	Ned
						545	CD	1439	1458	-	1200	Ned
						450	CD	1436	1459	1447	3400	NBS
						169	CAM	1439	1448	-	600	Ucc
Har,38						167	ECD	1821.8	1824.5	1823	3000	NBS
	0245				44	9400	ECD	0245	0248	0246.5	(2400)	Nag
						3750	ECD	0245.4	0250.4	0246.3	(2650)	Nag
						3000	ECD	0245	0300	0246	2300	Tok
						2000	ESD	0245.5	0248	0246.5	(1690)	Nag
						1000	ECD	0246.5	0249.5	0246.5	(780)	Nag
						600	ECD	0247	0251	0248	258	Syd
						545	CD	0244	0255	-	300	Hol
						200	SD	0246	0347.2	0246.7	1000	Tok
						200	SD	0248	0249	-	660	Hir
Har,38	2228				16, 44	9500	ECD	2229	2249	2233	1322	Tok
	2232	2255	3	330-100	Har, 38	1420	SD	2230	2237	2230	916	Syd
	2230				37	450	ECD	2229	2244	2230	3600	NBS
						200	CD	2230	2238	-	2500	Hol

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FLARE								SPECTRAL OBSERVATIONS TYPE II			
Gr. Day	Beg. UT	End UT	Max. UT	Position	Imp.	Flare Serial No.	Event No.	Beg. UT	End UT	Max. Int.	Freq. Range
Dec. 17	0734	1004	0737	N20 E41	2+						
18	0408	0550	0500	N17 E26	3	102					
18	0605	0712	0624	N17 E20	3	103					
19	0757	1015	0801	N20 E13	2+	104	238	0803	0825	-	-
20	0543	0606	0545	N15 E01	1+		241	0546	0551.7		
21	2232	2400	2251	N24 E50	3	105					
22	No Flare Reported						246				
22	1715	1821	1736	N18 W30	1+						
22	2240	2332	2244	N20 W34	2						
23	1436	1557	1440	N18 W45	1+		249				
25	1812	1900	1822	S07 W70			258	1822.2	1825	3	230-100
26	No Flare Patrol										
28	2229	2331		N25 W50	2		261	2231.5	2242	3+	330-100

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	SPECTRAL OBSERVATIONS TYPE IV					SINGLE FREQUENCY RADIO EMISSIONS						
Obs.	Beg. UT	End UT	Max. Int.	Freq. Range	Obsev. Ref.	Freq.	Type	Beg. UT	End UT	Max. UT	Flux	Obs.
Syd												
	1205		A		44	2800	SD	1205	1213	1207	(550)	Ott
						1500	CD	1204	1221	1208	(247)	HHI
						210	ECD	1204	1210	1205	675	Sim
						200	CD	1205	1216.5	-	38000	Ned
Syd						3000	SD	0420.5	0424.5	0422	330	Tok
						9400	SD	0838	0847.5	0839	(693)	HHI
						2980	SD	0837	0840	-	572	Ned
						9500	CD	0607	0618	0608	1112	Tok
						545	CD	0608	0610	-	200	Hol
Syd						9500	ECD	0457.5	0507.5	0458	567	Tok
						3000	CD	0457	0505	0458	440	Tok
						2000	SD	0457	0506	0458	(65)	Nag
						1420	SD	0458	0459	0459	162	Syd
						200	CD	0457.5	0460	-	160	Hol
						200	CD	0502	0505	-	160	Hol
						9500	CD	0525	0645	0545	483	Tok
						3000	CA	0522	0600	0542	537	Tok
						600	CD	0526	0526.8	0526	238	Syd
						600	SD	0543	0550	0544	247	Syd
Syd						9500	ECD	0042	0052	0045	517	Tok
						3750	SD	0042	0049	0045	(135)	Nag
						3000	SD	0041	0051	0045	445	Tok
						2000	SD	0046	0050	0046	(31)	Nag
						200	SD	0050.2	0050.7	-	1700	Tok
						200	CD	0052	0053	-	160	Hol
Syd	0406				44	9500	CD	0406	0441	0409	1960	Tok
						3750	ECD	0406	0416	0409.7	(380)	Nag
						3000	CD	0406	0436	0409	870	Tok
						1000	CD	0406	0410	0408.8	(557)	Nag
						200	F	0408	0416	0414	1400	Tok
	0750				44	9400	CD	0750	0855	0759	(800)	HHI
						2980	CD	0754	0808	-	560	Ned
						1500	CD	0759	0806	-	(179)	HHI
						231	CD	0800.2	0803.8	0802.5	1800	AOP
						200	CD	0758	0810	-	160	Ned
	0857		B		44	9400	CD	0857	1003	0903.5	(543)	HHI
	0848				16	2980	CD	0859	0939	-	998	Ned
	0903				27, 52	1500	CD	0857	0958	0904	(251)	HHI
						231	SA	0901	0958	-	1400	AOP
						210	E	0900	1000	0922	288	Sim
						208	ECD	0904	1000	0907	7400	Mos
						200	CA	0850	0955	-	50000	Ned
						169	CA	0905	0912	-	540	Ucc
						169	CA	0913	1032	-	540	Ucc
	1811	1931	3	580-100	Har, 27, 38	450	CD	1810	1832	1819	5900	NBS
Syd						200	CA	0415	0655	0623	550	Tok
Syd						9500	SD	0047	0247	0208	488	Tok
						9500	CD	0549	0559	0555	541	Tok
						3000	CD	0548	0556	0552	375	Tok
Syd						9500	CD	0350	0422	0407	508	Tok
						3750	SD	0349	0355	0350	(20)	Nag
						2000	SD	0349	0355	0352	(19)	Nag
						1000	F	0401	0409	0406	(82)	Nag
Har, 38						2800	CA	1757	1809	1804	(94)	Ott
						201	ECD	1758	1811.5	-	54	Cor
	0153				44	9500	CD	0156	0256	0205	2275	Tok
						9400	CA	0155	0237	0205	(1530)	Nag
						3750	CA	0155	0240	0232	(630)	Nag
						3000	CA	0153	0303	0232	1130	Tok
	1235		A		44	9400	CD	1228	-	1241	(940)	HHI
	1238				27	1500	CD	1230	1323	1240	(397)	HHI
						600	ESA	1237	1256	-	504	Ucc
						536	CD	1230	1316	1245	630	Pra
						231	CD	1237	1301	1242	1300	AOP
						200	CD	1238	1255	-	5000	Ned
	1135		A		44	2980	CD	1135	1210	-	366	Ned
						810	ECD	1139	1147	1141	280	Cra
						231	CD	1136	1148	1140	1300	AOP
						200	CD	1136	1145	-	50000	Ned

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TABLE V. CATALOGUE OF GEOMAGNETIC STORMS DURING 1957

This catalogue has been prepared from geomagnetic storm data from many sources. Data derived from papers published in the scientific literature are referenced in the last column of the table. The lists of sudden commencement storms published in the Journal of Geophysical Research (ref. 5, 67). The Annals of the IGY (ref. 50) and Bulletins 12 1, published by the IAGA (ref. 4) have been used to obtain the basic list.

The table has been set up in several sections that will be described in some detail under the column headings; these sections are as follows:

1. General storm classification.
2. Number of observatories reporting the storm and type of storm reported (from ref. 4).
3. Sudden commencement reports in references 4, 67, 5 and 50.
4. Planetary three hour Greenwich interval indices during the storm.
5. Values for D, H, and Z and other storm data from six selected magnetic observatories.

		Geographic		Geomagnetic	
		Lat.	Long.	Lat.	Long.
Co	College Alaska	N64°52'	212°10'	N64.5	255.4
Fr	Fredericksburg	N38°12'	282°38'	N49.6	349.9
Gr*	Greenwich	N51°00'	355°31'	N54.6	79.0
Ho	Honolulu	N21°18'	201°54'	N21.1	266.5
Si	Sitka	N57°04'	224°40'	N60.0	275.4
Tu	Tucson	N32°15'	249°10'	N40.4	312.2

*Data published by the Royal Greenwich Observatory in reference 21.

The column heading, together with any necessary descriptions or definitions, follows:

Column 1 Greenwich Day

GENERAL STORM CLASSIFICATION (Columns 2 through 7)

Column 2 Onset time UT

Column 3 End, Greenwich day/UT

Column 4 Type, g - gradual, sc - sudden commencement

Column 5 Maximum intensity, m - moderate (K - index as great as 5) ms = moderately severe (K = 6 or 7), s = severe (K = 8 or 9).

Column 6 Maximum three hour K_p

Column 7 Average storm K_p. This has been calculated as the average K_p for the period shown in Columns 2 and 3.

NUMBER OF OBSERVATORIES REPORTING THE GEOMAGNETIC STORM (Columns 8 through 20)

These data have been taken from the IAGA Bulletin 12 1 (ref. 4). The names of the observatories reporting in each category are given in that reference. The meanings of the column symbols follow:

A - The phenomenon is a very distinct ssc

B - It is a fair, ordinary, but unmistakable ssc

C - It is a doubtful ssc

D - The ssc was decidely not recorded on the magnetogram although the records were satisfactory

E - The phenomenon cannot be discovered because of heavy disturbance.

X - The recording is missing

Other observatories have classified the phenomena in question with the following symbols:

si - Sudden geomagnetic change or impulse

b - Clear and isolated bays appearing during calm periods without pulsations or sharp beginnings.

bs - Bay with sharp beginnings without pulsations

bp - Bay with pulsation without sharp beginnings

bps - Bay with pulsation and sharp beginning

pt - Train of pulsations consisting of several series of oscillations.

pg - Giant pulsations

The number of observatories reporting in each of the categories is given.

NUMBER OF ssc IN THE PUBLISHED LISTS (Columns 21 through 24)

Column 21 From reference 4. This is the sum of the A's and B's, Columns 8 and 9.

Column 22 From reference 67

Column 23 From reference 5

Column 24 From reference 50

PLANETARY THREE-HOUR INDICES AND OTHER DATA DURING THE STORM PERIOD

Column 25 Planetary three-hour indices

Column 26 Sum of the K_p for the Greenwich day

Column 27 Ap for the Greenwich day

Column 28 The Greenwich day and three hour interval with the first $K_p \geq 4-$

Column 29 The Greenwich day and the first three-hour interval in which the K_p for three consecutive intervals was less than 4-

Geomagnetic data for the six selected observatories listed on page 2.V-i, with the exception of the Greenwich (Gr) data, the values given in Columns 30 through 36 were taken from reference 67. The Greenwich data were published in The Observatory Vol 78 (1958) 40-42 (Ref. 21).

Column 30 D-Magnetic Declination - this is the azimuth of the horizontal component or the magnetic intensity measured from the geographic north towards the east from 0 to 360 . Unit in minutes of Arc.

Column 31 H-Horizontal Intensity. The magnitude of the horizontal component, always considered as positive. In units of gammas (10^{-5} gauss)

Column 32 Z-Vertical Intensity. The magnitude of the vertical component. Positives if downward, negatives if upward, in units of gammas (10^{-5} gauss)

Column 33 Onset Time. This is the time reported by the observatory.

Column 34 End Time. Reported by the observatory (Greenwich Day/UT)

Column 35 Maximum K_p. This is the maximum three-hour K_p reported by the observatory.

Column 36 Name of the Observatory. The code is given on page 2.V-i.

Column 37 Range of Starting Time.

Column 38 Sources. These are the published sources for the data given in this table. In many cases these references give relations of the storms to other phenomena, such as a solar flare, polar cap absorption, etc.

TABLE V-A. MAJOR GEOMAGNETIC STORMS DURING 1957

A list of all storms during 1957 with at least one K_p equal to or greater than 7+ is given on Table V-A, page 2.V-4. These data are taken from page 217, reference 4.

TABLE V CATALOGUE OF GEOMAG

Serial No.	Date	Onset	End	Type	Max. Int.	Max. Kp	Average Storm Kp	A	B	C	D	E	X	si	b	bs	bp	bps	pt	pg	4	67	5	50	Three-hour Gr. Interval 1	2	3	4	5	6	7
	Jan.																														
1	02	0910	03/03xx	sc	m	5+	4o	45	10	1	-	-	3	-	-	-	-	-	-	-	55	11	43		2+	2-	2+	5o	3-	2+	5
																									4-	3-	2+	3o	2+	1+	1
2	09	1224	11/17xx	g	m	5o	4o	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-		2o	2o	2-	2-	3+	4-	3
3	10	06xx	11/01xx	g	m	5o	4o	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-		3+	4+	5o	4o	4o	4o	4
																									4o	2-	4o	4-	4-	1o	2
4	21	0800	23/00xx	sc	s	9-	6-	-	5	4	47	1	2	-	1	-	-	-	-	-	5	3	4								
5		1255	24/06xx	sc	s	9-	6-	42	11	1	-	1	1	4	-	-	-	-	-	-	53	12	41		2-	3+	4-	4-	5-	6-	8
	22																								8+	7-	6+	5-	4o	4o	3
	23																								3o	4-	4+	5o	4o	4-	4
6	24	1016	-	-	-	-	-	1	10	16	20	-	1	9	-	2	-	-	-	-	11	-	2								
7		1910	25/10xx	sc	m	5+	5o	34	12	-	-	4	1	9	-	1	-	-	-	-	46	3	30		4o	5-	2-	3-	3+	3-	5
	25																								5o	4-	5-	3o	2o	2o	2
8	29	1313	30/21xx	sc	ms	6-	5+	27	26	6	-	-	-	-	-	1	-	-	-	-	53	10	40		1+	2+	2o	3-	5o	5o	4
																									5o	6-	5+	5-	4-	3+	4
	Feb.																														
	03																								2-	2+	1-	1o	2o	2+	4
9	04	0003	06/16xx	sc	ms	6o	4o	4	12	16	13	-	3	7	1	3	-	-	-	-	16	1	6								
10		1100	05/23xx	sc,g	ms	6o	4+	1	4	12	38	1	2	2	-	-	-	-	-	-	5	5	2		4o	3+	3o	4-	5o	4+	4
	05																								5o	6o	5-	5-	5o	4-	3
11	12	1850	14/09xx	sc	ms	6+	4+	24	19	3	-	-	1	9	-	3	-	-	-	-	43	9	37		2+	4+	3+	3-	2o	2o	4
12	13	0939	14/04xx	sc	ms	6+	4+	14	21	13	7	3	-	2	-	-	-	-	-	-	35	4	12		3+	5-	4-	5o	5+	5o	6
	14																								3-	3-	3o	2-	1+	1o	1
13	23	1807	24/14xx	sc	ms	7o	6o	47	8	-	3	2	-	-	-	-	-	-	-	-	55	15	43		4-	4-	3o	2o	3-	3o	6
	24																								7o	7o	6o	6o	5-	3-	3
	Mar.																														
14	01	1614	04/06xx	sc,g	s	8+	5o	13	25	11	7	1	1	1	-	1	-	-	-	-	38	12	25		1-	1o	1+	2-	3+	4o	4
	02																								6o	8+	8+	7o	7-	5+	6
	03																								5o	5+	5+	3+	3o	4+	3
	04																								4-	4o	3o	3-	3-	1-	2
15	09																														
16	10	0023	10/21xx	sc	ms	7-	5o	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16	44		3-	4+	4o	3o	4+	4-	4
		0323	-	-	-	7-	-	33	24	-	-	-	2	-	-	1	-	-	-	-	57	-	-		5+	7-	7-	6-	5-	5+	3
	11																								3o	2+	2-	5-	5-	2+	2
17	15	1938	15/24xx	sc,g	ms	6o	4o	3	14	24	15	-	1	3	-	-	1	-	-	-	17	-	7		2+	2+	2o	2-	1+	2-	3
18	16	1600	16/23xx	g	ms	6o	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2			5o	4+	4+	2+	3o	4-	6
	17																								3-	3+	3+	2+	3o	4o	2
	24																														
19	25	0130	25/16xx	sc	ms	6o	5-	14	32	15	1	-	-	-	-	-	-	-	-	-	46	6	22		3o	2o	2+	2-	1o	1o	4
																									4+	6o	5-	5-	5-	2+	2
20	26	1050	30/09xx	sc	s	8-	5-	1	17	24	17	-	-	2	-	-	-	-	-	-	18	3	9		1+	1+	1+	3o	4-	4-	2
21	27	1136	30/09xx	sc	s	8-	6-	13	20	14	7	2	1	3	-	-	-	-	-	-	33	3	19		4+	4-	3o	4o	5-	4+	5
22	28	0412	-	-	s	8-	6-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	2		7o	7-	6+	6-	3+	4o	2
23	29	0336	30/05xx	sc	s	8-	6-	50	10	-	-	-	2	-	-	-	-	-	-	-	60	14	45								
24		1315	30/09xx	sc	s	6-	6-	38	16	1	-	1	1	4	-	1	-	-	-	-	54	2	15								
	30																								3+	5+	4+	4o	7o	8-	6
																									6-	5-	3o	2-	2o	3-	2
	Apr.																														
25	05	09xx	06/12xx	g	ms	6-	-	-	-	-	-	-	-									1	-								
26		1000	06/12xx	g	ms	6-	4+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-		4o	3+	3+	5+	6-	5o	3
																									6-	5o	5-	5-	3-	2-	1
27	15	2048	16/06xx	sc	ms	6-	5-	18	25	8	3	-	2	5	1	-	-	-	-	-	43	4	34		0+	2o	2o	3o	3+	2o	3
	16																								4+	4o	2+	2+	3-	3+	3
28	17	1136	20/06xx	sc	s	8-	5o	50	11	-	-	-	-	-	-	-	-	-	-	-	61	13	45		3+	4o	3+	4+	5+	4o	6
29	18	1508	20/06xx	sc,g	ms	7-	5+	16	20	13	1	-	-	11	-	-	-	-	-	-	36	5	12								
30		1538	-	-	-	7-	-	22	13	6	3	-	-	18	-	-	-	-	-	-	35	0	7		6+	4-	3o	4-	2+	6-	5
	19																								6+	6+	7-	4+	5-	5o	5
	20																								4o	4o	3o	2o	2o	3-	3
31	26	0201	27/10xx	sc	m	5o	4o	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-		2o	3o	3+	4o	5-	5-	4
	27																								5o	4o	4-	3+	3+	2+	2

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(CONTINUED)

Gr. Interval 5 6 7 8	Σ Kp	Ap	Kp Interval 1st Kp≥4- Date/Interval	Time Where 3 Consecutive Kp≤4- Day/Interval	D	H	Z	Onset	End	Max. Kp	Obs.	Range of Starting Times	References
3+ 2+ 2+ 2o	22-	13	21/4	21/5	-	-	-	-	-	-	-	-	34
~~5- 5- 5- 3o~~	~~29+~~	~~28~~	~~30/4~~	~~30/8~~	~~29~~	~~134~~	~~86~~	~~29/0822~~	~~31/06xx~~	5	Fr	29/0922 - 30/0823	
1o 1o 2+ 2+	17+	10			41	371	405	30/0823	31/06xx	6	Si		
					16	97	26	30/0822	31/06xx	5	Tu		
4+ 4+ 6- 5o	32+	33	03/2	07/2	19	108	71	03/03xx	06/12xx	5	Tu	03/03xx - 06/2029	
3o 5- 5- 6-	36-	38											
2+ 4o 4o 5+	31-	29											
3+ 3- 4+ 5o	34-	33			12	165	29	06/2029	07/03xx	6	Fr		
1- 1- 1- 3o	14+	9			10	121	25	06/2029	07/08xx	5	Tu		
4- 5o 4- 2+	25+	19	15/5	15/8	-	-	-	-	-	-	-	-	
2o 2- 2- 2+	22-	14	24/1	24/4	-	-	-	-	-	-			
5- 5- 6- 5+	37o	41	25/1	27/1	250	1510	1270	25/0045	27/03xx	6	Co	24/0340 - 25/0048	
7o 7- 5- 5+	48-	84			30	290	151	25/0047	27/01xx	6	Fr		34,52
4o 3- 2+ 4+	25-	17			270	25	205	25/0047	-	-	Gr		
					8	130	100	25/0048	27/07xx	5	Ho		
					179	1520	811	25/0047	27/04xx	8	Si		
					18	135	53	25/0046	28/15xx	5	Tu		
2o 1o 1o 2+	11-	5	30/2	02/1	213	1660	830	29/2346	01/10xx	9	Si	29/2346 - 30/0529	
8o 8o 8o 8+	55-	150			450	48	365	30/0528	-	-	Gr		
					10	240	75	30/0529	01/22xx	6	Ho		10,16,23,28,52
					-	-	-	30/0528	-	-	Tu		
2- 5- 7o 5o	43o	83	30/2	02/1	11	211	36	01/16xx	01/22xx	7	Fr	01/16xx - 01/1747	28
					10	90	30	01/1746	01/24xx	6	Tu		
8o 6+ 6- 2+	32+	55	02/4	03/6	150	1390	740	02/0857	03/15xx	6	Co	02/0857 - 03/0150	16,22,28,33,36,42,
5+ 1+ 2+ 3o	30o	30			33	200	174	02/0857	03/15xx	6	Fr		46,52
					176	1333	821	02/0858	03/15xx	9	Si		
					16	117	86	02/0857	03/15xx	6	Tu		
1o 2- 4- 5o	15-	12	04/7	05/5	-	-	-	-	-	-	-	04/2342 - 05/0045	10,16,28,34,46
3+ 2o 3o 6-	38-	56			230	1630	1130	05/0043	05/17xx	7	Co		22,23,28,33,42,52
2o 1+ 3+ 2+	17+	9			3	180	35	05/0045	05/13xx	7	Ho		
					118	1208	641	05/0043	06/02xx	8	Si		
					21	162	19	05/0043	05/15xx	7	Tu		
3+ 4o 4o 3o	23-	16	16/4	16/8	-	-	-	-	-	-	-		22,28,33,36,42
4o 4+ 5- 4+	30+	25	19/5	20/1	-	-	-	-	-	-	-	0519 - 1344	22,28,33,42,52
2o 2o 2+ 4-	19+	11											
3+ 3+ 6- 4-	29+	26	22/3	23/3	42	216	302	22/0419	23/06xx	5	Si		22,28,33,36,42
1- 1- 1- 3-	15o	11			16	122	40	22/0418	23/07xx	5	Tu		
1o 2- 4o 3o	12-	8	27/7	27/8	-	-	-	-	-	-	-		22,28,33,34,36,
1o 1o 1+ 1+	12o	6											42,52
2o 6+ 5+ 4o	26-	27	03/6	04/2	90	730	410	03/1557	04/10xx	6	Co		22,23,28,33,36,
1o 2- 1o 2-	15+	12			180	35	70	03/1559	-	-	Gr		37,42
					55	186	137	03/1557	04/07xx	5	Si		
					15	138	49	03/1557	04/09xx	5	Tu		
4o 4- 4+ 4+	33o	31	06/2	07/1	11	41	16	06/0508	06/15xx	5	Tu		22,23,28,33,36,42
2o 1o 1o 1+	15-	8											
5- 2o 2o 3+	23o	16	09/5	09/6	-	-	-	-	-	-			28,33,34,36
4- 3o 4- 3o	33o	33	12/2	13/8	280	1930	1340	12/0200	13/24xx	7	Co	12/01xx - 13/0619	28,33
					27	122	90	12/0240	13/14xx	5	Fr		
					15	111	44	12/01xx	13/06xx	5	Tu		
					16	85	13	13/0019	13/13xx	6	Tu		
2+ 4- 1+ 1-	23+	19	21/1	21/3	14	22	56	0248	21/08xx	5	Hr		28
2o 1+ 7- 6o	22-	28	29/7	30/7	180	490	1160	29/1135	30/21xx	6	Co	29/1135 - 29/1921	10,34
					28	215	116	29/1900	30/14xx	6	Fr		16,22,23,28,32,33,
					225	21	65	29/1921	-	-	Gr		36,37,42,46,52
2o 5- 3o 1o	32-	38			4	120	40	29/1921	30/20xx	6	Ho		
					79	435	356	29/1921	30/12xx	6	Si		
					22	168	62	29/1921	30/15xx	7	Tu		
4- 5o 7o 5o	30-	36	31/5	01/5	110	1630	500	31/1200	01/16xx	7	Co	1200 - 1812	37
3+ 1+ 2o 2+	28+	28			200	25	130	31/13xx	-	-	Gr		10,16,22,28,33,34,42
					59	493	343	31/12xx	01/15xx	6	Si		
					17	139	50	31/1812	-	5	Tu		
7o 6o 8- 8-	49-	102	02/2	07/3	460	2750	1650	02/0300	04/06xx	8	Co	02/0300 - 03/1233	10,16,22,23,28,33,
8o 9- 6o 5-	54o	135			50	481	522	02/0315	04/06xx	7	Fr		34,36,37,42,46,52
					465	75	375	02/0315	-	-	Gr		16,23
					11	180	55	02/0315	04/06xx	6	Ho		
					241	1683	1008	02/0315	04/06xx	9	Si		
					48	256	83	02/0315	04/09xx	8	Tu		

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Serial No.	Date	Onset	End	Type	Max. Int.	Max. Kp	Average Storm Kp	A	B	C	D	E	X	si	b	bs	bp	bps	pt	pg	4	67	5	50	Three-hou 1	2	3	4
	May																											
32	21	0910	-	-	-	-	-	8	23	5	8	1	4	13	-	-	-	-	-	-	31	-	18		2+	3o	3-	4-
33	30	0822	31/06xx	sc	m	5+	4o	32	26	1	-	-	3	-	-	-	-	-	-	-	58	11	44		3-	1+	3o	5-
																									3-	4-	2-	3
	June																											
34	03	0457	07/03xx	g	ms	6-	4+	-	3	7	46	1	-	-	-	-	-	-	4	-	3	1	2		2-	4-	3o	5-
	04																								5-	5+	4-	4
	05																								6-	4-	3o	3
35	06	2029	07/03xx	sc	m	5o	4+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-		4+	5o	5-	4
	07																								4+	2o	1+	2
36	15	1358	-	sc	m	5o	-	6	17	18	11	1	2	5	1	1	-	-	-	-	23	-	13		3-	3o	3-	2
37	24	0340	-	sc	-	4o	-	6	24	12	7	1	-	11	-	-	-	-	-	-	30	-	15		4o	3+	4-	3
38	25	0046	27/01xx	sc	ms	7o	5+	23	36	-	1	-	2	-	-	-	-	-	-	-	59	12	41		5-	4-	3+	5
	26																								5o	6o	6+	7
	27																								3o	2o	3o	3
39	29	2346	01/10xx	sc	s	8+	6+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-		1o	1o	1o	1
40	30	0528	01/22xx	sc	s	8+	7-	45	9	-	1	-	3	5	-	-	-	-	-	-	54	12	36		3o	6+	5+	8
	July																											
41	01	1747	01/24xx	sc,g	ms	7+	6-	9	21	16	10	-	5	2	-	1	-	-	-	-	30	2	7		7+	7+	7-	3
42	02	0857	03/15xx	sc	s	8o	5o	42	15	2	-	-	4	-	-	-	-	-	-	-	57	13	42	55	2-	1o	3-	5
43	03	0150	03/15xx	sc	ms	6-	5-	-	-	-	-	-	-	-	-	-	-	-	-	-		1	-	-	6-	4+	4-	4
44	04	2342	-	sc	ms	7+	-	12	19	7	14	3	1	3	-	1	1	2	-	-	31	-	14	-	1o	1-	0+	1
45	05	0042	05/15xx	sc	ms	7+	5-	21	24	6	4	3	-	6	-	-	-	-	-	-	45	9	21	24	5-	7+	6o	6
	06																								2+	3-	2o	1
46	16	0714	-	sc	-	4o	-	28	26	3	-	-	5	1	-	-	-	-	-	-	54	2	44	53	1+	0+	3o	4
47	19	0519	-	sc	m	5-	-	1	10	17	29	-	-	2	3	-	-	-	-	1	11	-	2	-				
48		1344	-	sc	m	5-	-	9	22	17	10	-	1	5	-	-	-	-	-	-	31	-	27	27	4o	3o	3+	3
																									3o	3o	2o	1
49	22	0419	23/06xx	sc,g	ms	6-	4o	15	29	13	2	-	4	-	-	-	-	1	-	-	34	6	34	38	2-	3+	4o	4
	23																								4-	5-	1o	1
50	27	1959	-	sc	-	4o	-	27	35	2	-	-	-	-	-	-	-	-	-	-	62	-	41	56	0+	1o	0o	1
																									3o	2-	2-	1
	Aug.																											
51	03	1557	04/03xx	sc	ms	6+	5+	53	11	-	1	-	-	-	-	-	-	-	-	-	64	8	55	69	3-	1o	2+	2
																									5+	2o	2o	1
52	06	0508	06/24xx	sc	ms	6-	4+	26	28	5	4	-	-	2	-	-	-	-	-	-	54	7	42	53	3o	4+	6-	4
																									3o	2o	3-	2
53	09	1347	-	sc	m	5-	-	34	13	6	-	-	2	8	-	1	-	-	-	-	47	-	41	63	4o	3+	2+	1
54	13	0617	13/21xx	sc	ms	6-	4o	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	3	-	4+	5+	6-	4
55	21	0248	21/08xx	sc	m	5+	4o	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	4o	5+	3+	
56	29	1909	30/21xx	g	ms	7-	5o	6	10	25	19	-	3	1	1	-	-	-	-	-	16	1	6	-	2+	1+	1-	
57		1920	30/21xx	sc	ms	7-	5o	51	9	-	-	-	1	3	-	-	1	-	-	-	60	14	53	68				
	30																								7-	6-	4+	
58	31	1229	01/15xx	sc,g	ms	7o	5o	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-				
59		1414	01/15xx	g	ms	7o	5o	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	-				
60		1812	01/15xx	sc,g	ms	7o	5+	26	19	3	4	3	2	7	-	1	-	-	-	-	45	2	28	40	2o	3-	3-	
																									6-	6-	4+	
	Sept.																											
61	02	0314	04/06xx	sc	s	9-	6+	35	27	2	-	-	1	-	-	-	-	-	-	-	62	18	48	70	3-	6o	6+	
62	03	1233	-	-	s	9-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	7-	6+	6+	

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NETIC STORMS DURING 1957

8	ΣKp	Ap	Kp Interval 1st Kp≥4- Date/Interval	Time Where 3 Consecutive Kp≥ 4- Day/Interval	D	H	Z	Onset	End	Max. Kp	Obs.	Range of Starting Times	References
5o	27-	25	02/4	03/2	22	118	45	0909	03/01xx	5	Fr	-	
2-	18+	10			2	80	15	0910	03/03xx	5	Ho		
					12	156	36	0910	03/06xx	5	Tu		
4-	21o	13	09/5	11/2	140	1180	710	09/1224	11/17xx	6	Co	09/12xx - 10/06xx	
5-	34-	31			41	294	369	10/06xx	11/01xx	5	Si		
2o	22-	15											
					95	820	650	21/1255	24/06xx	9	Fr	0800 - 1255	
9-	39o	82	21/3	22/7	625	103	625	21/1255	-	-	Gr		32,34,52
2+	39+	70			5	270	110	21/1255	21/01xx	7	Ho		
3+	31o	26			25	329	89	21/1256	24/00xx	7	Tu		
5o	29+	27	24/7	25/4	-	-	-	-	-	-		-	
4o	27-	22										-	
4o	27-	24	29/5	30/8	200	1300	820	0950	30/22xx	7	Co	0950 - 13xx	37
3-	34o	36			27	126	79	1313	30/21xx	5	Fr		
					80	666	496	13xx	30/21xx	7	Si		
4+	18o	12											
5+	33o	31	03/7	04/7	220	1290	1030	1048	05/18xx	6	Co	0003 - 11xx	
3+	35+	39			20	91	82	11xx	05/23xx	5	Fr		
					95	1092	512	11xx	05/20xx	7	Si		
3-	23o	15	12/7	13/8	26	112	56	12/1850	14/09xx	5	Fr	12/1850 - 13/0939	
					12	98	35	12/1851	14/09xx	6	Tu		
3+	37-	43	12/7	13/8	340	1920	1040	13/04xx	14/04xx	7	Co		37
1-	14+	8			81	737	540	13/04xx	14/00xx	7	Si		
6o	30o	32	23/7	24/6	460	2100	1180	1806	-	7	Co	1806 - 1808	37,52
2o	38o	62			36	194	212	1807	25/04xx	7	Fr		
					175	35	135	1806	-	-	Gr		
					4	200	30	1808	24/14xx	5	Ho		
					216	1178	1017	1807	24/20xx	9	Si		
					20	176	70	1806	24/15xx	6	Tu		
5-	21-	16	01/6	04/3	260	1480	940	01/1000	04/15xx	7	Co	01/1000 - 02/02xx	37,52
7-	55-	132			42	604	438	01/1609	02/09xx	9	Fr		
3-	32+	32			305	68	325	02/02xx	-	-	Gr		
3o	21+	14			10	420	75	01/1600	04/06xx	7	Ho		
					206	1376	1017	01/1245	03/21xx	8	Si		
					22	330	81	01/1609	04/08xx	7	Tu		
5-	30+	25											
2o	40-	58	09/2	10/7	270	1570	950	0023	11/06xx	7	Co	00xx - 0323	
					28	253	238	0023	11/07xx	6	Fr		
3o	24-	17			165	43	160	00xx	-	-	Gr		
					4	200	35	0025	11/07xx	6	Ho		
					229	1251	849	0023	11/05xx	9	Si		
					17	188	62	0023	11/08xx	6	Tu		
4+	18+	11	15/8	17/1	-	-	-	-	-	-	-	15/1938 - 16/1600	
5+	34o	37											
3-	24-	15											
4-	18+	11											
1o	29+	31	24/7	25/8	19	96	45	0130	25/16xx	5	Fr	00xx - 0130	
					105	980	580	00xx	25/19xx	8	Si		
					12	89	29	0130	25/16xx	5	Tu		
4-	20+	13	26/5	28/7	36	222	246	26/1050	30/09xx	6	Fr		
7o	36+	44			160	47	95	27/1136	-	-	Gr	26/1050 - 29/1315	
1+	37-	58			7	210	35	27/1200	30/09xx	6	Ho		
					90	1150	743	28/0336	30/05xx	8	Si		
6o	44o	77	29/2	30/3	360	1430	990	29/0337	30/05xx	7	Co		
3+	25o	21			310	48	155	29/0336	-	-	Gr		
					21	169	50	29/0337	30/11xx	7	Tu		
5o	34+	37	05/1	06/5	21	107	71	05/1000	06/12xx	5	Fr	0707 - 10xx	34
1-	26o	27			74	931	558	05/10xx	06/15xx	8	Si		
6-	22-	18	15/8	16/3	42	302	178	2048	19/10xx	7	Fr	-	
3+	25o	17			14	62	39	2048	16/12xx	5	Tu		
8-	38o	55	17/2	20/3	290	62	135	17/1135	-	-	Gr	17/1135 - 18/15xx	10,37,52
					10	235	90	17/1137	20/12xx	6	Ho		
					62	299	149	17/1135	18/06xx	6	Si		
					31	245	59	17/1136	20/09xx	7	Tu		
					240	1490	1080	18/1500	20/00xx	7	Co		10,37
5o	35o	42			96	1144	624	18/15xx	20/13xx	8	Si		
4o	42o	60											
2+	23-	14											
3o	29-	23	26/5	27/4	46	43	421	26/0201	27/10xx	6	Si		
3-	26+	20											

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Serial No.	Date	Onset	End	Type	Max. Int.	Max. Kp	Average Storm Kp	A	B	C	D	E	X	si	b	bs	bp	bps	pt	pg	4	67	5	50	Three-hour Gr. In 1	2	3	4	5
	Sept.																												
63	04	1300	06/06xx	sc	s	9o	6+	52	8	3	-	-	2	-	-	-	-	-	-	-	60	18	50	72	4-	5-	2+	3-	8+
	05																								8+	9-	7-	5o	5-
64	06	1120	07/09xx	sc,g	ms	6-	4+	12	26	12	6	2	1	5	-	-	-	-	-	-	39	4	25	40	5-	5-	2+	5-	6-
	07																								3o	4-	2o	3o	2o
65	12	2154	15/06xx	sc	s	9-	5+	2	12	13	2	-	1	2	-	-	1	-	6	-	14	1	10	-	2-	2-	1+	2o	2o
66	13	0046	15/06xx	sc	s	9-	5+	53	6	-	3	-	2	-	-	-	1	-	-	-	59	16	48	72	8-	8+	9-	9-	7o
	14																								3o	3+	5+	6+	5+
	15																								4-	4+	2o	2o	2o
67	21	1005	22/12xx	sc	ms	7+	6o	58	6	-	-	-	-	-	-	-	-	-	-	-	64	15	47	72	3-	2-	1+	7+	6o
68	22	1344	23/00xx	sc	s	9-	7o	49	11	1	-	1	-	2	-	1	-	-	-	-	60	12	44	66	5-	6-	6-	5-	8o
69	23	0235	25/15xx	sc,g	s	9-	5+	39	6	3	-	6	1	10	-	-	-	-	-	-	45	3	27	39	8o	9-	8-	8-	8-
	24																								5o	5o	4+	5-	5+
	25																								4-	3o	5-	4o	4o
70	29	0016	01/05xx	sc	s	9-	6-	39	22	1	1	-	-	-	-	-	-	-	-	-	61	18	48	73	4o	5+	5o	4+	8o
	30																								6+	6-	5+	6-	5o
	Oct.																												
	01																								4+	4o	3o	2o	4-
71	02	1252	-	sc	m	5-	-	1	2	18	40	2	-	2	-	-	-	-	-	-	3	-	3	-	4-	4-	2-	2-	3-
	03																								3-	2o	1+	3+	4-
	04																								3o	3o	2+	3-	2+
	05																								3o	3o	2-	2+	2o
72	06	2055	-	-	-	-	-	-	6	18	28	-	-	4	-	-	-	-	-	-	6	-	3	-	2-	0+	1o	1-	0o
73	09	1329	15/21xx	sc	-	4o	4-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	-	0+	2-	2+	2-	2+
	10																								3o	4o	4o	3o	2+
	13																								5o	5+	3o	2+	3-
74	14	0035	15/01xx	-	ms	6+	5-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	4+	6+	6-	5o	4+
75		0440	15/01xx	sc,g	ms	6+	5-	5	21	14	16	4	1	2	-	-	1	1	-	-	26	7	21	34					
	15																								3+	2o	2-	2+	3o
76	21	2241	23/02xx	sc,g	ms	7-	4o	40	10	2	-	2	-	10	-	1	-	-	-	-	50	5	53	61	3+	3-	3-	2-	3-
	22																								4+	3o	4-	4-	2+
	23																								5o	3-	4-	3o	1+
	Nov.																												
77	06	1821	07/12xx	sc	ms	7o	5o	59	4	-	-	-	1	-	-	-	-	-	-	-	63	15	60	71	0o	0o	1+	1+	2o
																									7o	4+	3+	4-	3+
78	08	0726	12/20xx	g	m	5o	4+	-	8	19	32	1	3	2	-	-	-	-	-	-	8	1	3	-	1-	3-	4-	4-	4-
	09																								4o	4+	5-	3+	4+
	10																								5o	4+	4o	4-	4-
	11																								4o	4-	4o	4-	4o
	12																								4-	3-	3-	4-	4o
79	18	0952	-	-	m	5+	-	-	3	6	54	1	-	-	-	-	-	-	1	-	-	3	-	2	-	4-	4o	4o	4+	5+
80	24	0901	28/15xx	sc,g	m	5+	3+	3	4	10	41	1	2	2	-	-	-	-	1	-	7	2	6	-	3o	3+	2+	2o	3-
	25																								3+	4o	5+	4+	3+
81	26	0155	28/15xx	sc,g	ms	7-	5o	17	15	6	4	2	2	18	-	-	-	-	-	-	32	3	28	33					
82		0513	28/15xx	-	ms	7-	-	3	5	14	27	5	2	8	-	-	-	1	-	-	8	-	2	-					
83		1410	28/15xx	g	ms	7-	5o	1	7	8	35	4	2	7	-	-	-	-	-	-	8	2	2	-					
84		1454	28/15xx	g	ms	7-	5o	5	12	10	11	6	2	17	-	-	1	-	-	-	17	1	7	-	5o	5o	5o	4-	4+
	27																								6+	6+	5o	5o	3+
	28																								4o	4+	5o	4+	4o
	Dec.																												
85	01	0231	02/15xx	sc,g	ms	6-	4-	-	-	-	-	-	-	-	-	-	-	-	-	-		2	3	-	5-	6-	5-	4-	3o
86		0336	02/15xx	sc	ms	6-	4-	6	22	22	9	1	3	3	-	-	-	-	-	-	28	4	14	-					
	02																								3o	4-	4-	4-	4-

2.IV-3 (0)

(CONTINUED)

erval 6	7	8	≥Kp	Ap	Kp Interval 1st Kp≥4- Date/Interval	Time Where 3 Consecutive Kp≥4- Day/Interval	D	H	Z	Onset	End	Max. Kp	Obs.	Range of Starting Times	References
3-	2o	2+	22-	13	03/5	03/6	-	-	-	-	-	-		0335 - 0550	
4-	5-	4-	31+	26	05/1	06/8	300	1180	750	05/0700	06/23xx	7	Co	04/2108 - 05/0700	28,33
4+	4-	3-	32-	28			47	477	326	05/04xx	06/21xx	6	Si		
5-	3o	1+	27-	22	15/4	15/7	130	1000	630	15/0800	15/21xx	7	Co	0048 - 0800	28
2+	3+	4-	22+	13			45	281	365	15/0800	15/20xx	6	Si		
3o	3+	3+	27-	20											
3-	1+	2o	20o	11											
3o	4+	4-	27o	20	19/4	20/3	-	-	-	-	-	-			16,28,32,33,36
3-	3+	4-	27o	20											
2o	1o	1+	23+	18	30/3	30/6	71	647	366	30/0410	30/21xx	7	Si		28
5+	6-	6-													37
			41+	53	31/1	02/5	280	1900	1090	31/0300	02/22xx	8	Co	30/0410 - 31/1635	10,16,28,33,37
4-	5+	4o	38o	48			26	134	127	31/02xx	02/13xx	6	Fr		
2+	2+	2-	27-	20			157	1309	861	31/0117	02/21xx	8	Si		
							15	140	48	31/0115	02/15xx	6	Tu		

MAGNETIC STORMS 1957

Consecutive 3hr. - Kp's No. Kp≥5-, At Least One Kp 7+															Ap				Storm No. Table V
2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2			
7-	6+	5-															82	70	5
8+	8+	7o	7-	5+	6+	7-	5o	5+	5+								16	132	14
5-																	77	21	24
																	55	42	28
7+	7-																150	83	40
																	55		42
																	12 56		45
6+	6+	7+	8o	9-	6o	5-											102	135	61
9-	7-	5o	5-														145	112	63
																	160		66
5-	6-	5-	8o	8+	5o	7o	8o	9-	8-	8-	8-	7-	7-	5o	5o	5o	74	104	164 33 67
5-	5+	6-	5o	5o													139	56	70

2.V-4 (2)

Serial No.	Date	Onset	End	Type	Max. Int.	Max. Kp	Average Storm Kp	A	B	C	D	E	X	si	b	bs	bp	bps	pt	pg	4	67	5	50	Three-hour Gr. In 1	2	3	4	5
87	Dec. 03	0335	-	-	m	4-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-					
88		0550	-	-	m	4-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	2o	2+	3+	3+	4-
89	05	0331	06/21xx	sc	m	5-	4o	-	3	4	53	1	3	1	-	-	-	1	-	-	3	1	7	-	4o	4o	4o	3+	3+
	06																								4o	5-	4-	5-	4o
90	15	0048	18/12xx	sc	m	5-	3o	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	3-	3o	3o	4-	5-
	16																								3o	3-	2+	2+	3-
	17																								4-	4+	5-	2+	2o
	18																								3+	3-	2+	3o	3-
91	19	0937	20/23xx	sc	m	5-	3+	16	26	7	3	2	-	11	-	-	-	-	-	-	42	5	37	43	3-	3o	3-	4o	4-
	20																								4-	5-	3o	3o	3o
92	30	0410	30/21xx	sc	m	5-	4-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	3+	3o	4o	5-	4o
93	31	0120	02/15xx	sc,g	ms	6+	5-	-	5	10	44	2	2	1	-	1	-	-	-	-	5	8	3	-	4o	5o	6-	5+	5-
94		0514	02/15xx	g	ms	6+	5-	4	7	19	16	1	4	14	-	-	-	-	-	-	11	1	7	-					
95	Jan 1958	1635	02/15xx	sc	ms	6+	5-	-	5	7	31	10	4	5	1	2	-	-	-	-	5	-	4	-					
	01																								6o	6+	5+	4o	3+
	02																								4+	4+	4o	4o	4-

TABLE V-A MAJOR GEO

Mo.	Day	Onset sc	1st 3hr 5	No 3hrs Intervals	Number of 3 hours with Kp- 7-	7o	7+	8-	8o	8+	9-	9o	8	1	2	3	4	5	6	7	8	1
Jan.	21	1255	21/5	8	1			1		1	1							5-	6-	8-	9-	8+
Mar.	01	1614	01/8	12	1	1				2											5-	6o
	29	1315	29/5	6		1		1										7o	8-	6+	6o	6-
Apr.	17	1136	17/7	3				1												6o	8-	6+
June	30	0528	30/2	10	1		2	1	3	1					6+	5+	8-	8o	8o	8o	8+	7+
July	02	0857	02/4	4					1								5-	8o	6+	6-		
	05	0042	04/8	5			1						5o	5-	7+	6o	6-					
Sept.	02	0314	02/2	15	1	1	1	2	1		1				6o	6+	5+	7o	6o	8-	8-	7-
	04	1300	04/5	9	1				1	3	1	1						8+	9o	8o	8+	8+
	13	0046	13/1	6		1		1		1	2			8-	8+	9-	9-	7o	6o			
	21	1005	21/4	23	5	1	1	3	2	1	1						7+	6o	7-	7-	7-	5-
	29	0016	29/5	10					2	1	1							8o	9-	8+	8o	6+

2.V-40

7 (CONTINUED)

terval 6	7	8	ΣKp	Ap	Kp Interval 1st Kp≥4- Date/Interval	Time Where 3 Consecutive Kp≤4- Day/Interval	D	H	Z	Onset	End	Max. Kp	Obs.	Range of Starting Times	References
9o	8o	8+	47o	145	02/2	07/3	470	2460	1640	04/1300	07/05xx	8	Co		10,16,22,23,28,33,
4o	5+	6o	49-	112			181	884	854	04/1300	07/05xx	9	Fr		34,36,37,42,46,52
							810	91	800	04/1300	-	-	Gr		
							13	340	75	04/1300	07/05xx	7	Ho		
							302	2644	1448	04/1300	07/05xx	9	Si		
							42	391	219	04/1300	06/08xx	8	Tu		
5+	4+	2+	34o	36			19	59	41	06/1121	07/09xx	5	Tu		28,33
2+	2-	2o	20-	11											
2+	1+	3-	15o	7	-	-									
6o	4o	4o	54+	160	13/1	15/3	400	2700	2240	12/2400	15/07xx	8	Co	12/2154 - 13/0046	10,28,22,23,28,32,33,
4-	2+	4+	34-	38			104	1344	626	13/0046	15/06xx	9	Fr		16
2+	3o	3o	22+	14			705	46	240	13/0047	-	-	Gr		34,36,37,42,46,52
							11	460	100	13/0047	14/14xx	9	Ho		
							277	3766	1011	13/0047	15/06xx	9	Si		
							40	471	92	13/0048	15/06xx	8	Tu		
7-	7-	7-	39o	74	21/3	24/6	480	2850	1700	21/0800	25/16xx	8	Co	21/0800 - 21/1005	16,22,23,28,33,34
							154	926	748	21/1005	-	9	Fr		36,37,42
							475	68	650	21/1005	-	-	Gr		
							12	400	85	21/1005	24/14xx	7	Ho		
							330	2606	1516	21/0840	24/21xx	9	Si		
							18	275	80	21/1005	-	7	Tu		
8+	5o	7o	49o	104			-	-	-	22/1345	25/15xx	-	Fr	22/1345 - 23/0236	10,22,23,28,33,34
							40	262	104	22/1345	-	8	Tu		36,42,52
7-	7-	5o	58o	164			-	-	-	23/0226	25/15xx	-	Tu		16,28,33
3o	3+	2o	33-	33											
2-	1o	1+	23+	18											
9-	8+	8o	52-	139	29/1	02/3	750	3310	1660	27/0016	01/06xx	9	Co	0015 - 0017	10,16,22,23,28,33
5o	4o	5-	42-	56			55	444	282	27/0016	01/05xx	7	Fr		34,36,42.52
2+	4+	4-	27+	21			465	67	520	29/0015	-	-	Gr		
							17	240	90	29/0017	01/05xx	6	Ho		
							419	2907	1332	29/0016	01/05xx	9	Si		
							30	288	124	29/0017	01/09xx	7	Tu		
2+	2-	3o	20+	12	03/5	03/8	-	-	-	-	-	-	-		33
5-	4+	3o	25o	19											
3-	3o	3-	22-	12											
3-	3-	3o	19+	10											
0o	0+	0+	4+	2	-	-	-	-	-	-	-	-			
2+	2o	2+	15o	7	10/2	10/4	-	-	-	-	-	-		09/1329 - 14/0440	33
3o	4-	3-	26-	18											
2+	4+	4o	29o	26											
5+	4o	5o	40o	50	13/7	15/1	180	1040	810	14/0400	15/01xx	7	Co		22,28,33,42
3-	3+	2o	20+	12			30	115	128	14/01xx	15/02xx	5	Fr		
							89	873	474	14/01xx	15/01xx	7	Si		
							15	120	46	13/1530	15/03xx	5	Tu		
4o	4-	7-	27+	28	21/6	22/5	20	119	95	21/2241	23/02xx	6	Fr		10,16,22,23,28,32
3+	3-	4-	27-	19			16	105	58	21/2241	-	6	Tu		33,34,36,42,52
2o	4o	4-	25+	20											
3-	6-	6+	19+	24	06/7	07/5	115	740	390	06/1822	07/21xx	5	Co		10,22,23,28,33,36
3-	2+	1o	28-	31			26	182	87	06/1821	07/12xx	5	Fr		42
							205	29	170	06/1821	-	-	Gr		
							7	190	55	06/1821	07/14xx	6	Ho		
							66	373	298	06/1821	07/20xx	6	Si		
							11	203	67	06/1821	07/15xx	5	Tu		
3o	3o	4+	25-	18	08/3	12/7	190	1000	620	08/0700	12/20xx	6	Co	05xx - 0726	33
1o	4-	4+	33-	29			46	334	450	08/05xx	12/00xx	6	Si		
1-	3+	3o	31-	26											
1-	3-	4-	28+	21											
1-	2o	3-	25o	17											
1o	3o	2+	30o	25	18/1	18/7	-	-	-	-	-	-			
1o	3-	2+	21+	12	25/2	28/6	-	-	-	-	-	-			28,33
1o	4o	4-	33-	30											
															10,16,22,28,32,3342,52
'-	7-	6+	43-	64	26/1	28/6									33
o	3+	4o	37+	47			36	178	94	26/14xx	27/12xx	6	Fr	26/0155 - 26/1454	23,28
+	3+	3+	32-	28			145	53	170	indefinite	-	-	Gr		
							-	-	-	26/1454	-	-	Tu		
1-	2+	4o	31-	29	01/1	02/6	170	1020	510	01/0230	02/21xx	6	Co	01xx - 0336	16,22,33,42
o	2o	2o	25-	16			33	325	251	01/0233	01/23xx	5	Si		

TABLE VI. CATALOGUE OF SOLAR-TERRESTRIAL EFFECTS DURING 1957

This table will include short wave radio fadeouts of importance 3 that lasted for 30 minutes or more, as well as S.W.F.'s that occur at the times of the major flares catalogued in Table I. All polar cap absorptions reported in the literature; Geomagnetic storms with a maximum $K_p > 5$; and Forbush decreases.

A brief note of explanation of the Forbush decrease data is necessary. The only published list of Forbush decreases with onset time and other data is given in reference 32. This is limited to large decreases at Mt. Washington. The decreases indicated by a date but no UT starting time are from volume 16 of the Annals of the IGY (Ref. 50). The list of cosmic ray storms (Forbush decreases) given in reference 33 has been used, but only those with a decrease of 2% or greater have been included. The starting time is indicated by the date with the hour. This is at best an approximation based on the ΔT_2 shown on **Figure 1** and given in Table II of of reference 33. The duration in that reference is given in days indicated by the superscript d in column 34 of the catalogue. In general, the flare-Forbush decrease association is taken from reference 33.

The column headings together with any necessary description or definitions follow:

Column 1 Date

Column 2 Major Flare Serial Number from Table 2.I

Column 3 Event Serial Number from Table 2.VIII

FLARE DATA (Columns 4 through 8)

A few minor or sub flares are given when a clear association with an SWF or other terrestrial effect has been made in the literature.

Column 4 Flare Beginning Time

Column 5 Flare End

Column 6 Time of Maximum Intensity

Column 7 Heliographic Position of the Flare

Column 8 Flare Importance

SHORT WAVE FADE (Columns 9 through 13)

Column 9 Onset

Column 10 Importance. S.W.F.'s are given an importance rating on a scale from 1- to 3+, based on the amplitude of the fade, duration of the event, and confidence in the reality of the event.

Column 11 Type (S, SL, or G) the following classifications are used:
S - SWF (S) - sudden drop out and gradual recovery
Slow S - SWF (SL) - drop out takes 5 to 15 minutes and gradual recovery
G - SWF (G) - Gradual disturbance fade irregular in either the drop out or recovery stage

Column 12 Duration in Minutes

Column 13 Wide Spread Index. The degree of confidence in identifying the event by individual stations is combined into an index of certainty that the event is geographically wide spread, ranging from 1 (possible - single station reporting) to 5 (definite - many stations reporting).

SOLAR FLARE EFFECT (Columns 14 through 16)

Preliminary reports of solar flare effects, sometimes referred to as a magnetic crotchet, have been published in the Journal of Geophysical Research, Reference 5. The SFE's recorded in this catalogue are limited to those listed in reference 4. As a "distinctly" SFE or an "unmistakable" SFE (Classes A and B). The list of the reporting observatories is given in Reference 4.

Column 14 Beginning Time

Column 15 Number of Observatories Reporting the Effect

Column 16 Intensity. Strong effects, indicated by the letter "S", are marked by an asterisk in reference 4. Insofar as possible the SFE has been associated in time with a solar flare.

POLAR-CAP ABSORPTION (Columns 17 through 22)

Column 17 Onset Time. If reference 2 is listed in column 22 the starting time has been taken from that source.

Column 18 Rise Time in Hours from Reference 2

Column 19 Duration in Hours

Column 20 Absorption in db on the 30 Mc/s Riometer.

Column 21 Probable Flare - day/beg. If a polar-cap absorption-flare, association is given in the literature the reference is underlined in column 22

Column 22 The Sources Checked during the preparation of this catalogue have been listed.

GEOMAGNETIC STORMS (Columns 23 through 32)

The geomagnetic storms listed in this portion of the catalogue are limited to those with a maximum $K_p > 5$. A few minor storms have been included if one or more investigators associated it with a major flare, or it was preceded by a PCA and/or followed by a Forbush decrease.

Column 23 Onset Time

Column 24 End Time

Column 25 Type, the symbols g (gradual) and sc (sudden commencement) have been used. In a few cases both a g and an sc are indicated. In these cases, three or more magnetic observatories listed the storm with a sudden commencement.

Column 26 Maximum Intensity - the symbols m (moderate K_p as great a 5) ms (moderately severe K_p = 6 or 7) and s (severe K_p = 8 or 9) have been used.

Column 27 Maximum K_p

Column 28 Number of Magnetic Observatories Reporting the Storm as an sc in reference 4 and/or 50.

Column 29 K_p. This is the sum of the 8 three-hour Greenwich day K_p's.

Column 30 Ap from reference 4.

Column 31 Probable Flare day/beginning - An entry in this column is based on one or more flare-storm correlations in one or more of the references listed in column 32.

Column 32 Sources of flare associations

FORBUSH DECREASE (Columns 33 through 37)

Column 33 Onset Time. The day and hour is given if one is published in the literature, otherwise the date only is given.

Column 34 Magnitude of the Decrease in Percent. A number of cosmic ray storms are listed in reference 33. The entries in this portion of the catalogue are limited to decreases of two percent or greater.

Column 35 Duration in Hours, unless designated by the superscript d which indicates a duration in days.

Column 36 Probable Flare (day/hour) - An entry is given if a flare - Forbush decrease association has been found in the literature.

Column 37 Sources, the numbers refer to the references.

			FLARE						SHORTWAVE FADE					SOLAR FLA	
Date	Major Flare Serial No.	Event No.	Beg. UT	End UT	Max. UT	Position		Imp.	Onset	Imp	Type	Dur. (Min.)	W.S. Index	Beg. UT	No. Rep
July															
01															
02	31		0705	0805	-	N09	W30	2+	0709	1	S	17	5		
03	32	92	0712	0830	0745	N14	W40	3+	0729	2+	S	61	5		
			0830	1145	0840	N10	W42	3+	0830	3	S	44	5		
04															
05															
08	35		0521	0802	0538	N14	W41	2+	0536	1+	S	24	5		
15			No Flare reported						2012	3-	SL	138	5		
16			0731	0845	0744	N31	E80	1+	0721	3	SL	59	5		
			1742	2008	1804	S33	W29	2-	1740	3	SL	105	5		
19															
20			No flare reported						1740	3-	S	120	5		
			2358	2500	2426	N29	E18	2	2407	3	SL	60	5		
21	36		0633	0750	0658	N30	E15	2+	0647	3	S	60	5	1334	16
	37	103	1320	1442	1337	N29	E12	3	1335	2+	S	45	5		
22			0607	0727	0625	N29	E02	2+	0618	3-	S	42	5		
24	40	109	1712	1801	1737	S24	W27	3	1727	3	-	113	-		
24			1801	2025	1828				1759	3-	S	81	5		
25															
27															
28															
Aug.															
01			0516	0727	0608	N34	W06	2+							
02			1432	1448	1436	N26	E32	2	1435	2-	S	15	5		
03			1721	1735	1723	N26	E17	1+	1720	2	S	40	5		
04			1612	1639		S27	W48	1							
06															
08	42		1116	1257	1134	N27	W57	2+	1119	2	SL	51	5		
09			0204	0237	0213	N26	W59	1	0153	3-	S	47	5		
			0617	0720	0629	S09	E76	2	0615	3-	SL	35	5		
			1330	1442	1355	S33	W77	1	1340	3	SL	200	5		
10			No flare reported						0100	3	SL	60	5	0128	11
13															
28	45	125	0913	1404	0955	S31	E33	3+	0917	3	S	138	5		
	46	126	2010	2405	2024	S28	E30	3	2020	2+	S	18	5	2018	8
29	47		0545	0715	0555	N24	E35	2+	0542	3-	S	48	5		
	48		1031	1201	1052	S25	E20	3	1039	1+	S	16	4		
30	49		0620	0804	0600	N26	E22	2+	0620	2	S	40	5		
31			0544	0616	0551	N13	E03	2	0544	3	S	76	5		
	51	132	1257	1557	1312	N25	W02	3+	1303	3+	S	184	5		
	52		1338	1455	1352	N12	W02	2+							
Sept.															
01			0204	0224	0210	N13	W08	1+	0204	3	S	51	5		
	53	135	0946	1030	0952	N12	W09	3	0950	2	S	40	5		
02	55		1045	1254	1049	S31	W36	2+	1020	1+	S	20	3		
			1257	1346	1305	N10	W26	2							
	56		1313	1410	1316	S34	W36	3	1259	2-	G	68	5		
03	57		0647	0841	-	N14	W39	3							
	58	142	1412	1727	1429	N23	W30	3	1420	3	S	103	5		
04															
06	59		0751	0900	0803	N23	W66	3	0800	2-	SL	60	5		
07			0810	0845	0823	N16	W90	2	0806	3	S	36	5	0810	27
11	63	148	0236	0722	0300	N13	W02	3	0244	3	SL	100	5		
12	64	150	0703	0740	0713	N09	W15	3	0702	3-	S	32	5		
	65	152	1510	1638	1516	N11	W18	3	1513	2+	S	39	5	1514	32
13			1410	1505	1422	N09	W32	2	1416	3-	S	34	5		
14			0223	0321	0231	N08	E73	2							
			0226	0303	0238	N11	W39	2+	0228	3	S	35	5		
15			0333	0418	0336	N07	E69	2	0327	3	S	83	5		
16	66		1451	1709	1459	N08	E48	2+	1458	1+	SL	22	5		
17	67		0416	0945	0807	N23	E28	2+	0411	2+	S	49	5		
18	68		0624	0720	0633	N23	E13	2+	0630	1+	S	20	5	0630	10
	69	160	1026	1613	1325	N23	E10	3	1030	3	G	104	5		
									1245	3-	SL	95	5		
	70	161	1658	2110	1840	N23	E08	3+	1730	3+	S	43	5		
19	71	162	0350	0555	0410	N23	E02	3+	0359	3	SL	54	5		
	72		0744	1200	0800	N23	E01	2+	0800	2	S	35	5	0803	9
20		165	2117	2222	2123	N07	W14	2	2120	1+	S	21	5		
21			0405	0558	0422	N23	W23	2+	0410	3	SL	32	5		
	74	168	1330	1510	1335	N10	W06	3	1330	3-	SL	60	5		
22		170	1248	1458	-	N08	W37	2+	1252	3-	S	73	5		
23															
25			0842	0916	0845	S26	E45	1	0842	3	S	34	1		

2.VI-1 0

TABLE VI CATALOGUE OF SOLAR-TERRESTRIAL EFFECTS DURING 195

R FLARE EFFECTS			POLAR CAP ABSORPTION									
g.	No. Obs. Reported	Int.	Onset	Rise Time (hrs.)	Dur. (Hrs)	Abs. db 30 Mc S Riometer	Probable Flare	References	Onset	End	Type	Max. Int.
			1500	16	86	4.1	20/1100/3	2,32,34,52,56	Jan.			
									21 0800	23 00xx	sc	s
									21 1255	24 06xx	sc	s
742	13	–										
									29 1313	30 21xx	sc	ms
									Feb.			
									04 0003	06/16xx	sc	ms
314	13	–							04 1100	05 23xx	sc,g	ms
									12 1850	14/09xx	sc	ms
									13 0939	14/04xx	sc	ms
									23/1807	24/14xx	sc	ms
									Mar.			
									01 1614	04 06xx	sc,g	s
									10 0023	10 21xx	sc	ms
									10 0323	-	-	ms
									15 1938	16 24xx	sc,g	ms
									16 1600	16 23xx	g	ms
									26/1050	30/09xx	sc	s
									27 1136	30/09xx	sc	s
									29/0336	30 05xx	sc	s
									29 1315	30 09xx	sc	s
			1330	14	65	3.9	03/0825/3	2,34,56				
			0800	12	66	3.2		2				
									Apr.			
043	29	S							15/2048	16/06xx	sc	ms
									17 1136	20/06xx	sc	s
									18/1508	20/06xx	sc,g	ms
									18/1538	-	-	ms
435	21											
243	27											
810	24											
							18/0810/1+	34,47,52				
			0200		10	1	18/1353/2	26,56				
									May			
									30 0529	01 09xx	sc	ms
									June			
									03 0457	07/03xx	g	ms
			2215	-	105	-	1609/3	52				
			0500	44	115	5.0	0236/2	2,34,56				
			1000				0629/2	26,47,52				
									25 0046	27 01xx	sc	ms
									30 0258	01 22xx	sc	s

GEOMAGNETIC STORMS							FORBUSH DECREASE				
Max. Kp	No. Final Rep Ref. 4 50	Σ Kp	Ap	Probable Flare	References		Onset	Mag. Dec. %	Dur. Hrs.	Probable Flare	References
9-	5	39o	82	20 1100 3			Jan.				
9-	53	39o	82	20 1100 3	34,52		21 1830	17	14h	20 1100	32
6-	53	27-	24								
6o	16	33o	31								
6o	5	35+	39								
6-	43	23o	15								
6+	35	37-	43								
7o	55	30o	32	21 1605 ?	52						
8+	38	21-	16	28 0005 3	52						
7-	-	40-	58								
7-	57	40-	58								
6o	17	18+	11								
6o	-	34o	37								
8-	18	20+	13								
8-	33	36+	44								
8-	60	44o	77								
8-	54	25o	21								
6-	43	22-	18								
8-	61	38o	55	16 1040 3	10,52						
7-	36	35o	42	17 1006 3	10						
7-	35	35o	42								
5+	-	29+	28								
6-	3	32+	33								
7o	59	37o	41	24 0838 3	34,52		June				
							28 xxxx	3	-	-	29
8+	54	55-	150	28 0658 3	10,16,23,28,52						

			FLARE						SHORTWAVE FADE					SOLA
Date	Maj. Flare Serial No.	Event No.	Beg. UT	End UT	Max. UT	Position	Imp.		Onset	Imp.	Type	Dur. (Min.)	W.S. Index	Beg UT
Jan.														
03			0150	0200	-	S21 E81	1		0135	3-	SL	125	5	
04			No flare reported						1516	3-	SL	91	5	
07			No flare reported						1725	3	S	120	5	
08	3		1324	1455	1339	N17 W71	3-		1330	2	SL	70	5	
10			No flare reported						0102	3	SL	98	5	
20	5	9	1100	1417	1119	S30 W18	3		1113	1+	-	13	-	
21														
24	8		0247	0342	0250	N16 W26	3		0240	2	S	(20)	5	
	9	12	1225	1354	1241	N16 W31	3		1235	2	SL	35	5	
25			No flare reported						0320	3-	S	60	4	
	10		0520	0537	0526	S22 W89	3		0528	1	S	20	1	
27			No flare reported						0742	2+	S	44	5	0
29														
31	11	17	0358	0550	0436	N24 E05	3+		0356	1	G	84	1	
Feb.														
04														
10			0819	0830	-	S23 W72	2		0815	2	S	13	2	0
12														
13														
21														
23			1605	2205	1930	N20 W33	?							
28	13	26	0005	0420	0014	N18 W35	3		0020	1+	G	110	4	
Mar														
01														
10														
15														
16														
26														
27														
29	15		1025	1400	1115	S15 W40	3-		1024	3	S	131	2	
Apr.														
02			0255	0515	0339	S16 W45	2		0250	3	G	120	4	
			No flare reported						1915	3	SL	105	5	
03	17	40	0825	1026	0835	S14 W60	3		0833	2	G	35	5	
06														
08	18		0616	0830	0622	S19 W02	3		0612	2	SL	48	3	
11	19	50	1722	1850	1738	S23 E04	3		1731	3	S	64	5	
12			1850	2010	1916	S25 W73	2+		1856	3+	S	89	5	
15			1410	1430	-	N25 E90	2		1354	3	S	126	5	
16	20	54	1040	1300	1105	N30 E85	3		1044	3	S	76	5	1
17			0338	0400	0344	S16 E80	2		0322	3	G	60	3	
	21	55	1006	1118	1022	N29 E76	3		1004	3	S	79	2	
			No flare reported						1937	3+	SL	163	4	
18														
19			0431	0650	0459	N28 E47	2		0430	3	G	100	1	
May														
05			No flare reported						0145	3-	S	45	5	
14			0222	0230	0225	S20 E87	1		0222	3	S	62	5	
14			1426	1441	1426	S12 E33	1+		1435	3	S	27	5	1
16			1228	1301	1246	S10 E07	2		1243	2-	S	27	5	1
18			0810	0939	0813	S11 W15	1+		0808	2	S	42	5	0
			1353	1422	1401	S25 E25	2							
19														
30														
June														
01			2329	2356	2344	S25 W44	2-		2335	3	SL	77	5	
03	22		1040	1202	1047	S18 W18	3		1045	2+	S	20	5	
04			0027	0155	0054	S17 W23	2		0030	3	SL	72	5	
			0859	0950	0902	S18 W27	2		0900	3-	S	30	5	
05			1326	1433	1329	S17 W43	2		1328	3-	S	26	5	
15	23		0730	0840	0743	S18 E62	3-		0735	2	S	30	5	
19	24		0609	0811	0640	S38 E24	3		0615	2-	SL	41	5	
	25	82	1609	1649	1613	N20 E45	2+		1608	3	S	44	5	
22			0236	0257	-	N23 E12	2		0229	2	S	74	5	
			0629	0705	0634	S33 W13	2							
24	27		0838	0929	0850	N22 W14	3		0849	3-	S	28	5	
25														
28	28		0658	0950	0722	N10 E27	3		0708	2-	S	20	5	
30	29		0814	0915	0828	S28 E60	3							
	30		0924	1332	1025	N09 W03	2-							

TABLE VI 1957 (CONTINUED)

RE EFFECTS		POLAR CAP ABSORPTION								
Obs. orted	Int.	Onset	Rise Time (hrs.)	Duration Hrs.	Abs. db 30 Mc/S Riometer	Probable Flare	References	Onset	End	Type	Max. Int.	Max. Kp
								July				
								01/1747	01/24xx	sc,g	ms	7+
								02/0857	03/15xx	sc	s	8o
		03/0845	-	48	6	0712/3+	22,34,56	03/0150	03/15xx	sc	ms	6-
		03/1000	12	52	9.2		2,26,33,45,47,52					
								04/2342	-	-	ms	7+
								05/0042	05/15xx	sc	ms	7+
-												
								22/0419	23/06xx	sc,g	ms	6-
		24/2015	-	27	2	1712/3	22,26,33,45,47,52,56					
		25/0100	-	12	Mod		45					
		28/1500					9					
		28/2100		12	Weak		45					
								03/1557	04/03xx	sc	ms	6+
								06/0508	06/24xx	sc	ms	6-
		09/1245	-	24	2.5	-	64					
		09/1500					24					
		09/1600		50	3.1		2					
		09/2000		69	m		45					
		09/2245		24	2.5	0617/2	26,34					
-								13/0617	13/21xx	sc	ms	6-
		28/0400			Weak		45					
-												
		29/0000		27	3.2	28/2010/2+	2,34,45,56,64	29/1909	30/21xx	g	ms	7-
		29/1300		58	9	29/1031/3	2,22,26,32,33,34,47,52,56	29/1920	30/21xx	sc	ms	7-
								31/1229	01/15xx	sc,g	ms	7o
		1415	12	46	4.9	1257/3	2,26,34,56	31/1414	01/15xx	g	ms	7o
								31/1812	01/15xx	sc,g	ms	7o
								Sept.				
		1700	9	46	7.2	1045/2+	56	02/0314	04/06xx	sc	s	9-
						1313/3	(2),26,(34),47,52					
								03/1233	-	-	s	9-
								04/1300	06/06xx	sc	s	9o
S								06/1120	07/09xx	sc,g	ms	6-
		0200	-	33	m							
S		1200	-	18	1.5		45					
						12/0703/2	22,26,32,33,34,52,56	12/2154	15/06xx	sc	s	9-
								13/0046	15/06xx	sc	s	9-
-												
-												
		1630		48	5	1330/3	34,56	21/1005	22/12xx	sc	ms	7+
		1700	18	63	5.1		2					
		1900	-	-	-		22,26,45,52					
								22/1344	23/00xx	sc	s	9-
								23/0235	25/15xx	sc,g	s	9-

GEOMAGNETIC STORMS						FORBUSH DECREASE				
No. Rep 4	Final Ref. 50	Σ Kp	Ap	Probable Flare	References	Onset	Mag. Dec. %	Duration Hrs.	Probable Flare	Reference
30		43o	83							
57	55	32+	55	30/0924/2+	16,22,28,36	July 02/xxxx	3.2	3d		33
-	-	30o	30			03/xxxx				50
				July						
31	-	15-	12	03/0712/3+	10,16,28,34					
45	24	38-	56	03/0712/3+	22,23,29,52	05/xxxx	4	3d	03/0832	29,33
						19/xxxx	(2.5)	6d	16/1742	33
34	38	29+	26		36					
						27/xxxx	3	3	24/1712	29,33
						Aug.			Aug.	
64	69	26-	27	01 0516/2+	22,23,36	03/xxxx	8	11	02/1432	29,33
54	53	33o	31	04 1612 1	22,23,36	06/xxxx	2	3	03/1721	33
-	-	33o	33							
16	-	22-	28	28/0913 3+	10,16,22,23,28,29,34,36,52	29/2110	12.5	13	28/0913	29,32,33
60	68	22-	28						29/1030	
-	-	30-	36							
-	-	30-	36							
45	40	30-	36	29 0545 2+	34					
				29 1031 3	34					
						Sept.				
62	70	49-	102	31 1357 3+	10,16,22,23,28,29,34,36,52	02/xxxx	4.5	5d	31 1357	29,33
				Sept.						
-	-	54o	135	02 1313 3	23					
60	72	47o	145	02 1257 2	10,22,34	04/xxxx	2.1	4d	02/1313	33
				02 1313 3	28,29,52					
				03 1412/3	16,23,36					
39	40	34o	36							
14	-	15o	7	11 0236 3	10					
59	72	54+	160	12 0236 3	16,22,23,28,29,36,52	13/0330	6.1	3	11/0236	29,32,33
				12 1510 3	34					
64	72	39o	74	18 1658 3+	16,22,23,28,29,36	21 xxxx	6	-	18 1658	29
60	66	49o	104	21 1330 3	16	22/xxxx	(6.6)	-	20/2117	33
45	39	58o	164							

			FLARE						SHORTWAVE FADE					SOLAR FLARE EFFECT		
Date	Serial No.	Event No.	Beg. UT	End UT	Max. UT	Position		Imp.	Onset	Imp.	Type	Dur. (Min.)	W.S. Index	Beg. UT	No. Obs. Reported	Int.
26	75	173	1907	2345	1952	N22	E15	3	1925	2+	S	100	5			
29																
30	76	176	1657	1750	1706	N25	W37	3	1700	3	S	40	5			
Oct.																
08			1049	1135	1100	N42	W23	2	1056	3	S	30	1			
10		180	1630	1731	1648	N25	E38	1+	1607	3	SL	123	5			
13	78	181	0534	0641	0539	N12	E40	2+	0541	1	S	25	1			
14		182														
16	79	185	0152	0202	0152	S25	E21	3	0150	2-	S	20	5			
	80		0413	0500	0425	S26	E20	3	0417	2	SL	30	5			
19	81		0603	0920	0639	S24	W25	3	0620	1+	SL	55	5			
20			No flare reported						0149	3	G	121	1			
			0911	1200	0939	S25	W31	2+	0945	3	S	15	4			
	82	190	1637	1804	1642	S26	W45	3+	1639	3+	S	156	5	1644	12	–
21	83	194	1212	1314	1218	S25	W52	3	1215	2	S	35	5			
22																
23	84		0621	0645	-	S27	W77	3	0620	2	S	32	5			
25			0943	1132	-	N25	W44	1+	0948	3?	S	30	1			
			1855	1928	1900	N26	W50	1	1833	3-	SL	67	5			
Nov.																
02	86		0904	0955	0918	S21	W16	2+	0914	2-	S	26	5			
05	87	206	1205	1257	1207	S24	W54	3	1207	2-	S	14	5			
06	88	208	0834	0900	0841	S28	W67	2+	0833	3-	S	29	5	0838	24	–
08			No flare reported						2328	3-	S	114	1			
10	89		0606	0735	0623	S25	E65	3	0607	1	S	18	5			
13	90		0800	0925	-	N19	W18	3	0834	3?	S	21	3			
15	91	213	0517	0636	0537	N18	W45	3	0527	1-	G	51	3			
20			No flare reported						1000	3	S	50	1			
22		217	0404	0446	0409	N31	W28	2+	0406	3-	S	33	5	0407	6	–
23	92	218	0750	0925	0804	N26	W54	3	0757	2	S	40	5			
24	93	219	0848	1202	0911	S14	E37	3+	0901	3-	S	32	5			
25																
26																
29	94	224	0045	0600	0213	N41	E63	3+								
Dec																
01		226														
12	99	234	1750	1859	1806	N15	W41	2+	1802	1	SL	28	5			
13			No flare reported						0156	3	SL	49	5			
14	100	236	1245	1450	-	N18	E78	3	1233	3	SL	67	5			
16	101		1125	1238	1140	N17	E50	3	1129	1+	SL	33	5			
17			0734	1004	0737	N20	E41	2+	0732	2-	SL	58	5			
18	102		0408	0550	0500	N17	E20	3	0500	1+	G	15	4			
	103		0605	0712	0624	N17	E20	3	0620	2	S	30	5			
19	104	238	0757	1015	0801	N20	E13	2+	0757	3	S	23	5	0800	11	
20			No flare reported						0757	3	S	57	1			
21	105	242	2232	2400	2251	N24	E50	3	2235	3+	SL	65	1			
25		257	1605	1630	1607	N30	E06	1	1628	3	S	39	5			
		258	1812	1900	1822	S07	W70	1+	1815	3	SL	47	5			
28		261	2229	2331	2230	N25	W50	2	2230	2-	S	30	5			
31																

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TABLE VI 1957 (CONTINUED)

POLAR CAP ABSORPTION										
Onset	Rise Time (hrs.)	Dur. (Hrs.)	Abs. db 30 Mc/S Riometer	Probable Flare	References	Onset	End	Type	Max. Int.	Max Kp
26/2100	-	-	Weak		45					
26/2315	-	24	2	1907/3	2,26,33,34,47,52,56					
						29/0016	01/05xx	sc	sc	9
						Oct. 14/0440	15/01xx	sc,g	ms	6+
1300			Weak	0911/2+	26					
2100	22	64	7.8		2,45					
0630		24	5	20/1637/3+	22,26,32,33,34,47,52,56	21/2241	23/02xx	sc,g	ms	7-
0030			Med.		45					
0100					24					
0200	10	46	26		2	Nov. 06/1821	07/12xx	sc	ms	7o
0200			Weak		45					
						26 0155	28 15xx	sc	ms	7-
						26 0513	28 15xx	-	ms	7-
						26 1410	28 15xx	g	ms	7-
						26 1454	28 15xx	g	ms	7-
						Dec. 01 0336	02 15xx	sc	ms	6-
1600			Weak		45					
						19 0938	21 10xx	sc	m	4+
2300			Med.		45	31 0120	02 15xx	sc,g	ms	6+
						31 0514	02 15xx	g	ms	6+
						31/1635	02 15xx	-	ms	6-

EOMAGNETIC STORMS						FORBUSH DECREASE				
No. Rep 4	Final Ref. 50	Σ Kp	Ap	Probable Flare	References	Onset	Mag. Dec. %	Duration Hrs.	Probable Flare	Reference
						26/xxxx				27
61	73	52-	139	26/1907/3	10,16,22,23,28,29,34,36,52	29/xxxx	8	-	26/1907	29,33
26	34	40o	50							
						Oct.				
50	61	27+	28	20/1637/3+	10,16,22,23,29,34,36,52	21/xxxx	10	10	20/1637	29,33
						22/0030	8.2	8	20/1637	32
63	71	19+	24	05/1205/3	10,22,23,28,36					
						Nov.				
						25/xxxx				50
32	33	43-	64	24/0848/3+	10,16,22,23,28,52	26/0200	6.8	20	24/0848	32,33
17	-	43-	64							
8	-	43-	64							
8	-	43-	64							
28	-	31-	29	29/0045/3+	16,22					
						Dec.				
-	-	27o	20			19/1700	9.2	-	17/0734	32,33
						20/xxxx				50
5	-	41+	53							
11	-	41+	53			31/xxxx	2.6	-	28/2229	33
5	-	41+	53							

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TABLE VII. CATALOGUE OF BALLOON FLIGHTS ASSOCIATED WITH MAJOR SOLAR FLARES DURING 1958

A search of the literature reveals only 2 balloon flights during the first six months of 1957. The balloon flight program increased with the start of the IGY in July 1957. A total of 140 flights were reported to the World Data Center A (cosmic rays) and listed in the Annals of the IGY (Ref. 51). 54 of these flights were made in the USSR by A.N. Charakchian or S. N. Vernon Institute of Nucleus Physics Moscow State University; or Dr. Yu. G. Shafer, of the Yakutsk Filial Academy of Sciences. 72 of the flights by scientists of the free world and 34 by the USSR scientists were made within four days after a major solar flare; a polar cap absorption, a spectral emission of Type II (slow drift) or Type IV (broad band continuum). A bibliography of papers published in the scientific literature discussing 1957 balloon flights is given on page 2.VII-iii, and when applicable, referenced on Table VII. A description of the column headings follow:

Column 1 Greenwich Date

Column 2 Flare Serial Number. This refers to the major flare serial number in Table I. Minor flares are those associated with Type II, or Type IV spectral emissions, or Polar-cap absorption, listed in Columns 5, 6, or 7.

Column 3 Beginning Time of the Flare

Column 4 Flare Importance

Column 5 Spectral Observations Type II Beginning Time

Column 6 Spectral Observations Type IV Beginning Time

Column 7 Polar-cap Absorption, Greenwich day/beginning UT

BALLOON DATA (Columns 8 through 17)

Column 8 Balloon Flight Serial Number

Column 9 Launch Date

Column 10 Time the Flight Reached Recording Altitude

Column 11 Time at Altitude, Hours, Minutes.

Column 12 Maximum Altitude. This is given in either kilometers or milibars as reported in reference 51.

Column 13 Name of the Place Where Balloon was launched.

Column 14 Geographical Latitude and Longitude.

Column 15 Instrument Carried. Where:

C = Single Geiger Counter
SC = Scintillations Counter
T = Double Coincidence Counter Telescope
EM = Emulsion Pack
I = Ionization Chamber

Column 16 Group. These have been designated as follows.

Bartol - Bartol Research Foundation, Dr. Martin A. Pomerantz
MSU - Moscow State University
A. N. Charakchian, or S. N. Vernon
Minn. - School of Physics, University of Minnesota
Dr. J. R. Winckler
Yakutsk - Yakutsk Filial Academy of Sciences of USSR
Dr. Yu G. Shafer
Melbourne-Department of Physics, University of Melbourne, Dr. V. D. Hopper
New York -Department of Physics, New York University
Dr. S. A. Korff
CIT - Norman Bridge Laboratory of Physics
California Institute of Technology
Dr. H. V. Neher
UC - Department of Physics, University of California, Berkeley, Dr. Kinsey A. Anderson
Chicago - Ennco Fermi Institute, University of Chicago, Dr. Peter Meyer, Dr. Gordon Lentz
SUI - Department of Physics State, University of Iowa, Dr. J. A. van Allen, Dr. Carl McIlwain

Column 17 Published Balloon Flight Data. References that discuss the data obtained during some of the flights refer to the balloon flight bibliography, page 2.VII-iii. In many cases several of the flights are discussed in the reference. The number in Column 17 is not repeated for the later flights. In general, only large or outstanding changes in the radiation count are discussed.

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TABLE VII 1957 (CONTINUED)

Gr. Day	FLARE Serial No.	FLARE Beg. UT	FLARE Imp.	SPECTRAL Type II Beg. UT	SPECTRAL Type IV Beg. UT	PCA Beg. UT	BALLOON FLIGHTS Flight Serial No.	Launch Gr. Day	Launch UT	Time at Altitude Hr.	Time at Altitude Min.	Altitude Km	Altitude mb	LOCATION Place	Geographic Lat.	Geographic Long.	Instruments Carried	Group	Notes
19	71	0350	3+		0400		59	18	2046	3	00	25		Swarthmore, Pa.	N39.9	W75.4	T	Bartol	
	72	0744	2+				60	21	0040	4	43		10	Minneapolis, Minn.	N44.9	W93.3	C	Minnesota	
21	73	0518	3																
	74	1330	3		1330	1700	61	22	0344	1	22			Minneapolis, Minn.	N44.9	W93.3	C, I, EM	Minnesota	
							62		0542	3	00		10	Minneapolis, Minn.	N44.9	W93.3	C	Minnesota	
							63	23	0559	1	50		10	Minneapolis, Minn.	N44.9	W93.3	C, I, EM	Minnesota	
26	75	1907	3		192"	2315	64	30	0315	8	45		10	Minneapolis, Minn.	N44.9	W93.3	C, I, EM	Minnesota	
30	76	1657	3																
Oct.								Oct.											
							65	01	1523	6	30	27		Swarthmore, Pa.	N39.9	W75.4	T	Bartol	
13	78	0534	2+				66	15	1210	5	00	32		Swarthmore, Pa.	N39.9	W75.4	T	Bartol	
							67	18	0115	3	00	26		Crosby, Minn.			γ-ray, T	Stratolab	Danielson (1960)
16	79	0152	3				68	19	0415	6	00		10	Huron, S.D.	N44.4	W98.2	C, I, EM	Minnesota	
	80	0413	3				69		1230	8	30		3.8	Tyler, Texas	N31.8	W98.4	EM	Minnesota	Freier (1959 a)
19	81	0903	3				70		1240	0	20		10	Brownwood, Texas	N32	W99	C, I, EM	Minnesota	
20	82	1637	3+	1650.9	1638	2100	71	22	1113	9	30	30		Swarthmore, Pa.	N39.9	W75.4	T	Bartol	
21	83	1212	3																
23	84	0621	3				72	27	1301	6	38		10	So. St. Paul, Minn.	N44.9	W93	C, I	Minnesota	
27	85	1300	3				73	29	1207	4	30	32		Swarthmore, Pa.	N39.9	W75.4	T	Bartol	
Nov.								Nov.											
05	87	1205	3		1205		74	06	1339	3	45		10	Minneapolis, Minn.	N44.9	W93.3	I, EM	Minnesota	
06	88	0834	2+				75	07	1550	3	30	28		Swarthmore, Pa.	N39.9	W75.4	T	Bartol	
10	89	0606	3				76	10	-	-	-		10	Huron, S.D.	N44.4	W98.2	I	Minnesota	
							77	12	-	4	00	35		Victoria, Australia	S38	E145	EM	Melbourne	
							78		1600	3	30	32		Swarthmore, Pa.	N39.9	W75.4	T	Bartol	
23	92	0750	3		0750		79	25	1535	4	00	33		Swarthmore, Pa.	N39.9	W75.4	T	Bartol	
24	93	0848	3+		0848		80	26	1004	2	48	28		Dolgoprudnaya, USSR	N55.9	E37.5	C	MSU	
							81		1230	2	30	30		Swarthmore, Pa.	N39.9	W75.4	T	Bartol	
									1543	1	17	22		Dolgoprudnaya, USSR	N55.9	E37.5	C	MSU	
							82												
							83	27	1105	2	49	31		Dolgoprudnaya, USSR	N55.9	E37.5	C	MSU	
							84		1436	4	15	35		Swarthmore, Pa.	N39.9	W75.4	T	Bartol	
							85	28	0701	1	58	20		Murmansk, USSR	N69	E33.1	C	MSU	
29	94	0045	3+	0059			86	29	0700	1	46	13		Murmansk, USSR	N69	E33.1	C	MSU	
							87		1550	0	40		120	Yakutsk, USSR	N62	E129.6	T	Yakutsk	
							88		0703	2	45	28		Dolgoprundaya, USSR	N55.9	E37.5	C	MSU	
Dec.								Dec.											
02	95	1025	2+				89	03	0700	2	30	28		Dolgoprudnaya, USSR	N55.9	E37.5	C	MSU	
03	96	1035	2+				90		0950	0	11		240	Yakutsk, USSR	N62	E129.6	T	Yakutsk	
05	97	0548	3				91		1406	4	45		10	Minneapolis, Minn.	N44.9	W93.3	C, I, EM	Minnesota	
							92	06	0434	0	51		75	Yakutsk, USSR	N62	E129.6	T	Yakutsk	
							93		0700	1	35	16		Murmansk, USSR	N69	E33.1	C	MSU	
							94		0920	1	40	16		Murmansk, USSR.	N69	E33.1	C	MSU	
12	98	0249	3																
	99	1750	2+	1809			95	12	548	0	44		60	Yakutsk, USSR	N62	E129.6	T	Yakutsk	
							96		0700	2	35	19		Dolgoprudnaya, USSR	N55.9	E37.5	C	MSU	
							97		1239		40		220	Yakutsk, USSR	N62	E129.6	T	Yakutsk	
							98	13	0702	2	15	27		Dolgoprudnaya, USSR	N55.9	E37.5	C	MSU	
							99	14	429	0	38		100	Yakutsk, USSR	N62	E129.6	T	Yakutsk	
14	100	1245	3		1238		100	16	0700	2	35	32		Dolgoprudnaya, USSR	N55.9	E37.5	C	MSU	
16	101	1125	3		1135		101	17	0700	2	20	24		Dolgoprudnaya, USSR	N55.9	E37.5	C	MSU	
18	102	0408	3				102	19	0713	2	00	29		Dolgoprudnaya, USSR	N55.9	E37.5	C	MSU	
	103	0605	3				103		0832	7	12		10	Guantanamo, Cuba	N19.9	W75.1	C, I, EM	Minnesota	
	104	0757	2+	0803	0316		104	20	0709	2	00	29		Dolgoprudnaya, USSR	N55.9	E37.5	C	MSU	
21	105	2232	3				105	23	0739	2	10	31		Dolgoprudnaya, USSR	N55.9	E37.5	C	MSU	
							106	24	0700	1	25	10		Dolgoprudnaya, USSR	N55.9	E37.5	C	MSU	

TABLE VII BALLOON FLIGHTS ASSOCIATED WITH MAJOR SOLAR FLARES DURING 1957

FLARE				SPECTRAL		PCA	BALLOON FLIGHTS						LOCATION						
Gr. Day	Serial No.	Beg. UT	Imp	Type II Beg. UT	Type IV Beg. UT	Beg. UT	Flight Serial No.	Launch Gr. Day	Launch UT	Time at Altitude Hr.	Time at Altitude Min.	Altitude Km	Altitude mp	Place	Geographic Lat.	Geographic Long.	Instruments Carried	Group	Notes
Jan.								Feb.											
31	11	0358	3-	0407		1042	1	01						Guam	N04		T, CC	SUI	McDonald (1958, 1959)
June								June											
03	22	1040	3				2	06	0220	21	40	30		Minneapolis, Minn.	N44.9	W93.3	I, C, EM	Minnesota	Winkler (1960)
July								July											
02	31	0705	2-																
29	32	0712	3-		0832	1000	3	03	1029	4	31	31		Dolgoprudnaya, USSR	N55.9	E37.5	C	MSU	Vernon, et. al. (1958, 1959, 1960)
							4	04	0416	5	40		10	Minneapolis, Minn.	N44.9	W93.3	C, I, EM	Minnesota	Winckler (1960)
30	33	1134	3				5	06	0830	4	26	26		Loparskaya, USSR	N68.6	E33.3	C	MSU	
	34	1154	3				6		0220	5	24	28		Loparskaya, USSR	N68.6	E33.3	C	MSU	
26	35	0521	2-				7	08	0557	2	11	25		Loparskaya, USSR	N68.6	E33.3	C	MSU	
							8		0605	2	38	29		Dolgoprudnaya, USSR	N55.9	E37.5	C	MSU	
							9		1210	2	50	27		Dolgoprudnaya, USSR	N55.9	E37.5	C	MSU	
							10	11	0605	3	08	27		Dolgoprudnaya, USSR	N55.9	E37.5	C	MSU	
							11		0605	3	15	23		Loparskaya, USSR	N68.6	E33.3	C	MSU	
							12		0942	4	00	31		Swarthmore, Pa.	N39.9	W75.4	T	Bartol	Pomerantz (1960)
							13		1200	2	36	28		Dolgoprudnaya, USSR	N55.9	E37.5	C	MSU	
							14		1215	1	22	16		Loparskaya, USSR	N68.6	E33.3	C	MSU	
21	36	0633	2-																
	37	1320	3		1321														
22	38	0953	3																
	39	1240	3				15	23	0231	3	00	29		Swarthmore, Pa.	N39.9	W75.4	T	Bartol	Pomerantz (1958)
27	41	0437	2-				16	28	0217	7	30		10	Minneapolis, Minn.	N44.9	W93.3	C, I, EM	Minnesota	Winkler (1960)
Aug.								Aug.											
08	42	1116	2-				17	09	1345	7	45	–	–	Prince Albert, Canada	N53.2	W105.7	SC, EM	Chicago	Meyer (1959)
							18		1450	30			18	Thule, Greenland	N76.5	W68.9	I	CIT	Neher (1958, 1959)
							19	10	0150	3	40		10	Minneapolis, Minn.	N44.9	W93.3	C, I, EM	Minnesota	Winkler (1960)
							20		1428	36			16	Thule, Greenland	N76.5	W68.9	I	CIT	
							21	11	1448	40			30	Thule, Greenland	N76.5	W68.9	I	CIT	
							22	12	1050	2	00		10	Ft. Churchill, Canada	N58.7	W93.8	I, T, C	UC	
							23		1351					Thule, Greenland	N76.5	W68.9	I	CIT	
21	43	0745	3				24	21	1414	8	11	–	-	Prince Albert, Canada	N53.2	W105.7	SC, T, C	Chicago	
							25		1500	4	00	27		Swarthmore, Pa.	N39.9	W75.4	T	Bartol	
23	44	1124	3				26	23	1546	5		30		Swarthmore, Pa.	N39.9	W75.4	T	Bartol	
							27	24	0315	1	40		10	Minneapolis, Minn.	N44.9	W93.3	C, I, EM	Minnesota	
							28		0400	3		28		Swarthmore, Pa.	N39.9	W75.4	T	Bartol	
							29		0132	3	00		10	Ft. Churchill, Canada	N58.7	W93.8	T,C.	UC	
							30		1151	5	25	36		Swarthmore, Pa.	N39.9	W75.4	T	Bartol	
							31		1206	3	03	25		Murmansk, USSR	N69	E33.1	C	MSU	
							32	25	0736	7	00	26		Brownwood, Texas	N32	W99	C, BF_3	New York	
							33		1347	3	30	31		Minneapolis, Minn.	N44.9	W93.3	C, BF_3	New York	
							34	26	1126	3			10	Ft. Churchill, Canada	N58.7	W93.8	T,C.	UC	
							35	27	1221	2	00		10	Ft. Churchill, Canada	N58.7	W93.8	I, T, C	UC	
28	45	0913	3-		0920	0000	36	29	0341	4	00	26		Swarthmore, Pa.	N39.9	W75.4	T	Bartol	
	46	2010	2-	2021.9		0000	37		1130	2			10	Ft. Churchill, Canada	N58.7	W93.8	I, T, C	UC	Anderson (1958, 1964)
29	47	0545	2-				38		1202	3	20	32		Swarthmore, Pa.	N39.9	W75.4	T	Bartol	
	48	1031	3			1300	39		1632	3	30	29		Swarthmore, Pa.	N39.9	W75.4	T	Bartol	
30	49	0620	2-				40	30	1308	7	07			Prince Albert, Canada	N53.2	W105.7	SC, T, C	Chicago	Meyer (1959)
31	50	0521	3		0548	1500	41	31	0212	1	00		10	Ft. Churchill, Canada	N58.7	W93.8	T, C	UC	Anderson (1964)
	51	1257	3-		1301	1500	42		2530	18	30		12	—	N45.1	W93.2	EM	Minnesota	Freier (1959 b)
	52	1338	2-					Sept.											
Sept.							43	01	0126	7	50		10	Minneapolis, Minn.	N44.9	W93.3	I, EM, PC	Minnesota	
01	53	0946	3				44		0606	2			10	Ft. Churchill, Canada	N58.7	W93.8	I, T, C	UC	Anderson (1960)
	54	1225	3				45	02	1104	3	24	30		Swarthmore, Pa.	N39.9	W75.4	T	Bartol	
02	55	1045	2-			1700													
	56	1313	3		1310														
03	57	0647	3																
	58	1412	3		1417		46	04	1104	5	20	23		Swarthmore, Pa.	N39.9	W75.4	T	Bartol	
							47		1559	5	30		10	Minneapolis, Minn.	N44.9	W93.3	I	Minnesota	
							48	05	1306	2	00		10	St. St. Paul, Minn.	N44.9	W93	I, EM	Minnesota	
06	59	0751	3				49	06	1055	4	00		10	Ft. Churchill, Canada	N58.7	W93.8	I, T, C	UC	
							50	07	1121	3	00		10	Ft. Churchill, Canada	N58.7	W93.8	I, T, C	UC	
							51		1145	3	00		10	Ft. Churchill, Canada	N58.7	W93.8	T, C	UC	
							52	10	1829	6	30		10	Minneapolis, Minn.	N44.9	W93.3	I, EM	Minnesota	
09	60	0755	3																
10	61	0223	3																
	62	0702	3																
11	63	0236	3		0244		53	11	-	8	00	37		Prince Albert, Canada	N53.2	W105.7	EM	Chicago	Aizu, et. al. (1959)
							54		2326	2	50	29		Swarthmore, Pa.	N39.9	W75.4	T	Bartol	
							55	12	1104	8	00	30		Swarthmore, Pa.	N39.9	W75.4	T	Bartol	
12	64	0703	3	0712			56	13	0207	4	30		10	Minneapolis, Minn.	N44.9	W93.3	C	Minnesota	Winckler (1958 b)
	65	1510	3	1516	1515	1200	57	14		4	00	27		Weipera, Australia	S31.1	E136.8	EM	Melbourne	
							58		1231	9	00		10	Prince Albert, Canada	N53.2	W105.7	SC, T, C	Chicago	Meyer (1959)
16	66	1451	2-																
17	67	0416	2-																
18	68	0624	2-																
	69	1026	3																
	70	1658	3-			1804													

As in the previous tables, minor flares, small sunspot groups, plages, and the other solar and solar-terrestrial effects associated with any of the major entries are included if an observation is available.

Descriptions or critical comments about many of the events listed in this catalogue are given as footnotes on the appropriate pages.

A major entry, i.e., one qualifying under 1 through 6 above is indicated by an asterisk in the appropriate column. The column headings and explanations, where necessary, are given below:

Column 1 Event number, starting with one at the beginning of each year.

Column 2 Greenwich date of the event.

FLARE DATA (Columns 3 through 8)

These will include all 3 and 3+ flares (reference 9) as well as minor flares, and in some cases - sub-flares that may be associated with a solar or terrestrial event given in subsequent columns of the table:

Column 3 Beginning of the flare UT. If the start of the flare was observed, the beginning time is underlined.

Column 4 End time UT. If the end of the flare was observed, the time is underlined.

Column 5 Time of maximum, UT.

Column 6 Importance - This is the value assigned to the flare in the McMath-Hulbert working list of flares (reference 9).

Column 7 The heliographic position is the arithmetic mean of positions reported in the IAU Bulletin and given in reference 9.

Column 8 Number of observations.

SHORT WAVE RADIO FADEOUTS (Columns 9 through 14)

Sudden ionosphere disturbances may be detected in a number of ways: short wave fadeouts (SWF), enhancement of low frequency atmospherics (SEA), increase in cosmic absorption (SCNA), sudden phase anomalies at VLF (SPA), and sudden signal enhancements at VLF (SES).

The data included in this catalogue are limited to SWF's and includes all outstanding short wave radio fadeouts of importance 3 or 3+ that lasted for 30 minutes or more. In addition minor SWF's that occurred at the time of the flares catalogued in Columns 3 through 8 are included. The following data are given.

TABLE VIII. CHRONOLOGICAL CATALOGUE OF MAJOR SOLAR EVENTS DURING 1957

This table was prepared for publication by Dr. Prince and Miss Hedeman at the Mc-Math-Hulbert Solar Observatory. The entries include the following:

1. All major flares that are listed in the McMath-Hulbert working list of solar flares with importance 3 and 3+.

2. All great short wave fades of importance 3 or 3+ that last for 30 minutes or more.

3. All great 10 cm bursts with a peak flux equal to or greater than 500 units (10^{-22} Wm^{-2} $(c/s)^{-1}$).

4. The most active plages. (Produced 30 or more flares during disk passage.)

5. The greatest sunspots (area $\geq$ 1000 millionth in the Mt. Wilson list).

6. All spectral radio emission of Type II and Type IV. In addition, outstanding bursts of Type I and Type III have been included.

7. Radio emissions at 200 Mc/s at the time of major events.

8. Radio emissions at other frequencies.

9. Polar-cap absorptions.

10. Geomagnetic storms.

The entries in this section of the catalogue will bring together in chronological order many of the entries already given in Tables I through VI. The exceptions are defined below:

(a) The major solar flare requirement for Table I is based on the list of flares reported in the IAU Quarterly Bulletin and includes some of importance 2+ and all flares of importance 3 and 3+. In Table VIII only flares of importance 3 and 3+ listed in the McMath-Hulbert Observatory working list of flares are included.

(b) The Table VIII requirement for "the greatest" sunspots is based on the Mt. Wilson list and only those with an area greater than a 1000 millionth qualify. On the other hand, Table II includes all sunspot groups from the Royal Greenwich Observatory list with a maximum area, during disk passage, equal to or greater than 500 millionth, and all groups with γ , and $\beta\gamma$, Mt. Wilson magnetic classification.

Column 9 Type (S, SL, or G). The following classifications are used:
S-SWF (S): sudden dropout and gradual recovery
Slow S - SWF (SL): dropout takes 5 to 15 minutes and gradual recovery
G-SWF (G): Gradual disturbance: fade irregular in either the dropout or recovery stage.

Column 10 Importance: SWF's are given an importance rating on a scale from 1- to 3+ based on amplitude of the fade, duration of the event, and confidence in the reality of the event.

Column 11 Beginning time UT.

Column 12 Duration in Minutes.

Column 13 Widespread Index. The degree of confidence in identifying the event by the individual stations is combined into an index of certainty that the event is geographically widespread, ranging from 1 (possible - single station) to 5 (definite - many stations).

Column 14 Number of Observations: The column gives the number of observatories reporting the event.

SOLAR RADIO EMISSIONS AT 10 cm (Columns 15 through 19)

Column 15 Type: Two different classifications are used: (1) numerical, on a scale from 1 to 9, used in reference 52 and defined in "Descriptions Test and Index for CRPL-F, Part B. Solar-Geophysical Data," issued November 1962. (2) Alphabetical symbols used in reference 63. These are defined in the introduction of Table IV and illustrated on page 2.IV-iv.

Column 16 Beginning Time UT.

Column 17 Duration in Minutes.

Column 18 Time of Maximum Flux, UT.

Column 19 Peak Flux.

PLAGE DATA (Columns 20 through 28)

The data in this section of Table VIII are taken from the McMath-Hulbert Plage Catalogues. The entries in this table are limited to: plage regions that were the source of 30 or more flares during disk passage, indicated in Column 20 with an asterisk, and/or plage regions associated with flares tabulated in Columns 3 through 8. The column headings, in general, self-explanatory, follow:

Column 20 McMath-Hulbert Plage Number.

Column 21 Greenwich Day of Central Meridian Passage.

Column 22 Mean Longitude.

Column 23 Mean Latitude.

Column 24 Average Intensity - The intensity of calcium plages are estimated on a scale from 1 (faint) to 5 (very bright). The values given in this column are the average intensity during disk passage.

Column 25 Maximum Area - In units of millionth of the area of the solar hemisphere.

Column 26 Number of Flares - This is the total of all flares associated with the plage during disk passage.

Column 27 Age in Rotations - The number 1 indicates that the plage is new.

Column 28 Identification - This is the number of the plage region during the previous rotation. If two or more numbers are given in this column, those plages or parts of them combined to form the tabulated plage.

SUNSPOT DATA (Columns 29 through 35)

This portion of the catalogue is limited to the sunspots in the plage region given in column 20.

Column 29 Mt. Wilson Magnetic Classification from reference 67.

Column 30 Greenwich Day of Central Meridian Passage.

Column 31 Mean Latitude During Disk Passage.

Column 32 Mean Magnetic Field Strength H, in units of 100 gauss from reference 67.

Column 33 When seen: The first number gives the data the sunspot was first seen; the second number is the last date on which the spot was seen.

Column 34 Area (Mt. Wilson).

Column 35 Mt. Wilson Sunspot Numbers, of all spots located in the plage of Column 20.

Column 50 Beginning time UT.

Column 51 Duration in minutes.

Column 52 Time of peak flux.

Column 53 Peak flux.

Column 54 Observatory.

POLAR-CAP ABSORPTION DATA (Columns 55 through 60)

Column 55 Greenwich Day.

Column 56 Onset Time.

Column 57 Time to rise to peak.

Column 58 Duration in hours.

Column 59 Intensity.

Column 60 Observer.

B - Bailey

H - Hakura and Goh

K - Kiruna

L - Leinbach

GEOMAGNETIC STORMS (Columns 61 through 62)

Column 61 Greenwich Day.

Column 62 Beginning of the Storm.

Column 63 Duration of the Storm (h) indicates hours, (d) indicates days.

Column 64 Type

g - gradual

sc- sudden commencement

Column 65 Intensity

m - moderate

ms- moderately severe

s - severe

DYNAMIC SPECTRUM DATA (Columns 36 through 41)

Column 36 Type I Bursts. The following information is given: amount of activity indicated by the Symbols I_S, b, G, g, or s; duration of the burst - beginning time, end time; and the intensity on a scale from 1 (weak) to 3 (strong). The activity symbols are defined as follows:

At 100 Mc/s intensity 1 corresponds to 5 to 40 x 10^{-22} Wm^{-2} $(c/s)^{-1}$, 2 = 40 to 200 x 10^{-22} Wm^{-2} $(c/s)^{-1}$ and $3 \geq$ 200 x 10^{-22} Wm^{-2} $(c/s)^{-1}$

I_S - A noise storm
C - A noise storm with a slowly varying enhancement over a broad spectrum
b - Single bursts
g - Small group (≤ 10) of bursts
G - Large group (≥ 10) of bursts
s - Storm intermittent but apparently connected activity.

Column 37 Type III bursts, activity, duration and intensity.

Column 38 Type II (slow drift) bursts, duration, and intensity.

Column 39 Type IV (broad band continuum) duration and intensity.

Column 40 Observatory

Column 41 Frequency Range

200 Mc/s DATA (Columns 42 through 47)

Column 42 Type alphabetical symbols.

Column 43 Beginning time UT.

Column 44 Duration in minutes.

Column 45 Time of maximum flux.

Column 46 Peak flux.

Column 47 Observatory.

OTHER RADIO DATA (Columns 48 through 54)

Column 48 Frequency Mc/s

Column 49 Type

Event No.	DYNAMIC SPECTRUM DATA						200 MC/S DATA						OTHER RADIO D			
	Type I Time/Max. Int.	Type III Time/Int.	Time II Time/Int.	Type IV Time/Int.	Obs.	Freq. Range	Type	Beg. (UT)	Dur. (Min)	Max. (UT)	Peak Flux	Obs.	Freq. Mc/s	Type	Beg. (UT)	Dur. (Min)
1																
2																
3							CD CA	0054 0100	5 120	0055 0110	>>120 >120	TK TK	9400	CD	0054	15
4													169 81 81	CD M CD	1016 1020 1050	9 13 13
5	I_S in progress all day	g1706/3 g1719/2	*1703- 1712/3+	* 1711- 2000/3	H	580- 100	CD	1703 1711	8 156	- -	>159 >159	C C	460 167	6 6	1703 1706	181 110
6																
7	C1737- 1741/2 I_S 1741- 1810/1	g1739/3 g1740/1 g1741/2	*1734- 1738/3+		H	580- 100	CD	1734 1738	4 57		off-scale -	C C	460 167	CD CD	1733 1734	83 92
8																
9													536 81	CD E	1057 1056	93
10																
11																
12							CD SD	1242 1251	1.5 0.5		130 200	N N	536	CD	1229	58
13																
14		G2318/2	*2328- 2331/3		H,S	145- 100							167	CD	2317	2.4
15			*2348- 2354/3		H,S	135- 100							9400	SD	2335	2.5
16																
17		G0358- 0403/3	*0407 0424/3		S											
18																
19	I_S in progress all day	G1552- 1554/2	*1551- 1555/3+		H	580- 100	CD CD	1552 1604	7 108		>74	C C	460 169	CD	1551 1551	3 4
20		g1540/1	*1546- 1553/3		H	165- 100	CD	1538.5	2			C	167 167	SD SD	1539 1546	2.2 1.9
21																
22																
23																
24	I_S 2003- 2042/2	G1606/2 g1631/2	*2008 2011/2		H	155- 100	SD E	1630 1630	0.5 >270		>80	N C	167 167	CD E	1636 1827	3.5 257
25																
26	I_S 0002- 0014/2 I_S 0032- 0148/1	G0012- 0014/2	*0017- 0020/3+		H,S S	140- 100	CD	0011	40	0030	240	TK	600 460 167	CD CD CD	0001 0001 0001	101 33 29
27			*0036- 0047/3		S											
28																
29																
30																
31																

10 cm. events are reported with the type burst, which was observed over the frequency range 145 - 100 Mc. No observations exist at meter wavelengths at the time of the Type II burst.

15. No known flare, SWF, or 10 cm. bursts are reported at the time of the Type II burst on Jan. 24th at 2348 UT., therefore plage and spot data for this event are not available. The Type II burst covers a frequency range of 135 - 100 Mc, and was observed by both Ft. Davis and Sydney. No observations exist at meter wavelengths. Events No. 14 and No. 15 are so closely related in time, and are so similar, that they undoubtedly are related to each other.

16. This storm is difficult to explain. Except for the events on Jan. 24th, it is not preceded by any major solar activity. It should be noted, perhaps, that this storm occurs 27 days after the storm of Jan. 2nd (Event No. 1).

17. This great flare on Jan. 31st at 0358 UT. occurs in a region which is declining in brightness and in activity. The plage is a return of the region which was described in event No. 2 and which was associated with events Nos. 2, 3, 5, 6, and 7. No distinctive events are reported at any of the single radio frequencies at the time of the flare.

18. Three of the 10 stations start this storm later, with a sudden commencement, Feb. 4th at 00xx UT. Five stations start the storm even later-gradually-on 4th at 11xx UT. The 3-hr. Kp's indicate a rise in geomagnetic activity on Feb. 3rd.

19. The Type II burst on Feb. 8th at 1551 UT. was observed by Ft. Davis over the complete observable frequency range of 580 - 100 Mc. Inverted U bursts were also reported at 1552 UT. At meter wavelengths, the radio event consists of a major burst and a long second part which is made up of bursts and a rise in base level.

20. No known SWF is reported at the time of the Type II burst on Feb. 12th at 1546 UT. The related optical event is only a minor flare near the limb. The Type II burst occurred over the frequency range 165 - 100 Mc, and was preceded by an inverted U burst at 1540 UT. Only minor bursts are reported at the single radio frequencies at the time of the Type II event.

21. Four of the 15 stations that report this storm indicate a second SC on 13th at 0939 UT.

2. VIII - 1R (1)

TABLE VIII.

PLAGE DATA									SUNSPOT DATA						
McM. Plage No.	CMP Gr. Day	Mean Long.	Mean Lat.	Ave. Int.	Max. Area	No. Flares	Age in Rotations	Ident.	MT.W. Type	CMP Gr. Day	Mean Lat.	H	When Seen	Area	MT.W. No.
*3899	Mar. 26.5	262°	S15	3.5	8,500	31	1	NEW	ℓβpℓ	Mar. 26.3	S14	34	19-1		12216
3907	30.5	209°	S18	3	5,200	25	6	3872	dβℓ	29.7	S16	14	28-4		12235
3908	26.5	262°	N28	3	1,800	7	1	NEW	dβℓ	25.9	N27	10	25-31		12225
									dβℓ	26.6	N27	5	27-1		12231
									dαpℓ	26.7	N30	9	31-1		12239
3907															
3907															
*3923	Apr. 12.5	38°	S23	3.5	6,000	41	2	3888	ℓαpℓ	Apr. 12.1	S20	33	5-15		12254
									dβ	12.1	S23	14	6-15		12258
3918	3.5	157°	N14	3	3,000	2	1	NEW	dαℓ	3.9	N15	(10)	6-9		12255
*3923															
3916	07.5	104	S24	3	5,500	24	3,5	3881 and Part of 3884	dβℓ	07.3	S26	12	7-13		12259
									ℓβpd	8.0	S20	14	1-12		12241
*3941	23.0	259°	N28	3	9,000	36	2	3900 and 3908	*ℓβγd	22.9	N28	(20)	19-27		12285
*3941															
*3941															
3944	22.5	266°	S16	3	7,500	23	2	3899	αpℓ	22.1	S12	22	19-28		12283
									dβfℓ	22.9	S12	15	24-28		12292
*3941															

urgence of activity since
ectrum observations are
0250 UT.

6 UT. is associated with
est limb of the sun. The
flare is reported as in
vering. In the dynamic
III bursts are reported
al unclassified activity
r wavelengths, the radio
uperposed on an unusual
e reported at any other
of the SWF at 1915 UT.

40. The plage and spot data for this event are the same as that given for event No. 38. No dynamic spectrum observations are available at the time of the major flare on April 3rd at 0825 UT. There are no outstanding events at centimeter or meter wavelengths from which Type IV radio emission might easily be inferred (except possibly at 9400 Mc). This major flare was followed by PCA (event No. 41) within a period of 5 hours.

43. No flare observations were being made at the time of the Type II burst on April 5th at 0004 UT., therefore plage and spot data for this event are not available. No known SWF is reported, and no 10 cm. observations were being made, at the time of the Type II burst. No distinctive event is reported at meter wavelengths, although a major burst at 169 Mc evidently occurred 10 minutes earlier than the start of the Type II burst.

45. This event does not fulfill any of the criteria for inclusion in this catalogue as a "major" solar event. It is given here, however, as a possible predecessor of the next PCA event (No. 46). The plage and spot data are the same as that given for event No. 38. No dynamic spectrum observations exist at the time of the SWF on April 5th at 1408 UT. The associated flare data is incomplete, but is related to activity observed in progress in an active region at the west limb. (See note No. 38.) No distinctive event is reported at meter wavelengths at the time of the SWF.

46. This PCA event follows, in time, immediately after the end

2.VIII - 2L
(2)

Column 66 Number of stations reporting the storm.

Column 67 Maximum K_p during the storm.

TABLE VIII CHRONOLOGICAL CATALOGUE

Event No.	Gr. Day	FLARE DATA Beg. (UT)	End (UT)	Max. (UT)	Imp.	Position	No. of Obs.	SHORT-WAVE RADIO FADEOUTS Type	Imp.	Beg. (UT)	Dur. (Min)	Wide Spread Index	No. of Obs.	10 CM. EVENTS Type	Beg. (UT)	Dur. (Min)	Max. (UT)	Peak Flux
1	Jan. 02																	
2	02																	
3	05	0116	0200	0116	2	N17 W31	1(1c)	SL	2+	0050	63	5	2	*CD	0050	58	0056	501
4	06	*1038	1404	1128	3	S21 E40	6(3c)											
5	06	1822			1-	N16 W53	1(1c)	*S	3	1702	53	5	9	*2	1701.5	10	1703.5	700
6	06	1822			1-	N16 W53	1(1c)	G	1	1802	63	-	Mc	*2	1758	92	1827	585
7	07	1830	1840		2+	N20 W65	1(1c)	*S	3	1725	120	5	8	3	1729	180	1910	32
														6	1729.3	15	1737.5	212
														1	1745.5	3	1746.5	17
														1	1752	1.5	1752.5	8
8	08																	
9	20	*1100	1417	1119	3	S30 W18	5(1c)	S	1+	1113	13	-	-	-	1100	24	-	184
10	20																	
11	21																	
12	24	*1225	1354	1241	3	N16 W31	4(3c)	SL	2	1235	35	5	6	-	1233	12	-	250
13	24	1638	1653		2	S27 W80	2(2c)	S	2+	1638	27	5	4	*2	1637	10	1638.8	1000
														4	1647	120		25
14	24																	
15	28																	
16	29																	
17	31	*0358	0550	0436	3+	N24 E05	1(1c)	G	1	0356	84	1	1	CD	0359	>120	0435	234
18	Feb. 03																	
19	08	1550	1615	1555	2	S28 E38	2(2c)	S	2	1552	10	5	6	*2	1550	6	1551	865
														4	1556	5		7
20	12	1542	1620		1-	N19 E80								1	1540	2	1540.5	6
21	12																	
22	18																	
23	21																	
24	21	*1605	2205	1930	3+	N20 W33	1(1c)							3	1750	240	1915	19
25	23																	
26	28	*0005	0420	0014	3	N18 W35	2	G	1+	0020	110	4	2	CD	0000	>50	0045	224
27	Mar. 01							G	1-	0040	70	1	1	CD	0038	>9	0044	220
28	01																	
29	10																	
30	15																	
31	21																	

2. This large, bright and active plage (3808) is responsible for 5 major events in this catalogue, none of which are accompanied by any known PCA events, or are followed by any major magnetic disturbances.

3. The plage and spot data for this event are the same as that given for event No. 2. No dynamic spectrum observations exist at the time of the large 10 cm. burst on Jan. 5th at 0050 UT. A major burst with a very long-enduring second part is reported at meter wavelengths.

4. No known SWF or 10 cm. events are reported at the time of the large flare on Jan. 6th at 1038 UT. The plage is extremely large, and very bright, and contains numerous other small spots in addition to the three spots which are listed in the spot data. The βp spot No. 12068 is a return of the βf spot No. 12016 in Region 3788. No dynamic spectrum observations exist at the time of the flare. No distinctive event is reported at meter wavelengths (200 Mc) and only modest bursts are reported at the very low frequencies.

5. This is a very great solar event, for which we have very incomplete information with respect to the optical flare. The strong Type II and Type IV bursts reported by Ft. Davis on Jan. 6th at 1703 UT. cover the entire observable range of frequencies from 580 - 100 Mc. These events are superposed on a background of a moderate noise storm which is in progress throughout the day. At meter wavelengths the radio event consists of a major burst followed by a large rise in base level which continues for more than two and one-half hours.

6. This large 10 cm. burst on Jan perhaps be coupled with event N taken together seem to be relat sun. The strong Type IV radio er part" of the 200 Mc burst, and tr frequencies, related to event N the start of the 10 cm. burst.

7. This major SWF on Jan. 7th at 17 great Type II burst which covers of 580 - 100 Mc observable by which was undoubtedly related t progress about one hour later, still in progress. At meter wav sists of a major (off-scale) bur base level. Note that the 10 cm

2 VIII - 10 (-7)

OF MAJOR SOLAR EVENTS FOR 1957

PLAGE DATA									SUNSPOT DATA						
McM Plage No.	CMP Gr. Day	Mean Long.	Mean Lat.	Aver. Int.	Max. Area	No. Flares	Age in Rotations	Ident.	MT.W. Type	CMP Gr. Day	Mean Lat.	H	When Seen	Area	MT.W. No.
3808	Jan. 02.5	275°	N20	3.5	5,000	28	1	NEW	* $\beta\gamma$	Jan. 03.0	N18	35	27-8		12054
3808															
3813	09.5	183°	S22	3.5	19,000	27	3	3788	βp dβ βp	08.1 09.3 09.4	S15 S16 S23	15 15 13	1-9 6-15 2-14		12066 12075 12068
3808															
3808															
3808															
*3820	19.0	58°	S28	3	9,000	36	2	3794 and 3797	αp	18.8	S27	29	14-25		12085
*3823	23.0	5°	N20	3.5	16,000	37	3	3801	αp β	22.1 22.7	N17 N11	34 (20)	15-25 16-25		12089 12093
*3820															
3830	30	273°	N20	3	8,500	6	2	3808	dαp dxd	31.0 31.1	N16 N16	10 10	31-5 31-5		12114 12113
3844	Feb. 10.5	122°	S26	3.5	7,000	9	1	NEW	βp	Feb. 10.9	S26	35	4-16		12124
3856	19.0	10°	N15	2.5	2,800	4	4	Part of 3823	dβp	19.1	N09	20	19-25		12140
3856															
3863	25.0	291°	N18	3	3,500	4	3	3830	dβp	25.3	N14	27	22-27		12154

6th at 1758 UT., should
5, since the two events
to a single event on the
ission, the great "second
large bursts at the lower
2, are all in progress at

UT. is accompanied by a
e entire frequency range
t. Davis. A major flare,
is event, was observed in
while the large SWF was
gths the radio event con-
llowed by a large rise in
sts are superposed on a

very long-enduring rise and fall in flux.

8. This storm, which begins on Jan. 8th, subsides and then has a second start on Jan. 9th at 1200 UT. The maximum value of the 3-hour Kp's is reached on the 10th.

9. No dynamic spectrum observations, and no observations at meter wavelengths exist at the time of the major flare on Jan. 20th at 1100 UT. The αp spot No. 12085 is a return of the βt spot No. 12048 in region 3794. In addition to this spot, five other small spots of an ephemeral nature are also present in the plage.

11. This very severe storm is one of the rather rare storms for which the 3-hour Kp value reaches a value of 9. Only 37 such storms have been reported in the interval 1932-1961.

12. No dynamic spectrum observations exist at the time of the major flare on Jan. 24th at 1225 UT. Only monor bursts are reported at meter wavelengths. The flare occurred in a very large, very bright and active plage. The αp spot No. 12089 is a return of the βp spot No. 12040 in region 3801.

13. The plage and spot data for this event are the same as that given for event No. 9. The large 10 cm. event on Jan. 24th at 1637 UT. consists of a large burst followed by a long post-burst increase. No dynamic spectrum events, and no distinctive events at any of the other single radio frequencies, are reported at the time of the 10 cm. burst.

14. No flare observations were being made at the time of the Type II burst on Jan. 24th at 2328 UT., therefore plage and spot data for this event are not available. No known SWF or

2. VIII - 1L (2)

Event No.	Gr. Day	FLARE DATA							SHORT-WAVE RADIO FADEOUTS						10 CM. EVENTS				
		Beg. UT	End UT	Max. UT	Imp.	Position		No. of Obs.	Type	Imp.	Beg. UT	Dur. Min.	Wide Spread Index	No. of Obs.	Type	Beg. UT	Dur. Min.	Max. UT	Peak Flux
32	Mar. 25																		
33	26																		
34	26																		
35	28																		
36	29																		
37	31																		
38	Apr. 02	0255	0444		2	S16	W46	3/1c	*G	3	0250	120	4	6	*CD	0301	60	0336	800
39	02	1959	2120		1	N25	W90	1/1c	*SL	3	1915	105	5	10	2	1914	38	1923	247
															2	1955	23	1959	176
															4	2018	35		14
40	03	*0825	1026	0835	3	S14	W60	2	G	2	0833	35	5	7	CD	0827	65	-	-
41	03																		
42	03																		
43	05																		
44	05																		
45	05	1433	1446		1	S15	W90	1	SL	2	1408	32	5	2	6	1407	12	1411.5	50
															4	1419	15		6
46	06																		
47	08	0342	0359		1+	S22	E50	2(1c)	S	1	0338	17	1	2	CD	0341	5.2	0342	440
48	09																		
49	09	0510	0522		1-	N13	W70	1											
50	11	1722	1850	1738	2+	S23	E05	2(2c)	*S	3	1731	64	5	8	3	1725	75		16
															6	1729.5	16	1733	135
51	12	1850	2010	1920	2	S25	W73	3(3c)	*S	3+	1856	89	5	10	*2	1855.5	23	1900.5	525
															4	1918.5	60		20
52	15	1410	1430		2	N25	E90	1(1c)	*S	3	1354	124	5	13	2	1351	19	1354	160
53	15																		
54	16	*1040	1300	1105	3	N30	E85	10(3c)	*S	3	1044	76	5	10	*GB	1040	54	1046	1650
																		1049	1650
															4	1134	110		15
55	17	*1006	1118	1022	3	N29	E76	6(1c)	*S	3	1004	79	2	6	CD	1006	4		
															SD	1013	1.3		
56	17																		
57	17	1851			1-	S18	E73	1(1c)	S	2+	1843	27	4	8	3	1840	270		90
															2	1844	5	1845	5
															1	1850	2	1851	
58	17	*2000	2300	2116	3+	N20	E69	2(2c)	*SL	3+	1937	163	4	8	*GB	2006	79	2042	6000

32. This SC on March 25th at 0129 UT, was preceded by an earlier phase change on the 24th at 2115 UT.

33. No known flare is reported at the time of the Type II burst on March 26th at 0412 UT., therefore plage and spot data for this event are not available. No SWF and no 10 cm. events are reported at the time of the Type II burst, and no observations were being made at meter wavelengths at that time. No events were reported at any other single radio frequencies.

34. Seven of the 12 stations which report this Sc storm start the storm later, on the 27th at 1136 UT.

35. This event appears in this catalogue only because it represents the central meridian passage of a large, bright, and active plage which had more than 30 flares during its transit across the disk. However, the activity was not of the type necessary to produce any great solar optical and radio events such as those listed in this catalogue.

37. The 3-hour Kp values indicate that this is only a very minor magnetic disturbance. It was reported as a storm by only two stations, both of which are located in the antarctic polar region.

38. This major SWF on Apr. 2nd at 0250 UT, is accompanied by a large 10 cm. burst and is associated with flare activity in a very long-lived region in its 6th rotation. However, although plage 3907 is a return of plage 3872, its characteristics indicate that there has been a its last appearance. No dynamic available at the time of the SWF

39. This major SWF on April 2nd at flare activity in a region at th flare data is incomplete, but progress while the SWF is r spectrum, only a few small T by Ft. Davis, along with add between 1917 - 1925 UT. At n event consists of a major burs rise in base level. No events single radio frequencies at the

2. VIII - 2c

ATA			POLAR CAP ABSORPTION						GEOMAGNETIC STORMS						
Max. (UT)	Peak Flux	Obs.	Gr. Day	Onset UT	Rise to Peak	Dur.	Peak Int.	Obs.	Gr. Day	Beg. UT	Dur.	Type	Int.	No. Sta. Rep.	Max. Kp
									Jan. 02	0909	1.3d	Sc	m	11	5
	(255)	NAG													
	>70	UC													
	>15	CAV													
	>20	CAV													
1703-06	>1300	NBS													
1706-09	>6300	NBS													
1738	>1300	NBS													
1736	>5600	NBS													
									08	01--	3.5d	g	m	8	5
	>280	PRA													
		CAV	Jan. 20	1500	16^h	86	33	B							
									21	1256	4d	Sc	S	19	9
	235	PRA													
	980	NBS													
	109	NAG													
									29	1313	2d	Sc	m	12	6
									Feb. 03	15--	3d	g	m	10	6
1552	>1400	NBS													
	>100	UC													
1540	240	NBS													
1547	510	NBS													
									12	1850	2d	Sc	ms	15	6
									18	1834	1.5d	g	ms	1	5
									21	02--	2.5d	g	m	10	5
1637	490	NBS													
2100	460	NBS													
									23	1807	1.5d	Sc	ms	15	7
	>100	SYD													
	>900	NBS													
0004.5	640	NBS													
									Mar. 01	1610	3d	Sc?	ms?	18	8
									10	0023	1.3d	Sc	ms	16	7
									15	19--	1.5d	g	m	7	6
									21	12--	2.5d	g	m	4	5

24. No known SWF is reported at the time of this major flare and Type II burst at 1609 and 2008 UT. Although it occurs late in the lifetime of the flare, it seems likely that the Type II burst is related to some form of activity during this major and long-enduring solar event. The Type II burst covers a frequency range of 155 - 100 Mc. Note the small but very long-enduring rise and fall in flux reported at 10 Cm., and the minor burst followed by a long-enduring noise storm at 169 Mc. In the dynamic spectrum there was also reported an inverted U burst at the start of the flare at 1606 UT.

26. This major flare on Feb. 28th at 0005 UT. occurs in a region which is a return of the plage described in note No. 17. The Type II burst which occurs after flare maximum was observed by Ft. Davis over the frequency range 140 - 100 Mc.

27. No known flare is reported at the time of the Type II burst on March 1st at 0036 UT., therefore plage and spot data for this event are not available. No observations were being made at meter wavelengths at the time of the Type II burst, and no distinctive events were reported at any other single radio frequencies.

28. This major storn is difficult to classify. Nine of the 18 stations start the storm gradually, the other nine start the storm with a sudden commencement. Seven stations rate the storm as severe, and 11 as a moderately severe storm.

29. It is difficult to find any major solar event to account for this storm.

2. VIII-1R (2)

Event No.	DYNAMIC SPECTRUM DATA: Type I Time/Max. Int.	Type III Time/Int.	Type II Time/Int.	Type IV Time/Int.	Obs.	Freq. Range	200 MC/S DATA: Type	Beg. UT	Dur. Min.	Max. UT	Peak Flux	Obs.	OT: Freq. Mc/s	Type	Beg. UT
32															
33		g0421/3 g0438/3	*0412- 0416/3		S										
34															
35															
36															
37															
38							CA	0250	40	0303	630	TK	9400	CD	0302
39	C1955- 1958/3	b1921/1 b1926/1 g1932/1 b1935/1			H		M CD CD	1903 1912 1954	27 10 3		 >159 >159	C C C			
40							CD	0826	70		>10	N	9400 1500 545	CD CD CD	0828 0829 0830
41															
42															
43			*0004- 0013/1		S								167	CD	2354
44															
45													9400 1500	SD CD	1405 1410
46															
47	I_s 0352- 0440/2	G0341- 0343/3	*0347- 0353/1		S		CD	0341	1.5	0342	360	TK	9400 1000	CD CD	0342 0341
48															
49	I_s 0312- 0634/2 g0544/3	g0530/2 b0534/1	*0532- 0544/2		S										
50	I_s in progress all day	G1733- 1734/2 g1736- 1737/1 b1742/1 b1744/1			H		M CD	1727 1733	18 12	 1738		C C	460 167	M CD	1717 1726
51	C1858- 1902/2 I_s in progress all day	G1858- 1902/2 b1913/1 g1914/1	*1905- 1916/3		H	200- 100	CD	1857.5	18			C	460 167	CD CD	1858 1858
52		g1402/1	*1401- 1407/3		H	200- 100	CD	1358	12		1500	N,C	9400 1500 536 167	 CD CD CD	1351 1353 1346 1359
53															
54							CD	1047	16		800	N	9400 600 545	CD CD CD	1038 1044 1046
55													9400	CD	1000
56															
57	C1845/2	G1842- 1845/3 g1855/1	*1846- 1852/3		H	230- 100	CD	1842	9		>75	C	460	SD	1847
58	 C2011- 2055/1 I_s 2036- 2228/2	 b2020/1 b2022/1 G2027- 2034/3	*2032- 2039/3	* 2011- 2055/2	H	180- 100	 CD	2018 2026	97 4	2047 2028	>159 >75	C C	460	CD	2014

of event No. 41. It is difficult to find any outstanding or definite solar event as the source of the PCA. Event No. 45 is offered only as a suggestion - and a rather poor one, at that. It is a limb flare in the same region that caused the earlier PCA event on April 3rd (event No. 41).

47. The αp spot No. 12254 in region 3923 is a return of the βp spot No. 12191 in region 3888.

48. Six of the 13 stations start this gradual storm later, on April 9th at 22xx UT.

49. Only incomplete flare data is available at the time of the Type II burst on April 9th at 0532 UT. Minor flare activity occurred in a region near the west limb. No known SWF or 10 cm. events are reported at the time of the Type II burst. No observations exist at meter wavelengths, and no distinctive events are reported at any other single radio frequencies.

50. The plage and spot data for this event are the same as that given for event No. 47. Note that the modest 10 cm. burst is superposed on a long rise and fall in flux, and at meter wavelengths and radio event follows a similar pattern.

51. This great SWF and large 10 cm. burst on April 12th at 1856 UT. are associated with flare activity in a region near the west limb. The Type II burst at 1905 UT. was observed by Ft. Davis over the frequency range 200 - 100 Mc. At meter wavelengths, the radio event consists of a major + burst, and a similar type of event is reported at even lower single frequencies.

52. This major SWF and Type II burst on April 15th and 1401 UT. are associated with flare activity at the east limb. The large, bright and active pl a $\beta\gamma$ spot No. 12285, which is possibly a return No. 12225 in plage 3908 (event No. 39). The was observed by Ft. Davis over the frequency 100 Mc. At meter wavelengths, the radio even a very great burst (without a second part), ar reported at other single radio frequencies in similar type of burst occurred throughout the of radio observations.

54. This is a very great solar event. The plage and s the same as that given for event No. 52. The g April 16th at 1040 UT. was an elevated limb fl followed by an extensive system of bright loo

2 VIII -2R
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TABLE VIII.

PLAGE DATA								SUNSPOT DATA						
CMP Gr. Day	Mean Long.	Mean Lat.	Ave. Int.	Max. Area	No. Flares	Age in Rotations	Ident.	MT.W. Type	CMP Gr. Day	Mean Lat.	H	When Seen	Area	MT.W. No.
May 03.5	120°	S25	3	2,500	12	1	NEW	dρρl	May 3.8	S26	18	2-9		12315
11.0	21°	S28	3.5	10,000	42	2	4939	*lβγl	10.9	S27	23	3-17	1300	12318
20.0	262°	S20	3	11,000	24	3	3944	dρρl	19.0	S18	(15)	20-24		12348
								lβl	20.1	S24	17	15-25		12337
11.5	28°	N13	3.5	10,000	41	2	3932	*lβγl	11.5	N12	30	5-17	>1000	12324
26.5	176°	S10	3	6,500	16	2,5	3956 and 3957	lαρl	26.3	S11	15	20-31		12350
25.0	196°	N18	3	6,000	35	2	3966	dβρd	24.7	N15	18	19-29		12347
								dβl	25.0	N23	13	24-31		12356
29.5	136°	S24	2.5	4,000	8	1	NEW	*lγl	29.8	S24	15	24-4		12357
June 01.5	97°	S22	3	5,500	36	1	NEW	lαρl	June 01.7	S25	23	26-8		12360
								*dβγl	02.3	S17	13	30-8		12368
05.0	50°	S18	3	5,200	29	4	3967	lβρl	04.4	S17	30	29-10		12365
								dβρl	04.5	S25	8	4-10		12377
14.5	285°	N30	3.5	11,000	17	1	NEW	*lβγl	14.7	N32	23	7-20		12387
22.5	179°	N18	3.5	9,000	64	2	3989 and 3991	lαρl	21.8	N18	26	15-27		12415
								*lβγl	22.5	N18	39	15-29	1100	12417
21.0	199°	S35	3.5	7,000	53	2	3986	lβl	20.9	S38	27	14-28	1200	12409

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- area equal
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ly is a return

of the x spot No. 12281 in region 3932. The Type II burst was observed by Ft. Davis over the frequency range 200 - 100 Mc. No distinctive events are reported at meter wavelengths or at any of the other single radio frequencies, at the time of the Type II burst.

68. No known flare, SWF, or 10 cm. events are reported at the time of the Type II Burst on May 19th at 0008 UT., therefore plage and spot data are not available. The Type II burst was observed by Ft. Davis over a frequency range 250 - 170 Mc. At the single radio frequencies, the only event reported is a large burst at meter wavelengths at the time of the Type II burst.

69. This PCA event on May 19th at 0200 UT., reported by Leinbach from riometer observations, is not confirmed by Bailey. The only antecedent, in the form of distinctive solar activity, that can be found to precede this PCA event is the Type II burst described in No. 68 above, without any known flare or SWF.

70. The Type II burst on May 21st at 1915 UT. is associated with small flare activity in a large, bright plage near the east limb. The Type II burst was observed by Ft. Davis over the frequency range 165 - 100 Mc. At meter wavelengths the radio event consists of a very minor burst superposed on a rise and fall in flux. No distinctive events are reported at any of the other single radio frequencies.

71. This active region is similar to the plage described in Note No. 35.

2. VIII - 3 c (2)

Event No.	Gr. Day	FLARE DATA Beg. UT	End UT	Max. UT	Imp.	Position	No. of Obs.	SHORT-WAVE RADIO FADEOUTS Type	Imp.	Beg. UT	Dur. Min.	Wide Spread Index	No. of Obs.	10 CM. EVENTS Type	Beg. UT	Dur. Min.	Max. UT	Peak Flux	McM. Plage No.
59	Apr. 18	1310	1353	1323	2	S16 E64	4(1c)	S	2+	1304	36	5	12	2 4	1304.5 1311.5	7 13	1306.8	385 16	3944
60	21																		
61	24																		
62	26																		
63	May 08																		
64	09	2325	2338		1-	S22 W90	1(1c)	S	1	2327	10	5	3	2	2327	3	2328	22	3969
65	11																		*3972
66	14	0222	0230	0225	1	S20 E87	1(1c)	*S	3	0222	62	5	3	CD	0223	4	0224	273	3980
67	14	1840	1850		1	N09 W50	1(1c)	S	1+	1838	25	5	7	2 4	1837.5 1847.5	10 30	1838.5	410 16	*3974
68	19																		
69	19																		
70	21	1900	1935	1908	1	S12 E63	1(1c)	SL	2	1858	54	5	6						3990
71	25																		*3987
72	26																		
73	30																		
74	June 01	2329	2356	2344	2-	S25 W44	1(1c)	*SL	3	2335	77	5	3	3 6	2330 2338.5	30 6	2341.5	10 98	3993
75	03																		
76	04	0029	0155	0054	2	S17 W22	2(1c)	*SL	3	0030	72	5	3	CD	0040	38	0045	280	*3996
77	04	0859	0950	0902	2	S17 W27	4(2c)	S	3-	0900	30	5	7	SD *SD SD SD	0859 0917 0928 0934	10 11 4 30		350 610 66 52	3996
78	05	1326	1433	1330	2	S18 W44	8(4c)	S	3-	1328	26	5	12	*2 4	1326.5 1334.5	8 70	1328	725 9	3996
79	06	1130	1148	1133	1	S14 W27	5(1c)							*6 4	1129 1130.5	1.5 4	1129.8	525 8	3997
80	14																		4011
81	17																		
82	19	1609	1649	1613	2	N20 E45	4(2c)	*S	3	1608	44	5	14	3 *6 4	1445 1608.8 1618.8	330 10 50	1610.2	15 2325 24	*4024
83	20																		
84	21																		*4021

59. The plage and spot data for this event are the same as that given for event No. 57. The Type II burst on April 18th at 1304 UT. was observed by Ft. Davis over the frequency range 220 - 100 Mc.

60. This brief and minor magnetic disturbance was reported as a storm by only three stations - all of which were located in the north and south polar and auroral zones.

61. This storm was reported as a storm by only one station - APIA. However, the 3-hour Kp values indicate a real period of storminess during this interval.

62. The weak interval of storminess - covering events No. 60, 61, and 62 - between April 24-27, follows the more disturbed period between March 27-30 by an interval of approximately one solar rotation, or 27 days.

64. The Type II burst on May 9th at 2329 UT. is associated with minor flare activity in a region near the west limb of the sun. The region is a new plage that formed on the disk in the east on May 1. The Type II burst was observed by Ft. Davis over a frequency range of 300 - 100 Mc. No observations exist at meter wavelengths at the time of the burst, and only minor bursts are reported at the higher single radio frequencies.

65. This is an interesting example of a very large and very bright plage, with a spot of very large area, which produces numerous flares but no great solar or terrestrial effects in the form of large flares, large radio bursts, large SWF's, PCA, or magnetic storms. The No. 12318 is one of the largest spots of the to 1300 millionths of the hemisphere

66. The large SWF on May 14th at 0222 UT. small flare activity in a region at the ea No dynamic spectrum observations, and meter wavelengths, exist at the time of th

67. The Type II burst on May 14th at 1841 UT. small flare activity in a very large, ver active plage (3974). This region is ve haviour to plage 3972 described in note complex $\beta\gamma$ spot No. 12324 region 3974 largest spots of the year - area equal t of the hemisphere (Mt. Wilson data) and p

2.VIII-31 (1)

ER RADIO DATA				POLAR CAP ABSORPTION						GEOMAGNETIC STORMS						
Dur. Min.	Max. UT	Peak Flux	Obs.	Gr. Day	Onset UT	Rise to Peak	Dur.	Peak Int.	Obs.	Gr. Day	Beg. UT	Dur.	Type	Int.	No. Sta. Rep.	Max. Kp
										Mar. 25	0129	1d	Sc	m	8	6
										26	1050	2.3d	Sc	ms	12	7
										29	0337	1.2d	Sc	ms	15	8
										31	16--	1.5d	g	m	2	4
48		(240)	NG													
257		(632)	HHI													
38		(383)	HHI													
60		1600	N													
				Apr. 03	1330	14h	65	31	B							
										Apr. 03	16--	0.5d	g	m	2	5
14	2359	350	NBS													
										05	10--	1.2d	g	ms	6	6
12		(298)	HHI													
10		(126)	HHI													
				06	0800	12h	66	26								
1.4		(343)	NAG													
1.6		326	NAG													
										09	05--	2.5d	g	ms	13	7
11	1728	150	NBS													
13	1733	270	NBS													
25	1900	160	NBS													
15		1600	NBS													
			HHI													
18		(162)	HHI													
14		70	PRA													
6	1402	>>1500	NBS													
										15	2048	0.5d	Sc	ms	5	6
128		(1262)	HHI													
20		>400	UC													
17		1100	N													
75		(348)	HHI													
										17	1136	3d	Sc	ms	14	8
0.9		260	NBS													
42	2041	608	NBS													

354 UT.
a region
contains
e β spot
II burst
re 200 -
sists of
events
e that a
e range

ata are
flare on
hat was
er 1120

UT. The 10 cm. event consists of a great burst followed by a long post-burst increase. No dynamic spectrum observations were being made at the time of the large flare. At meter wavelengths, the radio event consists of a very large burst (without a second part).

55. This major flare and SWF on April 17th at 1006 UT, occurred in the same region that was responsible for events No. 52 and 54. No dynamic spectrum observations, and no observations at meter wavelengths, were being made at the time of the flare.

57. The Type II burst on April 17th at 1846 UT, was observed by Ft. Davis over the frequency range 230 - 100 Mc. The flare data is incomplete, but there seems to be no question about the association with a minor flare in a region near the east limb of the sun. The 10 cm. event consists of two minor bursts superposed on a very long-enduring rise and fall in flux. At meter wavelengths, the radio event consists of a major burst, without any second part.

58. This is a very great solar event on April 17th at 2000 UT. The plage and spot data are the same as that given for event No. 52. The same active plage (3941) has been responsible for events No. 52, 54, 55, 56, and 58. The Type II burst at 2032 UT. was observed by Ft. Davis over the frequency range 180 - 100 Mc, and the Type IV emission covered the entire observable spectral range of 580 - 100 Mc. The 10 cm. event consists of a very great burst of long duration, and at meter wavelengths the radio event consists of a large burst superposed on a great rise and fall in flux.

2, VIII - 2R

Event No.	DYNAMIC SPECTRUM DATA: Type I Time/ Max. Int.	Type III Time/Int.	Type II Time/Int.	Type IV Time/Int.	Obs.	Freq. Range	200 MC/S DATA: Type	Beg. UT	Dur. Min.	Max. UT	Peak Flux	Obs.	Freq. Mc/s	Type	Be U
59	I_s in progress all day C1302-1304/1	G1304-1306/3 ~~b1310/2~~ b1318/1 g1322/2	*1304-1312/3		H	220-100	CD	1305	6		800	N	9400 1500 600 536	 CD E CD	13 13 13 13
60															
61															
62															
63															
64	I_s in progress	G2320-2322/3	*2329-2334/3		H	300-100							9400 1000	SD CD	23 23
65															
66													9400	SD	02
67	I_s in progress all day	g1838-1839/1	*1841-1843/3		H	200-100									
68			*0008-0016/2		H	250-170	CD CD	0007 0016	5.5 5	0010 0017	1400 900	TK TK			
69															
70			*1915-1918/3		H	165-100	 CD	1857 1924	40 0.5	1918		C C			
71															
72															
73															
74							CD	2339	7		320	TK	9500 2000	CD CD	23 23
75															
76	I0045-0052/1	III_s in progress <0000->0612/1			H,S								9500	CD	0
77							CD	0907	70		>800	N	600 536 169 81 	ECD ECA CD CD	0 0 0 0 0 0 0
78	I_s in progress all day	g1319/2	*1329-1333/3+		H	540-100	CD	1330	4		>250	N,C	600 536 460 81	ECD CD CD CD	1 1 1 1
79							CD	1128	2.5		>200	N	600 545 169	CD CD SA	1 1 1
80															
81															
82	I_s 1622->2400/3	G1609-1613/3	*1615-1620/3		H	210-100	CD M	1615 1623	3 90	1616 1641	>260	C C	545 460	CD CD CA	1 1 1
83															
84															

74. No dynamic spectrum observations exist at the time of the large SWF on June 1st at 2335 UT.

75. Four of the nine stations that report this storm indicate that there is a second start, on 6th at 00xx UT, which is designated as a sudden commencement.

76. This major SWF on June 4th at 0030 UT. is associated with a flare which evidently produces only a brief noise storm in the dynamic spectrum. However, an unclassified burst is also reported at 0040 UT., which has its counterpart at the high frequencies also. No observations at meter wavelengths are available at the time of the SWF.

77. The plage and spot data for this event are similar to that given for event No. 76. No dynamic spectrum observations exist at the time of the large 10 cm. burst on June 4th at 0917 UT. At meter wavelengths the radio event consists of a large major + burst of long duration, and the same kind of major + burst is indicated in the reports of the other single frequencies in the low and intermediate frequency range.

78. The plage and spot data for this event are similar to that given for event No. 76. The 10 cm. event on June 5th at 1326 UT. consists of a large burst followed by a long but modest post-burst increase. The Type II burst was observed by Ft. Davis over the frequency range 540 - 100 Mc.

79. No known SWF is reported at the time of the large 10 cm. burst on June 6th at 1129 UT. No dynam servations exist at the time of the burst. seems to be characterized by a burst c that sweeps almost instantaneously through range covered by the single frequencies.

80. This event appears in this catalogue only b sents the central meridian passage of a la that contains a complex $\beta\gamma$ spot. Howev associated with this spot did not produce optical and radio events such as those listed

81. This gradual storm has a second start on

82. The 10 cm. event on June 19th at 1609

2.VIII-3R (1)

TABLE VIII.

PLAGE DATA								SUNSPOT DATA						
MP Day	Mean Long.	Mean Lat.	Ave. Int.	Max. Area	No. Flares	Age in Rotations	Ident.	MT.W. Type	CMP Gr. Day	Mean Lat.	H	When Seen	Area	MT.W. No.
25.5	139°	S20	3.5	9,000	28	2	3993	$\ell\beta p\ell$	June 25.3	S14	37	18-1	1800	12426
June 10.0	79°	N12	4	6,000	43	2	4001	$\ell\alpha p\ell$	30.2	N10	35	24-6		12434
July 04.5	20°	N12	3	5,000	61	4	3999	$d\beta\ell$	July 04.3	N11	17	30-9		12453
								$\ell\alpha p\ell$	04.5	N11	21	28-10		12447
								$\ell\beta f\ell$	05.4	N13	19	29-11		12451
05.0	13°	S27	3.5	9,000	26	1	NEW	$*\ell\gamma\ell$	05.4	S30	35	28-11		12449
20.5	168°	N21	3.5	17,000	74	4,3	4023, 4024, 4028, 4029	$\ell\beta f\ell$	19.9	N18	30	12-17		12481
								$\ell\beta fd$	20.7	N25	15	14-24		12487
								$\ell\beta fd$	22.3	N28	23	15-28		12491
14.5	247°	S32	3.5	1,800	14	1	NEW	$*d\gamma\ell$	14.6	S33	25	10-20		12473

n No. 88a
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90. No known flare is reported in association with the large 10 cm. burst on July 2nd at 0015 UT., therefore plage and spot data for this event are not available.

92. This is a very great solar event on July 3rd at 0712 UT. The plage and spot data are similar to that given for event No. 88b. Note that the great flare has a "double" aspect, indicated by the spreading of the flare to a different location in the plage. This "doubling" is also characteristic of the SWF and of the 10 cm. burst. No dynamic spectrum observations exist at the time of the flare. However, it does not seem unlikely that Type IV radio emission accompanied the flare. Throughout the entire range, from very low to very high frequencies, the single frequency observations indicate that great major + bursts occurred with each aspect of the flare.

94. This active region is similar to the plage described in note No. 35.

95. Five of the 14 stations which report this Sc storm start the storm earlier, with a gradual beginning on 4th at 20xx UT.

2. VIII -4L (2)

Event No.	Gr. Day	FLARE DATA Beg. UT	End UT	Max. UT	Imp.	Position	No. of Obs.	SHORT-WAVE RADIO FADEOUTS Type	Imp.	Beg. UT	Dur. Min.	Wide Spread Index	No. of Ob.s	10 CM. EVENTS Type	Beg. UT	Dur. Min.	Max. UT	Peak Flux	McM. Plage No.	C Gr
85	June 22	0236	0257	0241	2	N23 E12	1(1c)	S	2	0229	74	5	4	*CD	0231	21	0238	570	4024	
86	22																			
87	25																			
87a	25																		4030	
88a	27	a2322	2418	2335	1	N20 W62	2(2c)	SL	1	2325	55	-	(MOM)	*CD	0008	250	0141	504	4024	
88b	28	b2330	2427	2335	1	N14 E32	2(2c)												*4039	
89	30																			
	July 02							SL	2	0013	47	5	3	*CD	0015	23	0016.5	>630		
91	02																			
92	03	*0712	0830	0745	3+	N14 W40	18(5c)	S	2+	0729	>60			*6	0726.5	31		585	*4039	
		*0830	1145	0840	3+	N10 W42	18(5c)	*S	3	0830	44	5	9	6	0805.5	15				
														*6	0832	33		>600		
93	03																			
94	04																		*4046	
95	05																			
96	05																		4044	
97	16	0731	0816	0744	1+	N31 E80	9(4c)	SL	3	0721	59	5	8	CD	0730	21	0734		*4065	
98	16	1742	2008	1804	1+	S33 W28	5(5c)	SL	3	1740	105	5	8	6	1739	32	1757	350	4061	
														4	1811	229		30		
99	17	0112	0148	0116	1+	N11 E30	2(2c)	S	2+	0127	-	-	(1)	CD	0114.5	3.5	0115	269	*4065	
100	19																			
101	20	2358	0100	0026	1	N29 E18	2(2c)	*SL	3	0007	60	5	7	6	0013	8.8	0013.5	465	*4065	
102	21	0633	0756	0700	2	N30 E15	10(3c)	*S	3	0647	60	5	8	*2	0659.5	4		536	*4065	
103	21	1320	1442	1337	2	N29 E12	8(4c)	S	2+	1335	45	5	10	9	1329.5	5		35	*4065	
														*2	1334.5	6	1335.9	850		

85. The plage and spot data for this event are similar to that given for event No. 82. The large 10 cm. burst on June 22nd at 0231 UT. appears to have related radio events only at the higher frequencies. No distinctive events are reported at meter wavelengths at the time of the 10 cm. burst, and in the dynamic spectrum there is only a noise storm, with continuum, in progress throughout the day.

86. The onset of this PCA event on June 22nd at 0500 UT. is superposed on the earlier weak event described in event No. 83.

87. This Sc storm had a small initial impulse preceding the main impulse.

87a. This active region is similar to the plage described in note No. 65. The βp spot No. 12426 is the second largest spot of the year - area equal to 1800 millionths of the hemisphere (Mt. Wilson data).

88. The flare event associated with the large 10 cm. burst on June 28th at 0008 UT. is ambiguous. Two flares occurred simultaneously between 27th, 2322 UT. and 28th, 0027 UT., in two different regions on the sun. Information concerning both of these flares is given. The flare described i occurred in the region described in event No. 82. T burst resembles a long-enduring rise and fall in fl dynamic spectrum, the event consists of Type III a noise storms. The SWF is taken from the McM record.

89. Four of the 16 stations that report this severe indicate that the storm has a second gradual July 1st at 17xxUT.

2. VIII - 4L (1)

OTHER RADIO DATA				POLAR CAP ABSORPTION					GEOMAGNETIC STORMS						
	Dur. Min.	Max. UT	Peak Flux	Obs.	Gr. Day	Onset UT	Rise to Peak	Dur.	Peak Int.	Obs.	Gr. Day	Beg. TU	Dur.	Type	Int.	No. Sta. Rep.	Max. Kp
				HHI													
	25		(451)	HHI													
	12		110	UC													
	26.5		170	PRA													
											Apr. 21	03--	0.6d	g	ms	3	4
											24	00--	1d	g	m	1	5
											26	02--	1.3d	Sc	m	4	5
											May 08	21--	0.7d	g	m	4	5
	1.8		(180)	NAG													
	2.5		23	NAG													
	1.7			NAG													
					May 19	0200		12.	(1)	L							
											26	00--	1d	g	ms	3	5
											30	0822	1.2d	Sc	m	12	5
	29.5		549	Tk													
	4.5		(34)	NAG													
											June 03	04--	4d	g	ms	9	6
	25	0045	464	TK													
	9		84	UC													
	71		>370														
	80		>334	PRA													
	16		>135	UC													
	84																
	1.5		>15	CAV													
	45		7														
	5		66	UC													
	4.5		118	PRA													
	1.9		>3100	NBS													
	2		>5	CAV													
	5		75	UC													
	2		200	N													
	5		135	UC													
											17	21--	2d	g	ms	4	5
	45		400	N													
	180																
	4.2		>2600	NBS													
					June 20			48		B							

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represents a

very great burst, superposed on a very long-enduring rise and fall in flux that began more than an hour earlier. The flare that is associated with this event is not outstanding, but occurred in a very large, very bright and very active plage. The $\beta\gamma$ spot No. 12417 is one of the largest spots of the year - area equal to 1100 millionths of the hemisphere (Mt. Wilson data). The Type II burst was observed by Ft. Davis over the frequency range 210 - 100 Mc., and was accompanied by the onset of a noise storm. At meter wavelengths the radio event consists of a major burst followed by a long rise and fall in flux.

83. The peak absorption for this PCA event is not known. Bailey refers to this as "a weak event."

84. This active region is similar to the plage described in note No. 65. The β spot No. 12409 is one of the largest spots of the year - area equal to 1200 millionths of the hemisphere.

Event No.	Gr. Day	FLARE DATA							SHORT-WAVE RADIO FADEOUTS						10 CM. EVENTS					McM. Plage N
		Beg. UT	End UT	Max. UT	Imp.	Position		No. of Obs.	Type	Imp.	Beg. UT	Dur. Min.	Wide Spread Index	No. of Obs.	Type	Beg. UT	Dur. Min.	Max. UT	Peak Flux	
104	July 21	1405	1500	1410	1	N11	E62	6(4c)	SL	1	1408	23	-	(2)						*4075
105	21	1737	1752	1742	1	N22	W12	2(2c)							2	1742.7	5	1743.3	165	*4065
106	21	2215	2302		1-	N20	W15	1(1c)							6	2243.3	5	2243.7	32	*4065
107	22																			
108	22	*0953	1150		3	N15	E51	1(1c)												*4075
109	24	*1712	1801	1737	3	S24	W27	4(4c)	SL	-	1727	113	5	8	*GB	1628	290	1645	15	*4070
		*1801	2025	1828	3	S24	W27	4(4c)	*S	3	1759	113	5	8		(1733)		1736.8	175	
																(1801)		1810.5	630	
																		1838.5	1080	
110	24																			
111	Aug. 01	1352	1437	1420	1	S35	E04	1(1c)							3	1400	510	-	25	*4082
															3	1407	18	1412.5	21	
															3	1438	24	1448	18	
112	02	1432	1448	1436	1	N26	E32	9(5c)	S	2-	1435	15	5	7	6	1435.5	7	1436	60	*4083
113	03																			
114	03	1721	1735	1723	1	N26	E17	3(3c)	S	2	1720	40	5	7	6	1720.5	6.5	1721.1	90	*4083
115	05	1900	1954	1905	1	N26	W08	4(4c)	S	1+	1904	16	5	6	6	1902	3.5	1904.5	44	*4083
															5	1905.5	40		-5	
116	06														SD	0229.2	1.8	0229.5	255	
117	06	0423	0433	0426	1-	N25	W22	1(1c)												*4083
118	08																			
119	09	1330	1442	1355	1	S33	W77	2(2c)	*SL	3	1340	200	5	6	3	1334	>660	1515	38	*4083

104. This incomplete Type IV event on July 21st at <1513 UT. is being associated with a flare which began earlier, at 1405 UT. The single frequency radio events reported with this flare seem to indicate that such an association is not impossible. No known 10 cm. event is reported with the event at 1405 UT., and the SWF is taken from the CRPL "check-list." The flare in question occurred in a region which is the return of a plage related to events No. 88b and 92. No distinctive event is reported at meter wavelengths. At 450 Mc., NBS reports a great M+ burst, "one of the largest bursts ever observed," from 1411 - 1529 UT.

105. The plage and spot data for this event are similar to that given for event No. 97. No known SWF is reported at the time of the Type II burst on July 21st at 1746 UT., which was observed by Ft. Davis over a frequency range of 200 - 100 Mc. At meter wavelengths the radio event consists of a major + burst. At intermediate and higher frequencies the response is only a modest burst of short duration.

106. The plage and spot data for this event are similar to that given for event No. 97. The Type IV emission on July 21st at 2243 UT. was observed by Ft. Davis over the frequency range of 580 - 300 Mc., and appears to be associated with a relatively minor flare for which no known SWF was reported. Ft. Davis also reports an unclassified burst at 2244 UT.

108. It is quite probable that this event on July 22nd at 0953 UT. in region 4075 is not a real flare of importance 3. It may be only a very bright plage. Two other stations were watching a flare in progress in another region on the sun at this same time, and neither of them report this flare in region 4075. It is not likely that they would have missed a flare of Imp. 3. No known SWF, and no known 10 cm. events are reported at the time of the flare, and no dynamic spectrum observations exist at that time. The response throughout the entire range of the sp dicates that the radio event consists of short duration. These are all prob a flare of Imp. 1 in progress at this region 4073.

109. This is a great solar event on July 2 the event described in note No. 92, th aspect to the flare, SWF, and great βp spot No. 12496 is a return of the lar in region 4030. The Type IV emission seems to be associated with the secon and was observed by Ft. Davis over frequency range of 580 - 100 Mc. At me radio event consists of two parts - a r with bursts, during the early phase of great rise and fall in flux with a great it, during the second phase of the fla

2. VIII-5L ①

RADIO DATA				POLAR CAP ABSORPTION						GEOMAGNETIC STORMS						
ur. Min.	Max. UT	Peak Flux	Obs.	Gr. Day	Onset UT	Rise to Peak	Dur.	Peak Int.	Obs.	Gr. Day	Beg. UT	Dur.	Type	Int.	No. Sta. Rep.	Max. Kp
18	0238	1470	TK													
8		(92)	NAG													
7		(46)	NAG													
				June 22	0500	44h	115	40	B,L							
										June 25	0047	3.5d	Sc	ms	15	7
50	0311	600	TK													
8.2		>239	SYD													
1.3		164	SYD													
1.5		222	SYD													
8.5		(262)	NAG													
34		>77	SYD													
54	2357	610	NBS													
										30	0528	2d	Sc	S	16	8
21	0016.5	>1106	TK													
3	0016.3	(305)	NAG													
2.5	0016.3	(70)	NAG													
1.3	0016.4	(154)	NAG													
										July 02	0857	1.3d	Sc	ms	14	8
45	0742	(196)	NAG													
20	0841	(2960)														
50	0809.5	(1690)	NAG													
20	0839.6	928														
60	0809.7	(7570)	NAG													
20	0840.4	(8200)														
38		113	UC													
22		312														
72		>324														
14.5		850	N													
60		5200														
9		>400	UC													
28		>400														
15	0745	54	JOD													
5	0837	55														
				July 03	1000	12h	52	74	B,L,H							
										05	0043	0.5d	Sc	ms	14	7
7.7	0733.5	>1255	TK													
7.5	0733.9	(147)	NAG													
8	0734.8	(151)	NAG													
53		48	UCL													
47	1748	(627)	HHI													
40	1757	(200)	HHI													
30		> 324	UC													
18		1000	N													
36		>200	UC													
2	0115.3	34	NAG													
4	0115.5	(24)	NAG													
2	0114	1200	NBS													
										19	13--	0.5d	g	m	2	5
9	0019	1016	TK													
15	0018.6	(122)	NAG													
1.5	0633.2	820	TK													
4	0700.3	916														
9	0701	(122)	NAG													
2		78	UC													
8		24														
4		70	N													
70			UC													
6	0657	224														
14		>366	UC													
14		168														
1.5	1321.5	210	PRA													
31.5		>362														
8	1330.5	1300														
6	1338.9	-	NBS													
16	1355.7	-														
75			UC													

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101. The plage and spot data for this major SWF on July 21st at 0007 UT. are similar to that given for event No. 97. In the dynamic spectrum, in addition to the small Type III bursts, Ft. Davis also reports an unclassified burst at 0019 UT. No distinctive event is reported at meter wavelengths at the time of the SWF, and large microwave bursts are reported at the very high frequencies.

102. The plage and spot data for this major SWF and 10 cm. burst on July 21st at 0647 UT. are similar to that given for event No. 97. No dynamic spectrum observations exist at the time of the event. Only a minor burst is reported at meter wavelengths, and mostly minor bursts of short duration are reported at intermediate and higher frequencies.

103. The plage and spot data for this event are similar to that given for event No. 97. No dynamic spectrum observations exist at the time of the large 10 cm. burst on July 21st at 1334 UT. (This burst is one of those rare events which is preceded by a "precursor.") The single frequency reports indicate that the radio event consists of a major + burst, at the intermediate and higher frequencies.

2-III-4R

TABLE VIII.

PLAGE DATA								SUNSPOT DATA						
lo.	CMP Gr. Day	Mean Long.	Mean Lat.	Ave. Int.	Max. Area	No. Flares	Age in Rotations	Ident.	MT.W. Type	CMP Gr. Day	Mean Lat.	H	When Seen	Area	MT.W. No.
	July 26.0	95°	N16	3.5	9,000	54	3	4039	*ßpl*	July 26.1	N10	26	19-1		12503
9	22.0	148°	S21	3	7,000	31	3	4030	*lßpl*	22.8	S24	29	17-28		12496
2	Aug. 01.5	9°	S28	3.5	7,600	55	2	4044	*lαpl* *lγl*	Aug. 1.0 2.5	S28 S30	26 26	26-6 27-8		12513 12514
1	04.5	330°	N23	3.5	5,000	42	2	4057	*lßpl*	4.6	N26	23	28-10		12516

gle frequencies in- of only minor bursts ably associated with time at N30 E24, in

lth at 1712 UT. Like ere is a "doubling" 10 cm. burst. The e ßp spot No. 12426 starting at 1802 UT d phase of the flare, he enite observable ter wavelengths, the nodest rise and fall, he flare, and a very burst superposed on re. Only at the high frequencies is there any sizeable radio response to the "early" aspect of the flare. At the intermediate and low frequencies, the radio response consists of a large major + bursts, with the second phase of the flare only.

110. This small PCA event is not listed in Bailey's catalogue of principal events, but is listed in the NASA proton manual. The intensity of the event is estimated from riometer records.

111. This Type IV event on August 1st at 1409 UT. is associated with a rather modest flare which occurred at a high latitude of 35°, in a large, very bright and very active plage in its second rotation. The γ spot No. 12514 is a return of γ spot No. 12449 in a region 4044. No known SWF is reported at the time of the Type IV event. Note that the 10 cm. event consists of several small bursts superposed on a long-enduring rise and fall in flux that lasted for more than 8 hours. The Type IV emission was observed by Ft. Davis over a relatively small frequency range of 270 - 100 Mc. At meter wavelengths, the radio event consists of a large rise and fall in flux, with a large burst superposed on the R & F at the time of the start of the Type IV burst. All of the single radio frequency reports indicate that a large burst occurred at all wavelengths practically simultaneously with the start of the Type IV burst.

112. This Type II burst on August 2nd at 1438 UT. was observed by Ft. Davis over a frequency range of 210 - 100 Mc., and is associated with a relatively minor flare event in a very bright and active plage. This region, plage 4083 is responsible for 5 events in this catalogue - Nos. 112, 114, 115, 117, and 121, and probably also for two others - Nos. 113 and 118. The radio event consists of a major burst of short duration which occurs practically simultaneously at all radio frequencies, from the low to the very high frequencies.

Event No.	DYNAMIC SPECTRUM DATA: Type I Time/Max. Int.	Type III Time/Int.	Type II Time/Int.	Type IV Time/Int.	Obs.	Freq. Range	200 MC/S DATA: Type	Beg. UT	Dur. Min.	Max. UT	Peak Flux	Obs.	OTHER: Freq. Mc/s	Type	Beg. UT
85	I_s with continuum, in progress all day				S								9500 2000 1000	CD CD CD	0232 0233 0234
86															
87															
87a															
88a	I_s <2335->0534/1	III_s <2335->0534/3			S		CD	2330	0.7		250	TK	9500 1420	CD CD	2352 2357
88b													1420 1420 1000 600 460	SD CD CD CD CD	0016 0035 0011 2340 2346
89															
90	I_s in progress all day	III_s in progress all day			S		CA	0030	35	0047	400	TK	9500 3750 2000 1000	SD SD SD SD	0015 0015 0016 0015.7
91															
92							CD CD CD	0802.5 0837 0849	1.5 4 25		300 3400 700	N N N	9400 9400 2000 2000 1000 1000 600 600 600 545 545 169 169 80 80	SD CD CD CD CD F FD CD - CD CD CD - CD -	0730 0831.5 0726 0831 0723 0836.7 0722 0824 0833 0805 0832 0834 0848 0730 0832
93															
94															
95															
96															
97													9500 2000 1000 600	CD CD CD SD	0731 0731 0731.5 0735
98	I_s 1754-1819/1		* 1801-1825/3	H	580-100		CD	1753	54		850	C	9400 1500 600 545 169	CD CD CD CD CD	1740 1742 1751 1751 1803
99		G0114-0116/3	*0125-0131/2		S		CD	0113.8	1.8	0114.5	900	TK	2000 1000 167	CD CD CD	0114 0114 0113.9
100															
101	I_s 0112-0127/1	g0016/1 b0033/1			H								9500 2000	CD F	0012.8 0012
102							CD	0702	14		120	N	9500 9500 1000 600 600 545 169 169	CD CD SD CD - CD CA SA	0632.8 0659.8 0655 0659 0702 0700 0657 0657
103							CD	1329	30		>250	N	600 600 536 536 450 450 450 169	CD - SD CD CD SD CD CA	1332 1346 1321 1331.5 1328 1336 1342 1327

96. This active region is similar to the plage described in note No. 80.

97. The large SWF on July 16th at 0721 UT. is associated with flare activity at the east limb of the sun, in a region which is very large, very bright, and extremely active. This plage is a return of region 4024, which was responsible for events No. 82, 85, and 88a, and probably also for Nos. 83, 86, 87, and 89. The $\beta\delta$ spot No. 12481 is a return of the $\beta\gamma$ spot No. 12417 in region 4024. No dynamic spectrum observations exist at the time of the large SWF, and no distinctive events are reported at meter wavelengths. Region 4065 is a remarkable plage, being directly responsible for 7 events in this catalogue (Nos. 97, 99, 101, 102, 103, 105, and 106) and also probably for events No. 100 and 107.

98. The large SWF on July 16th at 1740 UT. is associated with flare activity in a very bright and new calcium plage which appeared on the disk of the sun when it was 4 days to the east of the central meridian. The complex γ spot No. 12473 formed on the disk on the same day, simultaneously with the appearance of the plage. The 10 cm. event consists of a complex burst followed by a very long-enduring po increase in flux. The strong, although brief burst of emission was observed by Ft. Davis over the e observable range of frequencies from 580 - 100 Mc. wavelengths, the radio event consists of a great burst.

99. The plage and spot data associated with this Type on July 17th at 0125 UT, are similar to that given No. 97. The SWF which is reported here, is taken CRPL unpublished "check-list," and does not appe

2. VIII -HR 0

ER RADIO DATA				POLAR CAP ABSORPTION						GEOMAGNETIC STORMS						
Dur. Min.	Max. UT	Peak Flux	Obs.	Gr. Day	Onset UT	Rise to Peak	Dur.	Peak Int.	Obs.	Gr. Day	Beg. UT	Dur.	Type	Int.	No. Sta. Rep.	Max. Kp
10		>1300	N													
70		>1300														
32	1428.6	27000	NBS													
44	1459.2	29000														
9		72	UC													
2		60	N													
5		>243	UC													
4	2243.7	(30)	NAG													
5.5	2246.3	(74)	NAG													
5	2214.1	11000	NBS													
14	2243.4	>26000														
10	2306.6	260														
										July 22	0419	1d	Sc	ms	6	6
3		162	UC													
3		>1400	N													
8.5	0952	351	PRA													
14		126	UC													
2.5		(100)	CAV													
18	1736	(336)	HHI													
19	1737	(155)	HHI													
48		246	UC													
29		240														
90		1200	N													
74	1830.8	1700	NBS													
39	1832	1000	NBS													
				July 24	2015		12	(2)	L,H							
11	1412	(295)	HHI													
87	1413	(122)	HHI													
20		66	UC													
12		75	N													
240		220	NBS													
17		>240	UC													
7.5	1436	(355)	HHI													
2.5	1436		HHI													
5		72	UC													
3		70	N													
3	1436	2800	NBS													
27		>240	UC													
										Aug. 03	1557	0.5d	Sc	m	8	6
7		114	UC													
4.5		250	N													
5	1722.9	340	NBS													
7		250	UC													
5	1905	250	NBS													
7		>230	UC													
1	0229.7	409	TK													
1	0229.2	(13)	NAG													
0.5		61	SYD													
										06	0509	1d	Sc	m	9	6
82			UC													
1			UC													
0.4		170	NBS													
105			UC													
1			UC													

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9. VIII - 5R (2)

		FLARE DATA						SHORT-WAVE RADIO FADEOUTS						10 CM. EVENTS					
Event No.	Gr. Day	Beg. UT	End UT	Max. UT	Imp.	Position	No. of Obs.	Type	Imp.	Beg. UT	Dur. Min.	Wide Spread Index	No. of Obs.	Type	Beg. UT	Dur. Min.	Max. UT	Peak Flux	McM. Plage No.
120	Aug. 09																		
121	10	0125	0142	0129	1	N26 W71	1(1c)	*SL	3	0100	60	5	7	*CD	0126.7	2.5	0127.5	1400	*4083
122	12																		
123	20																		
124	22																		*4112
125	28	*0913	1404	0925 0955	3	S31 E33	11(4c)	*S	3	0917	138	5	5	*6 4	0943 1030	40 90		1192	*4125
126	28	2010	2048	2024	2+	S28 E30	4(3c)	S	2+	2020	18	5	8	*2 4	2017.7 2022.5	5 15	2019.5	760 10	*4125
127	29																		
128	29																		
129	29																		
130	30							SL	2	2215	25	5	9	2 4	2210 2220	10 40	2213.7	480 30	
131	31																		
132	31	*1257	1455	1312	3	N25 W02	11(4c)	*S	3+	1303	220	5	10	9 *2 4	1256 1301 1406	5 65 205	1315.5	13 3900 35	*4124
133	31																		
134	Sept. 01	0204	0224	0209	1	N13 W08	2(1c)	*S	3	0204	51	5	5						*4124
135	01	0946	1030	0952	2	N12 W09	6(2c)	S	2	0950	40	5	4	*6	0949	7	0950	605	*4124
136	02																		
137	02	0409	0445	0412	1	N14 W25	3(1c)	SL	1+	0400	70	4	2	CD	0411	13.5	0420	437	*4124

121. The plage and spot data for this event are similar to that given for event No. 112. The Type II burst on August 10th at 0129 UT., and large SWF and 10 cm. burst, are associated with a modest flare of Imp. 1 which occurred in region 4083 when it was near the west limb of the sun. The Type II burst was observed by Ft. Davis over a frequency range of 330 - 100 Mc. The single frequency reports indicate that the radio event probably consisted of a large burst of short duration that swept through the entire frequency range, from high to low frequencies, almost simultaneously.

122. Three of the nine stations that report this storm do not start the storm until the following day, on 13th at 03xxUT.

123. This storm was reported by only three stations, which were all located at high geomagnetic latitudes.

124. This active region is similar to the plage described in note No. 35. The βp spot No. 12563 is a return of the βp spot No. 12503 in region 4075.

125. This is a very great solar event on August 28th at 0913 UT., which occurred in a very large, very bright, and very active plage in its third rotation. The re return of region 4082, which was respon No. 119 and was followed by the PCA ev complex γ spot No. 12579 is a return of γ in region 4082, which was a return of γ s region 4044. No dynamic spectrum obser the time of the large flare at 0913 UT. H radio emission has been deduced by Hakura frequency events. These reports indicate th occurred which had the characteristic of flux at meter wavelengths and at t frequencies.

2. VIII - 6L (1)

Event No.	DYNAMIC SPECTRUM DATA: Type I Time/Max. Int.	Type III Time/Int.	Type II Time/Int.	Type IV Time/Int.	Obs.	Freq. Mc/s	200 MC/S DATA: Type	Beg. UT	Dur. Min.	Max. UT	Peak Flux	Obs.	OTI: Freq. Mc/s	Type	Beg. UT
104				*<1513-1523/3	H	580-200							545	CD	1406
													545	CD	1418.5
													450	CD	1411
													450	-	1445
105		G1743-1744/3	*1746-1752/3		H	200-100	CD	1742	8	1744	>70	C	600	ESD	1741
													545	SD	1743
													169	CA	1743
106	C2212-2215/1	G2208-2209/3 g2213-2215/3 g2241/2 g2247/2		* 2243-2315/3	H	580 300	FD	2237	11		>250	N(H)	9400	CD	2243.5
													1000	F	2241.5
													450	CD	2211
													450	CD	2228
													450	CD	2303
107															
108							CD	0950	3		>250	N	600	CD	0950
													545	CD	0950
													536	CD	0947
													169	FA	0950
													81	CD	0951
109	I_s in progress all day	b1819/2+ g1924/1 G1926/1+		* 1802-1915/3	H	580-100	M	1645	35			C	9400	SD	1730
							M	1801	94	1834		C	1500	SD	1730
							CA	1812	8		>200	C	600	CD	1801
													600	-	1851
													545	CD	1801
													450	CD	1803
													167	CD	1810
110															
111	I_s in progress 1303-1441/2	g1356/1 g1404/3 b1405/2 g1432/1 b1436/1 g1454/3		* 1409-1459/2	H	270-100	M	1353	47	1415		C	9400	SD	1409
							CD	1409	4			C	1500	CD	1408
													600	SD	1407
													545	SD	1409
													450	MD	1350
													169	CA	1408
112	I_s 1430-1436/2 C1436-1438/3	b1430/1- b1433/1- G1436-1437/3 g1440/1	*1438-1442/3		H	210-100	CD	1436	6	1436.5	>53	C	9400	CD	1435.5
													2000	CD	1435
													600	CD	1436
													545	CD	1436
													450	CD	1435
													169	CA	1438
113															
114	C1720-1727/3 I_s 1720-1836/2	g1720-1722/3 G1723-1725/3 g1727/2	*1724-1729/3		H	160-100	CD	1720	8		>53	C	600	CA	1721
													545	CD	1720.5
													450	CD	1720.9
													169	CD	1720
115	I_s 2030-2400/1	G1902-1906.5/3 G1907-1913/2 G1920-1922/2	*1907-1910/3		H	165-100	SD	1902	3.5	1905	>800	OSL	450	CD	1903
													169	CD	1902
116		G0229-0230.5/3 b0231/3 G0232-0233.5/2	*0234-0246/2		S								9500	CD	0229.3
													1000	SD	0229
117		g0423-0425/1 G0425-0427/2 g0427.5-0430/1	*0431-0438/2		S		SD	0425.5	0.5		240	TK	600	CD	0427
118															
119	I_s 1246-1420/1	g1312/2 g1315/2+ G1517-1519/3			H								600	SD	1300
													600	SD	1314
													450	SD	1354.5
													169	SD	1200
													169	SD	1314

114. The plage ans spot data for this event are similar to that given for event No. 112. The Type II burst on August 3rd at 1724 UT. was observed by Ft. Davis over a frequency range of 160 - 100 Mc. The same comments can be made about this Type II burst and its related optical and radio events as were made about the Type II burst described in note No. 112.

115. The plage and spot data for this event are similar to that given for event No. 112. The Type II burst on August 5th at 1907 UT was observed by Ft. Davis over a frequency range of 165 - 100 Mc. See comments in note No. 112. It should be noted that the associated 10 cm. burst at 1902 UT. is followed by one of those periods of reduced flux, referred to as "absorption" or a "negative burst."

116. No known flare or SWF were reported at the time of the Type II burst on August 6th at 0234 UT., therefore plage and spot data for this event are not available. (Since region 4083 has been responsible for the Type II events described in Nos. 112, 114, 115, 117 and 121, it is tempting to assume that this event on August 6th is also due to similar activity in this region. Indeed, the ability to produce Type II bursts appears to be one of the outstanding characteristics of the region.) No distinctive event was reported at meter wavelengths at the time of the Type II burst, and only a minor burst of very short duration was reported at the higher frequencies. See comments in note 112.

117. The plage and spot data for this event are similar to that given for event No. 112. No SWF is reported at the time of the Type II burst on August 6th at 0431 UT., and no 10 cm. observations exist at this time. See comments in note No. 112.

119. The plage and spot data for this event are similar to that given for event No. 111. The major SWF on Au 1340 UT. is associated with a relatively unimp brightening in a region near the west limb of th associated 10 cm. event consists of an increase in lasts throughout the observing day (11 hours). No events are reported at meter wavelengths at the large SWF, and only minor bursts, superposed enduring rise and fall in flux, are reported at oth intermediate single frequencies.

2. VIII -5R0

TABLE VIII.

PLAGE DATA								SUNSPOT DATA						
MP Day	Mean Long.	Mean Lat.	Ave. Int.	Max. Area	No. Flares	Age in Rotations	Ident.	MT.W. Type	CMP Gr. Day	Mean Lat.	H	When Seen	Area	MT.W. No.
Aug. 22.5	92°	N14	3.5	22,000	43	4	4075 and 4078	*ad* *βpl*	Aug. 21.8 21.9	N10 N16	12 26	15-20 15-27		12562 12563
30.0	353°	S27	3.5	8,000	61	3	4082	* *γ*	31.1	S30	28	24-6		12579
31.5	333°	N22	3.5	21,000	110	3,2	4083, 4084, 4095, 4096	*βp* * *βγ* * *βγ*	30.9 31.9 31.9	N15 N25 N15	17 23 20	27-5 25-7 25-6	1700	12585 12580 12581

on (4125) is a
ble for event
No. 120. The
pot No. 12514
No. 12449 in
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a great burst
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126. The plage and spot data for this event are similar to that given for event No. 125. The Type II burst on August 28th at 2022 UT. was observed by Ft. Davis over the frequency range 330 - 100 Mc., and was also observed by Michigan, where dynamic spectrum observations began at this time. The 10 cm. event consists of a large burst of relatively short duration. The single frequency reports indicate that the radio response consists of a major burst of very short duration. The single frequency reports indicate that the radio response consists of a major burst of very short duration at the low and intermediate frequencies.

127. & 128. These two PCA events are difficult to separate. The duration of No. 127 is based on extrapolation into the following event. Event No. 128 begins during the recovery period of the preceding event. It is tempting to associate these two successive PCA events with the occurrence in region 4125 of the two successive flare events described in Nos. 125 and 126.

130. No flare observations were being made at the time of the Type II and Type IV events on August 30th at 2212 UT., therefore plage and spot data for this event are not available. The single frequency events, however, indicate that a major event took place on the sun, which consisted of a

2. VIII - 6L
(2)

Event No.	Gr. Day	FLARE DATA Beg. UT	End UT	Max. UT	Imp.	Position	No. of Obs.	SHORT-WAVE RADIO FADEOUTS Type	Imp.	Beg. UT	Dur. Min.	Wide Spread Index	No. of Obs.	10 CM. EVENTS Type	Beg. UT	Dur. Min.	Max. UT	Peak Flux	McM. Plage No.
138	Sept. 02	a1257 b1313	1346 1410	1303 1316 1330	1 2+	N10 W26 S34 W36	6(3c) 5(4c)	G S	1 2-	1259 1324	>25 43	5 5	8 8	3 2 2 2	1247 1258 1317.3 1321.3	250 6 4 5.5	1330 1259.7 1319 1324	105 56 30 40	a *4124 b *4125
139	02																		
140	03	0037	0116	0049	1	N24 W24	1(1c)	S	2+	0040	35	5	5	CD	0034.5	17.5	0037	462	*4124
141	03	1018	1103	1023	2	N15 W40	6(2c)	S	2+	1020	42	5	5	*6	1021.5	13		738	*4124
142	03	*1412	1656	1428	3	N23 W30	14(7c)	*S	3	1420	103	5	10	*2 4	1417 1442	25 130	1424	1350 70	*4124
143	04																		
144	07	0810	0845	0823	1+	N15 W88	12(4c)	*S	3	0806	36	5	11	*2	0811.5	9		2220	*4124
145	08	1627	1634		1-	S13 E25	2(2c)												4138
146	10	*0223	0300	0250	3	N14 E16	1(1c)	S	2	0225	20	-	1	SD	0223	35	0228	349	*4134
147	11	0140	0200	0142	1-	N15 E90	2(2c)	G	-	0157	>45	-	1	SD	0141.2	1	0141.5	376	4148
148	11	*0236 *0243	0722 0722	0300 0300	3 3	N13 W02 N13 W02	5(3c) 5(3c)	*SL	3	0244	110	5	5	*CA	0244	75	0300.7	1110	4134
149	12							G	2	0202	57	-	1	*CD	0220.5	2	0221.3	610	
150	12	0703	0740	0713	2	N09 W15	7(3c)	S	3-	0702	32	5	6	6	0708	7	0709	443	4134
151	12																		

138. Both of these optical events, on September 2nd at 1257 and 1313 UT., are given here as possible predecessors of the PCA event that follows at 1700 UT. (event No. 139). Whether the PCA is due to one or the other flare event, or the combined effect of both flares, cannot be determined unambiguously. Information is given about both flares, one of which occurred in the active region 4124 (for plage and spot data, see event No. 132), the other in active region 4125 (for plage and spot data, see event No. 125). The 10 cm. event consists of several small bursts superposed on a long-enduring rise and fall in flux. In the dynamic spectrum, Ft. Davis was not observing at this time. Although the Michigan reports indicate only weak Type III bursts, and noise in progress throughout the day, Type IV radio emission of importance 3+ is deduced by Hakura from 1310 - 1410 UT. This seems quite possible, from the single frequency events. At meter wavelengths the radio event consists of a rise in base level, and the other single frequency reports indicate that the event is a major + burst which consists of a large burst and a rise and fall in flux.

140. The plage and spot data associated with Type II event on September 3rd at 0036 UT. are similar to that given for event No. 132. The Type II burst was observed by Ft. Davis over the frequency range 580 - 100 M

141. The plage and spot data for this ev given for event No. 132. No dynamic s exist at the time of the large 10 cm. b at 1021 UT. No distinctive event wavelengths at the time of the burst.

142. This is a large solar event, on Septe The plage and spot data are similar No. 132. The 10 cm. event consists followed by a long-enduring post-b

2. VIII - 7L

RADIO DATA			
Dur. Min.	Max. UT	Peak Flux	Obs.
3	0128.5	1689	TK
3	0128.6	(550)	NAG
2.5		>196	SYD
2.5	0128.7	(175)	NAG
2.5	0130	77	SYD
9	0127.9	1200	NBS
12	0950	(693)	HHI
44	0947		HHI
80	1001	(692)	HHI
28		60	UCL
72		-	UC
05		30	UC
55			N
1.2	2022	54	SYD
4	2017.9	>7100	NBS
4	2023.6	>5700	NBS
3	2213	>1351	TK
6	2213.7	(619)	NAG
30	2213	(433)	NAG
26	2215	315	SYD
8	2214.6	1900	NBS
75	2234.5	420	
8	2215.2	>5000	NBS
17	2233	810	
70		(>900)	HHI
22	1325		HHI
20		>450	UC
90		>5000	N
80	1338	14000	NBS
12		>>300	UC
22		>300	
8	1252	132	JOD
10	1305	132	
20	0204.5	934	TK
1.2	0233.2	491	TK
1.0	0238.8	481	TK
1.2	0242.0	480	TK
12	0204	(238)	NAG
6	0205	(195)	NAG
3	0205	264	SYD
9	0205	(83)	NAG
25	0950	(545)	HHI
6	0951	324	UC
5		550	N
9	0954	590	GOR
10		>330	UC
15	0946	>128	JOD
30	0419	501	TK
20	0419	(23)	NAG
8	0416	20	NAG

POLAR CAP ABSORPTION					
Gr. Day	Onset UT	Rise to Peak	Dur.	Peak Int.	Obs.
Aug. 09	1600	10h	50	25	B
29	0000	7h	27	26	B,H
29	1400	12h	58	66	B,L,H
31	1500	12h	46	39	B

GEOMAGNETIC STORMS						
Gr. Day	Beg. UT	Dur.	Type	Int.	No. Sta. Rep.	Max. Kp
Aug. 12	04--	2d	g	ms	9	6
20	13--	0.8d	Sc	m	3	5
29	1921	1d	Sc	ms	16	7
31	12--	1d	g	ms	9	7
Sept. 02	0315	3.2d	Sc	ms	18	9

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135. The plage and spot data for this event are similar to that given for event No. 132. No dynamic spectrum observations exist at the time of the large 10 cm. burst at 0949 UT. Large bursts, of relatively short duration, are reported throughout the entire spectrum range covered by the single frequency observations.

136. This is one of the few great geomagnetic storms for which the 3-hourly Kp value reaches 9. Seven of the 18 stations rate this as a severe storm.

137. The plage and spot data for this event are similar to that given for event No. 132. No distinctive event is reported at meter wavelengths at the time of the Type II burst at 0423 UT. In the dynamic spectrum, Sydney also reports a Type III noise storm, and bursts of unclassified activity, in progress throughout the day.

2. VIII - 6R (2)

Event No.	DYNAMIC SPECTRUM DATA: Type I Time/Max. Int.	Type III Time/Int.	Type II Time/Int.	Type IV Time/Int.	Obs.	Freq. Range	200 MC/S DATA: Type	Beg. UT	Dur. Min.	Max. UT	Peak Flux	Obs.	OTHE: Freq. Mc/s	Type	Beg. UT
120															
121	C0127.5-0128.5/3	g0127.5/1 G0128/2 g0129-0131/1 g0131-0132/1	*0129-0134/3		H	330-100	CD	0129.5	5.5			TK	9500 2000 1420 1000 600 167	CD SD CD CD CD CD	0126.8 0127 0128 0127 0129 0127.1
122															
123															
124															
125				* (0930-1045/3)	HK		CD SD	0917 0930	88 75	0945	100 -	SIM N	9400 2000 1500 600 600 600 545	CD CD CD SD MD SD SD	0915 0910 0900 0914 0921 0942 0920
126	I_s 2019->2400/3	G2018-2021/2-G2022-2023/3 G2023-2026/3	*2022-2026/3		H,M	330-100	CD	2022	5	2024.5	>450	C	600 450 167	CD CD CD	2021 2017.4 2021
127															
128															
129															
130	I_s in progress all day	g2211/3 G2213-2216/3 g2219/1 G2223-2225/1 b2235/2	*2214-.2217/3	* 2212-2243/3	H H	300-100 580-100	CA	2205	9.5	2206	1120	HIR	9500 2000 1000 600 450 450 167 167	CD CD CD-F CD CD CD CD CD	2212.5 2210 2211 2214 2211.9 2220 2213.7 2223
131															
132	I_s in progress all day	g1306-1307/3 b1309/3 G1341-1343/3 G1346-1348/3 G1349-1351/3 g1352/3 g1354/3 g1356/3		<1301->1600/3	H,M	580-100	CD	1303 1321	13 84	1312 1350	>1200	C,N	9400 2000 600 545 450 169 169 80 80	CD CD CA CA CA CA SA CD CD	1302 1258 1300 1259 1300 1303 1342 1250 1300
133															
134							CD CA	0238.5 0241.?	0.7 2.7	0239.1 0243	1500 2400	TK TK	9500 9500 9500 9500 3750 2000 1420 1000	ECD SD SD SD CD CD SD CD	0203.5 0232.8 0238.5 0241.8 0203 0203 0204 0203
135							CD	0949	6		>2000	N	9400 600 545 206 169 80	CD CA CD F CA SD	0948 0950 0949 0949 0950 0945
136															
137	I_s 0345->0616/2	g0410-0410.8/3 G0415/2 G0416.5-0417.5/2 b0419/2	*0423-0431/2		S								9500 2000 1000	CD CD CD	0412 0410 0408

major + burst from centimeter to meter wavelengths.

132. This is a very great solar event on August 31st at 1257 UT., which occurred in a very remarkable plage. Region 4124 is an extremely large, very bright, and tremendously active plage which consists mainly of the merging of two plages from the previous rotation - plage 4083 at N23, and plage 4084 at N12. There are two complex $\beta\gamma$ spots contained within the plage The $\beta\gamma$ spot No. 12580 is one of the largest spots of the year - area equal to 1700 millionths of the hemisphere (Mt. Wilson data), and is a return of the spot No. 12516 in region 4083. This latter region was responsible for seven events in this catalogue - Nos. 112, 113, 114, 115, 117, 118, and 121. Region 4124 is responsible for eleven events - Nos. 132, 133, 134, 135, 136, 137, 140, 141, 142, 143, and 144. The 10 cm. event consists of a very great burst, preceded by a precursor, and followed by a very long-enduring post-burst increase in flux. The strong Type IV radio emission, reported by Ft. Davis as in progress at 1301 UT., was observed over the entire observable frequency range of 580 - 100 Mc. Observations of this event, also made by Michigan, indicate that the Type IV burst began at 1258 UT. Ft. Davis remarks that "the Type IV changes gradully into noise storm activity." At meter wavelengths, the radio event consists of a very grea + burst, for which the second part consists of a la and fall in flux. A similar type of event eviden occurred at the other single radio frequencies.

134. The plage and spot data for this event are similar given for event No. 132. No 10 cm. observations dynamic spectrum observations, exist at the time large SWF on September 1st at 0204 UT. The sin quency observations indicate that the radio event o of a strong burst of relatively short duration which o simultaneously with the start of the SWF.

2.VIII-6R
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TABLE VIII.

PLAGE DATA								SUNSPOT DATA						
CMP Gr. Day	Mean Long.	Mean Lat.	Ave. Int.	Max. Area	No. Flares	Age in Rotations	Ident.	MT.W. Type	CMP Gr. Day	Mean Lat.	H	When Seen	Area	MT.W. No.
Sept. 10.5	201	S12	2.5	2,700	10	3	4099	*dβpl*	Sept. 10.5	S14	18	7-16		12601
10.0	207	N12	3.5	9,000	39	2	4098 and 4100	**lβγl*	10.8	N11	26	3-17		12596
17.0	115	N16	3	4,800	7	5	4112	*lαpl*	17.2	N15	15	10-23		12613

nt are similar to that
pectrum observations
rst on September 3rd
s reported at meter

mber 3rd at 1412 UT.
o that given for event
of a very large burst.
rst increase. In the dynamic spectrum, Ft. Davis reports only a few Type III bursts associated with bursts of continuum emission, and also an inverted U burst at 1455 UT. Michigan was also observing at this time, and neither station reports any Type II or Type IV events with the large flare and SWF.

143. This is one of the relatively rare great geomagnetic storms for which the 3-hr. Kp value reaches a maximum of 9. Four of the 18 stations indicate a second sudden commencement on 6th at 1122 UT.

144. The plage and spot data for this event are similar to that given for event No. 132. No dynamic spectrum observations exist at the time of the large SWF and 10 cm. burst at 0806 UT. A major burst of relatively short duration is reported throughout the range of frequencies covered by the single frequency observations.

145. No known SWF and no 10 cm. events are reported at the time of the Type II burst on September 8th at 1632 UT., and which was observed by Ft. Davis over the frequency range 190 - 100 Mc. This Type II event seems to be correlated with a solar event which is confined to the low radio frequencies.

2.VIII - 76

Event No.	DYNAMIC SPECTRUM DATA: Type I Time/Max. Int.	Type III Time/Int.	Type II Time/Int.	Type IV Time/Int.	Obs.	Freq. Range	200 MC/S DATA: Type	Beg. UT	Dur. Min.	Max. UT	Peak Flux	Obs.	OTHE: Freq. Mc/s	Type	Beg. UT
138	I_S in progress all day	g1259.2- 1259.7/w g1300.1/w g1301.4/w g1313/w g1314.9/w			M	BC ABC BC B BC	–	1310	60		(250)	N	9400 2980 1500 600 600 600 545 545 450 231 178 169 169 81	SD CD CD CA - SA CD CA CA SA CD CA - CD	1255 1257 1246 1258 1303 1309 1258.5 1255 <1245 1300 1245 1311 1331 1256
139															
140	C0041- 0042/1 C0043- 0044/1	G0039- 0040/2	*0036- 0041/3		H	580- 100	CD	0038	12	0039	420	TK	9500 2000 1420 1000 600 545 167	CD CD ECD CD ECD CD CD	< 0039 0028 0036 0034 0037 0038 0038.7
141													9400 1500 600 545 169	SD CD ECD CD SA	1020 1022 1025 1025 1023
142	I_S in progress all day C1424- 1428/1 C1455- 1456/3	g1424- 1425/2 b1437/1- g1455/3			H		CD CD	1411 1422	6 15	1427		C C	9400 1500 600 545 450 169	SD SD CD CD CD SA	1415 1420 1424 1423 1424 1425
143															
144							CD	0812	7.5	0818	800	OSL	9500 2000 1500 1000 600 169	CD ESD SD ECD CD SD	0812 0811 0811 0811 0813 0814
145	C1628- 1629/1 Ig1632- 1638/3 I_S (weak) in progress all day	g1628/1+ g1630/1- b1634/2 b1635/3	1632- 1638/3		H,M	190- 100	CD CD	1627.5 1630.5	1.5 2		120 150	N N	167	CD	<1634
146		b0213/1 b0246/1			S								9500 3750 2000	SD CD CD	0226 0222 0222
147	I_S (weak) in progress all day	g0141/3 b0142/2	0150- 0200.5/2		S								9500 3750 2000	SD SD CD	0141.3 0141 0141
148	I_S 0330- 0715/2	b0217- 0219/2 g0220/2 b0221/1 b0239/1 g0302/3	0259- 0310/2	0305- 0722/3	S		CD CA	0300 0326	25 120	0308 0405	520 4000	TK TK	9500 3750 2000 1420 1000 600 545 545	CA CA CA CA M CA CD CD	0247 0243 0243 0244 0235 0218 0214 0255
149	g0220/1 b0223/1 I_S 0319- 0712/1	b0228/2			S								9500 3750 1420 1000 600	CD CD SD CD CD	0219 0219 0221 0220 0221.2
150	I_S in progress	g0709/2 g0711- 0713/2 G0715- 0716/1	0712- 0721/2		S		CD	0709	6		>1100	N	9500 2000 1500 1000 600 545 169 169	ECD CD CD CD CA CD CA -	0708 0708 0707 0708 0708 0709 0708 0711
151															

146. The large flare on September 10th at 0223 UT, occurs in a very large, very bright, and active plage which contains a complex $\beta\gamma$ spot. The flare seems to be correlated with a solar event which is confined to the higher radio frequencies. Only very minor Type III bursts are reported in the dynamic spectrum, and no distinctive event is reported at meter wavelengths or at the low and intermediate frequencies. The SWF listed here is taken from the unpublished CRPL "check-list."

147. This Type II burst on September 11th at 0150 UT, is associated with minor flare activity in a region which is situated at the east limb of the sun. The plage (4148) is a return of region 4112, which was described in note No. 124. The αp spot No. 12613 is a return of the βp spot No. 12563 in region 4112, which is a return of the βp spot No. 12503 in region 4075. In addition to the Type II burst, Sydney also reports a group of unclassified bursts between 0141 and 0146 UT. No distinctive event is reported at meter wavelengths at the time of the Type II burst. At the higher frequencies, the radio event consists of a minor burst of very short duration. The SWF is taken from the unpublished "check-list."

148. This is a great solar event, on September 11th
The plage and spot data for this event are sim
given for event No. 146. Plage 4134 is responsi
events listed in the catalogue - Nos. 146, 148, 15
155, 156, 158, and 159. The Type II and Type IV e
here in association with the major flare at 024
appear in the Quarterly Bulletin, but were app
classified as such by Sydney, at a later time.
reports an unclassified burst at 0251 - 0256 U
wavelengths, the radio event consists of a very
+ burst, for which the second part is a long inte
high flux. The reports of the various single radi

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TABLE VIII.

PLAGE DATA								SUNSPOT DATA						
CMP Gr. Day	Mean Long.	Mean Lat.	Ave. Int.	Max. Area	No. Flares	Age in Rotations	Ident.	MT.W. Type	CMP Gr. Day	Mean Lat.	H	When Seen	Area	MT.W. No.
Sept. 07.5	240°	S25	3	2,600	13	1	NEW	dβℓ	Sept. 06.8	S24	20	4-12		12597
11.5	188°	S17	2.5	3,000	44	1	NEW	dβℓ	11.4	S17	26	8-17		12606
20.5	69°	N11	3.5	6,000	55	2	4114	ℓβpℓ *dβγℓ	20.2 21.3	N09 N10	30 31	13-25 20-27		12623 12634
19	89	N19	3.5	7,800	83	5	4112	*dβγℓ	19.3	N23	36	13-26	2200	12622
20.0	75°	S20	2.5	3,600	15	1	NEW	dβℓ dβpℓ	19.3 20.0	S23 S22	17 14	20-25 17-25	1400	12633 12630

e spectrum, the only storm. The single a burst of short y at all frequencies.

are similar to that on September 13th equency range 580 - ons indicate that the urst, for which the

are similar to that ctrum observations SWF on September 14th at 0204 UT. No distinctive event is reported at meter wavelengths.

157. This large SWF on September 15th at 0327 UT, is associated with a flare in a large, bright, and active region located near the east limb of the sun. No dynamic spectrum observations exist at the time of the SWF. No distinctive event is reported at meter wavelengths, and a large microwave burst of short duration occurs simultaneously at the higher frequencies.

158. The plage and spot data for this event are similar to that given for event No. 146. The Type II burst on September 15th at 2045 UT, was observed by Ft. Davis over a frequency range of 250 - 100 Mc. The single radio observations seem to indicate that the radio event consists of a modest burst which sweeps through the frequencies, from cm. to meter wavelengths, in an interval of about 4 minutes, and diminishing in duration.

159. The plage and spot data for this event are similar to that given for event No. 146. The Type II burst on September 16th at 2249 UT, is associated with an average flare in the active plage (4134), which has now reached a position near the west limb of the sun. The Type II burst was observed by Ft. Davis over a frequency range of 220 - 100 Mc. As in Event No. 159, the single frequency observations indicate that the radio event consists of a modest burst which sweeps through the frequencies, from cm. to meter wavelengths, in an interval of about 3 minutes, with diminishing intensity and duration.

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		FLARE DATA							SHORT-WAVE RADIO FADEOUTS						10 CM. EVENTS					
Event No.	Gr. Day	Beg. UT	End UT	Max. UT	Imp.	Position		No. of Obs.	Type	Imp.	Beg. UT	Dur. Min.	Wide Spread Index	No. of Obs.	Type	Beg. UT	Dur. Min.	Max. UT	Peak Flux	McM. Plage No.
152	Sept. 12	1510	1638	1516	2	N11	W18	8(6c)	S	2+	1513	39	5	12	*2	1514.3	18	1515.3	850	*4134
153	12	2145	2222	2150	1	S17	W76	2(2c)	SL	2-	2142	43	5	10	6 2	2145 2200	15 3	2153.8 2201.8	105 20	4136
154	13	0602	0707	0609 0623	1	S16	W24	5(1c)	SL	1	0603	24	4	3	*6	0622	4		618	*4141
155	13	1410	1508	1422	1+	N09	W32	7(5c)	S	3-	1416	34	5	9	3 2	1347.5 1414.5	05 13	1429 1418	24 235	*4134
156	14	0226	0303	0238	2	N11	W39	3(2c)	*S	3	0204	51	5	5	CD	0227	17	0237	400	*4134
157	15	0333	0418	0337	2	N07	E69	3(1c)	*S	3	0327	83	5	6	*SD	0332.5	7	0334	830	*4152
158	15	2030	2110	2042	1+	N11	W64	4(4c)	S	2-	2040	26	5	9	2 4	2040.5 2045.5	5 25	2041.8	365 35	*4134
159	16	2242	2310	2245	1	N11	W77	3(3c)	S	2-	2244	24	5	5	2 4	2243.8 2248.8	5 >15	2245	425 25	*4134
160	18	*1303 *1425	1600	1325 1530	3 3	N23 N20	E10 E04	9(5c) 9(5c)	SL SL	3- 3-	1245 1420	190 190	5 5	10 10	3 2	1258 1333	230 1.5	1330 1333.5	34 9	*4151
161	18	*1722 *1815	2110	1740 1840	3+ 3+	N23 N20	E08 E03	6(6c) 6(6c)	*S *S	3+ 3+	1730 1823	150 150	5 5	10 10	3 6	1805 1820.5	190 40	- 1824.7	92 275	*4151
162	19	*0350	0555	0410	3	N23	E02	5(2c)	*SL	3	0359	54	5	4	*CD	0401	10	0406	1410	*4151
163	20																			415
164	20	0529	0552	0533	1	N23	W13	1	S	1	0532	10	1	1	*CD	0537	11	0539	509	*4151

152. The plage and spot data for this event are similar to that given for event No. 146. The large 10 cm. burst on September 12th at 1514 UT, is accompanied by Type II and Type IV bursts which covered the entire observable frequency range of 580 - 100 Mc. At meter wavelengths, the radio event consists of a great burst which is followed by a great rise and fall in flux. The other single frequency reports indicate that a similar kind of major + burst occurred. At the intermediate frequencies, the "second part" consisted of a noise storm.

153. These Type II and Type IV dynamic spectrum events on September 12th at 2150 UT, are associated with flare activity in a region near the west limb of the sun. Plage 4136 is a new region - both the plage and its related βspot appeared on the disk on September 4, when the region was in the east. The Type II burst was reported by both Ft. Davis and Michigan, but only Michigan reports the Type IV emission, on their Cband only, and degenerating into weak noise storm activity. At meter wavelengths and at other single radio frequencies, the radio event consists of a minor burst of short duration.

154a. This very great geomagnetic storm is one of the few storms for which the 3-hr. Kp value reaches a maximum of 9.

154b. This large 10 cm. burst on September 13th at 0622 UT, is not associated with any other very major solar activity. The related flare occurred in an active plage which developed on the disk as a new plage of September 6, and in which a spot appeared on September 8. In the dyn response evidently was a weak no frequency observations indicate t duration occurred almost simultaneo

155. The plage and spot data for this ev given for event No. 146. The Type IV e at 1419 UT, was observed over the 400 Mc. The single frequency observ radio event consists of a major "second part" is a rise and fall in fl

156. The plage ans spot data for this ev given for event No. 146. No dynamic were being made at the time of the la

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RADIO DATA			
Dur. Min.	Max. UT	Peak Flux	Obs.
41	1302	(333)	HHI
45		429	N
142	1329	(304)	HHI
4		<150	UC
		< 10	
153		102	UC
1.5		170	N
60		35	
435	1317	360	NBS
62	1324	700	AOP
100		(400)	CAV
18		> 545	UC
44		> 545	
100		(1300)	CAV
>10	0044.3	1238	TK
22	0039	(57)	NAG
14	0040	175	SYD
8	0041	534	NAG
10	0037	106	SYD
1.5		>300	N(H)
1.8	0039.4	>4500	NBS
51	1026	(>500)	HHI
28	1026	(274)	HHI
3	1027	103	MOS
2		400	N
0.6		>72	UC
82	1423	(>515)	HHI
80	1425	(509)	HHI
19		198	UC
9		240	N
> 7	1428	400	NBS
8		33	UC
2.8	0812.5	>1355	TK
4.5	0813	(800)	NAG
43	0812	(571)	HHI
9	0814	(805)	NAG
9		60	UC
7		>75	UC
2.3	1635	980	NBS
5	0228	481	TK
35	0228	(36)	NAG
35	0228	(15)	NAG
1	0141.5	453	TK
1	0141.4	(18)	NAG
1.5	0141.4	20	NAG
130	0305	584	TK
90	0304	(373)	NAG
70	0304	(564)	NAG
66	0304	604	SYD
70	0320	(8200)	NAG
124		10000	SYD
12.5		180	N(H)
53		>30000	
5	0221	526	TK
2.5	0221.4	(102)	NAG
0.6		127	SYD
2	0221.4	(27)	NAG
0.7	0221.8	92	SYD
6	0709	697	TK
6	0709	(88)	NAG
10	0709	(191)	HHI
7	0709	(79)	NAG
3		180	UC
11		>300	N
2		>120	UC
9		>120	

POLAR CAP ABSORPTION						
Gr. Day	Onset UT	Rise to Peak	Dur.	Peak Int.	Obs.	
Sept. 02	1700	9h	46	58	B,L,H	
09	12	1200		36	0.5	L,H

GEOMAGNETIC STORMS						
Gr. Day	Beg. UT	Dur.	Type	Int.	No. Sta. Rep.	Max. Kp
Sept. 04	1300	2.5d	Sc	S	18	9

events indicate a large rise and fall in flux throughout the entire range of frequencies.

149. No flare observations were being made at the time of the large 10 cm. burst on September 12th at 0220 UT., therefore plage and spot data in association with this event are not available. The large 10 cm. burst is of very short duration, and is associated with only a modest Type III burst in the dynamic spectrum, and with bursts of very short duration throughout the range of frequencies covered by the single radio frequency observations. No distinctive event is reported at meter wavelengths. The SWF is taken from the unpublished CRPL "check-list."

150. The plage and spot data for this event are similar to that given for event No. 146. The Type II burst on September 12th at 0712 UT. is associated with, but preceded in time by, a large radio burst of short duration which occurs almost simultaneously at all wavelengths, throughout the entire range of frequencies covered by the single radio observations.

151. This PCA event is reported by Leinbach and Hakura, but does not appear in Bailey's list.

7R

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Event No.	DYNAMIC SPECTRUM DATA: Type I Time/Max. Int.	Type III Time/Int.	Type II Time/Int.	Type IV Time/Int.	Obs.	Freq. Range	200 MC/S DATA: Type	Beg. UT	Dur. Min.	Max. UT	Peak Flux	Obs.	OTH: Freq. Mc.s	Type	Beg. UT
152	I_S 1515- >2400/3	G1515- 1516/3 g1518- 1521/3	*1516 1528/3+	* 1515- 2025/3	H,M	580- 100	CD CD	1515 1522	7 125	1519 1528	>800 10	C,N	9400 1500 600 600 545 450 169 169	CD CD ECA - CD ECD CA -	1514 1515 1514 1516 1515 1515 1514 1517
153	I_S 2202- 2345/1-	g2147- 2149/1 g2151/1	*2150- 2153/3	* 2153- 2203/1-	H,M	300- 100	CD	2151	2		>150	N	9500 2000 1420 1000 600 545 167	CD CD SD CD CD CD CD	2146 < 2154 2154 < 2154 2149 2148.5 2153
154	I_S 0615- >0634/1				S		CA	0610	50	0700	570	TK	9500 2000 1420 1000 600 545 169 169	ECD ECD SD ECD CD CD ECA -	0623 0622 0623 0622 0623 0622 0622 0624
155	C1417- 1419/3	g1409- 1410/1- g1415- 1417/1 g1417- 1419/3		* 1419- 1606/3	H,M	580- 400	CD	1417.5	1.5	1418	225	OSL	9400 1500 600 600 545 545 169 169 169	CD CD ECD - CD - ECA - -	1415 1415 1415 1418 1414 1418 1417 1420 1428
156													9500 2000 1000 545	ECD CD CD CD	0227 0226 0227 0226
157													9500 2000	ECD SD	0332 0332
158	I_S (weak) in progress all day	g2039- 2040/1 g2041/3	*2045- 2049/3		H,M	250- 100	CD	2043	2		>150	N	450 167	ECD ECD	2041 2044.7
159	I_S in progress all day	g2244- 2245/1 b2253/1	*2249- 2254/3		H,M	220- 100	CD	2245	1.5		>180	N(H)	9500 2000 1420 1000 600 545 545	ECD ESD SD ESD CD CD -	2243 2243.8 2244 2244 2245 2244 2245
160	C<1315- 1521.1 I_S <1315- 1711/2 Also I_S (weak) in progress all day				H,M		ESD ECD	1333 1437	0.6 60		>500	N,C C	600 450	CA CA	1419 < 1348
161	I_S (weak) in in progress	g1741/3 G1835/1		* 1810- >0028/3	H,M	580- 100	CD CD	1740 1808	0.8 >293	1827	356	C C	545 450 450 450 167	CD CD - - CA	1807 1807 1910 1930 1820
162	I_S (weak) in progress all day g0411/2 g0413, 3 g0450, 2 I_S 0500- 0702/3	III$_S$ all day III$_S$ 0546- 0634/3		* 0427- 0730/3	S		CA CD	0308 0411.5	150 1.5	0510 0411.8	580 1420	TK TK	9500 2000 1420 1000 600 545	CD CD CD F CD CD	0358.8 0402 0403 0405 0407 0409
163															
164	I_S in progress all day	III$_S$ all day III$_S$ 0544- >0624/2			S								9500 3750 2000 169	SD SD CD SA	0537 0536 0537 0530

160. This major flare on September 18th at 1300 UT, is one of those rare great optical flares which shows a "double aspect" as it spreads within the plage. This "doubling" appears also in the SWF and in the radio event at meter wavelengths. The flare occurred in a large, very bright, and very active plage which was in its fifth rotation, and which is responsible for five events in this catalogue - Nos. 160, 161, 162, 164, and 166. This active region (4151) is a return of the plage described in note No. 124. The complex $\beta\gamma$ spot No. 12622 is the largest spot observed during the year - area equal to 2200 millionths of the hemisphere (Mt. Wilson data). The only effect of the flare at radio frequencies seems to be in the form of noise and a rise base level, as shown most clearly in the dynamic spectrum observations. The single frequency observations (at both cm. and meter wavelengths) indicate that the radio event consists of a very minor burst (which seems to be associated with the first phase of the flare) and a rise and fall in flux, with noise, (which seems to be related to the later aspect of the flare).

161. The unusual plage described above in note No. 160 experiences another great flare only a few hours after the preceding event. This second great flare on September 18th at 1722 UT. also has a "double" aspect as the flare spreads within the plage. The plage and spot data are similar to that given for event No. 160. This flare also has a similar response in the SWF, and at radio frequencies, but to a much greater degree. Instead of only continuum emission, as in event No. 160, Ft. Davis now reports strong Type IV emission, observed over a frequency range of 580 - 100 Mc. The 10 cm. event consists of a large burst long-enduring rise and fall in flux. At meter event is a minor burst (associated with t the flare), followed by a very large and long- base level (associated with the later aspe

162. This is another major optical and radio eve 19th at 0350 UT., in the same plage which for events No. 160 and 161. This unusual r ienced three of these great events within a pe The single frequency observations indicat event consists of a microwave burst, of 10 cm., which progresses slowly through from high to low frequencies, in a period of with decreasing intensity and duration.

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TABLE VIII.

PLAGE DATA								SUNSPOT DATA						
CMP Gr. Day	Mean Long.	Mean Lat.	Ave. Int.	Max. Area	No. Flares	Age in Rotations	Ident.	MT.W. Type	CMP Gr. Day	Mean Lat.	H	When Seen	Area	MT.W No.
Oct. 01.0	290°	N17	3.5	6,000	19	2	4145	*ℓβρℓ	Sept. 30.8	N16	30	23-6		12648
Sept. 28.0		N20	3	19,000	63	4.3	4124	*ℓβγℓ	27.2	N14	25	20-2		12635
								ℓαρℓ	27.4	N19	30	20-2		12636
								dβρd	27.8	N24	26	22-2		12642
								ℓβd	28.7	N11	20	22-2		12644
								dβℓ	28.9	N25	13	25-4		12652
Oct. 07.5	204°	N14	2.5	7,500	30	3	4134	dβℓ	Oct. 7.9	N14	16	6-12		12676
08	198°	S40	3	5,200	17	1	NEW	dβfd	8.2	S40	11	1-12		12669
14.5	112°	N23	2	2,500	14	6	4148	dβρℓ	14.5	N24	10	12-19		12691
17.5	59°	N10	2.5	8,500	26	3	4152	dβd	16.4	N09	13	10-18		12687
11.0	158°	N18	3.5	5,000	14	3	4132	ℓβρℓ	11.1	N19	28	4-16		12675
17.5	73°	S25	3.5	18,000	92	2	4155	*ℓβγδ	17.8	S25	29	10-24	1500	12689
								ℓαℓ	18.4	S29	17	12-24		12694
								ℓβρd	18.5	S23	15	12-19		12696

ing storm is still in

24th at 0212 UT. is
the east limb of the
e dynamic spectrum
very real event took
nd no event at meter
of the Type II burst.
CRPL "check-list."

t are similar to that
st on September 24th
t optical flare at the
No other related ac-
WF, no 10 cm. event,

and no events at any of the single radio frequencies.

173. This major flare on September 26th at 1907 UT., occurred in an extremely large, bright, and very active plage. This region (4159) is a return of the active region 4124, described in note No. 132, which was responsible for eleven major events in this catalogue during its disk passage - of which two (and possibly three) were PCA events. Region 4159 is responsible for 5 events in this catalogue - Nos. 173, 174, 175, 176, and 177 - one of which is a PCA event. The αp spot No. 12636 is a return of the βγ spot No. 12581 in region 4124. The βp spot No. 12642 is located in the same position, but is not a return, of the βγ spot No. 12580 in region 4124. The 10 cm. event consists of a modest but lengthy burst superposed on a very long-enduring rise and fall in flux, which began about 50 minutes earlier. The strong Type IV radio emission, which started at 1927 UT. at the same time as the 10 cm. burst, was observed by Ft. Davis over the entire observable frequency range of 580 - 100 Mc. Ft. Davis remarks that the Type IV burst "changes gradually into noise storm activity." At meter wavelengths, the radio event consists of a very great complex burst, followed by a great rise in base level.

176. The plage and spot data for this event are similar to that given for event No. 173. The major flare on September 30th at 1657 UT., and large SWF, are not associated with any other major activity. Only a small Type III burst is reported in the dynamic spectrum, and a minor burst at meter wavelengths. The 10 cm. event consists of several modest bursts superposed on a rise and fall in flux. No events at any other single radio frequencies are reported at the time of the large flare.

2.VIII-9C (2)

Event No.	Gr. Day	FLARE DATE Beg. UT	End UT	Max. UT	Imp.	Position	No. of Obs.	SHORT-WAVE RADIO FADEOUTS Type	Imp.	Beg. UT	Dur. Min.	Wide Spread Index	No. of Obs.	10 CM. EVENTS Type	Beg. UT	Dur. Min.	Max. UT	Peak Flux	McM. Plage No.
165	Sept. 20	2117	2222	2123	2	N07 W14	4(4c)	S	1+	2120	21	5	10	6 4	2119 2127	8 >80	2120.5	185 18	*4152
166	21	0415	0456	0422	2	N23 W23	4(1c)	*SL	3	0410	32	5	4	CD	0403	25	0406	420	*4151
167	21																		
168	21	*1330	1510	1335	3	N10 W06	11(4c)	SL	3-	1330	60	5	9	*6 4	1330 1344.5	14.5 25	1337	785 15	*4152
169	21																		
170	22																		
171	24	0224	0307	0227	1-	N15 E91	1(1c)	SL	2+	0217	143	1	1						4162
172	24	0507	0522	0513	1+	N15 E90	2(2c)												4162
173	26	*1907	2202	1952	3	N22 E15	6(5c)	S	2+	1925	100	5	5	3 6	1836 1927.8	>240 60	- 1938.5	57 67	*4159
174	26																		
175	29																		
176	30	*1657	1750	1706	3	N25 W37	5(4c)	*S	3	1700	40	5	9	3 1 6 2	1658 1658 1659.5 1705.5	70 1 6 3	1710 1658.4 1701.5 1706.3	30 18 77 120	*4159
177	Oct. 03																		
178	08	0231	0258	0240	2	N17 W05	2(1c)	SL	2-	0230	24	5	3	*ESD	0233.5	7.5	0234	800	*4172
179	09	0340	0438	0355	2	S38 W14	3(1c)	SL	1+	0340	44	5	4	CD	0342	27	0347	382	4173
180	10	1630	1731	1648	1+	N25 E38	2(2c)	*SL	3	1607	123	5	8	2 1	1608 1618.8	9.5 1.5	1609.9 1619.2	16 7	4183
181	13	0534	0641	0539	2+	N12 E40	3(1c)	S	1	0541	25	1	1	*CD	0535.3	7.7	0536.5	800	4186
182	14																		
183	15							S	1+	2150	12	5	8	*2	2150	>10	2152.7	1000	
134	16	0144	0155		1	N22 W56	1	S	2+	0150				*ECD	0142	39	0142	523	4179
185	16	*0152	0202	0152	3	S25 E21	1	S	2+	0150	20	5	7						*4189
186	18	0816	1022	0820	1	S24 W04	7(3c)	*S	3	0820	20	1	1	*2	0818	12		544	*4189

165. The plage and spot data for this event are similar to that given for event No. 157. The Type II burst on September 20th at 2121 UT, was observed by Ft. Davis over a frequency range of 330 - 100 Mc. The single radio observations indicate that the radio event, at meter wavelengths and the intermediate frequencies, consists of a major burst of short duration.

166. The plage and spot data for this event are similar to that given for event No. 160. No dynamic spectrum observations exist at the time of large SWF on September 21st at 0410 UT. Only a minor burst is reported at meter wavelengths.

167. Seven of these 17 stations rate this storm as a severe one. Four stations continue the storm for three more days, running it through the period of the next storm (event No. 170).

168. The plage and spot data for this event are similar to that given for event No. 157. The major flare on September 21st at 1330 UT, began earlier as a minor brightening of importance 1-, at 1227 UT. The large 10 cm. event consists of a very large burst followed by a modest post-burst increase. The brief interval of Type IV radio emission (15 minutes) was observed by Fort Davis over a frequency range of 300 - 100 Mc. At meter wavelengths, the radio event consists of a very great burst, superposed on a rise in flux, which began earlier, at 1230 UT., as the onset of a noise storm with a rise in base level.

170. This storm begins while the pre
progress, but is diminishing.

171. The Type II burst on Septembe
associated with a minor optical flar
sun. However, the large SWF, and
response at 40 - 240 Mc, indicate th
place on the sun. No. 10 cm. even
wavelengths, are reported at the t
The SWF is taken from the unpublis

172. The plage and spot data for this
given for event No. 171. The Type II
at 0504 UT, is associated with a m
east limb, similar to event No. 1
tivity is reported - there is no know

2. VIII - 9L

R RADIO DATA				POLAR CAP ABSORPTION						GEOMAGNETIC STORMS						
Dur. Min.	Max. UT	Peak Flux	Obs.	Gr. Day	Onset UT	Rise to Peak	Dur.	Peak Int.	Obs.	Gr. Day	Beg. UT	Dur.	Type	Int.	No. Sta. Rep.	Max. Kp
11	1516	(1150)	HHI													
28.5	1516	(627)	HHI													
2		>210	UC													
164		>>430														
220		>5000	N													
315	1528	>7500	NBS													
2.5		>270	UC													
63		>270														
10	2154	860	TK													
>7	2154	(86)	NAG													
1.5	2154	278	SYD													
>6	2154	(195)	NAG													
7.5	2150	178	SYD													
3		150	N													
142	2321	320	NBS													
2.8	0623.5	813	TK							Sept. 13	0047	2.2d	Sc	S	18	9
3	0622.4	(290)	NAG													
2.5	0623	224	SYD													
3	0622.6	209	NAG													
1.8	0624	191	SYD													
2.5		450	N													
1.5		110	UC													
3		120														
35	1418	(542)	HHI													
40	1420	(266)	HHI													
3		150	UC													
117		>510														
4		240	N													
110		>5500														
3		>120	UC													
8		72														
36		23														
>30	0228	706	TK													
17	0228	(28)	NAG													
14	0227	14	NAG													
1.5		45	N													
5.8	0333	1066	TK													
5	0335	(111)	NAG													
15	2042	800	NBS													
2.5	2045.9	3000	NBS													
17	2244.5	1030	TK													
3	2245	(320)	NAG													
10	2245	198	SYD													
6	2246	(145)	NAG													
>5	2245	86	SYD													
1		>300	N													
12		30														
32		45	UC													
258	1440	140	NBS													
50			N													
63	1823	980	NBS													
20	1915	2000														
>315	1947	220														
>390	2100	2000	NBS													
>50	0405	>1350	TK													
8	0406	(254)	NAG													
7	0406	193	SYD													
11	0409	305	NAG													
2	0408	131	SYD													
4		90	N													
9	0539	643	TK													
6	0539	(200)	NAG													
8	0539	(23)	NAG													
300			UC													

erposed on a velengths the first phase of during rise in of the flare).

on September s responsible on has exper- 1 of 24 hours. hat the radio at intensity at frequencies, t 10 minutes, meter wave-

lengths (200 Mc.), this burst is superposed on a lengthy rise and fall in flux.

163. This region is similar to the plage described in note No. 65. The plage is new, and appeared on the disk when the region was about 3 days east of the central meridian. The β spot No. 12633 is one of the largest spots of the year - area equal to 1400 millionths of the hemisphere (Mt. Wilson data).

164. The plage and spot data for this event are similar to that given for event No. 160. The large 10 cm. burst on Sept. 20th at 0537 UT, is not associated with any other major solar activity. In the dynamic spectrum, in addition to the Type III noise storm, Sydney also reports unclassified bursts at 0547, 0554, and 0558 UT. No distinctive event is reported at meter wavelengths at the time of 10 cm. burst. The SWF is taken from the unpublished CRPL "check-list."

2. VIII - 8R (2)

Event No.	DYNAMIC SPECTRUM DATA: Type I Time/Max. Int.	Type III Time/Int.	TimeI Time/Int.	Type IV Time/Int.	Obs.	Freq. Range	200 MC/S DATA: Type	Beg. UT	Dur. Min.	Max. UT	Peak Flux	Obs.	OTHE: Freq. Mc/s	Type	Beg. UT
165	C2119-2125/1 I_S in progress all day	g2119-2120/1	*2121-2123/3		H,M	330-100	CD	2121.5	3.5		>180	N(H)	9500 545 450 167	ECD CD ECD FD	2119 2121.5 2119 2120.2
166							CD	0446	1.5		90	N(H)	9500 2000	CA SD	0405 0403
167															
168	I_S (weak) in progress all day I_S 1315-1746/2	G1330-1339/3 g1406/3 g1410/3 g1415/3 G1424/1		1330-1345/3	H,M	300-100	E,M CA CA	1230 1306 1308	270 1.5 1410	 off-scale 1312-1321		C C C	9400 1500 600 545 450 450 169 167	CD CD ECD CD CD - CD ECD	1330 1330 1331 1334 1331 1350 1220 1330
169															
170															
171	I_S in progress all day	b0201/2 G0201-0204/1 b0204/2 g0204-0206/1	*0212-0226/2		S								9500 9500	ESD SD	0204.5 0238
172	I_S in progress all day	g0454/1 g0521/1	*0504-0507/1		S										
173	I_S 1932-2400/3	g1927/2		* 1927->2015/3	H,M	580-100	CD	1925 1947	40 >60	1940 2010	>384	C C	450 167 167	CA ECD CA	1915 1926.3 1927
174															
175															
176		g1658/1			H,M		CD	1657	0.8			C			
177															
178		g0233/2			S		ECD	0232.7	2.5	0233.8	1600	TK	9500 2000 1420 1000 600 545	ECD SD SD CD SD SD	0233 0232.5 0232 0232.5 0234.5 0233
179	I_S 0337-0400/2	III_S 0337-0427/1	*0402-0422/3		S								9500 2000 1420 1000 600 545	CD CD SD CD SD CD	0345 0340 0343 0341 0346 0343
180	I_S in progress all day														
181													9500 2000	CD CD	0536 0535
182															
183	I_S in progress from 1844 UT	G2152-2153/3 g2153-2155/1			H,M								9500 1420 600 450	CD SD CD ECD	2151 2152 2152 2151.7
184															
185													9500 2000 1000	ECD CD F	0151.8 0151.9 0151.9
186													9400 1500 600 545	SD CD ECD CD	0810 0816 0819 0818

177. This minor storm was reported by only two stations. However, the change in the 3-hour Kp's is quite definite.

178. This strong 10 cm. burst on October 8th at 0233 UT. is associated with flare activity in a large and fairly active plage (4172), which is the return of the very active region (4134) described in notes No. 146 and 148. This region (4172) is not important as a source of great activity, except for this single microwave burst. In the dynamic spectrum, in addition to the Type III burst, Sydney also reports an unclassified burst at 0232.5 - 0236 UT.

179. The Type II burst on October 9th at 0402 UT. is associated with flare activity in a new plage located near the center of the solar disk. No distinctive event is reported at meter wavelengths, at the time of the Type II burst.

180. No outstanding events in the dynamic spectrum are reported at the time of the large SWF on October 10th at 1607 UT. The 10 cm. event consists of two small bursts, and at meter wavelengths no distinctive event is reported, although a noise storm is in progress. No events are reported at any other single radio frequencies.

181. This strong microwave burst on October 13th at 0536 UT. is associated with an important optical flare, but the related activity and radio emission are not very great. No dynamic spectrum observations exist at the time of the 10 cm. burst. At meter wavelengths, no distinctive event is reported.

182. Five of the 12 stations which report this storm call it a sudden commencement storm. Four of the stations start the storm earlier, on 13th at 20xx UT.

183. No flare observations exist at the time of the burst on October 15th at 2150 UT., therefore pl data for this event are not available. The b incomplete, since it was recorded during the s lations. No distinctive event is reported at meter at the time of the 10 cm. burst.

184. This large 10 cm. burst on October 16th at 0142 to be associated with minor flare activity in a the west limb of the sun. There is a very little activity. The SWF given here is in all prob applicable to the next event (No. 185). No dynam event is reported at the time of the large 10 cm no distinctive events are reported at any frequencies.

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TABLE VIII.

PLAGE DATA								SUNSPOT DATA						
CMP Gr. Day	Mean Long.	Mean Lat.	Ave. Int.	Max. Area	No. Flares	Age in Rotations	Ident.	MT.W. Type	CMP Gr. Day	Mean Lat.	H	When Seen	Area	MT.W. No.
Oct. 22.0	13°	N15	2	2,600	8	4	4158	*dβl*	Oct. 22.2	N14	14	22-27		12712
22.0	13°	N26	2	1,400	11	1	NEW	*dβl*	21.8	N25	7	22-27		12711
25.5	327°	N20	3	12,500	45	5	4159	*lβl* *lβpl* *lβpl*	24.8 25.7 25.7	N13 N22 N13	13 17 16	18-30 19-30 22-30		12707 12710 12716
27.5	301°	N18	3	6,000	13	3	4162	**dβpl* *lαpd* *lβp*	27.5 27.9 28.7	N21 N14 N12	22 14 11	26-1 22-30 22-1	1400	12733 12719 12720

- 20th at 1637 UT. re similar to that e has a "double" nother part of the very great burst, by a long-enduring or coincides with of the large burst e flare. The great over a frequency Type IV emission over the entire observable frequency range of 580 - 100 Mc. At meter wavelengths the radio event consists of a large and complex major + burst. The single radio observations indicate that a great burst occurs at all wavelengths, followed by a "second part" which consists mostly of a long period of noise at the lower frequencies, with "irregular intensity fluctuations" (NERA).

192. No flare observations were in progress at the time of the Type II burst on October 20th at 2149 UT., therefore plage and spot data for this event are not available. The Type II burst was observed by Ft. Davis over a frequency range of 190 - 100 Mc. No distinctive event is reported at meter wavelengths, and only minor bursts of short duration are reported at the low and intermediate single radio frequencies. The SWF is taken from the unpublished CRPL "check-lists."

193. The plage and spot data for this event are similar to that given for event No. 185. The Type II burst on October 21st at 1304 UT. is associated with minor flare activity. No SWF is reported at the time of the Type II burst. Only minor

2, VIII -10 L
(2)

Event No.	Gr. Day	FLARE DATA							SHORT-WAVE RADIO FADEOUTS						10 CM. EVENTS					McM. Plage No.
		Beg. UT	End UT	Max. UT	Imp.	Position		No. of Obs.	Type	Imp.	Beg. UT	Dur. Min.	Wide Spread Index	No. of Obs.	Type	Beg. UT	Dur. Min.	Max. UT	Peak Flux	
187	Oct. 19	0406	0415	0410	1	S28	W20	1	S	1	0406	24	3	2	*ESD	0405	7	0406	700	*4189
188	20								S	2+	0242	38	5	4	*CA	0239	40	0254	1100	
189	20	0938	1120	0942	2	S25	W32	11(4c)	*S	3	0945	15	4	3	CD	0938	7	0941	-	*4189
190	20	*1637	1644	1642	3+	S26	W45	2(2c)	*S	3+	1639	156	5	12	9	1636	8		12	*4189
		*1644	1804	1647	3+	S26	W35	2(2c)							*6	1644	51	1650.8	4000	
															4	1735	195		68	
191	20																			
192	20								S	1	2136	12	1	1	2	2145	>5	2145.8	230	
193	21	1301	1314	1302	1	S28	W50	1(1c)							2	1301	5.5	1301.5	155	*4189
															4	1306.5	20		8	
194	21																			
195	23	2222	2236		1	S18	W79	1(1c)												*4189
196	24	2314	2326	2319	1-	N15	W42	1(1c)	S	1	2259	9	5	3						4195
197	24	2329	2406	2340	1-	N27	W44	1(1c)												4194
198	25																			*4197
199	26								S	2	0135	20	5	3	*CD	0138	10	0139	880	
200	27																			4202
201	27																			
202	30														*CD	0037	16	0040	550	

187. The plage and spot data for this event are similar to that given for event No. 185. The strong microwave burst on October 19th at 0405 UT. is similar to the one described in note No. 186. No dynamic spectrum observations exist at the time of the burst. At meter wavelengths, the radio event consists of a minor burst. The single frequency observations indicate that a brief burst progresses from high to low frequencies, diminishing in intensity and duration as it does so.

188. No flare observations exist at the time of the large 10 cm. burst on October 20th at 0239 UT., therefore plage and spot data for this event are not available. No dynamic spectrum observations exist at the time of the large burst.

189. The plage and spot data for this event are similar to that given for event No. 185. No dynamic spectrum observations exist at the time of the large SWF on October 20th at 0945 UT. The single frequency observations indicate that the radio event consists of a minor burst, of short duration at the low and intermediate frequencies.

190. This is a very great solar event, on Octob
The plage and spot data for this event
given for event No. 185. The great fla
aspect, due to the spreading of the flare to
plage. The 10 cm. event consists of
preceded by a "precursor," and followe
post-burst increase. Note that the precu
the start of the flare, and the start
coincides with the time of spreading of t
Type II burst was observed by Ft. Davi
range of 350 - 100 Mc., and the stron

2. VIII-10 ①

R RADIO DATA				POLAR CAP ABSORPTION						GEOMAGNETIC STORMS						
Dur. Min.	Max. UT	Peak Flux	Obs.	Gr. Day	Onset UT	Rise to Peak	Dur.	Peak Int.	Obs.	Gr. Day	Beg. UT	Dur.	Type	Int.	No. Sta. Rep.	Max. Kp
36	2120	887	TK													
5.5		>300	N(H)													
7	2119	1000	NBS													
3.1	2121.3	>3500	NBS													
80	0420	556	TK													
4	0405.4	(10)	NAG													
										Sept. 21	1005	1.2d	Sc	ms	17	7
67	1336	(1095)	HHI													
31	1336	(432)	HHI													
16		180	UC													
10		200	N													
15	1336	600	NBS													
>650	1424	160														
>160		95	IRS													
9	1334	>4000	NBS													
				Sept. 21	1700	18h	63	41	B,L,H							
										22	1345	3d	Sc	ms	17	9
0.3	0204.7	512	TK													
1.0	0238.5	502	TK													
>315	2028	450	NBS													
0.8	1926.8	2000	NBS													
>308	2200	>4000														
				26	2100	—	24	15	B,L							
										29	0016	3.2d	Sc	ms	18	9
										Oct. 03	1019	0.8d	Sc	m	2	5
3	0233.8	575	TK													
3	0234.2	(217)	NAG													
3	0234	186	SYD													
2.5	0233.7	(147)	NAG													
1.6	0234.8	55	SYD													
2		160	N(H)													
50	0355	499	TK													
17	0348	(43)	NAG													
11	0347	148	SYD													
15	0347	(24)	NAG													
9	0349	58	SYD													
12		70	N(H)													
13	0538	538	TK													
6	0538.5	(49)	NAG													
										14	0440	1d	g	m	12	6
10	2153	>1230	TK													
3.5	2153	421	SYD													
4.2	2154	316	SYD													
1	2152.1	>5200	NBS													
8.5	0152	701	TK													
3	0152.8	92	NAG													
1	0152.8	305	NAG													
63	0821	(485)	HHI													
9	0820	(184)	HHI													
1		78	UC													
0.6		75	N													

arge 10 cm.
age and spot
urst itself is
unset oscil-
wavelengths

UT. appears
region near
ther related
ability more
ic spectrum
burst, and
f the single

185. This may not be a real flare of importance 3 on October 16th at 0152 UT. Such great flares last much longer than 10 minutes. The event occurred in an exceptionally large, very bright, and very active plage. The β f spot No. 12689 is one of the largest spots of the year - area 1500 millionths of the solar hemisphere (Mt. Wilson data) and is possibly a return of β spot No. 12633 in region 4155. No additional 10 cm. events are reported at the time of the flare, other than the event in progress with No. 184, above. No events are reported in the dynamic spectrum, or at meter wavelengths, at the time of the flare. The region in which this flare occurred (plage 4189), is responsible for nine events in this catalogue - Nos. 185, 186, 187, 189, 190, 191, 193, 194, and 195.

186. The plage and spot data for this event are similar to that given for event No. 185. The strong microwave burst on October 18th at 0818 UT, apparently is not associated with any other major solar activity. No dynamic spectrum observations were being made at the time of the large burst. At meter wavelengths, no distinctive events were reported.

9R

2. VIII-9 (2)

Event No.	DYNAMIC SPECTRUM DATA: Type I Time/Max. Int.	Type III Time/Int.	Type II Time/Int.	Type IV Time/Int.	Obs.	Freq. Range	200 MC/S DATA: Type	Beg. UT	Dur. Min.	Max. UT	Peak Flux	Obs.	OTH: Freq. Mc/s	Type	Beg. UT
187							CD	0412	0.3		680	TK	9500	CD	0357
													2000	SD	0403
													1000	SD	0404
188							ESD	0250.2	2	0250.5	9500	TK	9500	CA	0237.8
													2000	F	0248
													1420	F	0251
													1000	F	0250
													600	F	0251
													545	CD	0253
189							CD	0953	0.4		>140	N	9400	CD	0940
													1500	CD	0940
													210	F	0948
190	I_s 1646-2341/1	g1638/1 g1646-1647/1 G1647-1649/2 G1650-1651/2 g1701-1702/3	*1650-1658/3+	* 1651-2013/3	H,M H,M	350-100 580-100	CD	1646	90		>>120	N	545	CD	1646
													545		1840
													450	CD	1647
													450	N	1835
													167	CD	1646
													167	N	1815
191							SD	2140.2	1		1140	HIR			
192	I_s in progress C2145-2146/3	G2145-2146/3	*2149-2150/3		H,M	190-100							9500	ECD	2145
													1420	SD	2146
													600	SD	2147
													450	ECD	2144.1
193	I_s 1329-1340/1	g1301-1302/3 g1303/2 g1303.5-1304/2 g1306/2	*1304-1307/3		M		CA	1302	6		>48	C	1500	SD	1301
													600	ECD	1301
													545	CD	1303
													169	ECD	1301
													169	-	1302
194															
195	I_s in progress 2103-2314/1 C2217-2218/1 C2226-2230/2	g2203-2206/1 g2207/3 G2213-2216/3 g2217-2218/2 b2224/2 G2225-2229/2 g2235-2236/3	*2204-2205/1 *2226-2227/1	?	S,M,H		CD	2228	4		>170	N	9500	CA	2129
													2000	SD	2217
													1420	CD	2213
													600	F	2218
													545	CD	2219
													450	ECD	2217.
													167	ECD	2212
													2000	SD	2226
													1000	F	2226
196		g2257-2259/2 g2300/1 g2314-2317/1 b2320/2 G2321-2323/1	*2310-2315/1		S		CD	2257	1.5		>150	N(H)	9500	CD	2256
													2000	CD	2255
													1000	CD	2256
197		g2324/3 g2325-2326/1 g2349/1 g2356-2358/1 b2359/1	*2341-2358/1		S								9500	CD	2327
198													9400	CD	0138
													2000	CD	0138
													1420	CD	0139
													1000	F	0138
													600	CD	0139
199															
200															
201															
202	I_s in progress all day	g0039/1 g0040/2 g0041-0043/1 g0043-0046/3			S								9500	CD	0039
													3750	CD	0038
													2000	CD	0038
													1000	F	0038

bursts are reported at the single radio frequencies.

194. Four of the nine stations give this storm a gradual start (instead of Sc), between 12xx and 20xx UT on 21st.

195. The plage and spot data for this event are similar to that given for event No. 185. No known SWF and no 10 cm. events are reported at the time of the Type II bursts on October 23rd at 2204 and 2226 UT. These bursts are probably associated with a flare in progress near the west limb of the sun. The Type II bursts reported by Sydney are called Type III bursts by Michigan. Michigan also reports Type IV emission from 2212 - 2236 UT., but neither Sydney or Ft. Davis concur in this observation.

196. No 10 cm. bursts are reported at the time of the Type II burst on October 24th at 2310 UT. The burst is associated with only minor flare activity, and the SWF and the single radio frequency observations appear to indicate that the solar event started at 2257 UT. (instead of 2314 UT).

197. The Type II burst on October 24th at 2341 UT. is associated with minor flare activity, for which no known events are reported. No distinctive event meter wavelengths.

198. This active region is similar to the plage d No. 35. Although flare-rich and very lar (4197) is declining in intensity and area sponsible for any other major events in The region is, however, a return of the ac described in note No. 173. The β spot return of the $\beta\gamma$ spot No. 12635 in region 4

2. VIII -10 R (1)

TABLE VIII.

PLAGE DATA								SUNSPOT DATA						
CMP Gr. Day	Mean Long.	Mean Lat.	Ave. Int.	Max. Area	No. Flares	Age in Rotations	Ident.	MT.W. Type	CMP Gr. Day	Mean Lat.	H	When Seen	Area	MT.W. No.
Oct. 31.5	248°	S18	3	18,000	54	3	4167 and 4175	ℓβfd	Oct. 31.7	S15	17	25-4		12730
								*ℓγℓ	Nov. 1.0	S24	20	25-6		12732
Nov. 14.5	63°	S21	2.5	8,000	17	3	4189	ℓαd	14.9	S 23	10	8-16		12768
12.0	96°	N18	3.5	11,000	16	1	NEW	ℓβpd	11.7	N19	19	5-12		12762
								ℓpℓ	12.5	N19	16	5-18		12763
20.0	351°	N26	3.5	7,000	28	1	NEW	ℓβpℓ	20.0	N28	18	16-25		12779
								dxℓ	18.7	N26	(10)	21-24		12790
27.0	259°	S15	3.5	8,500	38	4	4207	ℓαpd	26.7	S10	(10)	20-26		12787
								ℓβpℓ	26.7	S16	21	20-2		12788
25.5	278°	S15	3	7,000	12	2	4214	ℓβfℓ	25.4	S13	21	18-1		12784
Dec. 5.0	153°	N39	1.5	1,000	1	2	4220							

ed at meter wave-

time of the Type II herefore plage and le. No SWF, and no ncies are reported

are similar to that trum observations t on November 6th ort duration and is

associated with a flare near the west limb of the sun. The events reported at the single radio frequencies indicate that the radio event consists of a burst of relatively short duration, which occurred almost simultaneously at all wavelengths.

210. This long interval of weak geomagnetic disturbance was reported by stations which were located at very high geomagnetic latitudes, and by a station in the equatorial zone.

211. The Type II event on November 13th at 0502 UT. is associated with minor flare activity in a region which is the return of the very active plage described in note No. 185.

212. This so-called storm is a very minor geomagnetic disturbance.

213. The large 10 cm. burst on November 15th at 0522 UT. is associated with flare activity in a very large and very bright plage. No dynamic pectrum events are reported at the time of the large 10 cm. burst. No known observations exist at meter wavelengths at this time. Events which are reported at other single radio frequencies indicate that the radio event consists of a burst which appears to progress slowly through the frequencies, from high to low frequencies, with diminishing intensity and duration.

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(2)

Event No.	DYNAMIC SPECTRUM DATA						200 MC/S DATA						OTHER RADI			
	Type I Time/ Max. Int.	Type III Time/Int.	Type II Time/Int.	Type IV Time/Int.	Obs.	Freq. Range	Type	Beg. UT	Dur. Min.	Max. UT	Peak Flux	Obs.	Freq. Mc/s	Type	Beg. UT	Dur. Min.
203		b2120/3	*2119-2121/2		H,M	210-130	CD	2119	1		>160	N(H)	167	CD	2119.1	1.5
204			<*2240-2242/2		S											
205																
206							CD	1205	11.5		38000	N	1500	CD	1204	17
													600	SD	1206	21
													545	CD	1205	19
													169	CA	1205	16
													81	SD	1214	0.5
													81	SD	1218	1.5
													81	CD	1221	15
207			*0424-0434/2		S											
208							CD	0837	7	0838	>120	N	9400	SD	0838	9.5
													1500	SD	0837	17
													600	ESD	0838	9
													169	ECA	0838	7
209																
210																
211		g0457.5-0459/2 G0459-0503/3	*0502-0505/3		S		CD	0457.5	2.5		>160	N(H)	9500	ECD	0457.5	10
													2000	SD	0457	9
													1420	SD	0458	1
													1000	SD	0457.5	4
													545	CD	0458	2
212																
213													9500	CD	0525	80
													2000	CD	0526	25
													1420	F	0530	25
													1000	SD	0542	6.5
													600	SD	0543	7
214																
215													9500	SD	0323	10
216			*0050.5-0052/2		S		SD	0050.5	0.5		1700	T	9500	ECD	0042	10
													2000	SD	0042	8
217			*0413.5-0422.5/3		S		F	0408	8	0414	1400	T	9500	CD	0406	35
													2000	ECD	0406	9
													1420	CD	0407	2.5
													1000	CD	0406	4
													600	CD	0409	1
													545	CD	0407	8
218							CD	0758	12		>160	N	9400	CD	0750	65
													1500	CD	<0759	>7
													600	ECD	0753	25
													545	CD	0754	23
													169	CD	0754	23
219							CA	0850	65		>50000	N	9400	CD	0857	66
													9400	SD	1105	15
													1500	CD	0857	61
													1500	CD	1105	5
													600	ECA	0901	28
													600	CA	0931	25
													600	CA	0956	18
													600	CA	1105	4
													545	CA	0900	75
													169	SA	0836	324
													169	CA	0905	86
													23	S	0928	6.6
220																
221		G1811-1812/2		* 1811-1931/3	H	580-100	SD	1805	60		(30)	N(P)	545	CD	1810	35
													450	CD	1810	22
															1832	54
222	S0449->0632/3	S0442->0632/2	*0416-0430/1		S		CA	0415	>160	0623	550	T				
223																
224		S>0000-0222/1 g0101/2	*0059-0103/2		S								9500	SD	0047	120

214. This storm is only a minor geomagnetic disturbance.

215. No known flare or SWF are reported at the time of the large 10 cm. burst on November 18th at 0321 UT., therefore plage and spot data for this event are not available. No dynamic spectrum event is reported at the time of the burst. No events are reported at any of the single frequencies, except for a burst at 9500 Mc.

216. No known flare is reported at the time of the Type II burst on November 20th at 0050 UT., therefore plage and spot data for this event are not available.

218. The plage and spot data for this event are similar to that given for event No. 217. No dynamic spectrum observations exist at the time of the large 10 cm. burst on November 23rd at 0754 UT. The single frequency radio observations indicate that the radio event consists of a major burst.

219. This is a great solar event, on November 24th at 0848 UT. The great optical flare has a "double" aspect, which is repeated in the SWF and in the radio event. No dynamic spectrum observations exist at the time of the large flare and great 10 cm. burst. However, the single frequency reports indicate that Type IV radio emission may have occurred.

220. It is difficult to assign a definite start to this storm. Tw tions start the storm earlier, on 23rd at 22xx UT. Two stations start the storm on 24th at 09xx UT., which i close to the starting time of the great flare descri event No. 218. Three stations start the storm even la 25th at 03xxUT. Nine stations continue the storm throu period of the next storm.

221. The flare association with the Type IV event on No at 1811 UT. is ambiguous. Two minor flares oc simultaneously in two different regions on the sun (al they are fairly close to each other). Information is gi both of these flares. The plage and spot data for

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TABLE VIII.

PLAGE DATA									SUNSPOT DATA						
cM. ge No.	CMP Gr. Day	Mean Long.	Mean Lat.	Ave. Int.	Max. Area	No. Flares	Age in Rotations	Ident.	MT.W. Type	CMP Gr. Day	Mean Lat.	H	When Seen	Area	MT.W. No.
	Nov.									Nov.					
269	29.5	225°	S18	3.5	5,000	27	1	NEW	*dβpl	29.8	S19	21	24-3	1500	12800
	Dec.									Dec.					
288	3.5	173°	S20	3.5	7,000	47	4	4218	*lγl	3.3	S18	20	26-10	1200	12808
295	09.5	94°	N15	2.5	4,000	7	2	4230	lβd	9.9	N18	9	3-11		12832
288															
295															
314	20	316°	N17	3.5	8,500	43	1	NEW	*lβγl	20.1	N18	22	13-26	1300	12855
314															
314															
314															
314															
323	27	223°	S14	3	10,000	21	2	4269	lβl	26.7	S19	14	20-1		12882
321	24	263°	N22	3	12,000	40	1	NEW	*lβpl	24.6	N23	27	18-31	1300	12874
314															
319	24	263°	S22	3	14,000	24	5	4263	lαpd	23.7	S14	11	17-28		12870
									lβl	23.8	S25	21	17-30		12869
									dβl	24.7	S25	18	19-30		12877
314															
319															
313	19	329	S14	3	11,000	13	1	NEW	lβpl	19.1	S15	36	12-24		12851
322	25.5	243	S21	2	3,600	1	5	4265 and 4267	lβpl	25.3	S16	12	19-30		12879
314															

event are similar to that is reported at the time of mber 7th at 0000 UT., but n, coincident with the start h is associated with event riod of this event No. 231. ns exist at the time of the nts are reported at any of s.

early as Dec. 10th at 08xx at 03xx UT., but the 3-hr. Kp values only change from 3 to 4 during this interval.

234. The plage and spot data for this event are similar to that given for event No. 229. The Type II burst on December 12th at 1809 UT. was observed by Ft. Davis over a frequency range of 135 - 100 Mc. Only minor bursts are reported at 10 cm. and at meter wavelengths, and no distinctive events are reported at any other single radio frequencies.

235. This large SWF on December 13th at 0156 UT. and very large 10 cm. burst are associated with an average optical flare in a region located at the east limb of the sun. This large, bright and very active region (4314) is a primarily new plage, but is in the same position as old region 4254. The complex βγ spot No. 12855 is one of the largest spots of the year - area equal to 1300 millionths of the solar hemisphere. In addition to the numerous Type III bursts in the dynamic spectrum, Sydney also reports many reverse drift bursts between 0231 and 0252 UT. The active plage 4314 is responsible for eleven events in this catalogue - Nos. 235, 236, 237, 238, 239, 240, 241, 245, 247, 249, and 257.

236. The plage and spot data for this event are similar to that given for event No. 235. The very large 10 cm. burst and

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(2)

Event No.	Gr. Day	FLARE DATA							SHORT-WAVE RADIO FADEOUTS						10 CM. EVENTS					McM. Plage No.
		Beg. UT	End UT	Max. UT	Imp.	Position		No. of Obs.	Type	Imp.	Beg. UT	Dur. Min.	Wide Spread Index	No. of Obs.	Type	Beg. UT	Dur. Min.	Max. UT	Peak Flux	
203	Oct. 31																			
204	Nov. 04																			
205	05																			
206	05	1205	1257	1207 1237	2	S24	W54	6(1c)	S	2+	1207	14	5	10	*2 4	1205 1213	8 270	1207.3	550 16	*4207
207	06														SD	0420.5	4	0422	330	
208	06	0834	0900	0841	2	S28	W67	9(6c)	S	3-	0833	29	5	4	*2	0837	3	-	572	4207
209	06																			
210	08																			
211	13	0457	0511	0458	1	S25	E27	1(1c)	S	1	0458	15	3	2	CD	0457	8	0458	440	4237
212	13																			
213	15	0517	0636	0537	1+	N18	W45	3(2c)	G	1-	0527	51	3	2	*CA	0522	>33	0542	537	4230
214	17																			
215	18														*SD	0321.5	14	0325.5	592	
216	20								SL	2	0040	58	5	4	SD	0041	11	0045	445	
217	22	0404	0446	0409	2	N31	W28	2(1c)	S	3-	0406	33	5	4	*CD	0406	30	0409	870	4246
218	23	0750	0925	0802	2	N26	W54	10(4c)	S	2	0757	40	5	7	*CD	0754	14		560	4246
219	24	*0848 *1100	1100 1202	0911 1109	3 3	S14 S12	E37 E35	7(4c) 7(4c)	S S	3- 1	0901 1107	32 16	5 4	4 2	*CD	0859	40		>998	*4263
220	24																			
221	24	a1817 b1825	1939 1950	1855 1842	1- 1-	S12 S16	E12 E24	1(1c) 1(1c)							3	1811	>180	1855	38	a 4257 b 4263
222	25	0457	0509		1+	N29	W71	1	SL	1	0449	59	1	1						4246
223	26																			
224	29	*0045	0600	0213	3+	N41	E63	1(1c)												4282

203. No flare observations were being made at the time of the Type II burst on October 31st at 2119 UT., therefore plage and spot data for this event are not available. No known SWF or 10 cm. events are reported at the time of the Type II burst, which was observed by Ft. Davis over a frequency range of 210 - 130 Mc. Only very minor bursts are reported at single radio frequencies.

204. No known flare, no SWF, and no 10 cm. events are reported in association with the Type II burst in progress on November 4th at 2240 UT., therefore plage and spot data for this event are not available. No events are reported at any of the single radio frequencies.

205. Any positive flare association with this PCA event on November 5th at 0200 UT. is unknown. A possible solar event may have occurred at the time of the Type II burst described in the preceding event, No. 204, but the association is discouraging because of the lack of related events with this burst. It may be possible that the proton event is mostly influenced by the occurrence of the next major solar event, described below in event No. 206.

206. The large 10 cm. burst on November 5th at 1205 UT. is associated with a flare in a very large, bright and active region which contains a complex γ spot. No dynamic spectrum observations were being made at the time of the large burst. A great burst was repor lengths.

207. No known flare was reported at the burst on November 6th at 0424 UT., spot data for this event are not availa events at any of the single radio frequ with the Type II burst.

208. The plage and spot data for this even given for event No. 206. No dynamic spe exist at the time of the large 10 cm. bu at 0837 UT. This burst is of very s

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ER RADIO DATA				POLAR CAP ABSORPTION						GEOMAGNETIC STORMS						
Dur. Min.	Max. UT	Peak Flux	Obs.	Gr. Day	Onset UT	Rise to Peak	Dur.	Peak Int.	Obs.	Gr. Day	Beg. UT	Dur.	Type	Int.	No. Sta. Rep.	Max. Kp
17	0405.5	935	TK													
7	0405.7	(135)	NAG													
6	0406.1	(109)	NAG													
66	0254	1080	TK													
10	0255	(339)	NAG													
8	0255	252	SYD													
10	0254.7	(200)	NAG													
8	0252	220	SYD													
25		>300	N(H)													
34.5	0940	(468)	HHI													
3	0940.3	(224)	HHI													
10		36	SM													
45		>>400	N													
200																
43	1656	14000	NBS													
215	1915	1000	NBS													
89	1700	3700	NBS													
340		880														
				Oct. 20	2100	22h	64	62	B,L,H							
6.3	2146	1042	TK													
4	2146	300	SYD													
3.5	2149	112	SYD													
0.5	2145	1300	NBS													
8	1302	(214)	HHI													
8		84	UC													
1.5		120	N													
1		>190	UC													
1		72														
										Oct. 21	2241	2d	Sc	ms	9	
92	2243	543	TK													
2	2217.9	(75)	NAG													
6	2213	183	SYD													
12.5	2219	98	SYD													
1		120	N													
1.3	2217.8	1100	NBS													
25.4	2214	1600	NBS													
2	2226.8	(12)	NAG													
6	2226.9	(24)	NAG													
5	2257	546	TK													
7	2257	(20)	NAG													
7	2301	(10)	NAG													
17	2327	495	TK													
8	0141	(21)	NAG													
8	0139	(125)	NAG													
6	0139	99	SYD													
6.5	0141.6	(1160)	NAG													
7	0140	44	SYD													
										27	06	3.4d	g	m	2	5
21	0039.6	575	TK													
9	0040	(78)	NAG													
9	0040	(64)	NAG													
8	0039.9	(60)	NAG													

F or 10 cm. reported at

ibed in note this region d is not re- s catalogue. plage 4159, . 12707 is a

199. No flare observations and no dynamic spectrum observations were being made at the time of the large 10 cm. burst on October 26th at 0138 UT., therefore plage and spot data for this event are not available. No distinctive event was reported at meter wavelengths at the time of the burst.

200. This region is similar to the plage described in note No. 65. The βp spot No. 12733 is one of the largest spots of the year - area equal to 1400 millionths of the solar hemisphere (Mt. Wilson data).

201. This storm is really only a minor disturbance, for which the 3-hr. kp values reach 5 for only one 3-hr. interval.

202. No flare observations were being made at the time of the large 10 cm. burst on October 30th at 0037 UT., therefore plage and spot data for this event are not available. No SWF, and no distinctive event at meter wavelengths, are reported at the time of the burst. In addition to the various groups of Type III bursts in the dynamic spectrum, Sydney also reports several unclassified bursts at 0034, 0039, and 0044 UT.

2. VIII - 10R
(2)

Event No.	DYNAMIC SPECTRUM DATA: Type I Time/Max. Int.	Type III Time/Int.	Type II Time/Int.	Type IV Time/Int.	Obs.	Freq. Range	200 MC/S DATA: Type	Beg. UT	Dur. Min.	Max. UT	Peak Flux	Obs.	OTHER: Freq. Mc/s	Type	Beg. UT
225															
226															
227															
228															
229	I_s in progress	g0348/1	*0400-0419/2		S								9500	CD	0350
													2000	SD	0349
													1000	CD	0349
													1000	F	0401
230													9500	CD	2346
													2000	SD	2346
													1000	F	2346.5
231															
232															
233															
234	S1757-1810/2		*1809-1814/3		H	135-100	ECD	1758	13.5		>54	C			
235		g0159/2 g0218/2 g0233/2 G0235-0237/2 g0245-0247/2			S		F	0231.5	6.5	0236	300	TK	9500	CA	0156
													2000	CA	0159
													1420	SD	0159
													1420	SD	<0230
													1000	SD	0159
													1000	SD	0228
236							CD	1238	17		>5000	N	9400	CD	1228
													1500	CD	1230
													600	ESA	1237
													545	CD	1237
													536	CD	1230
													169	ESD	1240
													23	-	1244
237															
238	I_s in progress all day S0620-0847/3 C0620->0847/3	III_s in progress all day G0804-0810/3	*0803-0825/3		S		CD	0804	21		>950	N(H)	1500	CD	<0805
													600	ECA	0802
													545	CD	0803
													169	ECA	0804
239							CA	0859	6	0901	270	AB	9400	CD	0930
							CA	0923	11	0931	1650	AB	1500	CD	0916
													810	ECD	0904
													600	SA	0909
													600	SA	0919
													600	ECA	0926
													545	CD	0918
													169	ECA	0926
													169	SA	0939
240															
241	I_s in progress all day	G0545-0546/3 G0551-0552/2	*0546-0552/3		S		CD	0545	2	0545.4	3000	TK	9500	ECD	0545
													2000	SD	0544
													1000	SD	0544
													600	CD	0545
													545	CD	0543
242													9500	SD	2345.7
													2000	SD	2346
													1000	SD	2346
243													9500	CD	0232
													2000	SD	0234.5
244													9500	CD	0437
													2000	CD	0437
													1420	CD	0439
													1000	CD	0437
													600	CD	0440
													545	CD	0437
245							CD	1028	5		>900	N	9400	CD	1028
													1500	SD	1025
													600	CA	1028
													545	CD	1028
													169	CA	1028
													81	CD	1028

major SWF are associated with a flare located very near the east limb of the sun. No dynamic spectrum observations are available at the time of the large 10 cm. burst on Dec. 14th at 1227 UT. Type IV emission may perhaps be deduced from the single frequency observations.

237. Four of the 6 stations end the storm on 15 th at 20xx UT. However, the 3-hr. Kp values reach a maximum value of 5 on both the 15th and the 17th. Therefore the storm is given the longer duration, although perhaps a truer picture would be given if the entire interval were divided into two storms, starting on 15th and 16th.

238. & 239. The plage and spot data for these events are similar to that given for event No. 235. The same flare is apparently related to the major SWF on December 19th at 0757 UT., with its Type II burst at 0803 UT., and to the large 10 cm. burst at 0917 UT. No SWF is reported at the time of the large 10 cm. burst. The dynamic spectrum observations at Sydney end at 0847 UT. and therefore do not cover the period of event No. 239. The single frequency observations indicate that a major + burst occurred with each event.

241. The plage and spot data for this event are similar to that given for event No. 235. The large 10 cm. microwave burst on December 20th at 0544 UT. occurs almost sim with the Type II burst and with the large burs duration which are reported at the various other s frequencies.

242. The flare data at the time of the large 10 c December 21st at 2345 UT. is ambiguous. Nume flares were occurring on widely scattered p solar disk. Information concerning each of thes given. Flare b is in a very large, bright and a (4321), containing the βp spot No. 12874, whi the largest spots of the year - area equal to 1300

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TABLE VIII.

PLAGE DATA								SUNSPOT DATA						
CMP Gr. Day	Mean Long.	Mean Lat.	Ave. Int.	Max. Area	No. Flares	Age in Rotations	Ident.	MT.W. Type	CMP Gr. Day	Mean Lat.	H	When Seen	Area	MT.W. No.
Dec. 21.0	302°	S14	2	2,000	13	3	4255	dβℓ	Dec. 20.5	S04	(15)	24-26		12894

consist of large
. No known flares
nes, therefore any
or Type III bursts
with each of these
orted at any of the

nts are similar to
SWF is reported
December 24th at
s are reported at
pectrum. For the

latter, the time of the bursts follows the end of a Type III noise storm.

254. This is a very weak geomagnetic disturbance, which follows three extremely quiet days.

255. This large 10 cm. burst on December 25th at 0434 UT. is associated with flare activity in a plage which experiences a resurgence in brightness and flare activity when in the western part of the disk. No dynamic spectrum observations exist at the time of the large burst. No distinctive event is reported at meter wavelengths.

256. No known flare or SWF are reported at the time of the large 10 cm. burst on December 25th at 0530 UT. No dynamic spectrum observations exist at the time of the large burst, and only a minor burst is reported at meter wavelengths and at all other single radio frequencies.

257. The plage and spot data for this event on December 25th at 1628 UT. are similar to that given for event No. 235.

258. The plage and spot data for this SWF on December 25th at 1815 UT. are similar to that given for event No. 255. The Type II burst at 1822 UT. was observed by Ft. Davis over a frequency range of 230 - 100 Mc.

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		FLARE DATA						SHORT-WAVE RADIO FADEOUTS						10 CM. EVENTS					
Event No.	Gr. Day	Beg. UT	End UT	Max. UT	Imp.	Position	No. of Obs.	Type	Imp.	Beg. UT	Dur. Min.	Wide Spread Index	No. of Obs.	Type	Beg. UT	Dur. Min.	Max. UT	Peak Flux	McM. Plage No.
246	Dec. 22																		
247	23	0025	0040	0029	1	N18 W38	6(2c)	SL	1+	0022	43	5	3	*ESD	0024.5	4	0025.5	582	4314
248	23	0038	0052	0039	2	N26 E40	2(1c)	SL	1+					*ESD	0038	2	0038.5	564	4321
249	23	1436	1523	1440	1+	N18 W45	3(1c)	SL	2+	1438	24	5	7	*CD	1441	10		602	4314
250	24													*CD	0018	7	0019.5	511	
251	24													*CD	0103	1	0103.7	527	
252	24													*CD	0127	3	0127.7	503	
253	24	0221	0234	0227	1	N21 E01	1(1c)							*SD	0222	1	0222.5	570	4321
														*CD	0227.5	2.5	0229.5	512	
254	25																		
255	25	0435	0437		1	S07 W59	1	S	2+	0430	25	5	2	*SD	0434	16	0437	800	4315
256	25													*CD	0529.9	5	0530.2	524	
257	25	1632	1655	1635	1-	N21 W72	2(2c)	*S	3	1628	29	5	7	3	1627	19	1634	8	4314
														2	1628	3	1629.2	26	
														2	1634	6	1635	445	
258	25	1812	1900	1822	1+	S07 W70	1(1c)	*SL	3	1815	47	5	7	6	1815.6	7	1818.3	185	4315
														4	1822.6	23		10	
259	26							S	2+	0245	40	5	5	*ECD	0245	15	0246	2300	
260	26							S	1+	0443	20	1	1	*SD	0435	2	0436	513	
														*CD	0449.3	8	0450	500	
261	28	2229	2331	2230	2	N25 W50	1(1c)	S	2+	2230	30	5	7						4321
262	29																		
263	31																		

246. This Type IV radio emission on December 22nd is reported by Ft. Davis to be "intermittent throughout the day," and is not specifically associated with any special flare or flares, but rather is due to the presence of very active regions on the sun.

247. The plage and spot data for this event are similar to that given for event No. 235. No distinctive event is reported at meter wavelengths at the time of the large 10 cm. burst on December 23rd at 0024 UT. Only a minor Type III burst is reported in the dynamic spectrum.

248. The SWF for event No. 247 also covers the time of this event - a large 10 cm. burst on December 23rd at 0038 UT. No distinctive event is reported at meter wavelengths at the time of the 10 cm. burst.

249. The plage and spot data for this event are similar to that given for event No. 235. The Type IV burst on December 23rd at 1437 UT. was observed by Ft. Davis over the whole frequency range of 580 - 100 Mc.

250, 251, & 252. These similar events on December 24th 10 cm. bursts at 0018, 0103, and 0127 UT or SWF's are reported at any of these tir plage and spot data are not available. Min are reported in the dynamic spectrum v events, but no distinctive events are rep other single radio frequencies.

253. The plage and spot data for these ever that given for event No. 242b. No known at the time of the large 10 cm. bursts on 0222 and 0229 UT. No distinctive event meter wavelengths or in the dynamic s

2. VIII - 13L (2)

RADIO DATA				POLAR CAP ABSORPTION						GEOMAGNETIC STORMS						
Dur. Min.	Max. UT	Peak Flux	Obs.	Gr. Day	Onset UT	Rise to Peak	Dur.	Peak Int.	Obs.	Gr. Day	Beg. UT	Dur.	Type	Int.	No. Sta. Rep.	Max. Kp
										Dec. 01	0330	1.8d	g	m	8	6
										05	00--	2d	g	m	5	5
32	0407	508	TK													
6	0352	(19)	NAG													
6	0349.8	(23)	NAG													
8	0406	(36)														
10	2348	608	TK													
5	2348.5	(174)	NAG													
5	2348.5	(233)	NAG													
										07	07--	0.7d	g	m	3	5
										11	03--	2.8d	g	ms	8	6
60	0205	2275	TK													
43	0200	(211)	NAG													
3	0200	165	SYD													
14	0235	190														
4	0200.5	(20)	NAG													
14	0234	(18)														
	1241	(940)	HHI													
53	1240	(397)	HHI													
19		504	UCL													
19		>400	N													
46	1245	630	PRA													
16		>85	UC													
1			AOP													
										15	08--	3.3d	g	m	6	5
>7.5	0804.5	(316)	HHI													
23		1140	UC													
30		>300	N(H)													
11		>810	UC													
9	0933	(411)	HHI													
31	0933	(243)	HHI													
39	0931	>400	CRA													
5		36	UC													
7		60														
11		575	UC													
18		>350	N													
9		>415	UC													
300		260														
										19	0937	2 d	Sc	m	4	5
10	0545.8	1129	TK													
3		(154)	NAG													
3		(1600)	NAG													
1.5	0545	523	SYD													
2		>300	N													
4	2347	807	TK													
3	2347	(41)	NAG													
2	2347	(27)	NAG													
11	0235.5	946	TK													
2	0235.2	(35)	NAG													
7	0439	634	TK													
5	0439	(93)	NAG													
1	0439	479	SYD													
3	0439	(915)	NAG													
3	0443	180	SYD													
3.5		200	N(H)													
35	1031	(736)	HHI													
10	1031	(236)	HHI													
5		205	UC													
30		>400	N													
17		>630	UC													
12		>180	CAV													

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e flares is
tive plage
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millionths

of the solar hemisphere. No dynamic spectrum observations exist at the time of the large 10 cm. burst. No distinctive event is reported at meter wavelengths, and no SWF is reported at the time of the event.

243. No known SWF is reported on December 22nd at 0233 UT, at the time of the large 10 cm. burst. The αp spot No. 12870 is a return of the βp spot No. 12788 in region 42631. No dynamic spectrum observations exist at the time of the large 10 cm. burst. No distinctive event is reported at meter wavelengths.

244. The flare data at the time of the large 10 cm. burst on December 22nd at 0437 UT. is ambiguous. Numerous small flares were occurring in widely scattered regions on the solar disk. No known SWF is reported, and no dynamic spectrum observations exist at this time. No distinctive event is reported at meter wavelengths.

245. The plage and spot data for this event are similar to that given for event No. 235. No dynamic spectrum observations exist at the time of the major SWF and large 10 cm. burst on December 22nd at 1030 UT. A large burst is reported at meter wavelengths and simultaneously at all of the single radio frequencies.

2R

2. VIII - 12R
(2)

		FLARE DATA							SHORT-WAVE RADIO FADEOUTS						10 CM. EVENTS					M
Event No.	Gr. Day	Beg. UT	End UT	Max. UT	Imp.	Position		No. of Obs.	Type	Imp.	Beg. UT	Dur. Min.	Wide Spread Index	No. of Obs.	Type	Beg. UT	Dur. Min.	Max. UT	Peak Flux	Pla
225	Nov. 29 Dec.																			4
226	01																			
227	03																			*
228	05																			
229	06	0347	0443	0353	2	N15	E45	4(2c)	SL	2	0348	26	5	4	CD	0348	25	0351.5	384	4
230	06								SL	1+	2347	33	5	3	*SD	2346	9	2348	810	
231	07	0000	0030		1+	S22	W25	1(1c)							*ESD	0000	0.9	0000.2	740	4
232	07																			
233	11																			
234	12	1750	1859	1806	2+	N15	W41	4(4c)	SL	1	1802	28	5	5	6 4	1757 1809	12 27	1803.9	94 15	4
235	13	0227	0346	0234	1	N15	E90	1(1c)	*SL	3	0156	49	5	6	*CA	0153	70	0232	1130	*
236	14	1245	1450		2+	N18	E78	2(1c)	*SL	3	1233	67	5	9	*	1227	55		1000	4
237	15																			
238	19	0757	1015		2+	N20	E13	5(1c)	*S	3	0757	23	5	4	CD	<0804				4
239	19		1015		2+	N20	E13	5(1c)							*CD	0917	21		632	4
240	19																			
241	20	0543	0606	0545	1	N16	E00	2(1c)	S	2	0545	26	5	3	*ECD	0544.3	4	0545.5	636	4
242	21	a2334 b2344 c2349	2400 2402 2425	2345 2347 2418	1- 1- 1-	S15 N25 N17	E60 E27 W27	1(1c) 1(1c) 1(1c)							CD	2345	5	2346.3	556	a 4 b *4 c 4
243	22	0237	0301	0239	1	S27	E30	1(1c)							*CD	0232.7	15	0235.3	542	4
244	22	a0437 b0438 c0438 d0439	0505 0443 0445 0504	0442 0439 0440 0443	1- 1- 1- 1-	N18 S21 S20 S26	W26 E16 W35 E41	1(1c) 1(1c) 1(1c) 1(1c)							*CD	0437	7	0439	505	a 4 b 4 c 4 d 4
245	22	1022	1101	1035	1+	N19	W28	7(2c)	*S	3	1030	22	3	2	*CD	1028	6.5	1031	583	4

225. This bright and active plage is similar to the region described in note No. 65. The βp spot No. 12800 is one of the largest spots of the year - area equal to 1500 millionths of the solar hemisphere. The region (4269) is a new plage, but it is in the same position where old and dying plage 6210 (in its fifth rotation) had been located.

226. Three of the 8 stations report the start of this storm as a sudden commencement.

227. This large, very bright and very active plage is similar to the region described in notes Nos. 65 and 80. The complex γ spot No. 12808 is one of the largest spots of the year - area equal to 1200 millionths of the hemisphere.

229. No event at meter wavelengths is reported at the time of the Type II burst on December 6th at 0400 UT.

230. No known flare is reported at the time of the large 10 cm. burst on December 6th at 2346 UT., therefore plage and spot data for this event are not available. No dynamic spectrum observations exist at the time of the burst, and no event is reported at meter wavelengths.

231. The plage and spot data for this given for event No. 227. No SWF this large 10 cm. event on Dec the burst is of very short duratio of the flare, and the SWF whic No. 230 continues through the pe No dynamic spectrum observati 10 cm. burst. No distinctive ev the other single radio frequencie

233. Four stations start this storm as UT., with a second start on 11th

2. VIII - 12

DATA			POLAR CAP ABSORPTION						GEOMAGNETIC STORMS						
Max. UT	Peak Flux	Obs.	Gr. Day	Onset UT	Rise to Peak	Dur.	Peak Int.	Obs.	Gr. Day	Beg. UT	Dur.	Type	Int.	No. Sta. Rep.	Max. Kp
2120	>2800	NBS													
			Nov. 05	0200	10h	46	21	B							
1208	(247)	HHI													
	120	UC													
	120	N													
	>180	UC													
	>30	CAV													
	>30														
	>30														
0839	(693)	HHI													
0839	(175)	HHI													
	72	U													
	>180	U													
									Nov. 06	1821	1d	SC	ms	15	7
									08	05--	4.5d	g	ms	4	5
0458	567	T													
0458	(68)	NAG													
0459	162	SYD													
0458.3	(42)	NAG													
	25	N(H)													
									13	20--	3d	g	m	3	4
0545	483	T													
0542	(138)	NAG													
0545	(128)	SYD													
0543	165	NAG													
0544	247	SYD													
									17	2200	1d	g	m	5	5
0325.6	542	TK													
0045	517	T													
0046	(31)	NAG													
0409	1960	T													
0409.4	(200)	NAG													
0409	184	SYD													
0408.8	(557)	NAG													
0410	100	SYD													
	170	N(H)													
0759	(800)	HHI													
0759	(179)	HHI													
	96	U													
	180	N													
	>120	U													
0903.5	(543)	HHI													
1108	(313)	HHI													
0904	(251)	HHI													
1107	(179)	HHI													
	210	U													
	40	U													
	75	U													
	90	U													
	>300	N													
	>540	U AOP													
									24	14--	1.5d	g	ms	11	5
	>350	N(P)													
1819	>5900	NBS													
1834	>3600	NBS													
									26	02--	3.3d	g	ms	14	7
0208	488	T													

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is similar to that given for event No. 219. No SWF is reported at the time of the Type IV burst, which was observed by Ft. Davis over the entire observable frequency range of 580 - 100 Mc. At meter wavelengths the radio event consists of a rise and fall in base level.

222. The Type II burst on November 25th at 0416 UT, is associated with flare activity in a region near the west limb of the sun. The plage and spot data are similar to that given for event No. 217. At meter wavelengths, the radio event consists of the onset of a noise storm. No known 10 cm. burst is reported at the time of the Type II burst, and no events are reported at any other single radio frequencies. The SWF is taken from the unpublished CRPL "check-list."

223. Eight of the 14 stations include this storm as part of the storm reported in event No.219. Two stations give the storm a sudden commencement start on 26th at 0154 UT, and three stations give an even later gradual start on 26th at at 14xx UT.

224. This unusual event - a major flare and Type II burst on November 29th at 0045 UT. - occurred in a plage which was located at a very high latitude, near the west limb of the sun, and which contained no spots. This flare of importance 3 is the only flare that is known to have occurred in the region. No known SWF and no 10 cm. events are reported at the time of the event. A major burst is reported at the very high frequencies, but no distinctive event is reported at meter wavelengths.

2, VIII - 11R
(2)

Event No.	Type I Time/Max. Int.	Type III Time, Int.	Type II Time/ Int.	Type IV Time/Int.	Obs.	Freq. Range	200 MC/S DATA Type	Beg. UT	Dur. Min.	Max. UT	Peak Flux	Obs.	OT Freq. Mc.s	Type	Beg. UT
246	I_S in progress all day			* 1543- >2337/3	H	580- 100									
247	I_S in progress all day	b0030/1			S								9500	ESD	0025
248	I_S all day	b0037/1 b0041/3			S								9500 2000	ESD SD	0038 0038
249	I_S all day	g1439/3 G1441- 1442/3 b1444/1 G1445- 1448/2		* 1437- 1520/3	H	580- 100							600 600 545 450 169	CA CA CD CD CA	1440 1444 1439 1438 1439
250	I_S in progress C0015- 0016/2	b0018/1 g0020/1 b0022.5/1			S										
251	I_S in progress	b0104/1			S										
252	I_S in progress	b0119.5/1 s0143- 0220/1			S										
253	I_S in progress				S								9500	CD	0228
254															
255													9500 2000 1420 1000 600 545	CD SD CD CD CD CD	0434 0434 0436 0434 0437 0432
256							CD	0529.8	1	0530.2	500	TK	9400 2000 1000	ESD SD SD	0530 0530 0530
257	I_S in progress C1629/2 C1634- 1639/3	g1628- 1629/1 G1634- 1638/3 g1643/3 g1646- 1647/1			H		CD	1635	5		>400	N	545 450 167	CD ECD ECD	1635 1633 1634.4
258	I_S in progress C1816- 1817/3	G1815- 1817, 3	*1822- 1825, 3		H	230- 100	CD ECD	1816 1821.5	2.5 3.5		> 400 > 224	N,C C	167 167	ECD ECD	1815.2 1821.8
259							SD	0246	1.2	0246.7	1000	TK	9500 2000 1000 600 545	ECD ESD ECD ECD CD	0245 0245.5 0246.5 0247 0244
260													3750 1000	SD CD	0435 0449.5
261	I 2252- S2347/1	g2230/3 b2233/3	*2230- 2242/3+	2232- 2255/3	H	330 100	CD	2230	8		>2500	N	9500 1420 600 545 450	ECD SD CD CD ECD	2229 2230 2230 2230 2229
262															
263															

259. & 260. No flare observations were being made at the time of these large 10 cm. bursts on December 26th at 0245 UT, and 0435 and 0449 UT., therefore plage and spot data for these events are not available. No dynamic observations exist at any of these times. At meter wavelengths, a minor burst is reported with event No. 259, but no event is reported with No. 260. The SWF for No. 260 is taken from the unpublished CRPL "check-list."

261. The plage and spot data for this event are similar to that given for event No. 242b. No 10 cm. observations exist at the time of the Type II and Type IV bursts on Dec. 28th at 2230 UT., which were observed by Ft. Davis over a frequency range of 330 - 100 Mc.

2. VIII-13R

ER RADIO DATA				POLAR CAP ABSORPTION						GEOMAGNETIC STORMS						
Dur. Min.	Max. UT	Peak Flux	Obs.	Gr. Day	Onset US	Rise to Peak	Dur.	Peak Int.	Obs.	Gr. Day	Beg. UT	Dur.	Type	Int.	No. Sta. Rep.	Max. Kp
4	0025.5	693	TK													
3	0038.5	1052	TK													
1	0038.5	(14)	NAG													
4		80	UC													
14		350														
19		>1200	N													
21	1447	>3400	NBS													
9		>600	UC													
3	0229	562	TK													
										Dec. 25	02--	1.6d	g	m	3	4
20	0437	956	TK													
6	0437.2	(94)	NAG													
4.5	0437	356	SYD													
4	0435.1	(185)	NAG													
11	0444	274	SYD													
13		>260	N													
1	0530.1	(136)	NAG													
1	0530.3	(33)	NAG													
1	0530.3	(22)	NAG													
5		180	N													
6	1635.3	>1900	NBS													
5	1634.8	>3400	NBS													
1.9	1816.2	3100	NBS													
2.7	1823	>3000														
15	0246.5	3250	TK													
2.5	0246.5	(1690)	NAG													
>3		(780)	NAG													
4	0248	258	SYD													
11		>300	N(H)													
2	0436	(15)	NAG													
2	0450	(12)	NAG													
20		>1322	TK													
7	2230	916	SYD													
13	2231	156	SYD													
6		>300	N													
15	2230	>3600	NBS													
										29	2000	0.8d	g	ms	5	5
										31	0115	2.8d	g	ms	10	6

2. VIII 13R

MSC 3300-65