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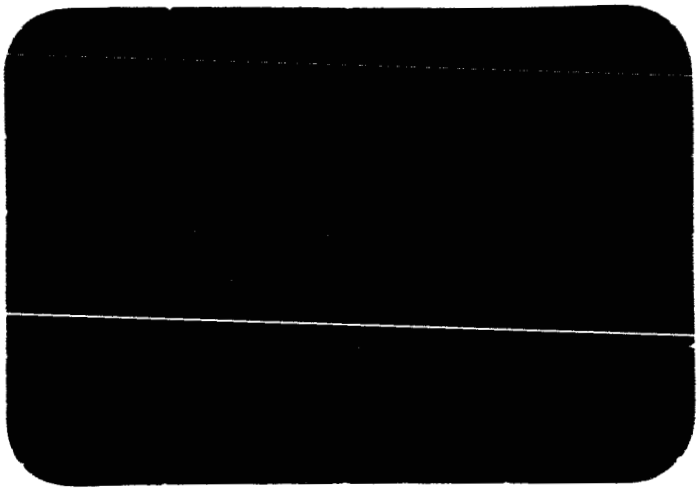

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SOLAR ACTIVITY CATALOGUE
VOLUME 1
CATALOGUE OF SOLAR ACTIVITY DURING 1954-1956

BY
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INTRODUCTION

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TABLE II. CATALOGUE OF IMPORTANT SUNSPOTS DURING 1954 - 1956

Serial No.	Sunspot No. Mt. Wilson	Sunspot No. Greenwich	Category	McMath Plage	Lat.	Long.	CMP	All Spots in Plage	Plage Serial No. Table III
1	11172	17127	L	2923	S08	91	1954 Mar. 17.14	11172	
2	11215	17158	L	3063	N20	127	1955 Jan. 08.30	11215	7
3	11218	17161	1, L, M	3065	N36	61	13.35	11218	8
4	11246	17188	L	3161	N24	172	May 21.38	11246 11248	
5	11259	17200	2, L, M 3 4	3182	S23	177	June 17.23	11259	13
6	11290	17220	L	3240	N16	178	Aug. 10.59	11290	17
7	11291	17221	L	3241	S23	172	10.98	11291	18
8	11307	17237	L	3260	S22	235	Sept. 02.50	11307	
9	11331	17253	L	3292	N21	139	Oct. 7.04	11331 11332	19
10	11353	17267	L	3309	S23	211	28.89	11353 11359	20
11	11354	17269	L	3308	N29	197	29.93	11352 11354	
12	11356	17270	L	3311	S24	189	30.53	11356	21
13	11365	17277	L	3324	S29	1	Nov. 13.78	11365	
14	11367	17278	5, L	3326	N24	346	14.92	11367 11371 11376	22

Serial No.	Um.	Whole Spot Position	Gr. Day	Flare Day	Flare ΔT
1	120	712 S08 E11	1954 Mar. 16.xx	-	-
2	112	737 N20 E26	1955 Jan. 06.28	-	-
3	156	980 N36 E66	07.29	Jan. 16.9	-10
4	135	709 N24 W13	May 22.31	-	-
5	116	907 S23 W40	June 20.31	June 18.5 18.8 19.6	+2 +2 +1
6	111	511 N16 E28	Aug. 08.31	-	-
7	106	716 S22 W13	12.39	-	-
8	97	566 S23 W47	Sept. 06.30	-	-
9	113	582 N23 E47	Oct. 03.36	-	-
10	181	978 S22 E05	28.37	-	-
11	110	558 N29 W14	31.37	-	-
12	110	556 S24 E42	27.36	-	-
13	142	709 S29 E77	Nov. 07.54	-	-
14	176	1449 N24 E58	10.48	Nov. 12.4	-2

Serial No.	Area Umb.	Whole Spot	Mt.Wilson Mag. Cl.	H
1	73	403		
2	78	423		33
3	109	660		35
4	69	378		29
5	78	522		21
6	68	358		33
7	114	680		29
8	60	333		12
9	89	428		31
10	140	751		39
11	52	276		22
12	80	422		34
13	70	420		27
14	138	1026		29

Serial No.	Area Umb.	Area Whole	Zurich Class	Mag. Class	H	Position
1						
2						
3	95	526	E		-	N35 W47
4						
5	81 81 99	639 639 670	E E E		18 18 22	S21 W14 S21 W17 S21 W28
6	--	-				
7	-	-				
8						
9						
10						
11						
12						
13						
14	169	1411	F		-	N24 E35

Serial No.	Days Seen, Position Seen, Zurich Class, Mag. Class, Magnetic Strength
1	Mar. 12 — Mar. 23 E61 W80 A C D E E E D D D D - - βp βp βp (βp) β (β) (β) - (β) (β) - - 9 22 29 - 32 - - - - - - -
2	Jan. 4 — Jan. 14 E57 W82 C C E E - G G C G H H (β) βp - βp βp (βp) - αp αp αp αp - 30 - 32 26 - - 21 22 15 -
3	Jan. 7 — Jan. 19 E74 W74 H H H E - E E E E E H H (α) γ (γ) - - γ γ (γ) (γ) - - (γ) - - - - 32 29 34 32 - - 24 - -
4	May 16 — May 27 E65 W79 B C D D D E - E E E D C (x) β βp βp βp βp (βp) βp (β) β βp βp βp x - - - - - - 20 - 24 - 29 24 -
5	June 11 — June 23 E77 W78 - D D C - E E E E E D D C βγ βp βp βγ βγ (βγ) βγ βp βγ βγ βγ (βγ) (α) 23 21 21 21 21 - 18 18 22 15 19 - -
6	Aug. 5 — Aug. 16 E73 W77 A B C C E G G G H H H H (β) βp βγ (βp) βp (βp) βp (βp) βp (βp) βp (αp) - 9 26 - 24 - 28 - 32 - 24 -
7	Aug. 5 — Aug. 17 E74 W79 D D E E E E E E E G G G - (β) βp βf (βf) βf (βf) βp (β) βp (βp) βf (β) - - 15 23 - 26 - 25 - 29 - 27 - -
8	Sept. 3 — Sept. 8 W10 W74 A B D D - D - βf (β) (β) (βp) (x) - 13 - - - -
9	Sept. 30 — Oct. 13 E86 W83 - H H H H H H H H H H H H H (α) (αp) αp βp (αp) (αp) βp αp (αp) αp αp (αp) (αp) (αp) - - 29 31 - - 29 29 - 31 30 - - -
10	Oct. 23 — Nov. 4 E75 W84 D E E E E E F E E E G G - (βp) βp (βp) (βp) βp βp (βp) αp αp (αp) (αp)(αp) - - 38 - - 28 37 - 30 25 - - - -
11	Oct. 24 — Nov. 5 E76 W78 H H G G G G G H H H H H H αf (βf) (βp) βp βp (β) βf βp (βf) (β) (β) (βp) (α) - - - 18 20 - 22 23 - - - - -
12	Oct. 24 — Nov. 5 E78 W75 H H G G G G G H H H H H H (α) (βp) (βp) βp βp (βp) βp αp (αp) (αp) (αp) (αp) (αp) - - - 26 30 - 33 30 - - - - -
13	Nov. 7 — Nov. 19 E77 W74 H H H H H C C C C B A - A (β) βf βf (βf) βf - - - βf - (αf) (αf) (αf) - 23 27 - 26 - - - 14 - - - -
14	Nov. 8 — Nov. 21 E79 W74 F F F F F F F F F G G G B - αp βp (βp) βp - - - βp - (βp) βf (βp) β - 20 24 - 29 - - - 27 - - 14 - 14 -

Serial No.	Greenwich and/or Mt. Wilson
1	
2	
3	
4	
5	
6	
7	17214 11278
8	
9	
10	
11	
12	
13	
14	

Serial No.	Greenwich Description
1	
2	A stream, led by a regular spot. The following part dies out rapidly after January 7.
3	Return of group 17155. A nearly regular spot with a companion touching the leading edge for most of the disk-passage.
4	A pair of spots until May 19. On the next day intermediate spots appear to form a stream, of which the leading portion soon coalesces into a regular spot, while the followng part becomes composite and soon dies out.
5	A stream, undergoing considerable changes from day to day, immediately following group 17198.
6	A stream, developing from a single spot, in which the leader becomes a regular spot and remains the only stable component.
7	Return of group 17214. A stream, which by August 10 has coalesced into two principal components. These take on regular outline as they near the limb.
8	A bi-polar group, forming quickly within a few days of the west limb.
9	A stable regular spot, with occasional small companions.
10	A large composite spot, followed by a train of small variable spots.
11	A stream of small spots, which by November 1 has developed into a normal bi-polar group.
12	A regular spot with a few variable companions.
13	A long stream of normal type which is slowly dying out as it approaches the limb.
14	At first a bi-polar group consisting of two fair-sized composite spots. On November 11 intermediate spots appear to form a stream. The leader remains composite but the follower becomes a regular spot by November 13.

TABLE II 1954 - 1956 (CONTINUED)

POSITION DATA										MAXIMUM AREA						SUNSPOT MEAN DATA				MAJOR FLARE DAY DATA						DISK PASSAGE DATA	RETURN SEQUENCES	GREENWICH DESCRIPTION
Serial No.	Sunspot No. Mt. Wilson	Sunspot No. Green	Category	McM Plage	Lat.	Long.	CMP	All Spots in Plage	Plage Serial No. Table III	Um.	Whole Spot	Position	Gr. Day	Flare Day	Flare ΔT	Area Umb.	Whole Spot	Mt. Wilson Mag. Cl.	H	Area Umb.	Area Whole	Zurich Class	Mag. Class	H	Position	Days Seen, Position Seen, Zurich Class, Mag. Class, Magnetic Strength	Greenwich and/or Mt. Wilson	
15	11378	17287	L	3337	S20	205	Nov. 25.64	11378 11381		121	665	S20 E04	Nov. 25.29	-	-	86	502	ℓβpℓ	36			-		-	- -	Nov. 19 Dec. 1 E79 W74 - H H H G G G E E G G H H (α) αp - βp (αp) (βp) (βp) βγ βγ (βp) βp αp - - 24 - 31 - 29 - 35 30 - 23 14 -	17267 11353	Return of group 17267. A regular spot with a number of small variable companions.
16	11387	17294	L	3343	S26	90	Dec. 04.37	11387		117	783	S27 E80	28.41	-	-	73	370	ℓβpℓ	23	-	-	-		-	- -	Nov. 28 Dec. 10 E80 W80 G G G G G G G G G - J J J (βp) βp βp - βp (βp) - - - βp (βp) (αp) (αp) - 20 20● - 18 - - - - 24 - - -	17274 11362	Return of group 17274. A regular spot, followed by a distant companion until December 7.
17	11388	17293	6, L	3342	N22	91	04.30	11386 11388	25	100	806	N22 W01	Dec. 04.38	Dec. 03.40	+1	84	539	dβpℓ	20	74	548	E	(βp)	-	N22 E13	Nov. 28 Dec. 10 E77 W77 J D E E E E E E E D D D - (α) βp βp - βp (βp) - - - βp (βp) (βp) (α) - 9 8 - 9 - - - - 21 - - -	17280 11368	Return of group 17280. A group of numerous spots forming an almost continuous structure until December 5, after which the whole becomes a normal stream.
18	11392	17296	L	3350	N29	14	10.14	11392 11393	26	100	630	N27 W41	Dec. 13.56	-	-	47	327	dαpd	8	-	-	-	-	-	- -	Dec. 4 Dec. 16 E68 W78 A B C C C D C E D D C C - - - - βp (βp) (αp) αp (x) (x) (x) - - - - - - 3 - - 3 - - - - - -	17276 11364	Return of group 17276. A long stream of small spots until December 10. On the next day there is a big increase in area in the rear part, which alone survives to the limb.
19	11400	17306	L	3354	N21	294	16.23	11400		136	714	N21 E26	14.28	-	-	82	470	dβpℓ	30	-	-	-	-	-	- -	Dec. 12 Dec. 22 E50 W75 A A A B C D E E D D - (α) αf βf βp (βp) βp (βp) βp βp βp - - 10 7 8 - 30 - 20 16 23 -		A stream, developing from a few tiny spots. The leader becomes a regular spot and is the most stable component.
20	11408	17309	L	3360	S17	191	24.04	11407 11408		102	563	S17 E33	21.30	-	-	51	280	dβfℓ	28	-	-	-	-	-	-	Dec. 18 Dec. 30 E75 W80 - C D D D D D D D C C J J (α) βp βf βf βf - - - (βf) βf (αf) - (αf) - 8 14 28 26 - - - - 15 - - -		A bi-polar group, in which the leader becomes a double spot and is the first to die out. The follower soon becomes regular in outline and survives to the limb.
21	11437	17329	L	3379	N28	206	1956 Jan. 19.24	11437 11439 11440	27	123	689	N28 E24	1956 Jan. 17.45	-	-	77	435	ℓβpℓ	22	-	-	-	-	-	-	Jan. 13 Jan. 24 E75 W70 - D E E E E G G G G G J (αp) (β) (βp) (βp) βp βp (βp) (βp) βp βp βp (αp) - 14 - 22 – 23 - 20 – – – –		A stream in which the leader, a regular spot, is the only stable component. It is preceded from January 16 by tiny spots for a few days.
22	11439	17330	L	3379	N24	202	19.54	Same as 21		81	519	N24 E13	18.51	-	-	82	450	ℓαpℓ	35	-	-	-	-	-	-	Jan. 13 Jan. 25 E79 W75 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) - - - 24 - 32 32 - - 34 - - - -		A stable regular spot.
23	11440	17331	7, L, M	3379	N20	189	20.47	Same as 21		358	1950	N20 W24	22.26	Jan. 19.20	+3	289	1582	ℓγℓ	35	318	1597	E	(γ)	-	N20 E15	Jan. 14 Jan. 26 E79 W76 - E E E E E F F F F E E E (x) γ (γ) γ γ (γ) (γ) γ (γ) (γ) (γ) - - - 23 - 31 34 - - 25 - - - - -		A large stream, in which the principal component, a large composite spot, is in the centre. There is a small regular spot leading the stream from January 18-23.
24	11443	17334	L	3382	N25	145	23.85	11442 11443	28	148	843	N26 E45	20.49	-	-	106	578	ℓβpℓ	33	-	-					Jan. 17 Jan. 30 E80 W82 - G G G G G G G G G H H H - (αp) βp (βp) (βp) βp (βp) (βp) (βp) - - - αp (αp) - - 14 - - 32 - - - - - - 19 - -		A composite spot, followed by many small variable companions until January 28.
25	11447	17339	L	3385	N25	71	29.46	11447 11451 11453		74	576	N24 W66	Feb. 03.46	-	-	19	129	dβd	11	-	-					Jan. 24 Feb. 4 E64 W78 - C C C C C B - A D D - (α) - - - βf (β) - - - - - - - - - - 12 - - - - - - -		A stream of small spots, not seen on January 31, which is growing rapidly as it approaches the limb.
26	11456	17342	L	3388	N30	325	Feb. 06.55	11456		93	633	N30 E55	02.42	-	-	49	291	ℓβpd	22	-	-					Jan. 31 Feb. 10 E77 W54 - G G G G G G G G B A - β (βp) βf (βf) βp (βp) βp (βp) βp (β) - 12 - 15 - 22 - 14 - 3 -		A pair of widely-separated spots, slowly breaking up and dying out before reaching the limb.
27	11462	17351	8, L, M 9 11 13	3400	N22	183	17.29	11461 11462 11470 11475	29	344	1734	N22 E12	16.35	Feb. 10.8 14.2 17.4 23.2	+6 +2 -1 -7	225	1437	ℓγℓ	18	Not seen 208 244 114	 1563 1393 797	- E F F	(x) γ γ -	 19 16 -	 N22 E40 N22 W01 N20 W76	Feb. 11 Feb. 23 E75 W76 - E E E E F F F F E E E - (x) γ γ γ γ (γ) γ (γ) (γ) γ (γ) - - - 15 14 19 18 - 16 - - 13 - - -	17331 11440	A large complex spot with numerous nuclei, slowly taking stream formation as it reaches the limb. It was in this group that a large flare occured on February 23, which was associated with an unusual increase of cosmic radiation.
28	11466	17352	L	3404	N20	166	18.58	11466 11469 11471 11472 11477 11479	32	127	629	N20 E50	14.38	-	-	103	498	ℓαpℓ	40	-	-					Feb. 11 Feb. 24 E79 W77 - - H H H H H H H H H H H H - (x) αp βp βp (αp) αp (αp) (αp) αp (αp) - - (αp) - - 23 29 35 - 32 - - 40 - - - -		A stable regular spot which becomes absorbed by Group 17355 on February 23.
29	11467	17353	10,L	3403	S22	160	19.07	11464 11467	31	285	1532	S22 E06	18.42	17.2	+1	162	883	ℓβpℓ	25	252	1281	F	βp	23	S21 E17	Feb. 12 Feb. 26 E83 W86 - - E E F F F F F E E G G G - (x) βf βp βp (βp) βp (βp) (βp) βp (βp) - - (β) (αf) - - 17 16 21 - 23 - - 25 - - - - - -		A large stream of normal type, developing from a single spot seen at the east limb. By February 24 only the leader and follower remain.

TABLE II 1954 - 1956 (CONTINUED)

POSITION DATA										MAXIMUM AREA						SUNSPOT MEAN DATA			MAJOR FLARE DAY DATA					DISK PASSAGE DATA	RETURN SEQUENCES	GREENWICH DESCRIPTION
Serial No.	Sunspot No. Mt. Wilson	Sunspot No. Greem	Category	McM Plage	Lat.	Long.	CMP	All Spots in Plage	Plage Serial No. Table III	Um.	Whole Spot	Position	Gr. Day	Flare Day	Flare ΔT	Area Umb.	Whole Spot	Mag. Cl. H	Area Umb.	Whole	Zurich Class	Mag. Class	H	Position	Days Seen, Position Seen, Zurich Class, Mag. Class, Magnetic Strength	Greenwich and/or Mt.Wilson	
30	11470	17355	L	3400	N20	172	Feb. 18.16	Same as 29		156	1263	N20 W30	Feb. 20.38			123	771	$d\beta\ell$ 26							Feb. 14 Feb. 24 E48 W74 A C D E E E E E E E - (x) βp (β) βf (β) (β) βp (βf) - - αf - 8 - 16 - - 18 - - -		A large complex stream, developing from a tiny spot when first seen. An unusual feature of this group is that it absorbs the regular spot (Group 17352) by February 23.
31	11471	17356	L	3404	N23	139	20.66	Same as 28		140	917	N22 E02	20.38	-	-	114	647	$\ell\beta\ell$ 15	-	-					Feb. 14 Feb. 26 E77 W73 - C E E E E E E E E E - x β (β) (βp) (βf) (βf) βγ (βf) - - (β) (β) x - 9 - 12 - ● - 16 - - - - -		A stream of numerous small spots which coalesce into two composite spots by February 21. The larger of the two, the follower, is the longer-lived.
32	11473	17357	L	3405	S21	134	20.99	11473	33	121	644	S21 E77	15.29	-	-	97	485	$\ell\beta p\ell$ 29	-	-					Feb. 14 Feb. 27 E86 W82 - G G G G G G G G H H H αp βp (βp) βp (βp) (βp) βp (βp) - - (αp) αp (αp) (αp) 21 23 - 26 - - 29 - - - - 24 - -		A regular spot, followed by a few small variable companions until February 22.
33	11480	17362	L	3412	N24	79	25.20	11480 11481 11484 11495	34	95	669	N24 E25	23.39	-	-	81	450	$\ell\alpha p\ell$ 22	-	-					Feb. 19 Mar. 2 E74 W79 - C D G G G G G H H H J - (α) αp (βp) - - (x) βp (αp) αp αp αp (αp) (α) - 20 - - - - 22 - 23 21 16 - -	11452	
34	11482	17365	14	3413	S29	47	27.61	11482 11486 11491	35	52	274	S30 E78	Feb. 21.49	Feb. 29.9	-8	16	92	$\ell\alpha pd$ 4	6	31	B	(β)	-	S31 W31	Feb. 21 Mar. 2 E78 W52 J J J A A B B B A - (αp) - - (αp) αp (αp) βp βf (β) - - - - - - 4 - 4 3 - - -		A very variable group of small spots, not seen on March 1.
35	11492	17373	L	3418	N24	336	Mar. 04.00	11492		106	641	N24 W46	Mar. 07.52	-	-	60	348	$\ell\beta p\ell$ 15	-	-					Feb. 27 Mar. 10 E75 W78 - B D C C D D E E E E G - (x) βp βf βp (βf) βp (β) βp (β) βp βf (β) (α) - - 2 6 11 - 12 - 15 - 16 11 - -		Variable spots, developing into a stream of normal type by March 4.
36	11493	17375	L	3419	S23	328	04.63	11493	36	182	1085	S23 E27	02.50	-	-	122	688	$\ell\beta p\ell$ 29	-	-					Feb. 28 Mar. 11 E69 W87 C E E E E E E G G G H - βp βp βp (βp) βp (βp) βp (βp) βp βp (αp) (αp) - 16 22 22 - 27 - 16 - 27 24 - - -		A stream of variable spots appearing past the central meridian.
37	11495	17374	15	3412	N16	64	Feb. 26.30	Same as 33		47	336	N16 W40	Mar. 01.30	Mar. 02.5	-2	38	214	$d\beta p\ell$ 10	45	285	C	(x)	-	N16 W61	Feb. 28 Mar. 3 W30 W74 B D D C - βp βp (β) (β) (x) 10 11 - - -		A stream of normal type, the leader of which becomes a regular spot and is the longest-lived.
38	11501	17378	L	3422	N34	252	Mar. 10.42	11501 11512		83	560	N34 E40	07.52	-	-	49	275	$\ell\beta pd$ 15	-	-					Mar. 4 Mar. 15 E72 W65 - G G G G G G G G G G - (α) βp (βp) βe βp (βp) βp (βp) (αp) αp (αp) (αp) - - 16 - 14 12 - 14 - - 14 - -		A stream in which the leader, a regular spot, alone remains by March 13.
39	11508	17385	16, L	3432	N21	162	17.24	11508 11511 11515	37	163	1237	N21 E52	13.41	15.7	-2	149	945	$\ell\beta f\ell$ 19	195	1089	E	βf	15	N20 E20	Mar. 11 Mar. 23 E75 W78 E E E E E E E E E E E E - (x) (x) βγ (β) βf βf (βf) βp (β) βf (β) (βf) (βf) (x) - - 15 - 15 15 - 18 - 11 - - -	17355 11470	A large complex spot, with several nuclei, which shows very little change throughout the transit. It is surrounded by many variable companions until March 17, after which the group consists of the principal spot and a small composite leader.
40	11524	17394	L	3438	N18	106	21.44	11522 11524		96	591	N19 W52	25.53	-	-	53	295	$d\beta p\ell$ 21	-	-					Mar. 18 Mar. 27 E41 W75 A A B D D D D D C - (x) o βp βf β βp βp βp βp (x) - - 7 - 14 22 17 12 5 -		A stream of normal type developing from a tiny spot first seen on March 18.
41	11527	17398	L	3440	N32	55	25.31	11525 11526 11527 11537 11539		110	778	N31 W52	29.34	-	-	59	361	$\ell\alpha p\ell$ 26	-	-					Mar. 19 Mar. 31 E72 W75 - H H H H H H H H H J J - (α) αp (αp) αp αp βp αp αp αp βp βp βp (αp) - 16 - 24 26 26 25 21 20 16 17 7 -		A regular spot, with two small companions on March 21. On March 27 more spots begin to appear preceding it and grow rapidly to form a stream.
42	11535	17406	17	3443	N26	360	29.52	11531 11535 11543 11550	38	45	325	N25 E14	28.34	28.4	0	35	190	$d\beta pd$ 17	45	325	D	βp	15	N25 E14	Mar. 25 Apr. 4 E52 W75 A B C D D C C D B B - βp βp βp βp βp βp (β) βp (β) (β) - 4 5 16 15 18 14 - 12 - - -		A small stream going through its life-history on the disk.
43	11551	17413	L	3454	N34	229	Apr. 08.42	11548 11551		113	562	N34 E13	Apr. 07.34	-	-	48	252	$\alpha\beta f\ell$ 22	-	-					Apr. 2 Apr. 13 E66 W55 - - B C D E E E C C C B - - βf βf βf βf βf βf (βf) - - - - - 5 9 16 18 23 22 - - - -		A stream which goes through its life history on the disk. The follower becomes a regular spot and is the last to disappear.
44	11553	17416	18, L	3457	N24	193	11.16	11553	39	113	793	N24 E08	Apr. 10.34	Apr. 9.4	-1	80	466	$\ell\beta f\ell$ 21	117	654	E	βf	18	N24 E23	Apr. 5 Apr. 17 E70 W82 - B B C E E E E G H H H - (x) β βf βp βf (β) - - - - - αp (αp) - - 3 12 15 18 - - - - - 19 - -		A stream of normal type developing from a few small spots first seen at the east limb. The leader becomes a regular spot and alone remains at the limb.

TABLE II 1954 - 1956 (CONTINUED)

POSITION DATA										MAXIMUM AREA						SUNSPOT MEAN DATA				MAJOR FLARE DAY DATA						DISK PASSAGE DATA	RETURN SEQUENCES	GREENWICH DESCRIPTION
Serial No.	Sunspot No. Mt. Wilson	Sunspot No. Greem	Category	McM Plage	Lat.	Long.	CMP	All Spots in Plage	Plage Serial No. Table III	Um.	Whole Spot	Position	Gr. Day	Flare Day	Flare ΔT	Area Umb.	Whole Spot	Mt. Wilson Mag. Cl.	H_	Area Umb.	Whole	Zurich Class	Mag. Class	H	Position	Days Seen, Position Seen, Zurich Class, Mag. Class, Magnetic Strength	Greenwich And/Or Mt. Wilson	
45	11561	17421	20, L	3462	S20	134	Apr. 15.61	11561	41	140	757	S21 W07	Apr. 16.35	Apr. 20.4	-4	78	399	$l\beta\rho l$	24	73	361	G	β	16	S21 W64	Apr. 9 Apr. 22 W82 E62 - B B B B C E E E G G G (x) (x) - - - - $\beta\rho$ (β) ($\beta\rho$) ($\beta\rho$) β β ($\beta\rho$) (α) - - - - - - 24 - - - 16 16 - -		A stream developing from tiny spots first seen at the east limb. Both the leader and follower first become composite in structure and after a day or two change into regular spots.
46	11562	17424	L	3461	S32	121	16.60	11562 11568 11569 11579 11582 11586	40	130	879	S31 E65	11.37	-	-	64	364	$l\alpha\rho l$	20	-	-					Apr. 10 Apr. 23 W85 E79 E E E E D D D D D C C J A - (x) - - - $\alpha\rho$ ($\alpha\rho$) (x) ($\alpha\rho$) $\alpha\rho$ $\alpha\rho$ ($\alpha\rho$) ($\alpha\rho$) - - - - - 21 - - - 13 9 - - -		A pair of regular spots closely followed by a small cluster. On April 17 the northern of the pair begins to break up, and by April 20 the other is the sole survivor.
47	11567	17425	19	3464	N19	115	17.06	11566 11567 11577	43	71	260	N19 E67	12.33	18.5	-6	24	124	$l\alpha\rho d$	12	13	69	B	(α)	-	N18 W19	Apr. 11 Apr. 22 W74 E80 C C C C C C B B B A A - - - - $\alpha\rho$ ($\alpha\rho$) ($\alpha\rho$) (α) αf (x) - -	17388 11524	A stream of unstable spots.
48	11572	17435	L	3467	N24	45	22.38	11571 11572 11574 11576 11583 11587 11594	44	127	609	N25 E00	22.38	-	-	65	354	$l\beta\rho l$	27	-	-					Apr. 17 Apr. 28 W75 E66 C C C C D D E E C D D - (β) ($\beta\rho$) $\beta\rho$ $\beta\rho$ ($\beta\rho$) $\beta\rho$ $\beta\rho$ $\beta\rho$ ($\beta\rho$) - - ($\beta\rho$) - - 19 17 - 24 27 26 - - - -		A regular spot leading a train of variable spots.
49	11603	17450	L	3481	N16	217	May 06.61	11602 11603 11610 11623	45	153	1125	N16 E54	May 02.32	-	-	145	847	$l\beta\rho l$	29	-	-					Apr. 30 May 12 W78 E80 - H E E E E E E E D C - $\alpha\rho$ $\beta\rho$ ($\beta\rho$) ($\beta\rho$) $\beta\rho$ $\beta\rho$ ($\beta\rho$) ($\beta\rho$) ($\beta\rho$) - ($\beta\rho$) $\alpha\rho$ (α) 22 25 - - 23 29 - - 27 - - 21 -		A stream, of which both leader and follower are composite spots. On May 4 the leader begins to divide, forming two regular spots, the northern of which soon begins to join up with some penumbral spots and form a composite mass north of the axis of the group before slowly declining. The follower dies out by May 11.
50	11604	17453	21	3485	N17	201	07.83	11604 11605 11606 11615	46	40	183	N17 E58	03.35	May 04.4	-1	23	101	$d\alpha\rho d$	15	36	163	D	$\beta\rho$	14	N17 E46	May 2 May 11 W52 E74 - - D D D D C C B A (x) (x) $\beta\rho$ $\alpha\rho$ ($\alpha\rho$) ($\alpha\rho$) $\alpha\rho$ - ($\alpha\rho$) (α) - - 14 16 - - 8 - - -		A pair of regular spots, dying out before reaching the west limb.
51	11605	17455	L	3485	N18	191	08.57	Same as 50		133	773	N19 W40	11.62	-	-	52	315	$l\beta\rho l$	18	-	-					May 3 May 14 W76 E68 A B C D C C C D E E D D (x) β $\beta\rho$ ($\beta\rho$) ($\beta\rho$) βf - ($\beta\rho$) $\beta\rho$ ($\beta\rho$) $\beta\rho$ (x) - - 7 - - 12 - - 19 - 9 -		A string of small spots slowly increasing in area until May 9, after which there is a sudden increase and a cluster of larger spots is formed.
52	11612	17458	23	3488	S19	147	11.89	11612 11620	47	33	143	S19 E70	07.46	16.5	-9	20	106	$l\alpha\rho l$	15	15	76	J	($\alpha\rho$)	-	S19 W62	May 5 May 18 W84 E84 - J J J J J J J J J J J - (α) (α) (α) $\alpha\rho$ - ($\alpha\rho$) $\alpha\rho$ ($\alpha\rho$) $\alpha\rho$ ($\alpha\rho$) $\alpha\rho$ ($\alpha\rho$) α - - - - 16 - - 16 - 16 - 12 - - -	17418, 17386, 17353 11556, 11509, 11467	A small regular spot.
53	11614	17462	22	3490	S31	132	13.00	11614	48	15	116	S31 E72	07.46	10.4	-3	11	79	$l\alpha\rho d$	10	4	16	J	($\alpha\rho$)	-	S31 E35	May 7 May 11 E24 E72 J C J J A (α) $\alpha\rho$ - ($\alpha\rho$) - - 11 - - -	17438	A small regular spot, dying out after a few days.
54	11620	17463	L	3488	S14	156	11.22	Same as 52		87	560	S15 W15	12.43	-	-	48	286	$d\beta f l$	17	-	-					May 8 May 17 W82 E39 A A D D D D D C C C - - (β) β (β) βf (βf) βf (βf) (x) - - - 14 - 13 - 12 - -		A short stream of normal type, developing from a tiny spot on May 8.
55	11621	17467	L	3494	N30	107	14.94	11621		221	1159	N30 E19	13.36	-	-	114	690	$d\beta\rho l$	19	-	-					May 11 May 21 W79 E41 D E E E E E E E D D - $\beta\rho$ ($\beta\rho$) βf ($\beta\rho$) $\beta\rho$ (β) (β) $\beta\rho$ $\beta\rho$ ($\beta\rho$) (x) 14 - 19 - 20 - - - 13 14 -		A stable regular spot.
56	11622	17466	24	3497	S21	91	16.10	11622	49	66	363	S21 W40	19.35	17.9	-2	66	339	$l\alpha\rho l$	34	67	346	H	($\alpha\rho$)	-	S21 W23	May 10 May 22 W81 E75 H H H G G G H H H H H H H (α) $\alpha\rho$ ($\alpha\rho$) $\alpha\mu$ ($\alpha\rho$) $\alpha\rho$ ($\alpha\rho$) ($\alpha\mu$) $\alpha\rho$ $\alpha\rho$ $\alpha\rho$ $\alpha\rho$ ($\alpha\rho$) ($\alpha\rho$) - - 30 - 33 - 31 - - 22 23 21 20 -		A large complex spot, appearing suddenly. After a few days it begins to break up and take on stream formation, with a regular spot as leader. The group is decreasing in area as it passes out of view.
57	11628	17471	L	3495	N25	94	15.90	11628 11634		102	583	N25 W70	21.31	-	-	32	173	$d\beta\rho l$	6	-	-					May 17 May 22 W78 W22 A B B C D - (x) $\alpha\rho$ βf $\beta\rho$ (β) - - 2 3 7 - -		A stream, developing in the western hemisphere and growing as it passes round the limb.
58	11636	17476	L	3506	S21	332	25.09	11632 11633 11636	51	239	1355	S20 W30	27.34	-	-	120	684	$d\beta\rho l$	28	-	-					May 19 May 31 W78 E77 A A A B D E E E E E E E - - - $\alpha\rho$ βf βf $\beta\rho$ βf (β) βf (β) $\beta\rho$ ($\beta\rho$) (α) - - 2 15 14 19 28 - 14 - 16 - -		A large stream, growing rapidly from a small spot at the east limb. The leading part coalesces into a composite spot, while the rear remains a cluster.
59	11641	17482	L	3514	S15	240	June 01.09	11641	52	139	799	S16 E68	27.34	-	-	108	591	$l\beta\rho l$	27	-	-					May 26 June 7 W84 E76 E E E E E E E G G H H - ($\beta\rho$) $\beta\gamma$ ($\beta\rho$) $\beta\rho$ ($\beta\gamma$) $\beta\rho$ ($\beta\rho$) ($\beta\rho$) $\beta\rho$ $\beta\rho$ $\alpha\rho$ ($\alpha\rho$) - - 21 - 27 - 27 - - 21 25 17 - -		A large regular spot, followed by a train of small spots to form a stream. These followers, however, all disappear by June 5.

II-4

II-4 #3

TABLE II 1954 - 1956 (CONTINUED)

POSITION DATA: Serial No.	Sunspot No. Mt. Wilson	Sunspot No. Green	Category	McM Plage	Lat.	Long.	CMP	All Spots in Plage	Plage Serial No. Table III	MAXIMUM AREA: Um.	Whole Spot	Position	Gr. Day	Flare Day	Flare ΔT	SUNSPOT MEAN DATA: Area Umb.	Whole Spot	Mt. Wilson Mag. Class	H	MAJOR FLARE DAY DATA: Area Umb.	Area Whole	Zurich Class	Mag. Class	H	Position	DISK PASSAGE DATA: Days Seen, Position Seen, Zurich Class, Mag. Class, Magnetic Strength	RETURN SEQUENCES: Greenwich and/or Mt. Wilson	GREENWICH DESCRIPTION
75	11741	17568	L	3615	S20	322	Aug. 15.47	Same as 74		134	876	S20 E02	Aug. 15.23	-	-	89	555	lβpl	27	-	-					Aug. 9 E79 — Aug. 21 W78 - C C E E E E E E G H H H (x) αp β βp βp βp βf βp βp βp βp βp (αp) - 4 10 18 24 23 26 23 24 21 27 20 -		One or two spots, soon developing into a complex group, of which the principal component is a large double spot which alone remains by August 19.
76	11746	17573	L	3624	N22	257	20.39	11746 11747 11760 11765 11766 11772	67	76	575	N23 W76	26.21	-	-	99	475	lαpl	31	-	-					Aug. 13 E87 — Aug. 26 W76 - H H H H H H H H H H H H H (α) αp αp αp αp αp αp αp αp αp (αp) αp (αp) (αp) - 2 30 28 24 25 25 23 31 30 - 14 - -		A stable regular spot with several small companions.
77	11751	17579	L	3625	S18	261	20.10	11751	68	172	884	S19 W54	24.31	-	-	103	546	lβpl	25	-	-					Aug. 17 E33 — Aug. 26 W76 A D D E E E E E E - βp βp βp βf βp βp (βp) βp (βp) - 4 15 24 26 20 22 - 14 - -		A stream, of which the leader becomes composite, while the follower soon breaks up and dies out before reaching the limb.
78	11754	17581	L	3630	S23	211	23.91	11753 11754 11758 11759 11761	71	126	565	S22 E64	19.34	-	-	103	474	lαpl	33	-	-					Aug. 17 E81 — Aug. 29 W70 - H H H H H H H H H H H H (α) αp αp αp αp αp (αp) αp (αp) αp (αp) αp (αp) - 29 30 30 30 33 - 31 - 33 - 24 -	17544 11717	A stable regular spot.
79	11756	17578	L	3631	S25	275	19.05	11756	72	91	660	S24 W69	24.31	-	-	45	268	dβpl	16	-	-					Aug. 17 E20 — Aug. 25 W78 A B B C C C C C - - βp β βp βp βp (βp) (βp) - - 8 10 16 17 14 - - -		A short stream, developing from a tiny spot on August 17.
80	11758	17584	L	3630	S27	206	24.28	Same as 78		95	649	S27 E21	22.60	-	-	53	344	dβpd	20	-	-					Aug. 18 E72 — Aug. 29 W64 A C D E E E D D C C C A αp βp βp βp βp (βp) βp (β) βp (β) βf (α) 2 9 19 20 21 - 20 - 11 - 2 -		A few small spots when first seen, growing into an elongated spot which dies out before reaching the limb.
81	11763	17588	31, L	3629	N31	205	24.36	11752 11757 11762 11763 11764	70	189	1387	N30 W67	29.30	Aug. 29.4	0	113	728	dβl	21	189	1387	E	βp	18	N30 W65	Aug. 20 E53 — Aug. 31 W83 A A C D E E E E E E E - βp β βp β βp (βp) βf (βf) β βp (βf) (αf) 2 5 10 14 22 - 20 - 19 18 - -		A stream of normal type, developing from a tiny spot first seen on August 20.
82	11776	17596	L	3641	S28	103	Sept. 01.13	11776		108	688	S28 E23	30.43	-	-	62	360	lβpl	19	-	-					Aug. 26 E77 — Sept. 6 W69 - D D D E E D D D C C J (x) (β) βf βp β (β) βp βp (βp) βp (αp) (β) - - 17 13 15 - 20 20 - 15 - -		A pair of spots, soon developing into a stream, with a brief maximum on August 30.
83	11777	17597	32, L, M	3643	N18	94	01.71	11777 11779 11780 11781 11801	73	100	918	N19 E44	29.30	31.5	-2	80	616	lγl	28	97	837	E	(γ)	-	N18 E16	Aug. 26 E85 — Sept. 7 W78 - E E E E E E E E G G G H (x) (γ) γ γ γ (γ) γ βγ (x) βp (β) αp (αp) - - 15 20 22 - 29 28 - 23 - 18 -	17555, 17523	A composite structure, developing into a stream of normal type, of which the leader is the most stable component and alone remains at the west limb.
84	11783	17604	L	3644	N32	82	02.68	11783		92	542	N33 E16	Sept. 01.33	-	-	55	309	dβpl	25	-	-					Aug. 27 E80 — Sept. 9 W87 - A J C D E E G G G G H H H - βp βp βp (βp) βp βp (βp) βp (βp) αp (αp) (αp) (αp) - 8 10 14 - 22 26 - 24 - 19 - - -		A regular spot, leading a group of small changing spots, which die out by September 8.
85	11789	17607	L	3648	N23	102	01.12	11786 11789		125	810	N22 W55	05.32	-	-	57	321	dβl	16	-	-					Aug. 30 E13 — Sept. 7 W84 A A B B C E E E - β (αp) β β (β) βγ (β) (x) - 3 - 4 16 - 17 - - -		A small stream, of fairly rapid growth.
86	11796	17612	35	3656	S15	341	10.29	11796	74	68	472	S15 E06	09.59	Sept. 10.4	-1	47	281	lβfl	20	52	327				S16 W01	Sept. E69 — Sept. W75 D D D E E E E D C C C (βf) βf βf (βf) βf (βf) βγ (β) β (β) (β) - 14 21 - 17 - 16 - 8 - -		A long stream, of which the largest component is the follower. This, however, breaks up and rapidly dies out after September 11.
87	11797	17613	33, L, M 34	3658	S24	323	11.65	11797 11831	75	267	2306	S24 E56	07.36	05.6 05.7 10.4	+2 +2 -3	265	1830	lβγl	26	68 68 251	755 755 2219	- - F	(x) (x) (βγ)	- - -	S24 E75 S24 E74 S24 E15	Sept. 5 E75 — Sept. 17 W74 - F F F F F F F F E E E E (x) βγ γ (βγ) βγ (βγ) βp (β) β (β) (β) (β) (x) - - 22 - 27 - 22 - 21 - - - -	17568	A large complex stream. The leading and centre parts are joined for nearly the whole transit. The rear portion, although complex, undergoes little change until September 14, after which it begins to die out.
88	11809	17621	L	3666	S19	258	16.57	11807 11808 11809 11811 11815 11816 11819 11828 11834 11837 11839 11841 11842 11849	77	90	631	S19 E71	11.30	-	-	48	301	lβpl	17	-	-					Sept. 10 E79 — Sept. 22 W72 - E E E E E D D D D C C A (β) β βp βγ (βp) βp (βp) β βp β βp βp (α) - 12 14 18 - 18 - 18 12 13 10 7 -	17579 11751	A compact bi-polar group, slowly dying out as it passes round the limb.

IV-6-1

II-6-3

TABLE II 1954 - 1956 (CONTINUED)

Serial No.	Sunspot No. Mt. Wilson	Sunspot No. Greenwich	Category	McM Plage	Lat.	Long.	CMP
60	11645	17485	25, L 26	3518	N23	209	June 03.38
61	11652	17490	27	3527	N23	118	10.28
62	11664	17501	L	3540	N22	354	19.69
63	11665	17502	L	3535	N32	28	17.12
64	11667	17504	28, L	3543	S20	331	21.39
65	11673	17506	L	3541	N13	347	20.20
66	11684	17515	L	3557	N31	195	July 01.67
67	11699	17524	29	3567	S21	80	10.38
68	11700	17523	L	3565	N20	90	09.61
69	11701	17527	L	3570	N15	54	12.36
70	11714	17540	L	3577	N26	331	18.61
71	11717	17544	L	3586	S22	217	27.24
72	11729	17555	L	3598	N18	91	Aug. 05.76
73	11735	17562	30, L	3607	N23	3	12.36
74	11740	17567	L	3615	S14	331	14.79

1. II -5

TABLE II 1954 - 1956 (CONTINUED)

POSITION DATA										MAXIMUM AREA						SUNSPOT MEAN DATA				MAJOR FLARE DAY DATA					DISK PASSAGE DATA	RETURN SEQUENCES	GREENWICH DESCRIPTION
Serial No.	Sunspot No. Mt.Wilson	Green	Catagory	McM Plage	Lat.	Long.	CMP	All Spots in Plage	Plage Serial No. Table III	Um	Whole Spot	Position	Gr. Day	Flare Day	Flare ΔT	Area Umb.	Whole Spot	Mt.Wilson Mag. Cl.	H	Area Umb.	Whole	Zurich Class	Mag. Class	H	Position	Days Seen, Position Seen, Zurich Class, Mag Class, Magnetic Strength	Greenwich and/or Mt.Wilson	
89	11811	17624	37, L	3666	S16	256	Sept. 16.74	Same as 88		141	691	S17 E58	Sept. 12.36	17.8	-5	68	379	$\beta_p \beta$	23	72	361	D	β_p	21	S16 W13	Sept. 11 E71 Sept. 22 W77 D D D D D E D C C C J J β_p β_γ β_γ (β_γ) β_p (β) β_p β_p β_p α_p α_p (α_p) 12 14 25 - 24 - 21 19 18 14 13 -		A stream of normal type, of which only the leader remains by September 21.
90	11815	17629	36	3666	S22	249	17.31	Same as 88		22	121	S23 E69	12.36	14.3	-2	5	30	βd	10	1	10	A	βf	11	S22 E39	Sept. 12 E69 Sept. 23 W76 A A A A A A A - - - A - β β_p β_p β_γ β (β) (x) 2 8 7 11 10 - - - - - -		A few small spots, not seen on September 19, 20 and 21.
91	11836	17640	L	3677	N27	176	22.82	11836	82	82	505	N27 E58	18.41	-	-	40	232	$\beta_p \alpha$	24	-	-					Sept. 16 E79 Sept. 27 W58 - D D D D C C C J J A (x) β_p β_p β_p β_p β_p β_p α_p α_p α_p (α_p) (α) - 14 17 24 21 21 24 25 21 20 - -		A regular spot, followed by some distant companions until September 23.
92	11858	17651	L	3686	S28	90	29.35	11855 11858 11864 11869 11879	83	197	1066	S28 W40	Oct. 02.47	-	-	136	795	$\beta_p \beta$	27	-	-					Sept. 23 E75 Oct. 5 W77 - D E E E E E G G G G G - (α) β_p β_p (β_p) β_p β_p (β_p) β_p (β_p) β_p - (αf) - 17 19 - 27 24 24 - 18 - 17 - -	17596	A stream, in which both leader and central portion become regular spots. The rear part consists of small, unstable spots.
93	11868	17656	38, L	3691	N45	116	27.3	11868	85	84	509	N45 W78	03.38	Oct. 01.3	+2	40	215	$\beta_p \beta$	21	47	261	D	β_p	22	N45 W52	Sept. 28 W19 Oct. 4 W87 B A A D E D - β_p α_p (β) β_p (β) (β) - 3 2 - 22 - - -		A stream, forming in high latitude.
94	11872	17657	L	3685	N18	111	27.7	11857 11866 11872 11875		111	510	N18 W62	02.47	-	-	47	244	$d\beta$	12	-	-					Sept. 28 W08 Oct. 4 W82 - A D D D D - - β_p (β) β_f (β) β_f - - 9 - 13 - 9 -		A group forming just past the central meridian and growing as it passes out of view.
95	11874	17662	L	3695	S20	346	Oct. 07.22	11874	87	118	847	S20 W40	10.35	-	-	53	336	$\beta_\alpha f d$	14	-	-					Oct. 1 E71 Oct. 13 W75 B B C J J J J J A - - - (x) (x) (β_γ) - (α) βf (αf) αf αf - - - - - - - - 6 - - 8	11885	A few small spots, slowly developing into a long stream. As the group approaches the west limb, however, only two composite spots remain.
96	11878	17663	39, L, M 40 41	3694	N20	351	06.83	11878	86	163	1586	N21 W58	11.34	07.2 11.4 11.6	+4 0 0	153	1089	$\beta_\gamma \beta$	34	152 163 163	1176 1586 1586	F F F	(β_p) β_γ β_γ	- 20 20	N20 W04 N21 W60 N21 W62	Oct. 1 E74 Oct. 13 W82 B D E E F F F F F F E - β_p (β) β_p - (β_p) β_p (β_p) β_γ β_γ (β_γ) β_γ β_γ (β) 8 - 14 - - - - - 33 24 - 20 15 -	17626	A stream, of which the leader becomes a regular spot and is the most stable component until October 10. As the group approaches the limb, the whole appears to be coalescing into a composite spot.
97	11883	17667	L	3698	S24	317	09.44	11883		94	622	S25 W66	14.36	-	-	42	231	$\beta \beta \beta$	28	-	-					Oct. 3 E78 Oct. 15 W75 - D D D C J J J J A C D - α_p - (β) β_p (β_p) α_p α_p (β_p) α_p β_p β_f β_f (αf) 13 - - 10 - 18 13 - 12 10 28 22 -	17613, 17568 11797	A pair of regular spots, of which only the leader remains by October 9. The group appears to be growing again as it passes round the limb.
98	11910	17684	42 L	3719	N17	118	24.49	11908 11910 11911	89	94	545	N18 E79	18.30	22.4	-4	44	262	$\beta_\alpha p d$	19	54	367	C	(α_p)		N17 E26	Oct. 18 E79 Oct. 28 W47 - J J J C C C J B B A α_p α_p α_p (α_p) (α_p) α_p α_p α_p (α_p) - - 20 70 - - - 17 12 3 - -	11872	A stream of small spots, dying out before reaching the limb.
99	11920	17694	43	3730	N14	63	28.67	11920 11939	92	46	370	N14 E70	23.44	23.3	0	34	191	$\beta_\alpha p \beta$	23	46	370	C	(x)	-	N14 E74	Oct. 22 E82 Nov. 3 W75 - C C C C C C J C C C J J - (α) (x) β_p β_p α_p α_p - α_p (x) α_p (α_p) α_p (α_p) - - 20 20 24 24 - 17 - 16 - 12 -		A regular spot, with some unstable companions until October 31.
100	11921	17693	L	3729	S29	58	29.01	11919 11921 11923 11926	91	72	662	S30 W44	Nov. 01.39	-	-	56	401	$\beta \beta \beta$	22	-	-					Oct. 22 E73 Nov. 3 W66 - B B B C C C C C D D C C x x β_p β_p β_f β_f - β_f (β_f) β_f (β_f) α_f (α_f) - - 8 10 11 22 - 23 - 6 - 8 -		A long stream, undergoing slight changes.
101	11024	17696	L	3731	S17	50	29.66	11924		98	704	S17 W07	Oct. 30.36	-	-	95	560	$\beta \beta f$	28	-	-					Oct. 23 E80 Nov. 4 W73 - E E E E E E E E E E D - (β) β_γ β_p β_f β_f - β_f (β) β_f (β_f) β_p (β) (x) - 15 22 26 22 - 28 - 25 - 14 - -		A close pair of regular spots, which join together but break up again as they pass out of view.
102	11930	17700	L	3736	N21	352	Nov. 03.07	11929 11930 11954		107	624	N20 E66	29.38	-	-	82	443	$\beta_\alpha p \beta$	33	-	-					Oct. 28 E75 Nov. 9 W81 H H H H H H H H H H H H - - β_p (β_p) β_p (β_p) α_p (α_p) α_p (α_p) α_p α_p (α_p) (α_p) - 32 - 24 - 26 - 26 - 22 13 - -	17663, 17626 11878	A regular spot, with several small unstable companions until November 5.
103	11937	17705	L	3739	S12	345	03.59	11931 11934 11935 11936 11937 11945 11951		96	508	S12 E58	30.36	-	-	52	280	$\beta \beta \beta$	24	-	-					Oct. 24 E73 Nov. 9 W79 C D D D D D C C C C J - β_p (β_γ) β_p (β_p) β_p (β_p) β_p (β_p) β_p β (α_p) - 24 - 23 - 17 - 16 - 15 2 - -	17666	A stream, of which the leader is a regular spot.

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I. II -7 2

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TABLE II 1954 -1956 (CONTINUED)

POSITION DATA										MAXIMUM AREA					SUNSPOT MEAN DATA			MAJOR FLARE DAY DATA					DISK PASSAGE DATA	RETURN SEQUENCES	GREENWICH DESCRIPTION
Serial No.	Sunspot No. Mt. Wilson	Sunspot No. Green	Category	McM Plage	Lat.	Long.	CMP	All Spots in Plage	Plage Serial No. Table III	Um.	Whole Spot	Position	Gr. Day	Flare Day	Flare ΔT	Area Umb.	Whole Spot	Mt. Wilson Mag. Cl. H	Area Umb.	Area Whole	Zurich Class	Mag. Class	H	Position	Days Seen, Position Seen, Zurich Class, Mag. Class, Magnetic Strength	Greenwich and/or Mt.Wilson	
104	11944	17711	L	3746	S13	299	Nov. 07.10	11944		123	735	S13 W03	Nov. 07.49	-	-	96	573*	$\ell\beta\rho\ell$ 26	-	-					Nov. 1 Nov. 12 E77 W75 C C D D D E E E G G G H (x) $\beta\rho$ ($\beta\rho$) $\beta\rho$ ($\beta\rho$) $\beta\rho$ $\beta\rho$ (ρ-) ($\beta\rho$) $\beta\rho$ ($\beta\rho$) ($\alpha\rho$) - 14 - 26 - 24 23 - - 17 - -		A stream of normal type, of which the leader is the only stable component.
105	11946	17714	46, L	3747	N28	273	09.07	11946	93	109	1007	N27 E66	04.29	Nov. 13.1	-9	72	520	$\ell\beta\rho\ell$ 14	29	231	J	$\alpha\rho$	12	N28 W54	Nov. 2 Nov. 15 E83 W80 - D E E E E E D C C J J - (α) (β) $\beta\rho$ ($\beta\rho$) $\beta\rho$ β ($\beta\rho$) ($\beta\rho$) $\beta\rho$ ($\beta\rho$) ($\alpha\rho$) $\alpha\rho$ ($\alpha\rho$) ($\alpha\rho$) - - 11 - 14 15 - - 14 14 - - 12 - -		A composite spot, soon breaking up and forming a stream, of which only the leader remains by November 13.
106	11949	17716	44, L 45 47	3751	S18	264	09.74	11949	94	165	1059	S17 E13	08.40	07.5 08.5 14.4	+1 0 -6	116	633	$\beta\rho\ell$ 26	187 165 59	929 1059 390	H H H	$\beta\rho$ ($\beta\rho$) (α)	26 - -	S17 E28 S17 E15 S19 W61	Nov. 3 Nov. 15 E83 W73 - H H H H H H G G G H H H (α) $\alpha\rho$ $\beta\rho$ $\beta\rho$ $\beta\rho$ ($\beta\rho$) ($\beta\rho$) $\beta\rho$ ($\beta\rho$) ($\alpha\rho$) $\beta\rho$ (α) (α) - 20 - 22 26 - - 24 - - 11 - -		A regular spot, with a number of fairly large, closely-associated companions. On November 10 they begin to separate from it and die out. By November 14 the regular spot has divided into two and is diminishing.
107	11953	17722	L, M	3752	S22	241	11.47	11953 11961		210	1866	S22 E66	06.51	-	-	179	1407	$\ell\beta\gamma\ell$ 22	-	-					Nov. 5 Nov. 17 E76 W73 E E F F F F F F E E E E - (x) $\beta\gamma$ $\beta\gamma$ ($\beta\gamma$) ($\beta\gamma$) $\beta\gamma$ (β) ($\beta\gamma$) βf (βf) (βf) βf (βf) - 17 21 - - 23 - - 19 - - 14 -	17673 Same Region as 11890, 11894, 11895, & 11898	A compact stream, of which a large regular spot, at first situated just north of the central portion, finally becomes the leader.
108	11958	17723	L	3753	N17	223	12.85	11958	95	131	814	N17 E44	09.45	-	-	74	465	$\ell\beta\ell$ 15	-	-					Nov. 6 Nov. 18 E84 W77 - E E E E E E G G G G G G (x) β (β) (β) $\beta\gamma$ ($\beta\gamma$) (β) $\beta\gamma$ ($\beta\gamma$) (α) α $\beta\rho$ ($\alpha\rho$) - 14 - - 13 - - 16 - - 15 12 -	17682 Pos. return of 11905	A stream, of which the leader remains a small regular spot throughout the transit, while the following part coalesces into a composite cluster and slowly dies out.
109	11961	17724	L	3752	S18	228	12.47	Same as 107		159	1152	S18 W39	15.44	-	-	94	561	$d\beta\rho\ell$ 23	-	-					Nov. 10 Nov. 18 E32 W79 A B C D D E E G G $\beta\rho$ ($\beta\rho$) ($\beta\rho$) $\beta\rho$ ($\beta\rho$) ($\beta\rho$) $\beta\rho$ ($\beta\rho$) ($\beta\rho$) 9 - - - 18 - - 24 - -		A stream, developing from a pair of tiny spots first seen on November 10. The leader becomes regular in outline and is the most stable component.
110	11963	17726	48, L, M 49	3755	S13	177	16.30	11963 11964	96	200	1942	S13 W26	18.30	15.3 20.4	+3 -2	166	1377	$\ell\gamma\ell$ 23	168 227	1233 1906	E E	(γ) (γ)	- -	S13 E13 S14 W62	Nov. 10 Nov. 22 E81 W81 - E E E E E F F F E E E - (x) (x) (x) γ (γ) (γ) γ γ γ (γ) (γ) γ (γ) - - - 17 - - 19 24 23 - - 17 -		At first a regular spot with a few north preceding companions. On November 14 these begin to grow rapidly and the whole group becomes a complex composite structure.
111	11969	17730	L	3764	S16	118	20.82	11969 11978		69	646	S16 W66	25.31	-	-	62	397	$d\beta\rho\ell$ 19	-	-					Nov. 15 Nov. 26 E74 W79 A B C C C C D D D D D C (x) βf $\beta\rho$ $\beta\rho$ ($\beta\rho$) ($\beta\rho$) $\beta\rho$ $\beta\rho$ $\beta\rho$ ($\beta\rho$) $\beta\rho$ ($\alpha\rho$) - 2 16 16 - - 19 20 16 - 11 -		A stream, of which the leader, a composite spot, is the largest component.
112	11970	17731	L	3765	N15	108	21.59	11970 11973 11980		108	560	N15 E68	16.48	-	-	50	306	$\ell\alpha\rho\ell$ 22	-	-					Nov. 15 Nov. 27 E80 W77 - H H H H G G G H J C B A (α) $\alpha\rho$ $\alpha\rho$ $\alpha\rho$ ($\alpha\rho$) $\alpha\rho$ $\alpha\rho$ $\alpha\rho$ ($\alpha\rho$) $\beta\rho$ (β) (α) - 15 19 22 - - 17 23 14 - 7 - -	17703	A slowly-diminishing composite spot, with a companion on November 25 and 26.
113	11974	17733	L	3767	S24	81	23.63	11974 11992		227	1377	S24 E52	19.45	-	-	170	987	$\ell\beta\rho\ell$ 31	-	-					Nov. 17 Nov. 30 E81 W80 - F F F F F F F G G G G G - (x) $\beta\rho$ ($\beta\rho$) ($\beta\rho$) $\beta\rho$ $\beta\gamma$ $\beta\rho$ ($\beta\rho$) $\beta\rho$ ($\beta\rho$) ($\beta\rho$) $\beta\rho$ ($\beta\rho$) - - 18 - - 26 28 25 - 31 - - 15 - -		A long stream, of which the leader, a large composite spot is the most stable component.
114	11988	17744	L	3777	N22	334	Dec. 01.74	11987 11988 11999		93	698	N22 E14	30.39	-	-	68	445	$d\beta f\ell$ 18	-	-					Nov. 26 Dec. 8 E71 W34 - - A D D D E E E D D D J - - (x) β βf βf (βf) βf (βf) βf - (βf) αf (αf) - - 12 16 17 - 19 - 23 - - 13 -		A stream, developing from a tiny spot first seen on November 26. The follower is the largest and most stable component.
115	12005	17757	L	3784	N27	255	07.73	12002 12005 12007		82	602	N27 W64	12.28	-	-	35	298	$d\beta\ell$ 16	-	-					Dec. 2 Dec. 13 E67 W70 A B B C D E E E E D D C (x) (x) β - (β) βf β (β) βf (βf) ($\beta\rho$) ($\beta\rho$) - - 13 - - 17 15 - 9 - - -		A stream, developing from a tiny spot on December 2. By December 8 it has completely coalesced but breaks up after a few days.
116	12009	17763	50, L	3785	S19	226	09.95	12003 12006 12008 12009 12011 12013 12015	98	252	1597	S19 E45	Dec. 06.48	Dec. 06.6	0	218	1292	$\ell\beta\rho\ell$ 37	252	1597	E	($\beta\rho$)	-	S19 E44	Dec. 3 Dec. 16 E81 W82 - E E E E E E E E E E E - (x) $\beta\rho$ - ($\beta\rho$) $\beta\rho$ $\beta\rho$ ($\beta\rho$) $\beta\rho$ ($\beta\rho$) ($\beta\rho$) $\beta\rho$ ($\beta\rho$) ($\beta\rho$) ($\beta\rho$) - 23 - - 34 36 - 32 - - 27 - -	11724 Part of 11961	A pair of composite spots. The leader has a preceding appendage which it slowly absorbs.
117	12016	17769	51, L 52	3788	S25	181	13.31	12014 12016 12020 12021 12024	99	169	1532	S25 W68	18.29	17.7 18.3	+1 0	121	929	$d\beta f\ell$ 25	219 169	1401 1532	E E	(β) ($\beta\rho$)	- -	S25 W57 S25 W66	Dec. 8 Dec. 19 E62 W80 - C C D E E E E E E E - (x) (x) βf (βf) (βf) $\beta\gamma$ $\beta\gamma$ βf (β) (β) ($\beta\rho$) (x) - - 22 - - 25 - 19 - - - -		A long stream, of which the leading portion at first consists of several small spots which soon begin to coalesce, forming a fair-sized composite spot by December 16. The follower is regular in outline until December 15, after which it breaks up.
118	12030	17779	53, L, M 54 55	3795	N14	80	20.96	12030 12042	100	195	1498	N14 W33	18.29	19.3 19.7 20.2	-1 -1 -2	147	977	$\ell\beta\gamma\ell$ 27	182 182 177	1286 1286 1184	F F F	$\beta\gamma$ $\beta\gamma$ $\beta\gamma$	26 26 27	N14 E18 N14 E14 N14 E07	Dec. 14 Dec. 26 E82 W73 - E E F F F F E E E E G G (x) $\beta\rho$ $\beta\gamma$ ($\beta\gamma$) ($\beta\gamma$) $\beta\gamma$ $\beta\gamma$ $\beta\gamma$ ($\beta\gamma$) $\beta\rho$ $\beta\rho$ ($\beta\rho$) ($\alpha\rho$) - 24 24 - - 26 27 26 - 25 23 - -		A stream, which at first consists of two composite spots. The leader finally becomes regular in outline and is the only survivor at the limb. The rear portion, stable until December 1, then quickly disintegrates.

POSITION DATA											
Serial No.	Sunspot Mt.Wilson	Green	Category	McM	Lat.	Long.	CMP	All Spots inPlage	Plage Serial No. Table III	Um.	Whole Spot
119	12031	17782	L	3794	S25	75	Dec. 21.40	12031 12048		85	964
120	12039	17789	57, L, M	3800	S16	21	25.51	12039	101	191	1136
121	12040	17790	L	3801	N16	17	25.76	12038 12040		115	695
122	12040	17794	L	3801	N18	1	26.96	Same as 121		52	743
123	12046	17797	56, L	3804	N34	327	29.59	12046	102	96	570

ZURICH

Class

Class			
A	11482 FEB. 25 1956	11636 MAY 21 1956	
B	11482 FEB. 27 1956	11874 OCT. 01 1956	
C	11811 SEPT. 19 1956	11740 AUG. 18 1956	
D	11811 SEPT. 15 1956	11740 AUG. 17 1956	
E	11440 JAN. 15 1956	11740 AUG. 14 1956	
F	11440 JAN. 20 1956	11717 JULY 24 1956	
G	11443 JAN. 20 1956	11717 JULY 29 1956	
H	11218 JAN. 09 1955	11740 AUG. 10 1956	
J	11482 FEB. 24 1956	11740 AUG. 19 1956	

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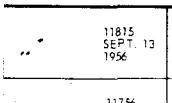
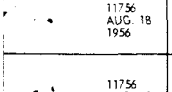
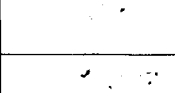
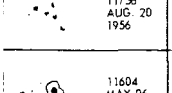
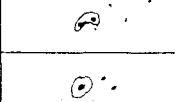
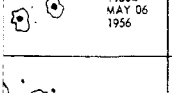
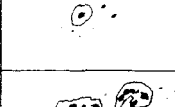
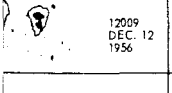
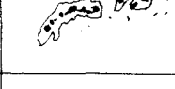
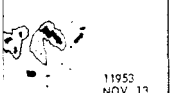
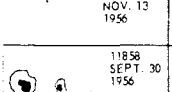
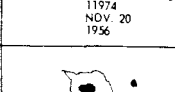
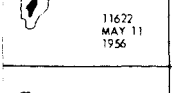
MAXIMUM AREA					SUNSPOT MEAN DATA				MAJOR FLARE DAY DATA						
Position		Gr. Day	Flare Day	Flare ΔT	Area Umb.	Whole Spot	Mt. Wilson Mag. Cl.	H	Area Umb.	Area Whole	Zurich Class	Mag. Class	H	Position	
S27	W78	Dec. 27.48	-	-	44	291	$\beta\alpha\beta$	17	-	-					
S16	E27	23.30	Dec. 26.6	-3	138	863	$\beta\beta_\gamma\beta$	26	133	1002	E	β_γ	23	S17	W13
N16	E72	20.28			118	597	$\beta\beta_p\beta$	37	-	-	-	-	-	-	-
N19	E73	21.50	-	-	37	359	$\beta\beta_p\beta$	37	-	-					
N34	E70	24.28	22.4	+2	83	436	$\beta\beta_p\beta$	33	Not seen						

CLASSIFICATION OF SUNSPOTS

 11815 SEPT. 13 1956  11763 AUG. 20 1956	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.
 11756 AUG. 18 1956  11652 JUNE 07 1956	A bipolar group of spots without penumbra, the long axis of which is directed roughly E-W, concentration of spots on the E & W ends.
 11756 AUG. 20 1956  11763 AUG. 22 1956	Bipolar group like B but with at least one main spot with penumbra.
 11604 MAY 06 1956  11665 JUNE 18 1956	Bipolar group, the largest spots having penumbra.
 12009 DEC. 12 1956  11763 AUG. 24 1956	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.
 11953 NOV. 13 1956  11974 NOV. 20 1956	Very large bipolar or complex group. Dimension in longitude at least 15°.
 11858 SEPT. 30 1956  11974 NOV. 25 1956	Large bipolar group, without small spots between the two major spots. Dimension in longitude at least 10°.
 11622 MAY 11 1956  11746 AUG. 16 1956	Unipolar spot with penumbra, sometimes with complicated structure. Diameter > 2.5°.
 11612 MAY 14 1956  11910 OCT. 20 1956	Unipolar spot with penumbra, round shape, Diameter <2.5°.

JED)

DISK PASSAGE DATA Days Seen, Position Seen, Zurich Class, Mag. Class, Magnetic Class	RETURN SEQUENCES Greenwich and/or Mt.Wilson	GREENWICH DESCRIPTION
Dec. 15 — Dec. 28 E76 — W81 C C C C C C C J J J A - - αp α (α) α α α βp (α) α α (α) (α) - - 17 15 - 15 16 18 15 - 15 11 - - - -	17733 11974	A small regular spot, with some close companions between December 20 and 24. On the next day a stream appears which becomes a large composite spot as it passes from view.
Dec. 19 — Dec. 31 E78 — W76 G G G G G G G E E E G G - (x) βγ βγ (βγ) βγ βγ (βγ) βγ βγ βρ β (β) (α) - 24 26 - 24 20 - 23 23 22 - - -		A bi-polar group. The leader remains a regular spot, while the follower becomes composite and the larger component. After December 28 the group begins to break up rapidly.
Dec. 19 — Dec. 31 E82 — W73 - G G G E E E G G G G G H (x) βp βγ (βγ) βγ βγ (β) βp βp βp (βp) (βp) (βp) - 24 28 - 32 32 - 36 34 35 - - -	Same Region as 11981	A stable regular spot with a few small close companions until December 28. Leading part of Mt. Wilson 12040.
Dec. 19 — Dec. 31 E82 — W73 - G G G E E E G G G G G H (x) βp βγ (βγ) βγ βγ (β) βp βp βp (βp) (βp) (βp) - 24 28 - 32 32 - 36 34 35 - - -		A pair of composite spots which disintegrate and die out before reaching the limb. Tailing part of Mt. Wilson 12040.
Dec. 23 — Jan. 4 E78 — W71 - G G G G G G G G G G G G (x) (x) (α) αp βp βp (αp) (βp) (βp) (βp) βp βp (βp) - - 23 - 28 29 32 - - - 21 21 - -		A stable regular spot, with small distant companions until 1957 January 1.

MT. WILSON MAGNETIC CLASSIFICATION OF SUNSPOTS

I. UNIPOLAR SPOTS

- α - The flocculi is fairly 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 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 calassified as bipolar spots.

III. CATALOGUE OF

PLAGE DATA FOR 1954 – 1956

III

TABLE III. CATALOGUE OF PLAGE DATA FOR 1954-1956

The data in this catalogue include plage regions associated with major solar flares, plages with average maximum areas equal to or greater than 10,000 millionths of the solar hemisphere, plages with an average brightness greater than 3.0 during disk passage, and plages where 30 or more flares of all importance equal to or greater than 1 occurred during disk passage. The categories are indicated in Column 4 by the symbols L = large, B = bright, and N = 30 or more flares. These data were obtained from the McMath-Hulbert unpublished plage catalogue (reference 9).

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 Latitude During Disk Passage.

Column 5 Greenwich Date of Central Meridian Passage.

Column 6 Life in Rotations.

Column 7 Date First Seen.

Column 8 Number of Days Seen.

Column 9 Average Maximum Area.

Column 10 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 11 Number of Flares During Disk Passage E/C/W
E = E90° to E45°
C = E45° to W45°
W = W45° to W90°

Column 12 Total Number of Flares During Disk Passage.

Column 13 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 14-17

Column 14 Mt. Wilson Sunspot Numbers of All Spots Covered by the Plage

Column 15 Mt. Wilson Mean Magnetic Classification of the Spots

Column 16 Field Strength in Units of 100 gauss. A bracket indicates an estimated value.

Column 17 Days Seen.

TABLE III CATALOGUE OF PLAGES DURING 1954 - 1956

	IDENTIFICATION			PLAGE POSITION				DISK PASSAGE PLAGE DATA					LIFE HISTORY	ASSOCIATED SUNSPOTS			
Serial No.	McM Plage	Major Flare Serial No.	Category	Mean Lat.	Date CMP	Life Rotations	First Seen	Days Seen	Average Max. Area	Intensity E/C/W	No. Flares E/C/W	Total Flares	Plage Numbers Previous Rotation	Mt. Wilson Number	Mag. Class	Intensity 100 Gauss	Days Seen
1	2967		B	N09	1954 July 30	1	July 23	13	1500	4/3.5/3	-			11185	$\ell\beta d$	4	1954 July 23 - 30
2	2973		B	N25	Aug. 08	2	Aug. 01	13	2200	4/3.5/3	0/4/0	4	2960	11186	$\ell\alpha p d$	13	Aug. 01 - 10
3	2976		B	S22	10	1	09	7	1600	-/4/3.5				11187	$d\beta p d$	22	09 - 14
4	2982		B	S30	21	1	20	8	1500	-/4/4	0/3/1	4		11188	$d\beta f\ell$	20	20 - 26
5	3013		B	N24	Oct. 09.5	1	Oct. 02	13	2500	4/3.5/3	-	-		11196	$\ell\alpha p d$	3	Oct. 02 - 12
6	3030		B	S32	Nov. 09.5	1	Nov. 09	8	1000	-/4/4	0/1/0	1	New in position of 3016	11206	$d\beta f\ell$	21	Nov. 09 - 15
7	3036		B	S33	21.5	1	16	>5	600	4/3.5/x	0/0/0	0		11210	$d\beta p d$	2	17 - 19
8	3065	1	B	N36	1955 Jan. 13	2	Jan. 06	13	8000	4/4/3	0/6/3	9	3055	11218	$\ell\gamma\ell$	35	1955 Jan. 07 - 19
9	3150		B	N34	May 02.5	1	April 27	13	1500	3.5/3.5/3	1/1/0	2		11242	$\ell\beta p d$	14	April 27 - 06
10	3154		B	S32	09.5	1	May 03	14	3000	4/4/3	0/0/0	0		11244	$\ell\beta p d$	11	May 03 - 12
11	3165		B	N26	25	1	18	14	2000	3.5/4/4				11250	$\ell\beta p\ell$	19	18 - 30
12	3171		B	N26	30.5	1	27	9	800	2.5/3.5/3.5			New in position of 3151	11254	$d\beta p d$	5	28 - 03
13	3182	2,3,4	B,N	S22	June 17	1	June 10	14	6000	4/4/4	7/27/7	41	New	11259	$\ell\beta\gamma\ell$	21	June 09 - 23
14	3197		B	N34	July 07	2	30	15	4000	3.5/3.5/3.5	1/7/1	9	3179	11267	$\ell\beta p d$	25	30 - 12
15	3201		B	N25	10.5	2	July 04	14	5000	4/4/3.5	1/0/0	1	3188	11269	$\ell\beta f d$	7	July 04 - 14
16	3206		B	S23	14.5	2	07	15	6000	3.5/3.5/3.5	0/0/4	4		11273 11278	$d\alpha p d$ $d\beta p\ell$	3 8	10 - 16 18 - 20
17	3240		B	N16	Aug. 11	2	Aug. 04	14	3000	4/4/3	4/6/0	10	3212	11290	$\ell\beta p\ell$	33	Aug. 05 - 16
18	3241		B	S24	11	2	04	14	4000	4/4/3	3/8/0	11	3206	11291	$\ell\beta f\ell$	29	05 - 16
19	3292		B	N20	Oct. 07	1	Sept. 30	14	4000	3.5/3.5/3	5/5/1	11		11331 11332	$\ell\alpha p\ell$ $\ell\alpha f\ell$	31 8	Sept. 30 - 13 01 - 13
20	3309		B	S22	Oct. 29	1	Oct. 22	14	4000	3/3.5/3.5	10/6/0	16		11353 11359	$\ell\beta p\ell$ $d\beta f\ell$	39 12	Oct. 22 - 03 28 - 04
21	3311		B	S24	31	1	24	13	4000	3.5/3.5/3	3/1/0	4		11356	$\ell\beta p\ell$	34	24 - 05
22	3326	5		N27	Nov. 15	1	Nov. 07	14	7500	3/3.5/x	3/10/0	13	New	11367 11371 11376	$\ell\beta p\ell$ $d\alpha p d$ $d\beta f d$	29 3 10	Nov. 07 - 20 10 - 11 17 - 20
23	3330		B	N20	18.5	1	12	13	2000	3.5/3.5/2.5	3/0/0	3	New	11375	$\ell\beta f d$	18	15 - 22
24	3331		B	N17	12	1	14	>3	1000	-/3.5/3.5	0/1/1	2		11374	$d\beta f d$	18	15 - 18

TABLE III 1954 - 1956 (CONTINUED)

	IDENTIFICATION			PLAGE POSITION				DISK PASSAGE PLAGE DATA					LIFE HISTORY	ASSOCIATED SUNSPOTS			
Serial No.	McM Plage	Major Flare Serial No.	Category	Mean Lat.	Date CMP	Life Rotations	First Seen	Days Seen	Average Max. Area	Intensity E/C/W	No. Flares E/C/W	Total Flares	Plage Numbers Previous Rotation	Mt.Wilson Number	Mag. Class	Intensity 100 Gauss	Days Seen
25	3342	6		N23	Dec. 03.5	3	Nov. 26	15	7000	3/3/-	1/5/0	6	3320, 3295	11386	$\ell\beta p d$	12	Nov. 26 - 03
														11388	$d\beta p\ell$	20	28 - 10
26	3350		B	N28	10	2	Dec. ≤04	13	4000	3/3.5/3.5	0/2/0	2	3323	11392	$d\alpha p d$	8	Dec. 07 - 13
														11393	$d\beta p\ell$	27	07 - 16
27	3379	7	L,B,N	N22	1956 Jan. 19.5	1	Jan. 13	14	13000	4/3.5/3.5	18/19/10	47	New	11437	$\ell\beta p\ell$	22	1956 Jan. 12 - 24
														11439	$\ell\alpha p\ell$	35	13 - 24
														11440	$\ell\gamma\ell$	35	13 - 24
28	3382		B	N25	24	2	17	13	5000	3.5/3.5/3	2/0/1	3	3363a	11442	$\ell\alpha p d$	3	17 - 21
														11443	$\ell\beta p\ell$	33	17 - 29
29	3400	8,9,11, 13	L,B,N	N20	Feb. 17	2	Feb. 10	15	16000	3/4/3.5	7/21/4	32	3379	11461	$\ell\alpha p\ell$	31	Feb. 10 - 21
														11462	$\ell\gamma\ell$	18	10 - 21
														11470	$d\beta\ell$	26	14 - 24
														11475	$d\alpha p d$	(1)	15 - 15
30	3401	12		N41	16	1	10	12	400	3/2/1.5	0/0/2	2	New	No Spots			
31	3403	10	B	S22	19	2	12	15	6000	3.5/3.5/3	2/13/2	17	3380a	11464	$d\alpha d$	(1)	11 - 11
														11467	$\ell\beta p\ell$	25	12 - 25
32	3404		L	N22	19.5	3	12	15	12000	3/3.5/3	2/11/5	18	3382 (See No. 28)	11466	$\ell\alpha p\ell$	40	12 - 24
														11469	$\ell\beta p\ell$	17	13 - 24
														11471	$\ell\beta\ell$	15	14 - 26
														11472	$\ell\alpha p\ell$	15	14 - 26
														11477	$d\times d$	(2)	18 - 19
														11479	$d\times d$	(2)	19 - 19
33	3405		B	S23	21	1	14	14	2400	4/3.5/3	0/2/0	2	New	11473	$\ell\beta p\ell$	29	14 - 27
34	3412	15	B	N24	25.5	5	19	14	9000	3.5/3.5/3	3/5/6	14	3385, 3364, 3342, (See No. 25)	11480	$\ell\alpha p\ell$	22	19 - 02
														11481	$\ell\alpha p d$	17	20 - 01
														11484	$d\beta f d$	3	21 - 29
														11495	$d\beta p\ell$	10	28 - 03
35	3413	14		S27	28.5	1	20	15	3500	3/2.5/2	0/2/0	2	New	11482	$\ell\alpha p d$	4	20 - 29
														11486	$\ell\alpha p d$	7	24 - 28
														11491	$d\beta f d$	11	27 - 02
36	3419		B	S24	Mar. 04.5	2	27	14	3500	3.5/3.5/3	15/4/3	22	3391	11493	$\ell\beta p\ell$	29	27 - 10
37	3432	16		N22	17	4	Mar. 10	14	9000	3.5/3/3	4/17/2	23	3404 (See No. 32)	11508	$\ell\beta f\ell$	17	Mar. 10 - 23
														11511	$\ell\alpha p\ell$	34	11 - 23
														11515	$d\beta f d$	8	13 - 18
38	3443	17		N24	28	2	22	14	5000	3/3/3	0/3/0	3	3415	11531	$d\alpha p d$	2	22 - 28
														11535	$d\beta p d$	17	24 - 03
														11543	$d\beta d$	8	30 - 02
														11550	$d\alpha d$	(2)	03 - 03
39	3457	18	B	N24	Apr. 11	4	Apr. 05	13	8000	3.5/3.5/3	1/4/1	6	3431, 3400, (See No. 29)	11553	$\ell\beta f\ell$	21	Apr. 05 - 16
40	3461		B	S32	17	1	09	15	8000	4/4/3.5	4/2/6	12	New	11562	$\ell\alpha p\ell$	20	09 - 22
														11568	$a d$	(3)	15 - 18
														11569	$a f d$	10	15 - 18
														11579	$d\alpha p\ell$	7	19 - 21
														11582	$d\alpha p\ell$	3	20 - 22
														11586	$d\alpha p\ell$	7	21 - 23

TABLE III 1954 - 1956 (CONTINUED)

	IDENTIFICATION			PLAGE POSITION				DISK PASSAGE PLAGE DATA					LIFE HISTORY	ASSOCIATED SUNSPOTS			
Serial No.	McM Plage	Major Flare Serial No.	Category	Mean Lat.	Date CMP	Life Rotations	First Seen	Days Seen	Average Max. Area	Intensity E/C/W	No. Flares E/C/W	Total Flares	Plage Numbers Previous Rotation	Mt. Wilson Number	Mag. Class	Intensity 100 Gauss	Days Seen
41	3462	20	B	S20	Apr. 15.5	3	Apr. 09	13	5000	4/3.5/3.5	0/9/1	10	3435, 3405	11561	$\ell\beta p\ell$	24	Apr. 09 - 22
42	3463		B	N15	15.5	1	09	13	1800	4/3.5/3	5/1/0	6	New	11563	$\ell\beta p\ell$	14	09 - 21
43	3464	19	B	N19	17.5	2	10	14	4500	3.5/3.5/3	8/6/1	15	3437	11566	$d\beta pd$	3	15 - 21
													3438	11567	$\ell\alpha pd$	12	15 - 20
														11577	$d\times d$	(4)	18 - 18
44	3467		L,B	N23	22	2	15	14	10000	4/4/3.5	1/20/3	24	3440	11571	$d\times d$	(7)	16 - 19
														11572	$\ell\beta p\ell$	27	16 - 28
														11574	$\ell\beta d$	9	16 - 25
														11576	$d\times d$	(2)	17 - 17
														11583	$d\alpha pd$	2	20 - 20
														11587	$d\times d$	(2)	21 - 21
														11594	$d\times d$	(2)	24 - 25
45	3481		B	N18	May 06.5	1	30	13	8000	3.5/3.5/3	0/16/4	20	Mostly new near position of old 3456	11602	$\ell\alpha pd$	6	30 - 06
														11603	$\ell\beta p\ell$	29	30 - 12
														11610	$d\times d$	(2)	04 - 04
														11623	$d\times d$	(2)	11 - 11
46	3485	21		N20	08.5	5	May 02	13*	5000	3/3/3	4/8/5	17	3457 (See No. 39)	11604	$d\alpha pd$	15	May 02 - 11
														11605	$\ell\beta p\ell$	18	02 - 14
														11606	$\ell\alpha p\ell$	29	02 - 15
														11615	$d\alpha fd$	3	07 - 08
47	3488	23		S18	12	1,4,5	05	14	5000	3/3/3	0/13/9	22	Part New	11612	$\ell\alpha p\ell$	15	05 - 17
													3462, (See No. 41)	11620	$d\beta f\ell$	17	10 - 17
													3460, 3433, 3403, 3380a				
48	3490	22		S32	13.5	2	07	12	1000	2.5/2.5/2	1/1/0	2	Part of 3461	11614	$\ell\alpha pd$	10	06 - 10
49	3497	24		S24	16.5	3	10	13	3000	2.5/3/3	1/2/1	4	3465, 3445	11622	$\ell\alpha p\ell$	34	10 - 22
50	3503		B	S24	22.5	1	16	13	6000	4/3.5/3	8/17/1	26	New	11627	$\ell\beta p\ell$	17	16 - 28
51	3506		B,N	S20	25	2	18	14	7000	3/3.5/3.5	4/19/18	41	3477	11632	$\ell\beta pd$	6	18 - 24
														11633	$d\alpha pd$	2	19 - 23
														11636	$d\beta p\ell$	28	21 - 31
52	3514		B	S15	June 01.5	1	26	13	5000	4/3.5/3	10/3/1	14	New	11641	$\ell\beta p\ell$	27	25 - 06
53	3518	25,26	B,N	N22	03.5	2	27	14	9000	3.5/3.5/3	9/19/5	33	3481	11643	$\ell\alpha p\ell$	22	27 - 07
														11644	$\ell\beta p$	14	28 - 02
														11645	$\ell\beta p\ell$	27	28 - 09
54	3527	27		N22	10.5	3	June 04	11	2500	3.5/2.5/1.5	4/1/1	6	3491, 3463	11652	$d\alpha fd$	3	June 04 - 12
55	3535		B	N28	17	4	10	14	4500	3/3.5/3.5	1/6/11	18	3501	11659	$\ell\beta pd$	16	10 - 20
														11660	$\ell\alpha pd$	17	10 - 21
														11665	$d\beta pd$	19	14 - 21
														11670	$d\beta f\ell$	17	19 - 23
56	3541		B	N12	20	1	13	14	1500	2/3.5/3.5	0/8/4	12	New	11669	$d\alpha pd$	2	17 - 17
														11673	$d\beta f\ell$	21	20 - 26
57	3543	28	L,B,N	S20	20.5	3	14	14	10000	3.5/3.5/3.5	6/19/9	34	3506 (See No. 51)	11666	$\ell\beta\ell$	9	14 - 25
														11667	$\ell\beta f\ell$	22	14 - 27
58	3551		B	S30	29.5	1	23	13	3000	3.5/3.5/3	4/7/0	11	New	11678	$\ell\alpha p\ell$	20	23 - 05
														11680	$d\beta fd$	(10)	24 - 02
59	3560		B	N28	July 05	1	28	14	4000	4/3.5/3.5	2/1/2	5	New	11690	$\ell\beta p\ell$	25	28 - 10

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III-3-2

TABLE III 1954 - 1956 (CONTINUED)

	IDENTIFICATION			PLAGE POSITION				DISK PASSAGE PLAGE DATA					LIFE HISTORY	ASSOCIATED SUNSPOTS			
Serial No.	McM Plage	Major Flare Serial No.	Category	Mean Lat.	Date CMP	Life Rotations	First Seen	Days Seen	Average Max. Area	Intensity E/C/W	No. Flares E/C/W	Total Flares	Plage Numbers Previous Rotation	Mt.Wilson Number	Mag. Class	Intensity 100 Gauss	Days Seen
60	3567	29		S23	July 10	3	July 04	13	2500	3/3/3	5/4/12	21	Part of 3531, 3492	11699 11708	$l\alpha p l$ $d\beta f d$	26 26	July 04 - 16 11 - 15
61	3577		B,N	N26	18.5	1	16	10	2000	-/4/4	-/24/15	39	New	11714	$d\beta p l$	17	16 - 25
62	3586		B,N	S24	27	1	20	14	7500	4/3.5/3.5	15/26/4	45	New	11717	$l\beta p l$	30	20 - 02
63	3592		B	S27	Aug. 02.5	2	26	15	9500	3.5/3.5/3	10/12/0	22	3563	11723 11725 11726	$l\beta d$ $l\beta d$ $l\beta p l$	10 4 14	26 - 03 27 - 31 27 - 08
64	3598		L,B,N	N18	06	2	28	14	12000	4/3.5/3.5	12/14/10	36	3565	11729 11730 11731	$l\beta p l$ $l\alpha p l$ $d\beta d$	29 32 4	30 - 11 30 - 12 31 - 07
65	3607	30	B	N20	12.5	3	Aug. 05	14	5500	4/3.5/3	8/16/5	29	Part of 3574, 3540 3541	11735	$l\beta p l$	29	Aug. 05 - 18
66	3615		B	S18	15.5	1	08	14	6000	4/3.5/3	0/17/0	17	Mostly new, possibly related to 3576	11740 11741	$l\beta p l$ $l\beta p l$	23 27	08 - 20 09 - 21
67	3624		B	N22	21	2	13	15	5500	3.5/3/3.5	9/12/2	23	Mostly 3590	11746 11747 11760 11765 11766 11772	$l\alpha p l$ $l\beta p d$ $d\beta f l$ $d\beta f l$ $d\alpha d$ $d\beta l$	31 18 21 15 (3) (5)	13 - 26 15 - 20 19 - 26 22 - 27 22 - 25 26 - 28
68	3625		B	S19	20.5	1	15	12	3500	2/3.5/3.5	0/20/2	22	New	11751	$d\beta p l$	25	17 - 25
69	3626		B	N46	23.5	2	15	16	3500	3.5/3.5/3	0/5/0	5	3597	11749	$l\beta p l$	22	15 - 30
70	3629	31		N24	23.5	5,2	16	15	5000	3/3.5/3	1/10/10	21	3584 {3552, 3553, 3554} 3518, 3481 3587	11752 11757 11762 11763 11764	$d\alpha p d$ $d\beta p d$ $d\beta p d$ $d\beta l$ $d\alpha p d$	3 10 3 21 2	17 - 24 18 - 27 20 - 21 20 - 31 21 - 21
71	3630		B	S23	24	2	17	14	7500	3.5/3.5/3	8/11/2	21	3586	11753 11754 11758 11759 11761	$l\beta p d$ $l\alpha p l$ $d\beta p d$ $l\alpha p d$ $d\alpha d$	7 33 20 3 2	17 - 24 17 - 29 18 - 29 18 - 24 19 - 20
72	3631		B	S25	19	1	18	7	1500	-/3.5/3.5	-/5/5	10	New	11756	$d\beta p l$	16	18 - 24
73	3643	32	L,B,N	N16	Sept. 02	3	26	14	10000	3.5/3.5/2.5	13/16/1	30	3598 (See No. 64)	11777 11779 11780 11781 11801	$l\gamma l$ $l\alpha p d$ $d\beta p d$ $l\alpha p l$ $d\beta d$	28 26 9 25 2	26 - 07 26 - 06 27 - 01 27 - 08 07 - 08
74	3656	35		S15	10.5	2	Sept. 04	12	4000	3.5/3/3	4/10/2	16	Part of 3615 (See No. 66)	11796	$l\beta f l$	20	Sept. 04 - 15
75	3658	33,34	L,B,N	S22	11.5	2	05	13	10000	4/3.5/3.5	17/27/9	53	Part of 3615	11797 11831	$l\beta\gamma l$ $d\beta f d$	26 9	05 - 17 15 - 17
76	3665		B	N21	16.5	3	09	14	8000	3.5/3/3.5	1/9/2	12	3624 (See No. 67)	11812 11820 11821 11822 11838 11847 11848	$l\alpha p d$ $d\alpha p l$ $d\alpha f d$ $d\alpha d$ $d\beta l$ $d\beta l$ $d\alpha p d$	15 4 13 4 10 3 1	10 - 21 12 - 22 12 - 15 12 - 16 17 - 22 21 - 21 21 - 21

III-4-1

III-4-2

TABLE III 1954 - 1956 (CONTINUED)

	IDENTIFICATION			PLAGE POSITION				DISK PASSAGE PLAGE DATA					LIFE HISTORY	ASSOCIATED SUNSPOTS			
Serial No.	McM Plage	Major Flare Serial No.	Category	Mean Lat.	Date CMP	Life Rotations	First Seen	Days Seen	Average Max. Area	Intensity E/C/W	No. Flares E/C/W	Total Flares	Plage Numbers Previous Rotation	Mt. Wilson Number	Mag. Class	Intensity 100 Gauss	Days Seen
77	3666	36,37	L,B,N	N21	Sept. 16.5	3	Sept. 09	14	20000	4/3.5/4	8/29/8	45	3631 3625				Sept.
														11807	$l\alpha p l$	17	09 - 21
														11808	$l\alpha d$	(2)	09 - 11
														11809	$l\beta p l$	17	09 - 22
														11811	$l\beta p l$	23	10 - 22
														11815	$d\beta d$	10	11 - 17
														11816	$l\beta p d$	7	11 - 18
														11819	$d\alpha d$	2	12 - 14
														11828	$d\alpha p d$	(4)	14 - 17
														11834	$d \times d$	(2)	16 - 16
														11837	$d\alpha p d$	4	17 - 17
														11839	$d\alpha p d$	2	18 - 18
														11841	$d\alpha p d$	9	19 - 20
														11842	$d\beta d$	4	19 - 22
														11849	$d\alpha l$	(2)	22 - 22
78	3670		B	S16	19.5	1	13	13	4000	3.5/4/3	1/8/1	10	New	11826	$l\beta p l$	14	13 - 24
79	3672		B	N32	21	6,3	14	14	4000	3.5/4/3.5	0/0/0	0	Part of 3629 (See No. 70)	11829	$l\alpha p d$	21	14 - 23
														11856	$d\beta p d$	2	23 - 24
80	3675		B	N22	21.5	1	15	14	2500	4/4/3.5	1/1/0	2	New	11832	$d\alpha p d$	2	15 - 19
														11835	$d\beta p l$	18	16 - 27
														11851	$d \times d$	(1)	22 - 23
81	3676		B	N33	22.5	1	15	14	2500	4/4/3	0/1/0	1	New	11833	$l\alpha d$	(4)	15 - 16
														11852	$d \times d$	2	22 - 23
82	3677		B	N27	23	1	16	14	1500	4/3.5/3	3/2/0	5	New	11836	$l\beta p d$	24	16 - 27
83	3686		B	S27	30	2	23	14	8000	4/3.5/3.5	4/5/0	9	3641 3642	11855	$l\alpha p l$	23	22 - 03
														11858	$l\beta p l$	27	23 - 05
														11864	$l\alpha p d$	4	25 - 27
														11869	$d\beta d$	2	28 - 28
														11879	$d \times$	(2)	02 - 03
84	3688		B	N22	Oct. 01.5	1	24	15	4000	4/3.5/3	3/7/0	10	New	11860	$l\alpha p l$	30	24 - 07
														11876	$d\beta p d$	9	01 - 05
														11882	$d\beta p d$	8	03 - 05
85	3691	38		N45	Sept. 27.5	1	28	7	1500	-/2/3.5	0/5/7	12	New	11868	$d\beta p l$	21	28 - 03
86	3694	39,40,41	B,N	N18	Oct. 07	1	Oct. 01	13	6000	4/4/4	7/28/5	40	New	11878	$d\beta\gamma l$	34	Oct. 01 - 13
87	3695		B	S20	07	2	Sept. 30	13	3000	3.5/3.5/3	6/1/0	7	Part of 3654	11874	$l\alpha f d$	14	30 - 09
88	3697		B	S15	08.5	3	02	13	2500	4/3.5/3.5	0/2/0	2	Part of 3656 (See No. 74)	11881	$l\beta l$	23	02 - 14
89	3719	42	B	N17	24.5	3,5	17	14	5000	3.5/3.5/3	1/3/2	6	3682, 3648 3685, 3643, (See No. 73)	11908	$l\beta d$	9	17 - 27
														11910	$l\alpha p d$	19	18 - 27
														11911	$l\alpha p d$	11	18 - 27
90	3720		B	S46	24	1	17	13	3500	3.5/3.5/3	2/6/0	8	New	11907	$l\beta$	11	17 - 27
91	3729		B	S28	29	3	21	14	6000	4/3/4	2/6/0	8	Part of 3686 (See No. 83)	11919	$l\alpha p l$	13	21 - 02
														11921	$l\beta f l$	22	22 - 03
														11923	$d\beta f l$	12	23 - 27
														11926	$d\beta d$	2	25 - 26
92	3730	43	B	N16	29	2	22	13	5000	3.5/3.5/3	2/3/0	5	3688	11920	$l\alpha p l$	23	22 - 03
														11939	$d \times d$	(2)	30 - 30
93	3747	46	B	N27	Nov. 09	1	Nov. 02	13	3000	3.5/3.5/3	1/2/1	4	New	11946	$l\beta p l$	14	Nov. 02 - 15

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TABLE III 1954 - 1956 (CONTINUED)

IDENTIFICATION				PLAGE POSITION				DISK PASSAGE PLAGE DATA					LIFE HISTORY	ASSOCIATED SUNSPOTS			
Serial No.	McM Plage	Major Flare Serial No.	Category	Mean Lat.	Date CMP	Life Rotations	First Seen	Days Seen	Average Max. Area	Intensity E/C/W	No. Flares E/C/W	Total Flares	Plage Numbers Previous Rotation	Mt. Wilson Number	Mag. Class	Intensity 100 Gauss	Days Seen
					Nov.		Nov.										Nov.
94	3751	44,45,47	B	S18	10	1	03	13	4000	4/3.5/3	5/15/1	21	New	11949	$\ell\beta p\ell$	26	03 - 15
95	3753		B	N16	13	2	06	13	4000	3.5/3.5/3	18/4/0	22	3709	11958	$\ell\beta\ell$	15	06 - 18
96	3755	48,49		S13	16	1	09	14	6000	3.5/3/3	5/10/7	22	New	11963	$\ell\gamma\ell$	23	10 - 22
														11964	$d\,x\,d$	(2)	11 - 11
97	3774		B	N16	28	1	22	13	4000	3.5/3.5/3	1/2/1	4	New	11981	$d\beta p\ell$	15	22 - 03
					Dec.		Dec.										Dec.
98	3785	50	L,N	S20	09.5	2	01	15	12000	3.5/3/3	8/26/7	41	3752	12003	$\ell\alpha p\ell$	26	01 - 14
														12006	$\ell\beta f\ell$	14	02 - 15
														12008	$\ell\beta d$	4	03 - 09
														12009	$\ell\beta p\ell$	37	03 - 16
														12011	$\ell\alpha p\ell$	13	04 - 16
														12013	$d\beta\ell$	8	06 - 16
														12015	$d\alpha d$	2	08 - 09
99	3788	51,52	L,B,N	S18	13	2	06	14	10000	3.5/3.5/3.5	3/19/15	37	3755	12014	$d\alpha d$	6	06 - 15
													3757	12016	$d\beta f\ell$	25	08 - 19
														12020	$d\alpha p d$	2	10 - 17
														12021	$d\alpha f d$	3	10 - 16
														12024	$d\beta d$	4	12 - 16
100	3795	53,54,55	B	N15	21.5	1	14	15	5000	3.5/3.5/x	1/13/3	17	New	12030	$\ell\beta\gamma\ell$	27	14 - 26
														12042	$d\beta p\ell$	21	20 - 28
101	3800	57	B	S15	25.5	1	18	15	3000	3.5/x/3.5	7/12/2	21	New	12039	$\ell\beta\gamma\ell$	26	18 - 31
102	3804	56		N33	30	1	23	12	1500	x/x/3.5	2/1/1	4	New	12046	$\ell\beta p\ell$	33	23 - 03

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III-6-2

CATALOGUE OF SOLAR ACTIVITY FOR THE YEARS 1954-1956

INTRODUCTION

The data compiled in this volume of the Catalogue covers the three years 1954-1956. This includes the Year of Solar Minimum which occurred on 1954.3 (April) and two years on the ascending branch of the solar cycle.

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 1.9 , of references, pages 1.13 and 1.14.

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 the Period 1954-1956

The IAU Quarterly Bulletin (reference 28) lists 2316 solar flares during the period from 1 January 1954 through 31 December 1956, with importances ranging from 1 to 3+. There were only 16 reported in 1954, 292 in 1955, and 2008 in 1956. The number of flares by months and importance for each of the three years is given in Table 1.1. In counting the flares for Table 1.1 we have included importance 2- in the 1+ column and the 3- flares in the importance 3 column. We have included a column 2+ (≥ 2). These are flares reported by two or more observatories with importance 2+; i.e., are considered as major flares in the catalogue. In all cases the count of flares by importance uses the highest importance assigned to the flare in the IAU Quarterly Bulletin. The total number of observing hours is the actual hours the sun was under observation, as reported in reference 34.

For the purpose of this catalogue, a flare is classified as a major flare if at least one observatory reported it with an importance 3, or 3+, or if at least two observatories reported it with an importance 2+.

Because of the lack of uniformity among observatories in classifying flares, we have included two different reclassifications of all flares in our catalogue.

(a) The importance assigned to the flare in the McMath-Hulbert working list of solar flares (unpublished). The method that was used is described in the IGY Solar Activity Report Series Number 12.

(b) The importance assigned to the flare in reference 35. Normalized solar flare data July 1955 through June 1957.

Major flares that were reduced to minor flare importance in the McMath-Hulbert working list are listed in Table I-A.

Table I-B lists the flares that were reported by only one observatory--IAU importance 2+.

Table I-C gives other flares that have an importance of 2+ in the McMath-Hulbert working list that are not included in the Catalogue of Major Flares.

Table I-D lists all flares that have an importance of 2+ in reference 35 that are not included in the Catalogue of Major Flares.

SOLAR FLARES AND TOTAL OBSERVING TIMES DURING 1954

	Importance				No.Observing Hours	%
	1	1+	1+*	Total		
Jan.	0	0	0	0	146	20
Feb.	0	0	0	0	295	44
Mar.	7	0	0	7	257	35
Apr.	0	0	0	0	306	42
May	0	0	0	0	335	45
June	0	0	0	0	292	41
July	0	0	0	0	291	39
Aug.	6	0	0	6	377	51
Sept.	0	0	0	0	357	50
Oct.	0	0	0	0	342	46
Nov.	1	1	0	2	210	29
Dec.	1	0	0	1	150	20
Total	15	1	0	16	3358	38

* No flares with importance greater than 1+ were reported in the IAU Quarterly Bulletin during 1954.

SOLAR FLARES AND TOTAL OBSERVING TIMES DURING 1955

	Importance							No.Observing Hours		%
	1	1+	2	2+	2+** (2)	3	3+	Total		
Jan.	11	0	1	0	0	1	0	13	222	30
Feb.	6	0	2	0	0	0	0	8	252	37
Mar.	0	0	0	0	0	0	0	0	235	32
Apr.	4	1	0	0	0	0	0	5	448	62
May	11	1	2	0	0	0	0	14	420	56
June	25	10	4	3	0	3***	0	45	491	68
July	21	0	2	1	0	0	0	24	592	80
Aug.	37	10	7	1	0	0	0	55	535	72
Sept.	26	4	3	0	0	0	0	33	448	62
Oct.	41	6	2	2	0	0	0	51	387	52
Nov.	23	2	3	1	0	1	0	30	344	48
Dec.	10	2	1	1	0	1	0	15	346	46
Total	215	36	27	9	0	6	0	293	4720	54

** At least 2 observatories reported an importance of 2+.

***Includes one importance 3- flare in June 1955, one in November and one in December of 1956. Flares No. 3, 46, and 55 in the catalogue.

SOLAR FLARES AND TOTAL OBSERVING TIMES DURING 1956

	Importance							No.Observing		
	1	1+	2	2+	2+** (2)	3	3+	Total	Hours	%
Jan.	41	8	23	0	0	1	0	73	392	53
Feb.	53	8	25	2	0	7	0	95	388	56
Mar.	65	7	15	1	0	3	0	91	460	62
Apr.	83	10	22	0	0	3	0	118	425	59
May	149	22	37	0	1	5	0	214	520	70
June	100	15	23	2	0	2	0	142	521	72
July	176	38	33	2	0	1	0	250	609	82
Aug.	179	61	37	8	0	2	1	288	614	83
Sept.	149	40	28	4	0	5	0	226	584	81
Oct.	77	38	20	3	1	5	0	144	472	63
Nov.	109	42	27	6	1	4***	1	190	427	59
Dec.	103	35	31	0	2	6***	0	177	480	64
	1284	324	321	28	5	44	2	2008	5892	67

** At least 2 observatories reported an importance of 2+.

***Includes one importance 3- flare in June 1955, one in November and one in December of 1956, flares No. 3, 46, and 55 in the catalogue.

TABLE 1.1
Flares and Observing Times 1954-1956

2. Sunspots During the Period 1954-1956

Solar activity reached a very low level during 1954. Solar minimum occurred on 1954.3 (April) with a mean relative sunspot number of 3.4 for the month of April. Reference 21 shows a total of 241 spotless days. There were two long periods of spotless days, 12 January to 7 February (27 days) and 2 June to 2 July (31 days). The spotless days during 1954 were:

Jan. 1-10, 12-31; Feb. 1-7, 10-28; March 5-11, 25-31; April 1-6, 25-31; May 1-4, 6-13, 16-31; June 1, 3-30; July 1, 2, 4-7, 9-11, 19-23; Aug. 15-20, 28-31; Sept. 1-3, 6-14, 17-19, 21-29; Oct. 1, 6-11, 27-31; Nov. 1-4, 20-30; Dec. 1-6, 8-14, 27, 28.

Forty-six sunspot groups were observed with 27 in the Northern Hemisphere and 19 in the Southern. Fifteen of the spot groups were old cycle and 31 were new cycle. Of these 22 appeared during the second six months of the year. The Greenwich catalogue (reference 26) lists only one spot group (No. 17127) with a maximum area greater than 500 millionths (area 712 on March 16 at S08, E11). The mean area of this spot was 403 millionths, CMP March 17.14, 1954.

Nineteen large spots (maximum area greater than 500 millionths) crossed the solar disk during 1955; 7 of these had a mean area greater than 500 millionths. Only one of these had a maximum area greater than 1000 (maximum area 1449, mean area 1026). Four of these spots produced a total of 6 major flares. Two of the large spots were also magnetically complex, one produced one major flare, the other produced three.

The number of large spots increased to 90 in 1956. Nine of these were also magnetically complex. Twenty-nine of the large spots had maximum areas greater than 1000. The largest (No. 87) crossed the solar disk between September 5 and September 17, with a mean area of 1830 millionths. The maximum area of this spot was 2306 millionths. Only 8 of the 29 were also magnetically complex. They produced 16 of the 51 major solar flares that were reported during 1956.

A summary of the spots major flare productivity is shown in Table 1.2

Spot Type	Number of Spots	Number Major Flares Per Spot	Total Number Major Flares
Large spots (L)	81	0	0
	15	1	15
	2	2	4
	1	3	3
Large and Magnetically Complex (L,M)	1	0	0
	4	1	4
	2	2	4
	3	3	9
	1	4	4
Total Large Spots with Flares	29		43
Small Spots	13	1	13
No spot	0	1	1

TABLE 1.2
Major Flare Distribution
Among the Spot Groups

3. Important Plages for the Period 1954-1956

Our catalogue of important plage regions includes:

3.1 All plages that produced one or more solar flares.

3.2 Plages that had an average maximum area equal to or greater than 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).

This catalogue includes the 41 plages that produced one or more of the major flares listed in Table 1.I as shown in Table 1.3

Number of Plage Regions	Number of Major Flares Each	Total Major Flares
31	1	31
5	2	10
4	3	12
1	4	4
Total 41		57

TABLE 1.3
Major Flare Distribution Among Plage Regions

Twenty-one of these plage regions also satisfied one or more of the characteristics for inclusion in the catalogue, i.e., Bright (B), Large (L), and Flare Productive (N), as shown in Table 1.4.

	F	FB	FBN	FLN	FBLN	
1954	0	0	0	0	0	
1955	2	1	1	0	0	
1956	18	10	2	1	6	
Total	20	11	3	1	6	41
Total Major Flares	23	13	8	1	12	57

TABLE 1.4
Plage Type that Produced Major Flares

The number of major flares associated with each of the combinations of plage characteristics is shown on the last line of Table 1.4.

The distribution among the various characteristic contributions that did not produce major flares is shown in Table 1.5.

	B	BL	BN	L	BLN	
1954	7	0	0	0	0	
1955	15	0	0	0	0	
1956	33	1	3	1	1	
Total	55	1	3	1	1	61

TABLE 1.5
Outstanding Plages Without Major Flares

It is interesting to note that the great sea level cosmic ray flare of February 23, 1956 (No. 13, Table 1.I) occurred in plage 3400 (No. 29, Table 1.III), which was a return of plage 3379 (No. 27). Both plages were very bright, large, and flare productive. The flare occurred between sunspots 11462 (γ type) and 11470 (β type); 11462 was a return of the old γ type spot 11440.

While the number of major flares (Table 1.I) and associated plage regions (Table 1.III) in this catalogue is a statistically small sample; it is interesting to note that the plages in their first and second rotations produced almost 60% of the major flares (38.6% in the first rotation and 29.8% in the second rotation) as shown in Table 1.6.

Age in Rotations	1	2	3	4	5	Total
Number Plage Regions	13	11	8	3	6	41
No. of Major Flares	22	17	9	3	6	57
No. of All Flares	246	222	179	35	121	803

TABLE 1.6
Flares Associated with Plage Regions

These 41 plage regions produced 34.4% of all flares reported during 1954-1956 (803 of the 2330 reported).

McMath-Hulbert observed 152 plage regions during 1954 of which 108 did not contain sunspots, 42 had one spot and 2 had 2 spots each. The first plage in 1954 (McMath-Hulbert Serial Number 2895 crossed the central meridian on January 14, at a mean latitude S01. The maximum area was 100 millionths of the visible solar hemisphere. The last plage (McMath-Hulbert Serial Number 3056) crossed the central meridian on December 29.5, the mean maximum area of 1500 millionths. The plage contained a β_p spot (11214), which was first seen on December 30.0 with a mean latitude S 23°.

The only large spot seen during 1954 (Mt. Wilson No. 11172, Serial Number 1, Table 1.II) was in McMath plage 2923 which was first seen on March 12, and crossed the central meridian on March 17. This plage had a mean latitude S 09 with a brightness of 3/3/3 and an average maximum area of 2000 millionths. Five flares were associated with this plage and spot 2/3/0. The plage was last seen on March 24.

A total of 307 plages were observed by McMath-Hulbert Observatory during 1955; 145 of the plages were spotless. The last plage (McMath No. 3364) crossed the central meridian on December 31.5. This plage had a maximum area of 2500 millionths, a mean latitude N 22, and a brightness 2/3/0.

The number of plages observed during 1956 was 442, with 99 without sunspots.

The number of plages, sunspots, major flares, and all flares for the three years 1954-1956 is given in Table 1.7.

	Plages	Sunspots	Major Flares	All Flares
1954	152	46	0	16
1955	307	208	6	292
1956	442	642	51	2008
Total	901	896	57	2316

TABLE 1.7
Summary of Solar Regions and Flares 1954-1956

Because of the large percentage of the time when there was no flare patrol of the sun (62%, 46%, and 33% during 1954, 1955, and 1956, respectively, Table 1.1), the numbers given in Columns 4 and 5 of Table 1.7 may be as much as 40% on the low side. Any statistical study involving data for these three years must include a weighting factor.

4. Important Radio Emissions from the Sun During 1954-1956

Sweep frequency operation at the Harvard Radio Observatory, Fort Davis, Texas, did not begin until October 1956. They did not report any Type II or Type IV emissions in the frequency range 100-580 Mc/s. Spectral observations were started at Dapto (Australia) in 1952 with a frequency range from 40 Mc/s to 240 Mc/s. No spectral Type IV bursts were reported in the IAU Bulletin (reference 28) during the three year period of this catalogue, although McLean (reference 16) reports one Type IV burst (Jan. 19, 1956) from a study of the Dapto records. It must be kept in mind that during this three year period the radio patrol of the sun covered a very small fraction of the Greenwich day. In order to make our catalogue as complete as possible, we have included Type IV emissions derived from single frequency data. We have 18 cases by Pick-Gutmann (reference 18), 8 cases by Sinno (reference 20) and 2 cases derived by both Pick-Gutmann and Sinno.

The single frequency radio observation of the sun was very limited during this period with only eight observatories in operation in 1955. This was increased to 12 observatories by the last quarter of 1956 as shown on Table 1.8. We do, however, find radio emissions reported at one or more frequencies at the time of 45 of the 57 major flares.

TABLE 1-8 NORMAL OBSERVING TIMES UT
SOLAR RADIO OBSERVATORIES

Observing Station		Abbrev-iation	Frequency Mc/s	1955 Quarters 1	2	3	4	1956 Quarters 1	2	3	4
Cavendish Lab.,		Cav	81	10-15	10-15	10-15	10-15	10-15	10-15	10-15	10-15
Cambridge, England	Cambridge		175	10-15	10-15	10-15	10-15	10-15	10-15	10-15	10-15
Cornell Univ. Ithaca	Ithaca	Cor	200	13-20	13-20	13-20	13-20	13-20	13-20	13-20	13-20
Res. Inst. Atmosph.	Toyakawa	Nag	3750	00-08	00-07	00-07	00-07	00-07	00-07	00-06	00-06
Nagoya Univ. Toyakawa, Japan			9400	--	--	--	--	--	00-06	00-06	00-06
Observing Station			200	07-16	07-16	06-18	06-18	07-17	05-18	05-19	08-15
Den-Bery Radio	Nera	Ned	540	--	--	05-19	05-19	09-15	05-18	05-19	08-15
Inst. Teoretisk Astrop. Univ. Blindern	Oslo	Osl	200	08-16	07-19	--	08-14	07-17	06-18	03-21	06-21
Nat. Res. Council	Ottawa	Ott	2800	12-24	10-24	11-24	12-21	12-22	10-24	10-24	12-22
Radio Phys. Lab.	Sydney	Syd	62	20-08	20-08	20-08	20-08	--	--	--	--
			98	20-08	20-08	20-08	20-08	--	--	--	--
			200	20-08	20-08	20-08	20-08	--	--	--	--
			600	20-08	20-08	--	--	--	--	22-06	22-06
			1200	20-08	20-08	--	--	--	--	22-06	--
			1420	--	--	--	--	--	--	--	22-06
Tokyo Astron. Obs.	Mitaka	Tok	100	00-06	00-06	--	--	--	--	--	00-06
			200	--	22-09	22-09	00-06	00-06	00-06	00-06	00-06
			3000	--	--	22-09	00-06	00-06	00-06	00-06	--
Heinrich Hertz-Institut Berlin-Aldershof		HHI	1500	--	--	--	--	--	08-18	06-18	07-14
			9400	--	--	--	--	--	08-18	--	07-14
Nat. Bureau Stand.	Boulder	NBS	167	--	--	--	--	14-24	12-26	12-26	13-25
CRPL			460	--	--	--	13-23	14-24	12-26	12-26	13-25
Astron. Inst. Czechoslovak Acad. Sci. Ondrejov	Prague	Pra	536	--	--	--	--	07-16	06-16	05-17	07-15
Observ. de Belgique	Bruxelles	UCC	169	--	--	--	--	--	--	--	07-15
UCCLE, Belgium			600	--	--	--	--	--	--	--	07-15

On the other hand we find that 20 of the 27 Type II emissions reported by Sydney occurred at times when there was no flare reported or no flare patrol. Only 3 of the 28 derived Type IV emissions cannot be associated with a flare. The one remaining case reported by McLean (reference 16) from the Dapto (Syd.) sweep frequency records occurs at a time of no flare patrol. Ten of the derived Type IV emissions can be associated with major flares.

5. Geomagnetic Storm During 1954-1956

A comprehensive search of the literature fails to reveal a universal list of geomagnetic storms or agreement on starting times except for the ssc's published in the IAGA Bulletins (reference 3). 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 Kp 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 1954-1956

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 of 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 3. They are limited to those that are unistakable 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 data for the Forbush decreases listed in this catalogue were reported by Lockwood (references 14 and 14a). The data in reference 14 were restricted to those decreases with a magnitude greater than 5% and a maximum decrease rate greater than 1% per hour. Lockwood reports two in 1955 and three in 1956. Five additional slow (maximum rate of decrease less than 1% per hour) decreases are given in reference 14a. We have included all but the decrease on February 16, 1955 (No. II, reference 14a).

7. Catalogue of Balloon Flights

A search of the literature for reports on Balloon Flights during the period 1954-1956 revealed very few flights within four days after major flares (only 2 of the 1955 flares and 9 of the 1956 flares). Because of the importance of quiet sun data we have included all of the 1954 balloon flights that were reported in the literature. The sources of the information are given in the last column of the table and on pages 1.VII-iii to 1.VII-v.

8. Chronological Catalogue of Major Solar Events During 1954-1956

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 and those of lower importance that were unquestionably associated with a solar or solar-terrestrial phenomena. Because of the very low level of solar activity during 1954, a number of phenomena have been included in the chronological catalogue for that year, that would be considered as minor events during the other years of the solar cycle. The criteria for inclusion as a major event (indicated by an asterisk) are: except as noted above for the 1954 data,

8.1 Flares of importance 3 or 3+ in the McMath-Hulbert working list.

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 reported Type II and Type IV bursts.

8.7 Polar-cap absorptions included in Bailey's catalogue (reference 1) 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 1.9 SOURCES AND REFERENCE 1954 - 1956 SOLAR ACTIVITY CATALOGUE

Ref. No.	Author	Publication	Vol.	Year	Pages	SOLAR PHENOMENA: Plage	Sun Spot	Flares	RADIO EMISSIONS: II	IV	Single Freq.	SOLAR-TERRESTRIAL EFFECTS: S.W.F.	P.C.A.	Forbush Decrease	Geomag. Storm	Kp	S.F.E.
1	Bailey	Planet. Space Sci.	12	1964	495 - 541								⊗				
2	Bailey	J. Phys. Soc. Japan Supp. A1	17	1962	106 - 112			X				X	⊗				
3	Bartel, Romana, & Veldkamp	IAGA Bulletin, 1954 1955 1956	12i 12j 12k	1955 1957 1959	53, 78, 83, 114, 121, 107, 141, 147										⊗	⊗	⊗
4	Bartels, & Veldkamp	J. Geophys. Res.	59 60 61 62	1954 1955 1956 1957	423, 543 105, 219, 351, 525 129, 285, 559 155, 312										⊗		
5	Bartels	IAGA Bulletin	18	1962	89 - 106 172 - 177											⊗	
6	Besprozvannaya	J. Phys. Soc. Japan Supp. A1	17	1962	146 - 149								X				
7	Boorman, et. al.	M.N. Royal Astron. Soc.	123	1961	87 - 96				⊗								
8	Collins, Jelley, & Matthews	Can. J. Phys.	39	1961	35 - 52								⊗				
9	Dodson & Hedeman	Plage Catalogue	Unpublished			⊗	X										
10	Dodson & Hedeman	Astro, Phys. J.	128	1958	636 - 645												⊗
11	Eleman	Arkiv. Astronomi	3	1962	37 - 49												
12	Jelley & Collins	Can. J. Phys.	40	1962	706 - 718								⊗				
13	Knapp	J. Geophys. Res.	66	1961	2053 - 2085										X		
14	Lockwood	J. Geophys. Res.	65	1960	19 - 25 3859 - 3880									⊗			
14a	Lockwood	Phys. Rev.	112	1958	1750 - 1758								X	⊗	X		
15	Malitson	NASA TR	R169	1963	109 - 117			X		X			⊗		X		
16	McLean	Australian J. Phys.	12	1959	404 - 417				X	⊗					X		
17	Newton & Finch	The Observatory	75	1955	37 - 38										⊗		
18	Pick-Gutmann	Ann, Astrophys	24	1961	153- 210					⊗							
19	Pisharoty & Srivastava	J. Geophys. Res.	67	1962	2189 - 2192										X		
20	Sinno	J. Geomag. Geoelect.	13	1961	1 - 16					X					X		
21	Waldmeier	Pub. Eidgen. Sternwarte Zurich	Sunspots		1610-1960		⊗										
22	Warwick, C. & Haurwitz	J. Geophys. Res.	67	1962	1317 - 1332								X				
23	Wayman & Finch	Observatory	76 77	1956 1957	37 - 38 40 - 42										⊗		
24	CRPL	Solar Geophysical Data Part B			137 - 150	⊗		⊗				⊗					X
25	CSIRO	Spectral Observations							⊗	⊗							
26	Greenwich Obs.	Photoheliographic Results	 B14	1957 1958 1959	1954 data 1955 data 1956 data		⊗										

TABLE 1.9 1954 - 1956 (CONTINUED)

Ref. No.	Author	Publication	Vol.	Year	Page	SOLAR PHENOMENA: Plage	Sun Spot	Flares	RADIO EMISSIONS: II	IV	Single Freq.	SOLAR-TERRESTRIAL EFFECTS: S.W.F.	P.C.A.	Forbush Decrease	Geomag. Storm	Kp	S.F.E.
27	High Altitude Obs	Quarterly Bulletin	29 - 32					X							X		
28	IAU	Quarterly Bulletins	105 -116					⊗	⊗	⊗	⊗						
29	Mt. Wilson Obs.	Microfilm					⊗										
30	Mt. Wilson Obs. Sunspot Class	P. Astron. Soc. Pacific	66	1954	148, 212, 258, 338		⊗										
							⊗										
			67	1955	49, 122, 187, 263, 357, 422												
			68	1956	74, 166, 273, 365, 460, 550		⊗										
			69	1957	86, 180		⊗										
31	Principal Mag. Storms	J. Geophys. Res.	59	1954	304, 429, 547,										⊗	X	
			60	1955	109, 226, 356, 529										⊗		
			61	1956	133, 294, 564, 745										⊗		
			62	1957	160										⊗		
32	Tokyo Bulletin	Solar Phenomena for 1954	6								⊗						
		1955	7														
		1956	8								⊗						
33	U.S. Naval Obs.	Solar Summary for 1954	57				X										
		1955															
		1956	77				X										
34	Smith, H.C.	AFCRL Research Note	62- 827					⊗									
35	Warwick, C.S.	Solar Activity Rep	29	1964	1 - 77			⊗									
36	Waldmeier	Heliographische Karten 1954	10														
		Der Photosphere 1955	10				⊗										
		1956	11				⊗										
37	Bednavova-Novakova	Inst. Geophys. Acad. Techecosl.	190	1963	383-398										⊗		
38	Ohman, Editor	Annals of IGY	5	1958	296				X	X	⊗						

I

I. CATALOGUE OF MAJOR

SOLAR FLARES DURING 1954 – 1956

TABLE I. CATALOGUE OF MAJOR SOLAR FLARES DURING 1954 - 1956 WITH ASSOCIATED PHENOMENA AND SELECTED EFFECTS

Serial No.	Event No.	MAJOR FLARE: Gr. Day	Beg. UT	End UT	Max. UT	Position	SOLAR REGION: Plage No.	Region No.	Sunspot No. Mt. Wilson	Sunspot No. Greenwich	FLARE IMPORTANCE: IAU	No. Rpt.	No. Max.	CSW	McM	FLARE AREA SQ-DEG.: Range	No. Rept.	Mean	RELATED FLARE ACTIVITY: Minor/Major Before	After	1st Flare Pos/Imp.	S.W.F. Beg./Dur./Imp.	RADIO EMISSIONS: Peak Flux 10 Cm.	1.5 m	Other Wave Lengths	Dynamic II & IV	POLAR CAP ABS.: Gr. Day / Beg. UT / Abs. db	GEOMAGNETIC STORMS: Gr. Day / Beg. UT / Type / Int. / Max. Kp
		1954 No Major Flares																										
1	5	1955 Jan. 16	2130	2220	-	N33 W41	3065	2	11218	17161	3	1/1		3		16	1	16	4/0	2/0	E33/1						1955 Jan. 16/2230/2	
2	29	June 18	1218	1315	1232	S23 W25	3182	10	11259	17200	3	4/2		3		10-14	2	12	24/0	12/2	E68/1+		(84)	400	m			1955 Jan. 17/0930/sc/s/8-
3	30	18	1904	1940	1910	S22 W21	3182	10	11259	17200	3-	2/1		2+		-	-	-	25/1	11/1	E68/1+		(1580)	900	m			
4		19	1451	1549	-	S22 W38	3182	10	11259	17200	3	3/1		1		14	1	14	22/2	8/0	E68/1+		(9)		m			June 22/1039/sc/m/5-
5	59	Nov. 12	1116	1159	-	N27 E27	3326	17	11367	17278	3	2/1		2+	3	9-18	2	14	7/0	6/0	E80/1	1127/23/2+		1700	m			
6	71	Dec. 03	1112	1245	1112	N22 E10	3342	22	11388	17293	3	2/1		2+	3	9-10	2	10	3/0	1/0	E21/1	1105/20/3			m			
7	6	1956 Jan. 19	0535	0715	-	N22 E19	3379	7	11440	17331	3	1/1		3-	3	-	-	-	21/0	20/0	E85/1	0558/32/1+		750	cm			1956 Jan. 21/1644/sc/ms/6-
8	10	Feb. 10	2050	2143	2120	N21 E90	3400	17	11462	17351	3	3/1		2	2	-	-	-	1/0	26/3	E90/3	2110/55/3+	(346)		m			
9	13	14	0538	0730	0557	N21 E33	3400	17	11462	17351	3	3/2		3-	3	-	-	-	6/1	22/2	E90/3	0532/116/3		2400	cm			
10	15	17	0446	0652	0452	S20 E25	3403	18	11467	17353	3	2/1		3	2+	-	-	-	7/0	9/0	E76/2	0443/77/3	325	1200				
11	16	17	1100	1242	1120	N20 W04	3400	17	11462	17351	3	8/3		2-	3	9-24	3	12	16/2	12/1	E90/3	1102/44/3		480	m			Feb. 19/0221/sc/m/4+
12	19	21	1330	1338	-	N40 W72	3401	16	No spot	No spot	3	1/1		3	3	20	1	20	1/0	0/0	W60/1		12		m			
13	21	23	0334	0510	-	N23 W80	3400	17	11462	17351	3	3/2		3-	3	-	-	-	28/3	0/0	E90/3	0330/160/3+	4700	20000	cm	(IV)	1956 Feb. 23/0400/13	25/0307/sc/s/8+
14	25	29	2220	2309	-	S30 W21	3413	24	11482	17365	3	2/2		3+	3	-	-	-	1/0	0/0	E05/1	2228/72/3-	(525)					
15	27	Mar. 02	1220	1340	-	N21 W64	3412	23	11495	17374	3	1/1		3-	3	-	-	-	2/0	0/0	W53/2	1158/34/2		280				Mar. 03/0650/sc/ms/7+
16	35	15	1625	1745	1635	N22 E21	3432	35	11508	17385	3	5/1		2	2	9-14	3	11	10/0	13/0	E90/2	1623/120/3	(1320)	560	m			
17		28	0935	1055	0940	N25 E10	3443	46	11535	17406	3	6/1		2	2	7-14	2	11	0/0	4/0	E10/3	0939/31/1						
18	44	Apr. 09	0940	1050	1000	N22 E27	3457	8	11553	17416	3	5/2		2	3	10-17	4	14	3/0	2/0	E55/2	0945/70/2		300	m			
19		18	1247	1535	1342	N20 W16	3464	18	11567	17425	3	6/2		2	2+	8-14	5	12	8/0	0/0	E78/1	1320/65/1+	(206)		m			Apr. 21/1101/sc/ms/7+
20		20	0940	1130	0945	S22 W61	3462	12	11561	17421	3	3/1		2	2	8-64	3	27	9/0	0/0	E33/1	0945/39/2						22/0800/-/ms/7+
21		May 04	1033	1105	1035	N19 E54	3485	34	11604	17453	3	6/1		2	1+	3-5	3	4	0/0	8/0	E54/3	1035/85/2			m			
22		10	0934	1055	-	S30 E47	3490	40	11614	17462	3	3/1		2	2+	10-15	2	13	1/0	0/0	E73/1	0939/28/1						May 11/2342/sc/ms/7-
23		16	1240	1415	1250	S16 W65	3488	38	11612	17458	3	5/1		2	1+	4-18	4	9	22/0	0/0	E14/1	1248/20/1	(238)	85	m			
24	57	17	2230	2404	2305	S24 W18	3497	45	11622	17466	3	1/1		3	3	19	1	19	0/0	2/0	W18/3		(35)		m	(IV)		20/0638/sc/ms/6+
25		30	0933	1048	0945	N24 E53	3518	59	11645	17485	3	5/1		3	2	4-8	2	6	5/0	24/1	E85/1	0930/33/2+		275	m			
26	64	31	0752	0831	0756	N24 E38	3518	59	11645	17485	2+	5/2		2	2+	7-7	2	7	9/1	20/0	E85/1	0747/81/3+		340	m			
27		June 04	0935	1025	0943	N22 E79	3527	64	11652	17490	3	7/1		2	2	4-25	5	15	1/0	4/0	E85/1	0939/41/2-		130	m			
28		22	1525	1820	1612	S20 W16	3543	78	11667	17504	3	4/2		2+	2	7-14	2	11	18/0	8/0	E90/1	1548/67/3-	(33)	150				June 23/1806/sc/ms/7-
29		July 04	0925	1011	0940	S22 E82	3567	11	11699	17524	3	4/1		2-	1+	33	1	33	1/0	11/0	E85/1							
30		Aug. 08	1128	1336	1150	N19 E48	3607	42	11735	17562	3	7/1		2-	2	2-9	4	7	6/0	22/0	E90/2-	1137/143/2	(65)		cm			Aug. 09/1041/sc/m/5-
31	91	29	0937	1053	0956	N30 W63	3629	60	11763	17588	3	8/2		2	3	8-15	4	12	15/0	3/0	E58/1	0938/80/2			m			31/1016/sc/m/5+
32	94	31	1226	1630	1246	N15 E15	3643	64	11777	17597	3+	11/1		3-	3	5-40	8	16	21/0	6/0	E90/2-	1239/81/3	(340)	22500	cm	m (IV)	Aug. 31/1430/4.9	Sept. 02/0114/sc/s/8o
33	97	Sept. 05	1445	1507	-	S25 E77	3658	72	11797	17613	3	1/1		3	3	20	1	20	5/0	46/1	E90/1				m			
34	98	05	1645	1800	1650	S25 E82	3658	72	11797	17613	3	5/1		2-	1+	3-20	3	9	5/1	46/0	E90/1	1640/100/3		200				08/0730/sc/s/8+
35		10	0900	0948	0916	S18 E10	3656	71	11796	17612	3	5/1			2	2-24	4	9	10/0	5/0	E66/1+							
36	101	14	0813	0907	-	S22 E29	3666	81	11815	17629	3	3/1		2-	3	13-15	2	14	18/0	9/0	E85/1							
37	102	17	1942	2120	2002	S21 W15	3666	78	11811	17624	3	2/1		2	2+	14	1	14	5/0	4/0	E90/1	1941/81/3-	(440)	88		(IV)		20/0438/sc/ms/6o

TABLE I. 1954 - 1956 (CONTINUED)

Serial No.	Event No.	MAJOR FLARE Gr. Day	Beg. UT	End UT	Max. UT	Position	SOLAR REGION Plage No.	Region No.	Sunspot No. Mt. Wilson	Sunspot No. Greenwich	FLARE IMPORTANCE IAU	No. Rpt./ No. Max.	CSW	McM	FLARE AREA SQ-DEG. Range	No. Rpt.	Mean	RELATED FLARE ACTIVITY Minor/Major Before	After	1st Flare Pos/Imp.	S.W.F. Beg./Dur./Imp.	RADIO EMISSIONS Peak Flux 10 CM	1.5 m	Other Wave Length	Dynamic II & IV	POLAR CAP ABS. Gr. Day/ Beg. UT / Abs. db	GEOMAGNETIC STORMS Gr. Day / Beg. UT / Type / Int. / Max. Kp
38	104	Oct. 01	0755	0855	-	N45 W48	3691	1	11868	17656	3	1/1	3	3	15	1	15	1/0	6/0	W48/3							
39	106	07	0400	0502	-	N24 E07	3694	6	11878	17663	3	1/1	3	3	17	1	17	25/0	13/2	E 90/1		372		cm			
40	107	11	0955	1113	1026	N22 W56	3694	6	11878	17663	3	5/2	2	3	3-16	3	8	34/1	3/1	E73/1	1012/50/3-			m			
41		11	1406	1530	1417	N22 W59	3694	6	11878	17663	3	10/1	2	2	3-20	6	10	35/2	2/0	E 73/1	1411/79/3-	(14)					
42	109	22	0700	0903	0721 0838	N17 E25	3719	20	11910	17684	2+	8/2	2	2	5-10	5	8	3/0	2/0	E 54/2-	0703/19/1		1400	cm	m	(IV)		
43		23	0745	0832	-	N15 E72	3730	25	11920	17694	3	5/1	2	2	6-20	4	13	0/0	4/0	E 72/3	0749/28/1							Oct. 26/0027/sc/ms/7-
44	111	Nov. 07	1109	1403	1135	S17 E32	3751	38	11949	17716	3+	6/2	2+	3+	9-70	6	23	7/0	11/2	E 57/1	1106/21/2		2200	cm	m	(IV)		Nov. 09/2030/sc/ms/7-
45		08	1138	1340	1147	S17 E18	3751	38	11949	17716	2+	7/2	2	2+	3-10	6	6	10/1	8/1	E 57/1	1315/23/1+						Nov. 13/2000/5.4	
46	118	13	0157	0254	0203	N28 W50	3747	37	11946	17714	3-	1/1	2-	3-	11	1	11	4/0	0/0	E 65/1	0158/62/2+	359		cm	m	II		14/0200/sc/s/8-
47	122	14	1037	1427	1055	S20 W55	3751	38	11949	17716	3	3/2	2+	3	11-17	3	14	18/2	0/0	E 57/1	1037/78/2+		4000	cm	m	(IV)		15/0807/sc/s/8-
48		15	0700	1010	0813	S12 E11	3757	45	11963	17726	3	4/1	1+	2+	7-23	2	15	7/0	13/1	E 90/2	0808/20/2							
49	125	20	1002	1310	1020	S15 W56	3757	45	11963	17726	3	6/2	2+	3	8-18	3	12	15/1	5/0	E 90/2	1007/59/3-		4000	cm	m	(IV)		
50	132	Dec. 06	1405	1414	-	S21 E41	3785	65	12009	17763	3	1/1	2+	3	-	-	-	8/0	20/0	E 67/1	1338/38/3-							
51	136	17	1535	1705	1551	S24 W52	3788	69	12016	17769	3	1/1	3+	3	19	1	19	15/0	6/1	E 47/1+	1545/75/3	(335)						
52	137	18	0830	1026	0856	S25 W69	3788	69	12016	17769	2+	9/2	2-	2	7-22	6	16	17/1	4/0	E 47/1+	0826/40/3			cm	m	(IV)		
53	139	19	0725	0841	0752	N15 E25	3795	71	12030	17779	3	4/2	2	2+	14-25	2	20	4/0	8/2	E 56/2	0745/30/1							
54		19	1452	1540	1457	N15 E21	3795	71	12030	17779	2+	3/2	2-	2+	9	1	9	4/1	8/1	E 56/2	1450/25/2	(107)						
55		20	0603	0730	-	N13 E17	3795	71	12030	17779	3-	1/1	2+	3-	30	1	30	7/2	5/0	E 56/2	0637/33/2-			cm				Dec. 25/0754/sc/m/5-
56	143	22	0955	1058	-	N32 E90	3804	77	12046	17797	3	1/1	3-	3	-	-	-	0/0	2/0	E 90/3								
57	147	26	1401	1442	1412	S17 W11	3800	74	12039	17789	3	3/1	2	2	5-15	3	12	14/0	6/0	E 90/1	1403/97/3-	(800)	159		m	(IV)		27/1503/sc/m/5-

TABLE 1-A IAU MAJOR FLARES (TABLE I) 1954-1956, REDUCED TO IMPORTANCE 2 IN THE MCMATH WORKING LIST

Serial No. Table I	Date	Beg. UT	Position	Imp IAU	Imp McM	Warwick Ser. No.	Warwick Imp.	Observatory Reporting Max. Imp	Other Importance Reported
4	1955 June 19	1451	S22W38	3	1			Capri	1, 1
8	1956 Feb. 10	2050	N21E90	3	2	416	2	McMath	1, 1
16	Mar. 15	1625	N22E21	3	2	616	2	Herstmonceux	2+, 2, 2, 2
17	28	0935	N25E10	3	2	678	2	Capri S.	2, 2, 2, 1+, 1
20	Apr. 20	0940	S22W61	3	2	801	2+	Kiev	2, 2
21	May 04	1033	N19E54	3	1+	882	2-	Kiev	1+, 1+, 1, 1, 1
23	16	1240	S16W65	3	1+	1029	2	Capri S.	2, 2, 1+, 1
25	30	0933	N24E53	3	2	1194	3	Ondrejov	2+, 2, 1+, 1
27	June 04	0935	N22E79	3	2	1233	2	Abastumani	3-, 2, 2, 1+, 1, 1
28	22	1525	S20W16	3	2	1373	2+	Capri F., Capri S.	2, 2
29	July 04	0925	S22E82	3	1+	1463	2-	Abastumani	2, 1, 1
30	Aug. 08	1128	N19E48	3	2	1827	2-	Capri F.	2+, 2, 2, 2, 2, 2-
34	Sept. 05	1645	S25E82	3	1+	2235	2-	Kanzelhohe	1+, 1+, 1, 1
35	10	0900	S18E10	3	2	Not Included		Kanzelhohe	2, 2, 1, 1
41	Oct. 11	1406	N22W59	3	2	2695	2	Herstmonceux	2+, 2+, 2, 2, 2, 2, 2, 1, 1
42	22	0700	N17E25	2+	2	2747	2	Capri F., Ondrejov	2, 2, 2, 2, 2, 1+
43	23	0745	N15E72	3	2	2758	2	Kanzelhohe	2+, 2, 2, 1
52	Dec. 18	0830	S25W69	2+	2	3349	2-,	Abastumani, Capri S.	2, 2, 2, 2, 2, 1, 1
57	26	1401	S17W11	3	2	3430	2	Kanzelhohe	2, 2-

TABLE 1-B FLARES REPORTED BY ONLY ONE OBSERVATORY -IAU IMPORTANCE 2+

Date	Beg. UT	End UT	Max. UT	Position	Plage No.	Observatory
1954	None					
1955	None					
1956 Feb. 16	0751			S20E26	3403	Arcetri
Mar. 28	0508	0540	-	N28W38	3440	Abastumani
Sept. 08	2145	2240	2212	S25E41	3658	Mt. Wilson
Nov. 30	0735	0755	0735	S23W81	3767	Abastumani

TABLE I-C IAU IMPORTANCE 2+ FLARES NOT LISTED AS MAJOR FLARES

Date	Beg. UT	End. UT	Max. UT	Position	IAU Max. Imp.	Obs. Rpt. Max. Imp.	Imp. Reported by Other Stations	CSW Serial No.	CSW Imp.	McM Plage No.	Range	Area Sq. Deg. No. Rpt.	Area Sq. Deg. Mean
1955													
June													
17	1007	1052	1020	S23W09	2+	Capri	1			3182	4 - 13	2	8
17	1735	1956	1848	S23W11	2+	Mt. Wilson	1			3182	-	-	-
July													
04	0930	1030	0935	S35E09	2+	Capri S.	2, 2,2	11	2-	3195	5 - 12	3	8
Aug.													
08	1739	2306	2054	N16E29	2+	Mt. Wilson	1	70	2-	3240	-	-	-
Oct.													
25	1154	1440	1202 1420	S24E47	2+	Capri	2, 2, 1, 1	189	2	3309	3 - 12	4	7
25	1849	2033	1900	S22E42	2+	McMath	2, 1	191	2	3309	3	1	3
Nov.													
15	1251	1328	-	N28W08	2+	Capri	?	240	2+	3326	12	1	12
Dec.													
02	1321	1445	1404	N22E17	2+	Wendelstein	1	269	2-	3342	4 - 5	2	5
1956													
Feb.													
16	1805	2039	1837	N20E08	2+	McMath	2, 1+	454	2	3400	-	-	-
June													
14	1220	1350	1316	S25W19	2+	Capri S.	2, 1+, 1	1295	2-	3531	4 - 10	2	7
July													
22	1624	1720	1641	N29W54	2+	Mt. Wilson	2, 1	1659	2	3577	3	1	3
31	0905	0953	0927	S19W50	2+	Capri F.	1, 1, 1	1753	1+	3586	2 - 5	2	4
Aug.													
07	1237	1254	1238	N23W28	2+	Crimee	1+	1817	1+	3598	3	1	3
09	0543	0622	0557	N21E42	2+	Capri F.	2, 2, 1+, 1, 1	1831	1+	3607	3 - 10	3	6
11	0942	1128	-	N22E16	2+	Capri F.	2	1851	2	3607	5	1	5
16	0530	0803	0620	S16W13	2+	Capri F.	2	1908	2-	3615	10	1	10
21	1945	2200	2007	S20W17	2+	McMath	2	1994	2	3625	7	1	7
28	2220	2405	2252	N17E51	2+	Mt. Wilson	2	2113	2+	3643	10	1	10
30	0750	0938	-	N27W74	2+	Capri F.	2, 1+	2147	2	3629	9	1	9
30	0952	1159	1003 1144	N17E32	2+	Meridan	2, 2, 2-, 1, 1	2149	2-	3643	1 - 10	3	6
Sept.													
07	1245	1401	1306	S16E42	2+	Herstmonceux	2, 1+, 1+, 1+, 1+, 1, 1	2261	1+	3656	3 - 8	4	6
12	2235	2353	2249	S22E47	2+	Sac Peak	2	2349	3-	3666	14	1	14
16	1004	1113	1040 1142	S26E16	2+	Kiev	1+, 1, 1	2416	1-	3666	8 - 23	3	14
Oct.													
02	1149	1233	1215	S21E60	2+	Crimee	2, 1, 1, 1	2581	1+	3695	3 - 5	3	4
04	0715	0930	0825	N19E31	2+	Capri F.	2, 2, 2-, 1	2604	1-	3694	2 - 12	4	7
04	1510	1605	1516	N22E30	2+	McMath	1+, 1+	2608	2-	3694	4 - 5	2	5
Nov.													
01	1104	1118	1107	S19W38	2+	Crimee	2-, 1+	2822	2+	3731	3 - 7	3	5
01	1215	1245	1218	S15E86	2+	Crimee	2, 1+, 1	2826	2	3746	3 - 21	4	10
12	0514	0557	-	S15W43	2+	Tachkent	2	2964	2+	3751	21	1	21
19	0834	1056	0850 0936	S14W44	2+	Mendon	2, 2-, 1, 1	3049	2-	3757	8 - 14	3	12
22	0907	0832	0916	S15W88	2+	Herstmonceux	1, 1, 1	3092	2-	3757	9	1	9

TABLE I-D NATIONAL BUREAU OF STANDARDS NORMALIZED FLARE DATA FOR IMPORTANCE ≥2+ NOT INCLUDED IN TABLE 1

Date	CSW Serial No.	Beg. UT	End UT	Max. UT	Position	CSW Imp.	IAU Imp.	Observatory
1955								
July								
10	32	0549	0606	0553	N29W45	2+	2	Mitaka
Nov.								
15	240	1251	1328	-	N28W08	2+	2+, ?	Capri, Nera ICX
1956								
Jan.								
16	338	0254	0258	-	N20E60	2+	2	Mitaka
16	343	2335	2359	2335	N20E49	2+	2	Mitaka
17	344	0025	0038	0025	N20E49	2+	2	Mitaka
Feb.								
15	440	0018	0058	-	N20E20	2+	2	Mitaka
19	474	0616	0706	-	S20W05	2+	2	Mitaka
21	500	0435	0515	-	S20W05	2+	2	Mitaka
25	535	1020	1030	-	S18E89	2+	2	Kiev
27	543	1120	1140	1123	N24E77	2+	2, 2	Kazzelhohe, Ondrejov
Mar.								
02	575	0754	0813	-	N35E60	2+	2	Capri S.
15	613	0301	0405	-	N25E35	2+	2	Mitaka
Apr.								
10	739	0930	0947	0934	N17E75	2+	2	Ondrejov
19	793	1823	1853	1851	S31W35	2+	2	Sac Peak
May								
10	939	0208	0234	0220	S25E64	2+	2	Kodachanal
31	1207	0516	0534	-	S20W80	2+	2	Tachkent
June								
12	1283	0333	0455	-	N28E90	2+	2	Tachkent
22	1369	1000	1020	-	S31E81	2+	2	Kiev
July								
16	1586	0302	0353	-	S23W75	2+	2	Tachkent
22	1661	2300	2340	2315	S24E55	2+	2	Sac Peak
Aug.								
09	1830	0141	0204	0145	N21E48	2+	2	Mt. Wilson
28	2113	2220	2405	2252	N17E51	2+	2, 2+	Sac Peak, Mt. Wilson
Sept.								
06	2277	2145	2240	2212	S25E41	3-	2+	Mt. Wilson
12	2349	2235	2353	2249	S23E47	3-	2, 2+	Sac Peak, Mt. Wilson
Nov.								
01	2822	1104	1118	1107	S19W38	2+	1+,2,2+	Crimea, Capri F., Herstmonceux
08	2905	0613	0631	-	S13E19	2+	2	Mitaka
12	2964	0514	0557	-	S16W43	2+	2, 2+	Tachkent, Nizamiah
15	3007	2150	2220	2156	S26W66	2+	2	Sac Peak
Dec.								
01	3181	0249	0329	0309	N16W36	2+	2	Mitaka
15	3311	0520	0545	0525	S25W30	2+	2	Kodackunal
17	3333	0453	0554	0500	N15E55	2+	2, 2	Mit, Kod.
17	3339	1227	1204	-	S12W90	2+	2	Capri, S.
18	3357	2045	2313	2204	S22W78	2+	2	McMath
18	3358	2131	2313	2204	S24W76	2+	2	Mt. Wilson
26	3427	0507	0626	0539	S15W06	2+	2	Mitaka

TABLE I. CATALOGUE OF MAJOR SOLAR FLARES DURING 1954-1956

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 28).

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 unpublished McMath-Hulbert data. 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.

Column 14 This is the importance assigned to the flare in the table of normalized flare data (reference 35). These data start from July 1955.

Column 15 This column gives the importance assigned to the flare in unpublished McMath-Hulbert Observatory data.

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

Column 17 Number of Observatories Reporting an Area

Column 18 The Arithmetic Mean of the Reported Values

RELATED FLARE ACTIVITY

Column 19 Other Flares. This column lists the number of minor and major flares associated with the active region during disk passage (IAU active region, reference 28) before and after the major flare.

Column 20 This column gives the heliographic longitude (or central 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 21 Short Wave Radio Fadeouts (S.W.F.). Short wave radio fadeouts associated with major flares are listed with the following notation: Beginning/Duration in minutes/ 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 22 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 22-24 is limited to an indication of the radio activity of the region at the time of the flare.

Column 23 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 22 or 23 represents a smoothed flux (peak flux not reported), the value is enclosed in a bracket.

Column 24 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 25 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 bracket - (IV). (Detailed data are given in Table IV.)

SOLAR TERRESTRIAL EFFECTS

Column 26 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: Greenwich day/beginning time U.T./absorption in db. Additional data, including references, are given in Table VI, Catalogue of Solar-Terrestrial Effects.

Column 27 Geomagnetic Storms. Geomagnetic storms with a maximum $K_p \geq 5-$ 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: Greenwich day/onset time, U.T./type/degree of activity/maximum reported K_p. 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.

II

II. CATALOGUE OF IMPORTANT

SUNSPOTS DURING 1954 – 1956

TABLE II. CATALOGUE OF IMPORTANT SUNSPOT GROUPS DURING 1954-1956

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 Royal Greenwich Observatory Bulletins (reference 26).

(b) All sunspot groups that have a γ or $\beta\gamma$ magnetic classification as reported by Mt. Wilson Observatory in reference 30.

(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 36 with the daily spot data given in reference 26.

Column 4 Catalogue Classification from a, b, or c Above. A sunspot with a maximum area greater than 500 millionths is designated in this column by a 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 sunspots 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 Flare Day. This is the date of the major flare associated with the sunspot.

Column 15 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 16 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 17 Mean Magnetic Class. The value given in reference 30 is used. (The symbols are defined on page 1.II-9)

Column 18 Mean Magnetic Strength. The values in units of 100 Gauss have been taken from reference 30.

Column 19-23 give the values on flare day when applicable: (19) flare day, 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 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 26, 30, and/or 36.

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 36. (An explanation of the classification is given on page 1.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 29).

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 26 is given.

IV. CATALOGUE OF IMPORTANT RADIO

EMISSIONS FROM THE SUN DURING 1954 – 1956

IV

TABLE IV. CATALOGUE OF IMPORTANT RADIO EMISSIONS FROM THE SUN DURING 1954-1956

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

(c) All important radio emissions at frequencies between 9400 Mc/c and 62 Mc/s that occurred at the time of a major flare or a spectral emission of Type II or 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 28.

Normal observing hours of the solar radio observatories in both the discrete and sweep frequency programs are shown on page 1.9.

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 38), illustrated on page 1-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 28 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 1955-1956 are given on Table 1.8.

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.

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 28, subflares are denoted with importance 1-.

Column 7 Flare Serial Number. This is the serial numbers of the major flare in Table 1.I.

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). The Harvard Radio Astronomy Observatory (Har) at Fort Davis, Texas did not start operating until October 1956. They did not report Type II or Type IV emissions in 1956.

We have also included spectral emissions of the Type IV that have been derived by Pick-Gutman (reference 18) or Sinno (reference 20) from single frequency observations.

TYPE II SLOW DRIFT BURSTS (Columns 8 through 10)

Column 8 Beginning Time UT.

Column 9 End Time UT.

Column 10 Observatory or Reference.

TYPE IV BROAD BAND CONTINUUM (Columns 11 through 14)

Column 11 Beginning Time.

Column 12 End Time.

Column 13 Intensity.

Column 14 Observatory or Reference.

RADIO EMISSIONS AT SINGLE OR DISCRETE FREQUENCIES (Columns 15 through 20)

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 15 Frequency.

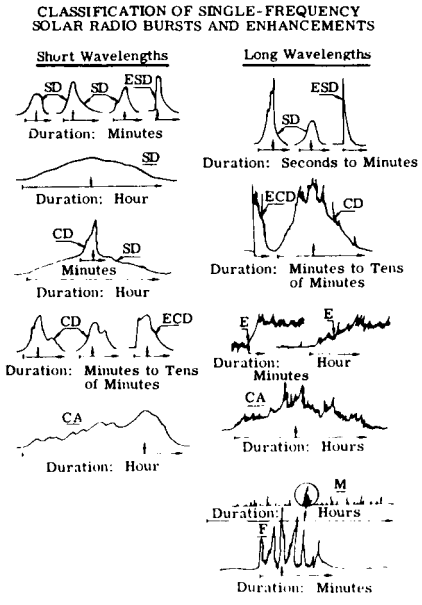
Column 16 Type.

Column 17 Beginning Time.

Column 18 End Time.

Column 19 Peak Flux (or smoothed flux)

Column 20 Observatory.



SOLAR RADIO OBSERVATORIES NORMAL OBSERVING TIMES

FIGURE IV-1 1ST QUARTER 1955

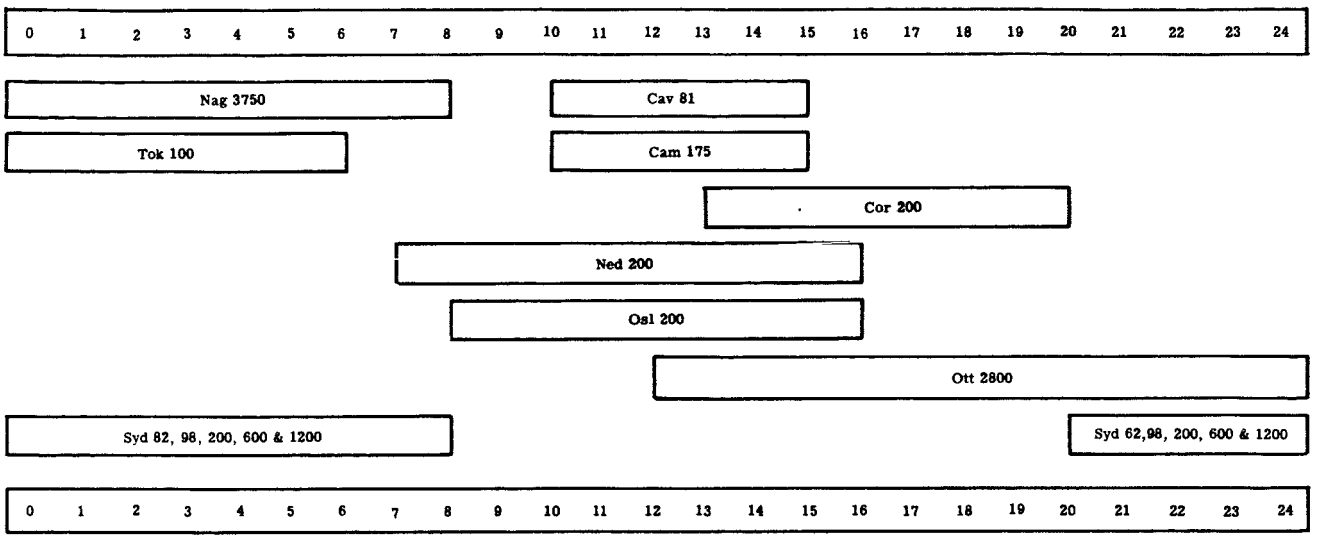


FIGURE IV-2 4TH QUARTER 1956

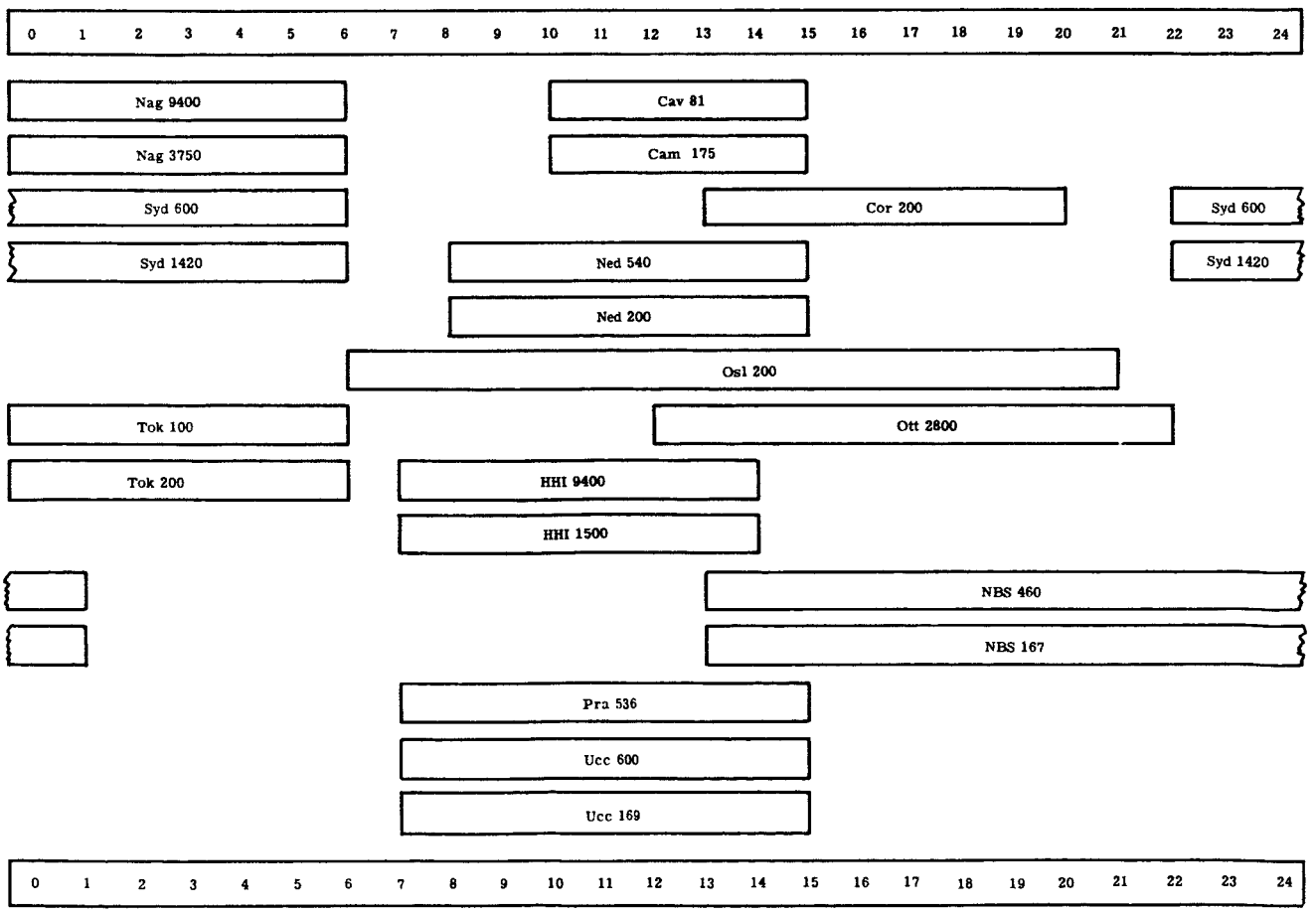


TABLE IV CATALOGUE OF IMPORTANT SOLAR RADIO EMISSIONS DURING 1954-1956

FLARE							SPECTRUM OBSERVATIONS						SINGLE FREQUENCY RADIO EMISSIONS					
							TYPE II			TYPE IV								
Gr. Day	Beg. UT	End UT	Max. UT	Position		Imp.	Flare Serial No.	Beg. UT	End UT	Obs.	Beg. UT	End UT	Max. Int.	Obs.	Freq.	Type	Beg. UT	End UT	Flux	Obs.
1955 Feb. 24		No Flare Patrol						0104	0124	Syd					3750	CD	0102	0104.5	(1470)	Nag
															200	CD	0104	0108	3600	Tok
															98	CD	0105	0111.7	16500	Syd
															62	CD	0105	0112.7	860	Syd
June 09		No Flare Reported						0001	0033	Syd					200	CD	0000	0000.7	750	Syd
15		No Flare Patrol						0400	0408	Syd					3750	CD	0359	0412.7	(400)	Nag
															1200	CD	0402	0407	63	Syd
															550	CD	0402	0409	58	Syd
															200	CD	0402	0404.5	660	Syd
															62	CD	0404	0404.8	800	Syd
18	1218	1315	1232	S23	W25	3	2								2800	CD	1222	1315.5	(84)	Ott
															545	CD	1223	1300	600	Ned
															200	CA	1222	1335	400	Ned
															200	CA	1235	1450	220	Osl
18	1904	1940	1910	S22	W21	3-	3								2800	BD	1907	1937.5	(1580)	Ott
															545	CD	1905	1920	250	Ned
															200	CA	1905	1912	900	Osl
19	1451	1549	-	S22	W38	3	4								2800	SD	1451	1454.8	(9)	Ott
															545	CD	1555	1605	100	Ned
21		No Flare Patrol						2330	2355	Syd					3750	SD	2318	2325	(4)	Nag
															3750	CD	2330	2339	40	Nag
															62	CD	2311	2345	8880	Syd
July 05								0215	0224	Syd					3750	CD	0209	0212	(172)	Nag
															200	CD	0203	0213	400	Tok
															62	CD	0205	0221	13510	Syd
07								0206	0213	Syd					3750	SD	0201	0205.5	(6)	Nag
															200	CA	0200	0200.7	540	Syd
															62	CD	0201	0201.5	8110	Syd
Sept. 10								0509	0520	Syd					3750	SD	0448	0452	(6)	Nag
19								0152	0202	Syd					3750	CD	0146	0159	(11)	Nag
															200	CD	0146	0148.5	140	Tok
															62	CD	0147	0149.5	510	Syd
Nov. 12	1116	1159	-	N27	E27	3	5								545	CD	1128	1138	120	Ned
															200	CD	1128	1135	1700	Osl
15	0428	0458	-	N26	W09	1+		0441	0505	Syd					3750	SD	0445	0445.7	(20)	Nag
															200	CD	0439	0441	720	Syd
15		No Flare Reported						2205	2208	Syd					460	CD	2204	2206	740	NBS
18		No Flare Reported						0242	0253	Syd					3000	CD	0238	0241.5	183	Tok
															98	CD	0229	0235	1970	Syd
															62	SD	0223	0223.3	700	Syd
24		No Flare Reported						0442	0513	Syd					62	CD	0444	0449	290	Syd
30		No Flare Patrol						0544	0549	Syd					3000	CD	0539	0542	148	Tok
															62	CD	0541	0542	780	Syd
Dec. 03	1112	1245	1112	N22	E10	3	6								545	CD	1108	1128	350	Ned
															545	CD	1136	1210	340	Ned
1956															175	CA	1107	1327	120	Cav
Jan. 16		No Flare Patrol						0031	0049	Syd										
19		No Flare Patrol						0026	0031	Syd ,16	0100	0226	2	16	3750	CD	0023	0024.8	(426)	Nag
															200	CD	0024	0030	750	Tok
															200	CA	0030	0120	500	Tok
Feb. 10	2050	2143	2120	N21	E90	3	8								2800	CD	2113	2142.5	(346)	Ott
															2800	SD	2141	2200	(46)	Ott
															460	CD	2046	2047	1200	NBS
															460	CD	2101	2102	1800	NBS
															460	CD	2116	2416	1800	NBS
14	0538	0730	0557	N21	E33	3	9	0554	0620	Syd					3750	SD	0538	0538.7	(15)	Nag
															3750	CD	0541	0656	(2720)	Nag
															3000	CD	0541	0701	1080	Tok
															200	CD	0555	0640	2400	Tok
16		No Flare Patrol									1804			20	2800	CD	1756	1847	(623)	Ott
															460	CD	1758	2423	420	NBS
															200	CD	1805	1820.5	199	Cor
															167	CD	1804	2527	620	NBS
17	0446	0652	0452	S20	E25	3	10								3000	CD	0449	0455	325	Tok
															3000	SD	0526	0527	277	Tok
															200	CD	0527	0527.7	1200	Tok
															200	CD	0545	0545.3	400	Tok
															200	CD	0548	0548.5	550	Tok

TABLE IV 1954-1956 (CONTINUED)

FLARE								SPECTRUM OBSERVATIONS								SINGLE FREQUENCY RADIO EMISSIONS					
								TYPE II			TYPE IV										
Gr. Day	Beg. UT	End UT	Max. UT	Position		Imp.	Flare Serial No.	Beg. UT	End UT	Obs.	Beg. UT	End UT	Max. UT	Obs.	Freq.	Type	Beg. UT	End UT	Flux	Obs.
17	1100	1242	1120	N20	W04	3	11								545	CD	1111	1139	1200	Ned
															200	CD	1115	1142	480	Osl
															175	CA	1100	1230	(180)	Cav
															81	E	1110	-	(180)	Cav
21	1330	1338	-	N40	W72	3	12								2800	SD	1343	1351	(12)	Ott
															545	CD	1427	1427.5	185	Ned
23	0334	0510	-	N23	W80	3	13				0335			20	3750	CD	0334	0349.5	(18000)	Nag
															3000	CD	0333	0423	4700	Tok
															200	CD	0335	0400	20000	Tok
															200	CA	0400	0600	50000	Tok
29	2220	2309	-	S30	W21	3	14								2800	SD	2217	2240	(525)	Ott
Mar. 02	1220	1340	-	N21	W64	3	15								200	SD	1216	1217	280	Osl
08	No Flare Patrol							0321	0342	Syd					3750	CD	0320	0349.5	421	Nag
															200	CD	0319	0331	3500	Tok
15	1625	1745	1635	N22	E21	3	16								2800	SD	1621	1644.5	(1320)	Ott
															2800	SD	1644	1717	(195)	Ott
															460	CD	1626	1757	1900	NBS
															200	CD	1623	1713	560	Osl
															200	CD	1624	1816	200	Cor
29	No Flare Reported										2224			20	167	CD	2300	2505	200	NBS
Apr. 09	0940	1050	1000	N22	E27	3	18								545	CD	0939	0951	260	Ned
															200	CD	0942	1000	300	Ned
															175	SD	0945	0955	65	Cav
															81	SA	0948	1001	(800)	Cav
12	0530	0557	-	N19	E65	2		0536	0552	Syd										
18	1247	1535	1342	N20	W16	3	19								2800	SD	1312	1902	(25)	Ott
															2800	SA	1322	1331	(206)	Ott
															536	CD	1319	1326.5	100	Pra
25	No Flare Reported							2353	2419	Syd					167	CD	2353	2354.8	1900	NBS
															167	CD	2438	2446	1900	NBS
26	0200	0300	0212	N14	W08	1		0154	0210	Syd					200	CD	0154	0209	1600	Tok
27	2050	2150	2100	N17	W27	2					2054			20	2800	SD	2051	2101	(375)	Ott
May 04	1033	1105	1035	N19	E54	3	21								536	CD	1032	1035	75	Pra
13	1750	1950	1809	S18	W30	1					1752			20	2800	SD	1746	2320	(23)	Ott
															2800	SD	1807	1831.7	(167)	Ott
															460	CD	1747	1820	260	NBS
															200	CD	1743	1818	60	Cor
															167	CD	1752	2549	530	NBS
16								0007	0039	Syd										
16	1240	1415	1250	S16	W65	3	23								2800	CD	1244	1251.2	(238)	Ott
															545	CD	1257	1307	380	Ned
															536	CD	1239	1308	220	Pra
															460	CD	1240	1327	320	NBS
															200	SD	1241	1258	55	Osl
															200	CD	1242	1254	85	Ned
17	2230	2404	2305	S24	W18	3	24				2234			20	2800	SD	2230	2320	(35)	Ott
															2800	SA	2252	2252.5	(14)	Ott
															2800	SA	2327	2331	(9)	Ott
															167	CD	2234	2406	590	NBS
30	0933	1048	0945	N24	E53	3	25								536	CD	0929	0946.5	300	Pra
															200	CD	0932	0935	120	Osl
															200	CD	0933	0936	275	Ned
30	2320	2357	2330	S20	E02	1		2331	2351	Syd										
31	0752	0831	0756	N24	E38	2+	26								536	CD	0751	0817	230	Pra
															200	CD	0853	0754.5	200	Ned
															200	CD	0756	0756.5	340	Ned
June 02	2230	2340	2254	N23	E03	2					2246			18	2800	SD	2228	2433	(31)	Ott
															2800	CA	2246	2329	(170)	Ott
															460	CD	2251	2607	100	NBS
04	0935	1025	0943	N22	E79	3	27								200	CD	0937	1001.5	60	Osl
															200	CD	0941	0951.5	130	Ned
															175	M	0940	1007	120	Cav
															81	M	0945	1010	(5)	Cav
20	No Flare Reported										1938			18	2800	CD	1938	2001	(340)	Ott
22	1525	1820	1612	S20	W16	3	28								2800	SD	1542	1818	(33)	Ott
															200	CD	1603	1603.5	150	Ned

TABLE IV 1954-1956 (CONTINUED)

FLARE								SPECTRUM OBSERVATIONS													
								TYPE II				TYPE IV				SINGLE FREQUENCY RADIO EMISSIONS					
Gr. Day	Beg. UT	End UT	Max. UT	Position		Imp.	Flare Serial No.	Beg. UT	End UT	Obs.		Beg. UT	End UT	Max. UT	Obs.	Freq.	Type	Beg. UT	End UT	Flux	Obs.
July																					
06	0346	0900	-	N20	E47	1		0346.5	0900	Syd						9400	SD	0344	0346.8	(172)	Nag
																3750	SD	0344	0347	(121)	Nag
																3000	CD	0344	0348.5	264	Tok
																1420	CD	0343	0347	182	Syd
																600	CD	0344	0347	89	Syd
																200	CD	0346	0353	4000	Tok
22	1634	1750	1641	N29	W54	2+						1638			18	2800	SD	1638	1646.5	(660)	Ott
																2800	SD	1647	1658.5	(389)	Ott
																200	CD	1654	1655	180	Ned
Aug.																					
08	1128	1236	1150	N10	E48	3	30									2800	SD	1135	1205	(65)	Ott
																1500	CD	1133	1153.5	(254)	HHI
28	2231	2406	2232	N17	E51	2+						2243			20	460	CD	2241	2621	5700	NBS
																167	CD	2243	2622	6600	NBS
29	0937	1053	0956	N30	W63	3	31									545	CD	0937	0944	140	Ned
																536	SD	0939	0941	100	Pra
31	1226	1630	1246	N15	E15	3+	32					1231			18,20	2800	SD	1231	1310	(340)	Ott
																1500	CD	1230	1355	(4920)	HHI
																545	CD	1237	1357	6500	Ned
																536	CD	1231	1400	1800	Pra
																200	CD	1231	1234	610	Ned
																200	CD	1231	1355	4500	Osl
																200	CD	1237	1333	22500	Ned
																175	CD	1240	1355	800	Cav
																81	E	1238	-	(100)	Cav
Sept.																					
05	1445	1507	-	S25	E77	3	33									460	M	1445	1446.1	190	NBS
06	1645	1900	1650	S25	E62	3	34									200	CD	1718	1720	200	Ned
07	1345	1401	1306	S15	E41	3+						1250			18	2800	CD	1250	1309	(177)	Ott
																536	CD	1247	1309.5	53	Pra
																167	CD	1253	1255.7	150	NBS
																81	CD	1251	1316	(5)	Cav
10	No Flare Reported							0134	0141	Syd											
12	2235	2251	2240	S23	E47	2+						2233			18	2800	SD	2233	2253	(325)	Ott
																167	CD	2245	2248.2	4000	NBS
14	0813	0907	-	S22	E29	3	36									200	CD	0757	0758	1500	Ned
																200	CD	0907	0909	250	Ned
17	1942	2130	2002	S21	W15	3	37					1945			18	2800	SD	1934	2301	(42)	Ott
																2800	CA	1945	1955	(440)	Ott
																200	CD	1947	1948.5	88	Cor
Oct.																					
07	0400	0502	-	N24	E07	3	39									9400	CD	0351	0353.2	(20)	Nag
																3750	CD	0350	0352.5	(32)	Nag
																3000	CD	0348	0353.5	372	Tok
																3000	CD	0355	0353.4	271	Tok
																3000	CD	0411	0446	273	Tok
11	0955	1113	1036	N22	W56	3	40									545	CD	1016	1016.5	150	Ned
																536	SD	1018	1019	155	Pra
11	1408	1530	1417	N22	W50	3	41									2800	SD	1411	1511	(14)	Ott
																2800	SA	1411	1415	(13)	Ott
22	0700	0903	0721 0838	N17	E26	2+	42					0710			18	9400	CD	0710	0727	(55)	Nag
																600	CD	0707	0740	264	Syd
																536	CD	0704	0724	100	Pra
																536	CD	0723	0821	210	Pra
																536	CD	0821	0836	185	Pra
																200	CD	0703	0704	250	Ned
																200	CD	0710	0721.5	1400	Ned
Nov.																					
01	1104	1118	1107	S19	W38	2+						1107			18	9400	SD	1105	1115	(442)	HHI
																169	E	1107	1615	34	Ucc
06	1000	1030	-	N16	E90	2						1015			18	169	CD	1015	1120	30	Ucc
																81	CA	1035	1235	10	Cav
07	1109	1403	1135	S17	E32	3+	44					1103		B	18	9400	CD	1103	1325	(640)	HHI
												1115			20	1500	CD	1106	1259	(465)	HHI
																600	CA	1117	1221	60	Ucc
																536	CD	1100	1254.5	235	Pra
																200	CD	1114	1214	800	Osl
																200	CD	1115	1200	2200	Ned
																81	E	1115	-	(100)	Cav
12	No Flare Reported							2300	2323	Syd											
13	0157	0254	0303	N28	W50	3-	46	0307	0320	Syd						9400	SD	0152	0152.4	(68)	Nag
																3000	CD	0211	0225	359	Tok
																600	CD	0201	0210	61	Syd

TABLE IV 1954-1956 (CONTINUED)

FLARE								SPECTRUM OBSERVATIONS													
								TYPE II				TYPE IV				SINGLE FREQUENCY RADIO EMISSIONS					
Gr. Day	Beg. UT	End UT	Max. UT	Position		Imp.	Flare Serial No.	Beg. UT	End UT	Obs.		Beg. UT	End UT	Max. UT	Obs.	Freq.	Type	Beg. UT	End UT	Flux	Obs.
13	1430	1555	1501	N16	W09	2						1431			18	9400	CD	1433	1445	(325)	HHI
																2800	SD	1431	1448	(175)	Ott
																1500	SD	1429	1447	(256)	HHI
																545	CD	1425	1445	940	Ned
																169	E	1431	1601	70	Ucc
14	1037	1427	1055	S20	W55	3	47					1035		A	18	9400	CD	1035	1230	(1045)	HHI
																1500	CD	1032	1145	(820)	HHI
																600	E	1038	1120	60	Ucc
																545	CD	1033	1034.5	220	Ned
																536	CD	1030	1157.5	300	Pra
																200	CD	1037	1039.5	180	Ned
																200	CD	1037	1139	600	Osl
																200	CD	1040	1110	4000	Ned
																175	CD	1050	1150	500	Cav
																169	E	1036	1226	70	Ucc
19	No Flare Reported							0219	0225	Syd											
20	1002	1310	1020	S15	W56	3	49					1009		A	18	9400	CD	1000	1322	(5000)	HHI
																1500	CD	1010	1345	(1500)	HHI
																600	E	1014	1244	60	Ucc
																545	CD	1011	1211	3000	Ned
																536	CD	1009	1244	300	Pra
																200	CD	1017	1137	4000	Ned
																169	E	1016	1310	70	Ucc
																81	CD	1018	1218	(80)	Cav
22	1312	1415	1341	S15	W83	2						1323			18	9400	CD	1245	1405	(610)	HHI
																2800	SD	1323	1803	(64)	Ott
																2800	SA	1336	1356.3	(1000)	Ott
																1500	CD	1328	1413	(419)	HHI
																545	CD	1330	1334	180	Ned
Dec. 02	1400	1406	1402	S15	E81	1+						1354			18	2800	SD	1354	1418	(360)	Ott
																200	CD	1358	1410	89	Cor
																169	E	1348	1407	100	Ucc
17	1535	1705	1551	S24	W52	3	51									2800	SD	1539	1555.5	(335)	Ott
18	0830	1026	0856	S25	W69	2+	52					0837			18	9400	CD	0837	1045	(632)	HHI
																536	SD	0909	0909.5	100	Pra
19	1452	1540	1457	N15	E21	2+	54									2800	SD	1451	1458	(107)	Ott
20	0432	0447	-	N12	E15	1						0444			18	9400	CD	0444	0451.5	(3650)	Nag
																3000	CD	0444	0508	530	Tok
20	0603	0730	-	N13	E17	3-	55									9400	CD	0640	0644.5	(745)	Nag
25	2150	2215	2215	S16	W02	2						2218			20	167	CD	2218	2324	4600	NBS
26	1401	1442	1412	S17	W11	3	57					1403			18	2800	CD	1403	1648	(800)	Ott
																200	CD	1438	1524	159	Cor
																169	CD	1409	1415	70	Ucc
																169	E	1415	1515	100	Ucc
29	0040	0255	0045 0220	N16	E59	1+						0043			18	9400	CD	0045	0100	(2110)	Nag
																3000	CD	0043	0213	1150	Tok

V. CATALOGUE OF

GEOMAGNETIC STORMS DURING 1954 – 1956

V

TABLE V. CATALOGUE OF GEOMAGNETIC STORMS DURING 1954-1956

This catalogue of geomagnetic storm data has been prepared 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 (references 4, 31), and Bulletins 12i, 12j, 12k published by the IAGA (reference 3) 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 reference 3).
3. Sudden commencement reports in references 3, 4, and 31.
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. In a few cases other observatory data have been used.

		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	Honolul	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

* Date published by the Royal Greenwich Observatory in references 17 & 23

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

Column 1 Storm Serial Number.

Column 2 Greenwich Day.

GENERAL STORM CLASSIFICATION (Columns 3 through 8)

Column 3 Onset time UT

Column 4 End, Greenwich Day/UT

Column 5 Type, g - gradual, sc - sudden commencement

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

Column 7 Maximum three hour K_p

Column 8 Average Storm K_p. This has been calculated as the average K_p for the period shown in Columns 3 and 4.

NUMBER OF OBSERVATORIES REPORTING THE GEOMAGNETIC STORM (Columns 9 through 12)

These data have been taken from the IAGA Bulletins 12i, 12j, and 12k (reference 3). 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 decidedly not recorded on the magnetogram although the records were satisfactory

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

NUMBER OF ssc IN THE PUBLISHED LISTS (Columns 13 through 15)

Column 13 From reference 3. This is the sum of the A's and B's, Columns 9 and 10.

Column 14 From reference 31.

Column 15 From reference 4.

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

Column 16 Planetary three-hour indices (from reference 5)

Column 17 Sum of the K_p for the Greenwich day (reference 5)

TABLE V-A. MAJOR GEOMAGNETIC STORMS DURING 1954-1956

A list of all storms during 1954-1956 with at least one K_p equal to or greater than 7+ is given on Table V-A, page 1.V-4. These data are taken from reference 3: pages 87, for 1954; page 121, for 1955; and page 153 for 1956.

Column 18 Ap for the Greenwich day (reference 5)

Column 19 The Greenwich day and three hour interval with the first $K_p \geq 4-$

Column 20 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 1.V-i, with the exception of the Greenwich (Gr) data, the values given in Columns 21 through 27 were taken from reference 31. The Greenwich data were published in The Observatory (references 17 and 23).

Column 21 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 22 H-Horizontal Intensity. The magnitude of the horizontal component, always considered as positive. In units of gammas (10^{-5} gauss)

Column 23 Z-Vertical Intensity. The magnitude of the vertical component. Positives if downward, negatives if upward, in units of gammas (10^{-5} gauss).

Column 24 Onset Time. This is the time reported by the observatory.

Column 25 End Time. Reported by the observatory (Greenwich Day/UT)

Column 26 Maximum K_p. This is the maximum three-hour K_p reported by the observatory.

Column 27 Name of the Observatory. The code is given on page 1.V-i.

Column 28 Range of Starting Time. This is the range of starting times reported.

TABLE V CATALOGUE OF GEOMAGNETIC STORMS DURING 1954 - 1956

Serial No.	Date	Onset	End	Type	Max. Int.	Max. Kp	Average Storm Kp	A	B	C	D	3	31	4	Three Hour Interval GR. 1	2	3	4	5	6	7	8	Σ Kp	Ap	Kp Interval IST Kp ≥ 4 – Date/Interval	Time Where 3 Consecutive Kp ≤ 4 – Day/Interval	D	H	Z	Onset	End	Max. Kp	OBS	Range of Starting Time	Sources
	1954																																		
1	Feb. 21	1034	24/00xx	sc,ᵋ	ms	6o	4+	15	-	3	-	15	11	10	1+ 2+ 2o 3- 4- 5o 6- 6- 29o									30	21/5	24/1	5	94	36	1000	24/01xx	5	Ho	1000 - 1037	
	22														5- 4- 4- 3o 4+ 4- 4+ 31+									26												
	Mar. 24														6o 5+ 4o 4- 4o 3+ 4- 3o 3o 4- 5- 35-									36												
	25														3o 1- 3- 3+ 4- 3o 3o 3+ 23-									15												
2	22	1716	25/15xx	sc,ᵋ	ms	6o	6+	28	-	7	-	28	9	12	4- 2o 2o 3- 1o 2+ 6o 5+ 25o									24	22/7	25/4	29	106	67	1717	27/04xx	6	Ch		
	23														5o 4- 4- 4o 4o 3+ 6o 6o 36+									42			8	95	41	1717	24/12xx	5	Ho		
	24														4+ 4o 4+ 4o 2+ 4o 4+ 4+ 32o									28			50	343	315	1717 ●	24/11xx	5	Si		
	25														4o 3+ 4- 3o 2o 2+ 3+ 2o 24-									15												
	April 26																																		
3	11	1529	12/24xx	sc,ᵋ	ms	7+	5o	7	-	7	-	7	5	2																					
	27																																		
4		1650	13/03xx	sc,ᵋ	mc	7+	5o	11	-	6	-	11	4	6	3+ 2- 1o 2- 1+ 4- 6- 7+ 26-									35	11/6	13/1	11	175	48	1600	12/24xx	6	Ho	1628 - 1700	
	28														7+ 5o 4- 3+ 4+ 5- 4+ 39-									56			92	960	431	1655	13/03xx	7	Si		
	May 29														3+ 2o 4+ 3+ 4+ 5- 4+ 25-									25			26	175	46	1700	13/03xx	7	Tu		
5	30	0722	25/15xx	sc,ᵋ	ms	6o	4+	33	-	2	-	33	11	16	4- 3o 3+ 4+ 3+ 4- 4+ 5- 30+									25	23/1	25/6	200	1390	1130	0736	25/17xx	6	Co	0700 - 0736	
	31														5o 5+ 5o 4+ 4+ 6o 5- 4o 39-									45			105	678	583	0723	25/16xx	7	Si		
	June 01														3- 4- 2o 2+ 3+ 2o 1+ 1+ 18+									10			16	136	23	0700	25/13xx	5	Tu		
	02														4o 4o 2+ 3+ 2o 2o 3- 3+ 24o									16			18	85	33	0747	27/19xx	5	Ch		
	03														4o 5+ 4- 4o 5- 4- 4+ 34o									32			20	147	78	0727	25/15xx	5	Am		
	04														2+ 2+ 2- 2- 2o 2+ 2+ 17o									8			5	106	25	0746	27/24xx	-	El		
6	27	0747	27/19xx	sc	m	5o	4-	33	-	4	-	33	5	21	1o 3- 3+ 5o 3+ 4o 2- 1o 22o									17	27/4	27/7	3	95	29	0747	28/00xx	5	Al	0723 - 0747	
	Nov. 05														5- 5+ 4o 4- 4o 3- 2- 1+ 27+									24												
7	23	1145	23/23xx	sc	m	5o	3o	26	-	3	-	26	4	12	1o 3o 1o 2o 2- 5- 3+ 2+ 19o									13	23/6	23/7	2	95	16	1145	23/23xx	5	Al	1145 - 1147	
	24																											1	139	26	1147	23/22xx	-	Bl		
	25																											9	126	21	1145	24/04xx	-	El		
	26																											7	72	93	1145	23/22xx	5	Hr		
	27																																		
	28																																		
	1955																																		
	Jan. 01																																		
8	11	1219	12/04xx	sc	m	5o	4-	45	-	-	-	45	2	33	2+ 2- 1- 1o 5- 1+ 3- 5o 19+									16	11/5	12/2	3	78	35	1218	12/15xx	5	Al		
	12														5o 2+ 2- 1- 0o 0+ 1+ 0+ 12-									9			23	71	29	1219	12/04xx	5	Ch		
9	17	0322	20/07xx	sc,ᵋ	s	8-	6+	25	-	4	-	25	13	16																					
10		0930	20/04xx	sc	s	8-	7-	20	-	5	-	20	4	11	1+ 3o 3o 4o 7- 6- 5o 5+ 34o									43	17/4	20/3	410	1500	2010	0324	20/07xx	7	Co	0322 - 1344	15
	18														8- 7o 6- 2- 4+ 4o 4o 5- 4o 36+									59			39	210	120	1344	19/xxxx	-	Gr		
	19														5o 6+ 6+ 5+ 5- 4o 4o 5- 4o 4o 5-									53			8	195	50	1000	19/19xx	7	Ho		
	20														4+ 4- 2+ 1o 2+ 2+ 3+ 4-									16			122	1720	649	1000	20/07xx	9	Si		
	21														4o 3- 2o 1- 1- 1o 2o 2+ 15+									9			35	187	20	1130	20/06xx	7	Tu		
	22																											3	81	40	0851	28/09xx	5	Al		
	23																																		
	24																																		
20	22	1039	24/18xx	sc	m	5-	3o	45	-	5	-	45	6	29	1+ 1- 0+ 3+ 3- 3o 2+ 2- 16+									10	23/7	24/6	20	101	56	1040	23/13xx	5	Ch	1038 - 1040	
	09														3+ 3+ 2- 2- 2o 2o 5- 4o 24o									17												
	08														4o 3+ 4o 4- 4- 2+ 2- 3- 26o									18			15	124	50	1038	25/12xx	5	Tu		
	07																																		
19	June 06	1728	09/00xx	sc	m	5o	3o	44	-	5	-	44	6	26	0+ 1- 1+ 1o 2- 2+ 4o 4o 15+									10	06/7	07/1	14	101	28	1127	9/00xx	4	Tu		
	05														3+ 3o 2o 3- 3- 2o 1o 3+ 12o									12												
	04														3o 5o 3o 3- 4o 5- 2+ 4- 28+									23	08/2	09/1										
	03														0+ 2- 2+ 2+ 3- 1+ 2o 3- 15+									8												
	02																																		
	01																																		
	May 31																																		
	30																																		
	29																																		
	28																																		
21	27	1514	-	sc	ms	6o	-	12	-	11	-	12	-	3	0+ 1- 1o 1- 1- 2- 2o 3- 1o									5	28.2	28.5										
	Aug. 28														1- 4- 6o 4- 3- 2- 2- 1+ 21+									20												

TABLE V 1954 - 1956 (CONTINUED)

Serial No.	Date	Onset	End	Type	Max. Int.	Max. Kp	Average Storm Kp	A	B	C	D	3	31	4	Three Hour Gr. Interval 1	2	3	4	5	6	7	8	ΣKp	Ap	Kp Interval 1st Kp ≥ 4- Date/Interval	Time When 3 Consecutive Kp ≤ 4- Day/Interval	D	H	Z	Onset	End	Max. Kp	OBS	Range of Starting Time	Sources
22	Oct. 05	1118	06/18xx	sc,g	ms	6-	4o	15	-	11	-	15	2	6	2+	2-	3o	3+	6-	5-	26+	23	05/7		06/7	17	68	79	11xx	06/18xx	5	HF	1118 - 11xx	
23	07	2257	08/22xx	sc,g	m	4-	2+	44	-	-	-	44	7	30	1+	2-	2o	2o	1+	1-	4-	14o	8	07/8	08/1	3	80	25	2258	08/21xx	5	Ho	2250 - 2258	19
24	08	0043	26/23xx	g	ms	6o	5o	-	-	-	-	-	10	-	0o	0o	1o	1-	0o	1-	1o	4o	2	24/8	26/8	240	1430	840	25/00xx	27/02xx	7	Co	24/0000 - 25/0043	
25	Nov. 19	1319	21/05xx	sc	s	8-	7o	29	-	4	-	29	6	21	3o	2o	3o	5+	8-	7o	6-	5o	39-	65	21/2	30	190	172	1320	21/10xx	6	Am		14
	20														6o	5o	4o	5o	6o	5o	4-	4o	47			51	200	226	1319	21/00xx	7	HF		
	21														4o	3o	2+	2-	1-	0o	1-	0o	12+	8			11	117	37	1319	20/05xx	6	SJ		
																										66	274	298	1319	21/05xx	7	WI		
26	Jan. 10	0439	12/00xx	g	ms	6o	4+	1	2	13	40	3	5	2	0o	3+	4-	4-	5+	4o	5-	28+	26	10/3	11/8	3	120	30	0400	11/15xx	5	Ho	0400 - 0439	
	11														6o	4+	5-	6o	4o	3+	5+	2o	36-	42			13	129	22	0400	13/09xx	6	Tu		
	12														1o	2+	2+	4-	3-	4-	6-	4-	25o	21											
27	17	2343	19/21xx	sc,g	ms	6-	5-	8	25	14	9	33	11	17	1-	2-	2o	2-	2+	1-	1+	3o	13+	7	18/1	19/8	28	114	51	17/2343	19/17xx	5	Ch	17/2342 - 18/2300	
	18														5o	5+	4+	4o	4o	6-	5-	6-	37o	40			11	99	26	17/2342	19/xxxx	5	Tu		
	19														6-	4o	4+	4-	5o	4-	4-	3-	33-	32			33	150	80	18/2300	18/xxxx	-	Gr		
28	21	1644	22/12xx	sc	ms	6-	5-	40	16	-	-	56	11	34	2o	0o	0o	1-	1-	3-	4-	14-	9	21/8	22/8	15	83	59	1644	22/15xx	5	HF		19
	22														6-	6-	4+	4-	2-	1o	4o	1+	27+	29			8	383	57	1644	25/03xx	5	Hu		
															7-	7o	7o	4-	5-	4-	4o	44o	80			11	71	38	1644	22/12xx	5	SJ		
															4o	3+	2+	2+	2o	1o	1+	2o	18+	11			20	180	45	1644	22/12xx	6	Wi		
29	27	0900	28/24xx	sc,g	ms	6+	4+	28	19	4	4	47	13	27	2-	1+	2-	4o	4-	5-	6o	3+	28-	27	27/3	28/8	30	220	90	0900	28/xxxx	-	Gr		
	28														5o	6+	5-	4o	4-	3+	4o	3+	34+	37			3	150	25	0900	28/11xx	5	Ho		
30	Feb. 11	0053	12/14xx	sc	m	5+	4o	8	13	15	19	21	2	8	4o	3o	2-	2o	3+	3-	5-	5-	26o	20	11/7	12/5	4	156	46	0056	12/14xx	5	Al	0053 - 0056	
	12														5o	5-	5+	3o	2o	2o	3o	2o	30-	28			22	131	71	0053	12/14xx	5	Hr		
31	19	0221	20/00xx	sc	m	4+	3o	42	6	-	1	48	2	39	4+	2+	3o	4+	4-	2+	2+	25+	17	19/1	19/6	2	128	23	0220	20/00xx	5	Al		20
	20														1-	1-	1o	1o	3+	2o	1-	1+	11-	6			7	106	50	0220	20/15xx	-	Bl		
32	21	2002	22/17xx	sc	m	4+	3+	41	13	-	-	54	4	35	1-	1+	1o	1+	2o	2o	3+	2-	13+	7	-		2	88	30	21/2002	22/21xx	5	Al	2000 - 2003	19
33	22	0016	-	sc	m	4+	-	44	11	1	-	55	-	29	4o	4o	3o	4+	3+	2o	1+	1o	24o	18	22/1	22/5	9	115	29	21/2000	22/19xx	5	Ap		
															1-	1-	1o	3+	4o	1-	1+	1o	26o	20			6	198	18	21/2003	22/19xx	5	Hu		
34	25	0307	25/22xx	sc	s	8+	7o	54	3	1	-	57	15	42	1-	6o	8+	7+	7-	7-	7-	3+	46-	103	25/2	25/8	53	310	358	0309	25/22xx	7	CH	0306 - 0310	13,15,20
																											580	1570	1550	0306	26/16xx	7	Co		
																											50	240	200	0308	25/xxxx	-	Gr		
																											7	360	65	0310	27/09xx	8	Ho		
																										213	2638	1120	0308	25/22xx	9	SI		
35	02	2342	04/15xx	sc,R	ms	7+	5+	22	21	8	2	43	12	28	3+	5o	5-	4+	3+	3+	3+	30+	26	03/1	04/6	8	180	50	02/2342	04/09xx	7	Ho	02/2342 - 03/0650	20
36	03	0690	04/17xx	sc	ms	7+	5+	17	12	4	3	29	1	8	5-	6-	7+	6+	6o	7+	7o	5i-	102			19	227	59	02/2342	04/12xx	6	Tu		
	04														5+	4+	4+	3+	4o	3o	2-	1+	27+	24			319	1980	1145	03/0143	04/17xx	7	Co		14
																											50	225	200	03/0650	03/xxxx	-	Gr		
37	10	1058	11/09xx	sc	ms	6o	4o	2	18	12	18	30	1	-	2-	3o	3-	3-	1+	1+	4o	6o	23-	20	10/7	11/4	18	65	91	18xx	11/07xx	5	HF	1058 - 18xx	
38	11	1813	11/07xx	R	ms	6o	5o	5	15	15	16	20	1	-													30	175	60	1058	11/09xx	6	WI		
39	20	1146	23/07xx	sc,R	ms	7o	5-	2	27	13	10	29	6	12	6o	4-	4+	3-	2o	2o	2o	4o	27-	24											
40	21	1615	23/09xx	sc	ms	7o	5+	18	16	9	1	34	3	17	4+	3+	5+	4+	3+	5-	5o	6-	36o	39	21/1	23/4	6	140	26	20/1200	23/08xx	6	Ho	20/1146 - 21/1615	
	22														7o	6+	5o	4-	4o	4+	4+	6+	41o	60			36	120	130	21/1615	23/xxxx	-	Gr		
	23														6+	6o	5o	2o	2-	1+	1o	0+	24-	31											
41	Apr. 02	0721	02/23xx	sc	m	5+	4o	6	28	11	8	34	1	16	2-	1o	2-	4o	4o	4-	4o	4+	24+	19	02/4	03/3	4	122	24	0721	2/23xx	5	Al	0721 - 0917	
42	03	0917	-	sc	m	5+	-	5	9	14	25	14	-	5	4-	5o	3+	3o	2o	3+	3o	2o	2+	26-	20										
43	21	0853	23/08xx	R	ms	7+	5+	1	12	16	22	13	3	3													38	260	185	1110	22/xxxx	-	Gr		
44	22	1101	22/24xx	sc,R	ms	7+	5+	42	10	-	2	52	11	34													5	230	30	1100	23/13xx	6	Ho	0800 - 1110	
45	23	1356	-	sc	ms	7+	-	13	5	5	9	18	-	6	3+	3+	5+	5+	5-	7o	4-	4o	39+	59	21/4	23/2	239	1733	942	08xx	23/04xx	9	SI		
46	25	1133	26/21xx	R	s	9-	3-	16	13	8	3	29	1	30	3+	1+	1o	3-	1+	2+	2o	2o	16o	8	-	-	6	111	24	25/1132	26/21xx	5	Ap		
47	26	2111	28/13xx	sc	s	9-	7+	53	1	1	-	54	16	44	2o	3+	4-	4o	2+	4o	8-	3o	31o	40	26/3	28/4	158	949	805	26/2112	30/23xx	9	Ch		
	27														8-	9-	8-	8-	7-	7-	7o	6-	59-	172			490	2850	1940	26/2111	01/19xx	8	Co		15,19
																											58	545	470	26/2111	30/xxxx	-	Gr		
																											9	410	45	26/2111	29/18xx	8	Ho		15
																											345	2234	1154	26/2111	28/13xx	9	SI		
															7o	7o	4o	3-	1+	2o	3+	5+	7o	38+	64	28/7	29/6	35	322	103	26/2112	28/12xx	7	Tu		
48	28	1727	29/21xx	sc,R	s	8-	6-	26	17	6	2	43	6	31													90	791	443	28/1727	29/21xx	8	SI	1727 - 1857	20
49	29	1857	29 21xx	sc	s	8-	6-	27	13	4	2	40	3	21	8-	6+	6o	5+	4-	3+	2o	2+	37-	58			26	142	47	28/1727	29/17xx	6	Tu		
50	30	0138	01/15xx	sc	ms	6+	5-	48	6	-	-	54	13	40	6o	6+	5o	4+	5o	5o	5-	3+	40-	51	30/1	01/6	5	95	40	30/0138	01/17xx	6	Ho	0138 - 0241	
51	02	0241	-	sc	ms	6+	-	27	5	6	2	32	-	6													83	912	568	30/0138	01/15xx	7	SI		
	May 01														4-	5-	3-	4o	4o	3+	2o	1o	26o	20			14	138	45	30/0138	01/15xx	5	Tu		

TABLE V 1954 - 1956 (CONTINUED)

Serial No.	Date	Onset	End	Type	Max. Int.	Max. Kp	Average Storm Kp	A	B	C	D	3	31	4	Three Hours Gr. Interval 1	2	3	4	5	6	7	8	Σ Kp	Ap	Kp Interval 1st Kp ≥ 4- Date/Interval	Kp Interval Kp ≤ 4- Day/Interval	Time When 3 Consecutive Kp ≤ 4-	D	H	Z	Onset	End	Max. Kp	OBS	Range of Starting Time	Sources
52	May 11	2342	13/19xx	sc,g	ms	7-	4+	18	29	5	-	47	10	34	2-	1-	0+	0+	2-	1-	0+	0+	5	38	13/9			36	120	113	11/2355	13/15xx	6	Ch		
53		2354	13/19xx	sc	ms	7-	4+	19	13	10	8	32	2	13	4	5-	4+	4+	5+	3+	4+	4+	5	38	13/6			95	1010	649	11/2342	13/17xx	8	Sl		
54	13	2222	17/18xx	sc,g	s	8+	5-	4	20	19	9	24	2	13	3-	4-	7-	6-	4-	3o	2o	3o	31-	34	11/8			34	276	208	13/2222	17/18xx	7	Am	13/2220 - 13/2222	
55	14 15 16	0417	17/15xx	sc,g	s	8+	7o	32	10	2	2	42	8	31	2+ 4o 5+	2o 3+ 7+	3o 4- 8-	4- 5- 7o	5+ 5o 8+	3+ 6+ 8-	2+ 4+ 8-	2o 4+ 7o	42 37+ 56o	156	14/4	17/6		14	265	43	16/0418	17/04xx	7	Hu	16/0417 - 16/0421	20
56	17 20	0638	21/09xx	sc	ms	6+	4+	41	13	-	1	54	12	41	6o 7o 20	7o 8o 2-	8o 5o 4-	6o 4o 6+	4o 5o 8o	2+ 3+ 6+	3+ 4+ 5o	4+ 5o 33o	39	20/3	21/3		17 34	166 113	14 15o	16/0418 20/0638	17/12xx 21/06xx	6 6	Sd Ch		
	21 22														4+	3-	2-	2o	3-	1+	22-	15					5o	227	162	16/0421	17/15xx	7	To		
57	23 24 25 26	1011	26/09xx	g	ms	7-	5+	1	9	13	32	10	3	3	2+	0+	1o	3+	4o	4o	4o	7-	26-	28	23/5	26/2		147 230 43 18 40 23	1120 1440 225 109 114	624 760 230 43 150	20/0638 20/0639 23/1200 20/0636 23/0933 23/2202	21/09xx 22/22xx 25/xxxx 21/09xx 25/11xx 26/09xx	9 7 - 5 7 6	Sl Co Gr Tu Tu Wa	20/0636 - 20/0639 23/09xx - 23/1200	20
58	27 28	0548	-	sc,g	ms	7o		15	18	6	5	33	2	15	6+ 7o 1-	6o 7o 1-	6- 6o 2+	7o 4o 1+	6+ 3+ 1+	6- 2o 1+	7o 4o 2+	6- 6o 3-	50+ 4o 24-	95 69 15				-	-	-	24/0548	-	-	Al		-
59	29 30	1308	-	sc	ms	6-	-	12	-	17	20	12	-	2	1+ 3o	1- 3o	0+ 3o	2o 3-	4o 4o	6- 2+	5- 3o	2oo 24-	19 15	29/6	30/1		8	168		24/0547	25/02xx	-	El		
60	June 05	1512	-	sc	m	4-	-	12	20	12	11	32	-	15	1+ 1+	2o 2+	3- 2o	1+ 3-	2o 5o	4- 4-	3+ 2o	2o 2-	18+ 21-	10 14	05/6	05/7										
61	23 24 25 26	1806	25/23xx	sc,g	ms	7-	5o	23	29	4	1	52	10	26	2+ 6+ 5o 3-	1+ 7- 3o 2-	1o 6+ 5o 3-	2o 4- 6o 3-	2- 4o 6o 2+	2o 2+ 5- 1+	5- 4o 6o 3-	6+ 2+ 5- 2+	21+ 37+ 37+ 25+	21 46 52 18	23/7	25/8		420 344 23 7	1720 1742 151 90	1880 870 70 40	1805 18xx 1807 1009	27/23xx 25/19xx 25/19xx 09/03xx	7 9 6 6	Co Sl Tu Ho		-
62	July 08	0102	09/14xx	sc	m	4+	3o	28	20	2	1	48	1	33	3+ 4-	3+ 3o	3- 3+	2o 2o	2- 3-	1+ 1o	2o 1-	4+ 2-	21- 18o	13 11	08/8	09/2		-	-	-	0104	09/14xx	-	Am	0102 - 0104	
63	12	1915	-	-	m	5o	-	-	-	-	-	-	-	-	2-	3o	1+	2+	1+	3-	2-	17-	9												
64	13 14	1245	14/02xx	g	m	5o	3o	4	22	11	16	26	1	-	3+ 5o	2+ 2o	1+ 1+	2- 2-	3o 2o	4+ 2o	5- 2+	4+ 3o	25o 19+	20 13	13/6	14/2		20	180	70	1200	14/02xx	6	Wi	12/1915 - 13/1245	
65	Aug. 09	1041	09/24xx	sc	m	5-	4o	40	17	-	1	57	4	33	2o	2+	2o	4o	5-	4+	4o	4-	27o	21	09/4	10/1		6	71	39	1041	10/03xx	5	Ap		-
															4-	3o	3+	3-	2o	1o	1-	2-	18o	11											
															5o	2o	1+	2-	2o	2o	2+	3o	19+	13				3	299	34	1040	09/21xx	5	Hu		
															4-	3-	4-	3+	2+	2o	1+	2o	13o	9				-	-	-	1041	10/06xx	4	Hr		
															3o	3+	4o	3+	4-	4o	5-	4+	27o	21	09/4	10/1		25	180	75	1040	09/24xx	5	Wi		
															3o	3o	2+	1+	2+	1o	3-	17+	9	-	-	11/7		30	195	28	11/0043	12/21xx	5	Ch		-
66	10	1310	-	sc	m	5+	-	12	6	10	11	18	-	12																						
67	11	0043	12/23xx	sc	m	5+	4o	52	-	-	-	52	12	40	5o	4o	4o	4+	5+	3+	4+	5+	34+	33	11/1	11/7		120	910	510	11/0043	12/23xx	6	Co		
68	12	0228	13/06xx	sc	m	4+	3o	8	23	8	6	31	1	8	3o	3+	3+	4o	3-	4-	4+	28-	20	12/5	13/1		47	383	330	11/0043	12/23xx	5	Sl		
	13														1-	1+	2-	2+	1+	2-	2o	12+	6												
69	21	0507	21/21xx	sc	ms	6-	4-	12	28	10	5	40	4	20	0+	2o	3-	3+	6-	5-	4-	4-	26o	24	21/5	22/1		15	97	76	21/0508	22/01xx	6	Hr		-
70	22 23	2201	26/09xx	sc	s	8-	5+	10	18	7	6	28	4	7	3o 4o	2- 4-	2- 4-	3+ 5+	2+ 3+	3- 4-	3o 6o	19+ 31+	11 6o	31	23/3		9 36	208 205	40 260	21/0507 23/2000	21/21xx 26/xxxx	6 5	Hu Gr		
	24 25 26														7o 4o 6+	6- 4- 4+	4o 4+ 5+	6- 5o 3+	7- 6+ 3-	8- 5o 3-	5o 4o 4+	5- 4o 2+	46+ 35- 32o	84 35 34				12 29 23	81 159 114	57 59 150	23/2202 23/2202 23/2202	24/24xx 26/11xx 26/09xx	5 6 6	Sd To Wa		
71	27 31	1016	31/23xx	sc	m	5+	4+	31	22	1	3	53	5	-	1-	1-	1+	5+	4+	4+	4o	3-	23+	21	31/3	31/8		49	433	453	1018	31/23xx	7	Sl	1016 - 1018	20
72	Sept. 02	0114	03/19xx	sc,g	s	8o	5+	2	17	25	13	19	5	3	5o	8-	8o	7-	5-	4o	4o	3o	42o	82	02/1	03/6		260	1420	1530	0115	3/19xx	7	Co	0114 - 0231	14,14,15
73	03	0230	03/15xx	sc,g	s	8o	6-	39	15	1	1	54	9	27	6-	6+	6o	6-	5o	3o	2+	2o	36o	48				5	280	50	0230	3/14xx	7	Ho		
																												207	2419	830	0115	3/19xx	9	Sl		
74	08	0730	10/02xx	sc	s	8+	4+	1	4	7	45	5	1	3																					
75		1006	08/21xx	sc	s	8+	6+	40	-	1	-	40	13	33	1o	4-	5+	8+	8o	6o	3+	37-	78	08/3	08/8		61	210	83	1007	08/24xx	7	Ch	0730 - 1443	
76		1443	-	sc	s	8+	-	18	5	3	5	23	-	4	3-	3-	4+	4+	3-	4o	3+	28+	22				61	515	250	1000	08/xxxx	-	Gr		
77	20	0438	22/12xx	sc	ms	6o	4o	21	21	3	4	42	5	24	2o	4+	4-	4o	5-	5+	4-	4o	32-	29	20/2	23/4		21	122	69	0438	23/12xx	5	Am	0437 - 1000	
78		1000	-	sc	ms	6o	-	5	10	20	14	15	-	2	5o	6o	5o	4+	4-	5-	4+	2-	34o	34				22	151	136	0438	22/20xx	5	Ar		
	21														5o	6o	5o	4+	4-	4-	3o	3-	33+	35				30	185	90	0437	22/20xx	6	Wi		
	22														4-	5o	3o	5+	4-	5-	4+	2+	34o	34												
	23														4-	3-	4-	3+	2+	2o	1o	2+	2oo	12												
	Oct. 27																																		
79	26	0027	28/14xx	sc	ms	7-	4+	20	20	4	3	40	5	30	5o	3o	4-	2o	4-	5-	7-	6-	33o	41	26/3	27/6		180	1170	820	0027	29/00xx	7	Co	0027 - 1312	
80		1312	28/14xx	sc	ms	7-	5o	36	19	-	1	55	11	28	6-	6-	4+	4-	4-	4-	3-	3+	32+	32				36	169	109	0027	-	5	Fr		
																												46	135	120	1312	27/xxxx	-	Gr		
																												106	774	468	1312	28/23xx	7	Sl		
																												14	185	65	1312	28/14xx	5	Tu		

TABLE V 1954 - 1956 (CONTINUED)

Serial No.	Date	Onset	End	Type	Max. Int.	Max. Kp	Average Storm Kp	A	B	C	D	3	31	4	Three Hour Gr. Interval 1	2	3	4	5	6	7	8	Σ Kp	Ap	Kp Interval 1st Kp ≥4 Date/Interval	Time When 3 Connective Kp ≤ 4 Day/Interval	D	H	Z	Onset	End	Max. Kp	OBS	Range of Starting Time	Sources
	Nov.																																		
81	09	2030	13/05xx	sc	ms	7-	5o	50	5	-	-	55	13	40	1+	1+	1+	2o	2o	3-	5o	4+	20o	15	09/7	13/3	420	1930	1390	09/2030	13/05xx	7	Co	-	14,20
82	10														6o	6-	6-	4+	5o	5o	5o	6+	43+	62			34	139	120	09/2030	13/04xx	6	Fr		
83	11	1105	-	sc	ms	7-	-	6	11	17	17	17	-	4													42	240	125	09/2030	12/xxxx	-	Gr		
		1337	-	sc	ms	7-	-	5	5	14	11	10	-	-	7-	7-	6+	5+	4+	3+	5-	7-	44o	72			224	1458	1248	09/2030	13/04xx	9	Si		
	12														6o	4-	5o	4+	6-	6-	4+	4+	39o	48			18	187	67	09/2030	13/05xx	6	Tu		
84	13	2138	16/24xx	sc	s	8-	5o	-	7	15	29	7	2	4	5o	4-	1+	3-	3+	2o	1o	2+	21+	16			47	240	180	13/2138	16/20xx	7	To	-	15
																											24	154	230	13/2138	16/24xx	6	Wa		
85	14	0200	16/21xx	sc,g	s	8-	5o	24	24	5	1	48	10	26	5-	5+	6-	4+	4-	4o	7o	6+	41o	59	14/1	16/8	380	2470	1230	14/0200	18/16xx	8	Co		
86	15	0807	-	sc	s	8-	-	18	14	3	42	32	-	8	7-	6+	8-	7+	6o	4-	4-	4-	45o	86			45	246	308	14/02xx	16/20xx	6	Fr		
	16														6+	7-	6o	4+	3o	3-	4+	3-	36o	48			37	260	110	14/0200	16/xxxx	-	Gr		
																											157	1655	895	14/02xx	16/23xx	9	Si		
																											23	165	54	14/0200	16/12xx	6	Tu		
87	25	0605	26/03xx	sc	ms	7o	4o	-	1	4	49	1	1	2																					
		1139	26/03xx	sc,g	ms	7o	4o	6	16	16	16	22	6	9	2+	2-	3o	3o	7o	4o	3+	3-	27o	29	25/5	26/2	23	213	34	1135	26/04xx	7	Fr	0605 - 1139	
88	26														4-	2-	1o	1-	1-	1o	1-	1-	10o	6			135	1892	842	0605	26/03xx	9	Si		
	Dec.																																		
89	24	0147	-	sc	m	5-	-	17	18	2	2	35	-	30	3+	3+	2+	2o	1+	1o	2o	1o	16+	9	-	-									
90	25	0754	26/14xx	sc	m	5-	4-	11	25	8	5	36	3	24	2-	2-	3o	5-	4+	3+	3+	4+	26+	21	25/4	26/4	11	105	64	25/0756	26/11xx	4	An	25/0753 - 25/0756	
	26														4-	5-	4+	3+	2-	1o	1-	0+	20-	16			16	86	78	25/0754	26/14xx	5	Hr		
																											13	294	89	25/0753	25/23xx	6	Hu		
91	27	1503	29/04xx	sc,g	m	5-	4-	19	21	7	4	40	6	24	0-	0+	1+	2-	1+	4o	4+	4-	17-	12	27/6	29/2	15	110	29	27/1500	29/06xx	6	Tu	27/1500 - 27/1513	20
	28														4o	3+	5-	3o	4o	4-	3+	3-	29-	22												
	29														4+	3o	2+	3o	3-	2+	3-	2+	23-	14												
92	30	0632	30/14xx	sc	m	5-	4+	16	23	6	2	39	2	25	2o	2-	5-	4+	3o	2+	2o	2+	22+	16	30/3	30/5	19	160	44	0633	31/04xx	5	Am	-	
																											25	83	84	0633	30/14xx	5	Hr		

TABLE V-A MAJOR GEOMAGNETIC STORMS DURING 1954 - 1956

Month	Day	Onset sc	1st 3 Hr. Kp ≥ 5-	No. 3 Hr. Interval	No. 3 hrs. With Kp= 7-	7o	7+	8-	8o	8+	9-	9o	Consecutive 3 hr-Kp's No Kp<5-, at Least One Kp ≥ 7+ 6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	Ap	Storm Table V
1954																																
Apr.	11	1650	11/7	5	1	-	2							6-	7+	7-	7+	5o													35,56	4
1955																																
Jan.	17	0930	17/5	7	1	1	-	1												7-	6-	5o	5+	8o	7o	6-					43,59	10
Apr.	27	1624	27/6	4	-	1	1	1					5-	8-	7+	7o															54,44	16
Nov.	19	1319	19/4	6	-	1	-	1												5+	8-	7o	6-	5o	6-						65,47	25
1956																																
Feb.	25	0307	25/2	6	3	-	1	-	-	1							6o	8+	7+	7-	7-	7-									103	34
Mar.	3	2/2342	03/1	9	-	1	2	-	-	-						5-	6-	6+	7+	6+	6o	7+	7o		5+						102,24	35
Apr.	21	1101	21/4	9	1	4	1													5+	5+	5-	7o	7o	7-	7+	7o	7o			59,80	44
	26	2111	26/8	11	2	3	-	3	-	-	2				8-	9-	9-	8-	8-	7-	7-	7o	6-		7o	7o					40,172,64	47
	28	1727	28/7	6		1	-	1						5+	7o	8-	6+	6o	5+												64,58	48
May	16	0417	16/1	13		3	1	3		1						5+	7+	8-	7o	8+	8-	7o	8-		7o	6o	6-	5+	5o		156,52	55
Aug.	24	23/2201	24/4	5	1	-	-	1											6-	7-	8-	5o	5-								84	70
Sept.	2	0230	02/1	5	1	-	-	1	1							5o	8-	8+	7-	5-											82	73
	8	1006	08/4	4	-	-	-	-	1	1									5+	8+	8o	6o									78	75
Nov.	14	0200	14/7	7	1	1	1	1						7o	6+	7-	6+	8-	7+	6o											59,86	85

V-4-1

V-4-2

VI. CATALOGUE OF SOLAR-TERRESTRIAL EFFECTS DURING 1954 – 1956

VI

TABLE VI. CATALOGUE OF SOLAR-TERRESTRIAL EFFECTS DURING 1954-1956

This table will include short wave radio fadeouts of importance 3 or greater 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, Solar Flare Effects from reference 3. 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 14. This is limited to large decreases at Mt. Washington.

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

Column 1 Date

Column 2 Major Flare Serial Number from Table 1.I

FLARE DATA (Columns 3 through 7)

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 3 Flare Beginning Time

Column 4 Flare End

Column 5 Time of Maximum

Column 6 Heliographic Position of the Flare

Column 7 Flare Importance

SHORT WAVE FADE (Columns 8 through 12)

Column 8 Onset

Column 9 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 10 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 11 Duration in Minutes

Column 12 Widespread Index. The degree of confidence in identifying the event by individual stations is combined into an index of certainty that the event is geographically widespread, ranging from 1 (possible - single station reporting) to 5 (definite - many stations reporting).

SOLAR FLARE EFFECT (Columns 13 through 15)

Preliminary reports of solar flare effects, sometimes referred to as a magnetic crochet, have been published in the Journal of Geophysical Research, reference 4. The SFE's recorded in this catalogue are limited to those listed in reference 3. As a "distinctly" SFE or an "unmistakable" SFE (Classes A and B). The list of the reporting observatories is given in reference 3.

Column 13 Beginning Time

Column 14 Number of Observatories Reporting the Effect

Column 15 Intensity. Strong effects, indicated by the letter "S", are marked by an asterisk in reference 3. Insofar as possible the SFE has been associated in time with a solar flare.

POLAR-CAP ABSORPTION (Columns 16 through 22)

Column 16 Onset Time. If reference 1 is listed in Column 21, the starting time has been taken from that source.

Column 17 Rise Time in Hours from Reference 1

Column 18 Duration in Hours

Column 19 Absorption in db on the 30 Mc/s Riometer.

Column 20 Probable Flare -day/beg. If a polar-cap absorption-flare, association is given in the literature the reference is underlined in Column 21.

Column 21 The Sources Checked during the preparation of this catalogue have been listed.

GEOMAGNETIC STORMS (Columns 22 through 31)

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 them with a major flare, or it was preceded by a PCA and/or followed by a Forbush decrease.

Column 22 Onset Time

Column 23 End Time

Column 24 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 25 Maximum Intensity - The symbols m (moderate K_p as great as 5) ms (moderately severe K_p = 6 or 7) and s (severe K_p = 8 or 9) have been used.

Column 26 Maximum K_p

Column 27 Number of Magnetic Observatories Reporting the Storm as an sc in reference 3.

Column 28 ΣK_p. This is the sum of the 8 three-hour Greenwich day K_p's, from references 3 and 4.

Column 29 Ap from reference 3.

Column 30 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 31.

Column 31 Sources of Flare Associations

FORBUSH DECREASE (Columns 32 through 35)

Column 32 Onset Time. The day and hour given in reference 14.

Column 33 Magnitude of the Decrease in Percent.

Column 34 Duration in Hours.

Column 35 Probable Flare (day/hour) - An entry is given if a flare - Forbush decrease association was given in reference 14.

TABLE VI 1954 - 1956 (CONTINUED)

Date	Serial No.	FLARE Beg. UT	End UT	Max. UT	Position	Imp.	SHORTWAVE FADE Onset	Imp.	Type	Dur. Min.	W.S. Index	SOLAR FLARE EFFECTS Beg. UT	No. Obs. Report	Int.	POLAR-CAP ABSORPTION Onset	Rise Time (Hr.)	Dur. (Hr.)	Abs. db 30 mc/sec dbriomtr	Prob. Flare	Ref.
June																				
02		2230	2340	2254	N23 E03	2	2250	3-	SL	40	5									
04	27	0935	1025	0945	N22 E79	3	0939	2-	S	41	3									
06		0549	0613	-	N21 W40	2	0545	3-	SL	71	4									
07		No Flare Reported										0649	11	-						
		1837	2115	1856	N22 W69	2-	1840	3-	SL	78	5									
14		No Flare Reported					0356	3+	S	60	4									
		No Flare Reported					0955	3-	S	65	2									
20		No Flare Reported					1937	3-	SL	63	5									
22	28	1525	1820	1612	S20 W16	3	1548	3-	SL	67	5									
23																				
24		No Flare Reported					1255	3	S	30	5									
July																				
12																				
13																				
23																				
24																				
25		No Flare Reported					0310	3	S	29	5									
		0510	0625	-	S12 W57	1	0523	3	S	36	5									
26																				
Aug.																				
08	30	1128	1336	1150	N19 E48	3	1137	2	S	23	3									
09		0141	0204	0145	N21 E48	2	0140	3	S	45	5									
10																				
11																				
19		0120	0129	-	S21 E67	1	0117	3	S	33	1									
21		No Flare Reported					0140	3	SL	84	1									
23		0215	0220	-	S19 W35	1	0208	3	S	34	5									
26		No Flare Reported					0215	3+	SL	50	1									
27		0941	1018	-	N30 W34	2-	0945	3	S	31	1									
28		2220	2405	2252	N17 E51	2+	2243	2+	SL	30	5									
29	31	0937	1053	0956	N30 W63	3	0938	2	S	80	2									
30		No Flare Reported					0157	3+	S	71	5				Aug.					
		0952	1159	1003	N17 E32	2+	1000	3	S	30	1				31/1430	14	69	4.9		1
31	32	1226	1630	1248	N15 E15	3+	1239	3	S	81	5				31/1500		60	S	31/1226	14,15,22
															31/1600		59		31/1226	20
Sept.															31/1800					6
02																				
05		No Flare Reported					1322	3-	SL	45	5									
	34	1645	1800	1650	S25 E82	3	1640	3	SL	100	5									
08																				
09		No Flare Reported					0746	3-	S	48	3									
17	37	1942	2120	2002	S21 W15	3	1941	3-	SL	81	5									
24		No Flare Reported										1130								
27		0747	0808	0752	N22 E56	1						0755								
Oct.																				
11	40	0955	1113	1026	N22 W56	3	1012	3-	SL	50	4									
	41	1406	1530	1417	N22 W59	3	1411	3-	S	79	5									
22	42	0700	0903	0721	N17 E25	2+	0703	1	G	19	4									
				0838							1									
23	43	0745	0832	-	N15 E72	3	0749	1	S	28										
25		0720	0855	-	S23 E53	1						0814	17	-						
26																				
Nov.																				
07	44	1109	1403	1135	S17 E32	3+	1127	3-	SL	153	5									
09																				
10		No Flare Reported					0330	3	SL	90	4									
		0840	0904	-	N27 W07	1	0840	3	S	42	1									
11																				
13	46	0157	0254	0203	N28 W50	3-	0158	2+	S	62	4									
		1430	1555	1501	N16 W10	2	1430	2+	SL	120	5				Nov.					
															13/2000	27	63	5.4		1,
14	47	1037	1427	1055	S20 W55	3	1037	2+	SC	78	4				13/2100	-	48	m	13/1430	15,22
15	48	0700	1010	0813	S12 E11	3	0808	2	S	20	4									
20	49	1002	1310	1020	S15 W56	3	1007	3-	S	59	5									
22		1312	1415	1341	S15 W83	2	1330	3	S	65	5									
Dec.																				
02		1400	1406	1402	S15 E81	1+	1359	3-	SL	128	5									
06	50	1405	1414	-	S21 E41	3	1338	3-	S	38	5									
		1600	1635	1607	S16 E35	2	1602	3-	S	83	5									
		No Flare Reported					1742	3-	S	58	5									
07		No Flare Reported					0457	3	SL	91	1									
15		0520	0545	0525	S25 W30	2	0522	3	S	48	4	0525	6	-						
17		0205	0216	-	N25 W37	1	0200	3-	SL	90	4									
		0453	0554	0500	N15 E55	2	0450	3-	SL	69	4	0455	6	-						
		1227		-	S12 W90	2	1229	3-	SL	61	5									
	51	1535	1705	1551	S 24 W52	3	1545	3	SL	75	5									
18		0404	0423	0411	S25 W68	1+	0358	3-	S	32	4									
	52	0830	1026	0856	S25 W69	2+	0826	3	S	40	5	0837	5	-						
		2045	2313	2204	S22 W75	2	2040	3	G	60	5									
19	53	0725	0841	0752	N15 E25	3	0603	3	S	60	5									
		0835	1143	0853	S15 E84	2	0839	3	S	62	5									
	54	1452	1540	1457	N15 E21	2+	1450	2	SL	25	5									
20		0432	0447	-	N12 E15	1	0442	3	S	81	5	0444	9	S						
	55	0603	0730	-	N13 E17	3-	0637	3-	S	33	5	0640	8	-						
24																				
25		2150	2215	2215	S16 W02	2	2218	2	S	27	5									
26		No Flare Reported					0047	3+	S	93	5									
	57	1401	1442	1412	S17 W11	3	1403	3-	SL	97	5									
27																				
29		0040	0255	0045	N17 E59	1+	0044	3+	S	106	1									
30																				

Date	GEOMAGNETIC STORMS Onset	End	Type	Max. Int.	Max. Kp	Final Reported Reference 3	4	Σ Kp	Ap	Probe Flare	Ref.	FORBUSH DECREASE Onset	Mag. Dec. %	Dur. (Hrs)	Rate Decrease %	Prob. Flare
June																
23/1800	25/23xx	sc,g	ms	7-	52	26		21+	21							
July																
12/1915	-	sc	m	5o	-	2		17-	9							
13/1245	14/02xx	sc,g	m	5o	26	-		25o	20							
23/1245	24/18xx	g	ms	6o	-	5		22o	16							
24/0012	-	sc	ms	6o	-	4		27-	24							
26/0031	-	sc	ms	6-	-	3		37+	41							
Aug.																
09/1041	09/24xx	sc	m	5-	57	33		27o	21							
10/1310	-	sc	m	5+	18	12		17+	9							
11/0043	12/23xx	sc	m	5+	52	40		34+	33							
21/0507	21/21xx	sc	ms	6-	40	20		26o	24							
23/2201	26/09xx	sc	s	8-	28	7		31+	31							
31/1016	31/23xx	sc	m	5+	53	-		23+	21	28/2220	20					
Sept.																
02/0114	03/19xx	sc,g	s	8o	19	3		43o	82			Sept.				
02/0230	03/15xx	sc,g	s	8o	54	27		43o	82	31/1226	14,15,20	02/0300	6.5	1	1.7	31/1226
08/1006	08/21xx	sc	s	8+	40	33		37-	78							
08/1443	-	sc	s	8+	23	4		37-	78							
Oct.																
26/0027	28/14xx	sc	ms	7-	40	30		33o	41							
26/1312	28/14xx	sc	ms	7-	55	28		33o	41							
Nov.												Nov.				
09/2030	13/05xx	sc	ms	7-	55	40		20o	15	07/1109	14,20	09/2100	8.3	11	2.2	
11/1105	-	sc	ms	7-	17	4		44o	72							
11/1337	-	sc	ms	7-	10	-		44o	72							
13/2138	16/24xx	sc	s	8-	7	4		21+	16	13/1430	15					
14/0200	16/21xx	sc	s	8-	48	26		41o	59							
15/0807	-	sc	s	8-	32	8		45o	86							
Dec.																
24/0147	-	sc	m	5-	35	30		16+	9							
25/0754	26/14xx	sc	m	5-	36	24		26+	21							
27/1503	29/04xx	sc,g	m	5-	40	24		17-	12	25/2156	20					
30/0632	30/14xx	sc	m	5-	39	25		22+	16							

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TABLE VI CATALOGUE OF SOLAR-TERRESTRIAL EFFECTS DURING 1954 - 1956

Date	Map. Flare Serial No.	FLARE Beg. UT	End UT	Max. UT	Position	Imp.	SHORTWAVE FADE Onset	Imp	Type	Dur. Min.	W.S. Index	SOLAR FLARE EFFECTS	POLAR-CAP ABSORPTION Beg. UT	No. Obs. Report	Int.	Onset	Rise Time (Hr.)	Dur. (Hr.)	Abs. db 30 mc/sec dritomtr	Prob. Flare	Ref.	GEOMAGNETIC STORMS Onset	End	Type	Max. Int.	Max. Kp	Final Repr. Reference 3	4	Kp	Ap	Prob. Flare	Ref.	FORBUSH DECREASE Onset	Mag. Dec.	Dur. (Hrs.)	Rate Decrease %/hr	Prob. Flare
1954	None																																1954 Nov. 02/1300	6.2	60	0.7	
1955 Jan. 16	1	2130	2220	-	N33 W41	3										1955 Jan. 16/2230 17/-		48	16 weak	16/2130	12 20 15	1955 Jan. 17/0322 17/0930	20/07xx 20/04xx	sc,R sc	s s	8- 8-	25 20	16 11	34o 34o	43 43	16/2130	15	1955 Mar. 22/1200	7.0	29	0.4	
17																																					
June 18	2	1218	1315	1232	S23 W25	3							1230	3																							
22	3	1904	1940	1910	S22 W21	3-							1905	6								1955 June 22/1039	24/18xx	sc	m	5-	45	29	16+	10						
Oct. 25																						Oct. 25/0043	26/23xx	sc,R	ms	60	-	-	42-	56						
Nov. 12	5	1116	1159	-	N27 E27	3	1127	2+	S	23	4		1128	14	S							Nov. 19/1319	21/05xx	sc	s	8-	29	21	39-	65			1955 Nov. 19/1730	5.4	8.8	1.0	
28							2230	3-	S	115	3																										
Dec. 03	6	1112	1245	1112	N22 E10	3	1105	3	S	20	5																										
06																																		1956 Dec. 06/0100	5.4	7.5	1.2	
1956 Jan. 17																						1956 Jan. 17/2343	19/21xx	sc,R	ms	6-	33	17	13+	7						
19	7	0535	0715	-	N22 E19	3	0558	1+	SL	32	1											21/1644	22/12xx	sc	ms	6-	56	34	14-	9						
21																						27/0900	28/24xx	sc,R	ms	6+	47	27	28-	27			1956 Feb. 08/-----	10.9	240	0.6	
27																						Feb. 11/0053	12/14xx	sc	m	5+	21	8	26o	20						
Feb. 11	8	2050	2143	2120	N21 E90	3	2110	3+	SL	55	5																										
17		0631	0710	-	N25 E77	2	0648	3-	S	32	1																										
No Flare Patrol 13		1438	1558	1450	N18 E47	1+	1440	3	S	48	5																										
14	9	0538	0730	0557	N21 E33	3	0532	3	SL	116	5	0537	7																								
16		1805	2039	1837	N21 E08	2+	1802	3	SL	93	5																										
17	10	0446	0652	0452	S20 E25	3	0443	3	S	77	4																										
19		1430	1657	1445	N25 W23	2	1429	3	S	151	5	1445				1956 Feb. 23/0400 23/0430	18	123	13 L.	23/0334	1 15,20,22	19/0221	20/00xx	sc	m	4+	48	39	25+	17	16/1805	20				
11		1100	1242	1120	N20 W04	3	1102	3	S	44	4																										
21		0435	0515	-	S20 W05	2	0424	3-	SL	69	4																										
23	13	0334	0510	-	N23 W80	3	0330	3+	S	160	5	0333	11	S																							
Mar. 25	14	2220	2309	-	S30 W21	3	2228	3-	S	72	5																										
02	15	1220	1340	-	N21 W64	3	1158	2	S	34	1											Mar. 03/0650 10/1058	04/17xx 11/09xx	sc sc	ms ms	7+ 6o	29 30	8 -	51- 23-	102 20						
03																																					
10		No Flare Reported					0438	3-	SL	117	5											10/1813	11/07xx	sc,R	ms	6o	30	-	23-	20			1956 Mar. 03/0100	6.9	10	1.6	
11																11/1600		96			15																
12																																					
13		1453	1529	-	N21 E50	2	1452	3-	S	68	5																										
15	16	1625	1745	1635	N22 E21	3	1623	3	S	120	5																										
17		0219	0232	0225	S19 E31	1	0222	1	S	8	1	0219	3	-																							
No Flare Patrol 19		2133	3	G	117	3																															
20		0235	0410	0250	S17 W04	1	0228	3	S	74	5																										
21																																					
28	17	0935	1055	0940	N25 E10	3	0939	1	G	31	1																										
31		1350	1430	-	N30 W80	1	1350	3	S	68	5																										
Apr. 02																																					
09	18	0940	1050	1000	N22 E27	3	0945	2	S	70	3																										
18	19	1247	1535	1342	N20 W16	3	1320	1+	G	65	5	0659	6	-																							
20		0648	0739	-	S17 E05	1																															
21	20	0940	1130	0945	S22 W61	3	0945	2	S	39	4																										
22																																					
25																																					
26																																					
27		2050	2150	2100	N17 W27	2	2053	1+	SL	24	3																										
28																																					
May 30																																					
04	21	1033	1105	1035	N19 E54	3	1035	2	SL	85	3																										
08		1300	1410	1322	S27 E84	2	1308	3-	S	72	5	1310	29	S																							
10		No Flare Reported					0005	3-	SL	50	5																										
11	22	0934	1055	-	S30 E47	3	0939	1	S	28	1																										
13		1750	1950	1809	S18 W30	1																															
16	23	1240	1415	1250	S16 W65	3	1248	1	SL	20	1																										
17	24	2230	2404	2305	S24 W18	3																															
20																																					
23																																					
24																																					
25																																					
29																																					
30																																					
May 01		No Flare Reported					0230	3+	S	85	5																										
02							0015	3-	G	77	4																										
03		No Flare Reported																																			
04																																					
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VII. CATALOGUE OF BALLOON FLIGHTS

ASSOCIATED WITH MAJOR SOLAR FLARES DURING 1954 – 1956

VII

TABLE VII. CATALOGUE OF BALLOON FLIGHTS DURING 1954 AND FLIGHTS ASSOCIATED WITH MAJOR SOLAR FLARES DURING 1955-1956

A search of the literature reveals 24 balloon flights during 1954. We have included all of these flights in the Balloon Flight Catalogue (Table VII) even though there were no major flares, polar cap absorptions, or spectral radio emissions. Five of these flights occurred within four days of importance 1 flares.

Five flights during 1955 occurred within four days after major flares, and one approximately 12 hours after a Type II emission. No flare association was possible with the Type II emission. We find balloon flights reported within four days after nine of the major flares in 1956.

A bibliography of paper published in the scientific literature from which the list of balloon flights was compiled, is given on pages 1.VII-iii. These flights are referenced in the last column of the Table

A description of the column headings follow:

Column 1 Greenwich Date

Column 2 Event Number from Table VIII

Column 3 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 6, 7, or 8.

Column 4 Beginning Time of the Flare

Column 5 Flare Importance

Column 6 Spectral Observations Type II, Beginning Time

Column 7 Spectral Observations Type IV, Beginning Time

Column 8 Polar-cap Absorption, Greenwich day/beginning UT

BALLOON DATA (Columns 9 through 17)

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 the literature.

Column 13 Name of the Place Where Balloon was Launched.

Column 14 Geographical Latitude and Longitude of the Launch Site.

Column 15 Instrument Carried. Where:

C = Single Geiger Counter
CC = Cerenkov Counter
SC = Scintillations Counter
T = Double Coincidence Counter Telescope
EM = Emulsion Pack
I = Ionization Chamber
N = Neutron Monitor
BT_3 = Boron Trifluoride Proportional Counter

Column 16 Group. These have been designated as follows:

Minn. - School of Physics, University of Minnesota
Dr. J. R. Winckler

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

Chicago - Enrico 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

SIU - Southern Illinois University, O. B. Young

Column 17 Published Balloon Flight Data. References that discuss the data obtained during some of the flights refer to the balloon flight bibliography, page 1.VII-iii. In many cases several of the flights are discussed in the reference. In general, only large or outstanding changes in the radiation count are discussed.

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TABLE VII BALLOON FLIGHTS ASSOCIATED WITH MAJOR SOLAR FLARES DURING 1954 – 1956

		FLARE			SPECTRAL		PCA						LOCATION					
Gr. Day	Event No.	Serial No.	Beg. UT	Imp.	Type II Beg. UT	Type IV Beg. UT	Gr. Day Beg. UT	Gr. Day	Launch UT	Time at Altitude Hr.	Min.	Altitude Km mb	Place	Geographic Lat.	Long.	Instr. Carried	Group	Ref.
1954 Feb.								1954 Feb.										
								02	1530	05	58	1	San Angelo, Texas	N31	W101	-	Minn.	7
								05		07	00	17.4	Texas	N41**		EM	SIU	30
								06	1500	06	15	27	Goodfellow Air Base, Texas	-		CC	Minn.	9
								09	1400	07	00	30	Goodfellow Air Base, Texas	-		CC	Minn.	9
								12		06	00	20	San Angelo, Texas			CC	SUI	27
								June 18	1200	06	00	10	Saskatoon, Canada	N60.5		EM	Minn.	3
								18					Saskatoon, Canada	N52.1	W107		Minn.	5,6
								July 09		05	39	12.5	England	N55**	W 00		Minn.	22,24,25
								11	1427*			40	USS Atka	N53		I	CIT	17
												100	Bismark, N.D.	N46.8	W100.7	I	CIT	17
								17	1459*			18	USS Atka	N56		I	CIT	17
												100	Bismark, N.D.	N46.8	W100.7	I	CIT	17
								19	1448*			30	USS Atka	N65		I	CIT	17
												100	Bismark, N.D.	N46.8	W100.7	I	CIT	17
								28	1455*			20	USS Atka	N81		I	CIT	17
												100	Bismark, N.D.	N46.8	W100.7	I	CIT	17
								Aug. 03	1554*			50	USS Atka	N88		I	CIT	17
												100	Bismark, N.D.	N46.8	W100.7	I	CIT	17
Aug. 06			1120	1				06	1300	27	00	12	Minneapolis, Minn.	N44.9	W 93.3	I	SUI	16
			1245	1				10	1435*			13	USS Atka	N89		I	CIT	17
			1600	1								100	Bismark, N.D.	N46.8	W100.7	I	CIT	17
								17	1456*			16	USS Atka	N87		I	CIT	17
								18	1553*			16	USS Atka	N88		I	CIT	17
								19	1454*			14	USS Atka	N88		I	CIT	17
												100	Bismark, N.D.	N46.8	W100.7	I	CIT	17
22			1525	1				24	1249	00	48	26	S. St. Paul, Minn.	N44.9	W 93.1	BT_3	N.Y. Univ.	19
			1604	1														
24			0443	1				28	1255	02	00	27	S. St. Paul, Minn.	N44.9	W 93.1	BT_3	N.Y. Univ.	19
								Sept. 14		06	45	32	Northern Ital	N46		EM	Minn.	22,23,24,25
								Oct. 07		07	30	15.4	Texas	N41**		EM	SIU	31
								12		06	00	26	Northern Italy			EM	Minn.	24,25,26
								14				32	Northern Italy			EM	Minn.	4
								Nov. 18		06	12	11.43	Texas	N41**		EM	SIU	30,31
1955 Jan.							1955 Jan.	1955 Jan.										
16	5	1	2130	3			16/2230	17	1400	06	00	13	San Angelo, Texas	N31	W101	SC	SUI	10,12
									1430	06	00	11	Minneapolis, Minn.	N44.9	W 93.3	C,SC,CC	SUI	11
								19		10	00	16	San Angelo, Texas	N31	W101	C,CC	Minn.	14
June 19		4	1451	3				24	1030	14	58	31	Minneapolis, Minn.	N44.9	W 93.3	EM	Chicago	8
July 07		No Flare Reported			0206			July 07	1400	06	00	11	Minneapolis, Minn.	N44.9	W 93.3	T, SC	SUI	10,11,12,14
1956 Feb.								1956 Feb.										
10	10	8	2050	3				11		08	00	9.25	Texas	N31.4	W100.5	EM	Minn.	1
										08	00	32.4	Texas	N41**		EM	SIU	30
										08	24	9.98	Texas	N41**		EM	SIU	30
17	15	10	0446	3				18				20				BT_3	Chicago	15
	16	11	1100	3				23	1300	03	00	20	-			NM^3	Chicago	28
21	19	12	1330	3					1900	03	00	10	Minneapolis, Minn.	N44.9	W 93.3	T	Minn.	15,28
23	21	13	0334	3		0335			1900	03	00	10	Iowa City, Iowa	N52		T	SUI	21
									1933	01	39		Iowa City, Iowa	N52			SUI	20
May 16		23	1240	3				May 17					Waukon, Iowa	N43.9	W 91.5		Minn.	5,6
June 22		28	1525	3				June 22									Minn.	29
July 04		29	0925	3				July 07					Minneapolis, Minn.	N44.9	W 93.3		SUI	13
Sept. 17	102	37	1942	3		1945		Sept. 18		06	15	36	Minneapolis, Minn.	N44.9	W 93.3	EM	U of Bristol	2,24,25

Foot Notes:
*Time Maximum Altitude was Reached
**Geomagnetic Latitude

VIII. CHRONOLOGICAL CATALOGUE OF MAJOR SOLAR EVENTS DURING 1954 – 1956

VIII

TABLE VIII. CHRONOLOGICAL CATALOGUE OF MAJOR SOLAR EVENTS DURING 1954-1956

This table was prepared for publication by Dr. Prince and Miss Hedeman at the McMath-Hulbert Solar Observatory. The entries include the following (except as noted on page 1.9, paragraph 8).

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 millionths 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.

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 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.

Column 7 The heliographic position.

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.

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 24 and defined in "Description of tables and graphs for CRPL-F, Part B. Solar-Geophysical Data," Alphabetical symbols used in reference 28. These are defined in the introduction to Table IV and illustrated on page 1.IV-iv.

Column 16 Beginning Time UT.

Column 17 Duration in Minutes.

Column 18 Time of Maximum Flux, UT.

Column 19 Peak Flux.

Column 20 Observatory.

PLAGE DATA (Columns 21 through 29)

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 21 McMath-Hulbert Plage Number.

Column 22 Greenwich Day of Central Meridian Passage.

Column 23 Mean Longitude.

Column 24 Mean Latitude.

Column 25 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 26 Average Maximum Area - In units of millionth of the area of the solar hemisphere.

Column 27 Number of Flares - This is the total of all flares associated with the plage during disk passage.

Column 28 Age in Rotations - The number 1 indicates that the plage is new.

Column 29 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 30 through 35)

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

Column 30 Mt. Wilson Magnetic Classification from reference

Column 31 Greenwich Day of Central Meridian Passage.

Column 32 Mean Latitude During Disk Passage.

Column 33 Mean Magnetic Field Strength H, in units of 100 gauss from reference 30.

Column 47 Peak Flux.

Column 48 Observatory.

OTHER RADIO DATA (Columns 49 through 55)

Column 49 Frequency Mc/s.

Column 50 Type.

Column 51 Beginning Time UT.

Column 52 Duration in Minutes.

Column 53 Time of Peak Flux.

Column 54 Peak Flux.

Column 55 Observatory.

POLAR-CAP ABSORPTION DATA (Columns 56 through 61)

Column 56 Greenwich Day.

Column 57 Onset Time.

Column 58 Time to Rise to Peak.

Column 59 Duration in Hours.

Column 60 Intensity.

Column 61 Observer.

B - Bailey

H - Hakura and Goh

K - Kiruna

L - Leinbach

GEOMAGNETIC STORMS (Columns 62 through 67)

Column 62 Greenwich Day.

Column 63 Beginning of the Storm.

Column 64 Duration of the Storm (h) indicates hours, (d) indicates days.

Column 34 When seen: The first number gives the date the sunspot was first seen; the second number is the last date on which the spot was seen.

Column 35 Area (Mt. Wilson).

Column 36 Mt. Wilson Sunspot Numbers, of all spots located in the plage of Column 21.

DYNAMIC SPECTRUM DATA (Columns 37 through 42)

Column 37 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 3 200 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 38 Type III bursts, activity, duration and intensity.

Column 39 Type II (slow drift) bursts, duration, and intensity.

Column 40 Type IV (broad band continuum) duration and intensity.

Column 41 Observatory

Column 42 Frequency Range

200 Mc/s DATA (Columns 43 through 48)

Column 43 Type, Alphabetical Symbols.

Column 44 Beginning Time UT.

Column 45 Duration in Minutes.

Column 46 Time of Maximum Flux.

Column 65 Type.

Column 66 Intensity.

m - moderate
ms- moderately severe
s - severe

Column 67 Number of Stations Reporting the Storm.

Column 68 Maximum K_p During the Storm.

		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
	1954 Jan.																	
1	01																	
2	18																	
	Feb.																	
3	01																	
4	15																	
5	21																	
6	22													2	1600	1.5	1600.5	
7	26																	
	Mar.																	
8	01	1042	1052		1	S24W42	1											
9	13	0344	0434	0414	1	S08E57	1											
10	13	1008	1105	1021	1	S08E52	2											
11	13																	
12	15	0212	0302		1	S08E30	2											
13	15	2207	2235	2217	1	S09E17	1											
14	16	0810	0832		1	S07E12	1											
15	22																	
	Apr.																	
16	01									1220	10							
17	11																	
18	26																	
	May																	
19	26													6	1956.7	3	1959.2	
	June																	
20	22									1024	4							
	July																	
21	17																	
	Aug.																	
22	06	1120	1145		1	N25E16	1											
23	06	1245	1307		1	N25E16	2											
24	06	1600			1	N24E17	1											
25	09													2 4	2154.4	1.5 2.5	2154.5	
26	22	1525	1537		1	S30W18	2											
27	22	1604	1650		1	S31W22	1											
28	23																	
29	23	1325	1420		1	S30W31	1							2 4	1323	5 50	1327.5	
30	26	0443	0500		1	S30W65	1											
31	28																	
	Sept.																	
32	01																	
33	03																	
34	06																	
35	13																	

1. This minor geomagnetic storm on January 2 is not associated with any known flare, or any other known form of solar activity, and is not a member of any sequence of storms.

2. This gradual storm has no known flare association, and is the first member of a sequence of storms that endures for four solar rotations.

3. This very minor disturbance follows a long period of seven days of very quiet geomagnetic conditions. As far as is known, it is not flare-associated.

4. This storm is the second member of a sequence which began on January 18 (Event No. 2).

5. This storm is not associated with any known flare or other kind of solar activity.

6. This 10cm. burst is the only event reported by Ottawa during the first four months of 1954. However, it is designated as "doubtful," and no flare or SWF is reported in association with the burst, nor were there any distinctive events reported at any other single radio frequencies.

7. This gradual storm of February 26 is not associated with any known flare activity, but it was preceded by an interval of burst activity at radio frequencies, during the period February 22-25. There are no known flares related to these radio bursts and, strangely, no significatnt calcium plages on the solar disk. However, a large, bright, new cycle plage, with spot, appears on th
on March 1 (described i

8. This flare in progress
flare reported in the ne
disk on March 1. The
reported with the flare
at any of the single freq

9. These events describe
10. occurred in plage reg
12. bright and active plage
13. data for events No. 10,
14. for event No. 9. As fa
accompanied by any re

1. Y

12-1

TABLE VIII CHRONOLOGICAL CATALOGUE

Obs.	PLAGE DATA: McM Plage No.	CMP Gr. Day	Mean Long.	Mean Lat.	Ave. Int.	Max. Area	No. Flares	Age in Rotation	Ident.	SPOT DATA: Mt. Wilson Type	CMP Gr. Day	Mean Lat.	H	When Seen	Area	Mt. Wilson No.
1 Ott																
	2915	1954 Feb. 26.5	344°	S25	3	800	1	1	NEW	dβpℓ	1954 Feb. 26.2	S25	15	1- 4		11171
	2923	Mar. 17	93°	S08	3	2000	5	1	NEW	dβpℓ	Mar. 17.2	S08	33	12-21		11172
	2923															
	2923															
	2923															
	2923															
2 Ott																
	2973	Aug. 8.0	349°	N25	3.5	2200	3	2	2960	ℓ∝ρd	Aug. 07.6	N23	13	1-10		11186
	2973															
	2973															
3 Ott 2																
	2982	21.0	178°	S30	4	1500	4	1	NEW	dβfℓ	21.0	S32	20	20-26		11188
	2982															
5 Ott 5																
	2982															
	2982															

disk, west of the central meridiam, Event No. 8).

n March 1 at 1042 UT is the only cycle plage which appeared on the is no known SWF or 10cm. event and no known related radio events ncies.

the five flares of Imp. 1 which n 2923. This region is a large, the old cycle. The plage and spot 12, 13 and 14 are the same as that is is known, these flares were not rted SWF's, or any related events at any of the single radio frequencies, with one exception. A group of minor bursts at 460 Mc was reported during the postmaximum phase of the flare event No. 13.

15. This sudden commencement storm of March 22 is not associated with any known flare activity. It may perhaps be the second member of a sequence which began on February 21, in which case the interval between storms would be 29 days, instead of the more usual 27 days.

16. This SWF was not accompanied by any known flare event, nor were there any distinctive events reported at any of the single radio frequencies.

17. The gradual storm of April 11 is the fourth member of a sequence which began on January 18.

18. This gradual storm of April 26 was reported by only two stations, but it represents a real though brief change in the Kp's. It has no known association with solar activity, but follows, by 27 days, a weak disturbance which occurred on March 30. The latter was excluded from this catalogue because it was reported by only one station, and the 3-hour Kp only reached a maximum value of 4.

19. No flare observations were being made at the time of the 10cm. burst May 26 at 1957 UT, therefore plage or spot data are not available. There is no accompanying SWF, and no known radio events at any other frequencies are reported at

-2

TABLE VIII

Event No.	Gr. Day	FLARE DATA: Beg. UT	End UT	Max. UT	Imp.	Position	No. of Obs.s	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	Obs.	PLAGE DATA: McM Plage No.	CMP Gr. Day	Mean Long.	Mean Lat.	Ave. Int.	Max. Area	No. Flares	Age in Rotation	Ident.	SPOT DATA: Mt. Wilson Type	CMP Gr. Day	Mean Lat.	H	When Seen	Area	Mt. Wilson No.
36	Sept. 20																																	
37	29																																	
38	Oct. 02																																	
39	06																																	
40	18																																	
41	23																																	
42	27																																	
43	Nov. 01																																	
44	09	2302	2331	2316	1	S33E08	1													3030	Nov. 09.5	195°	S32	4	1000	1	1	NEW	*dβfℓ*	Nov. 09.5	S34	21	9-15		11206
45	12													6	1930	7.5	1931.5 1934	6 6	Ott															
46	13	2332	2350	2336	1	N26W48	1													3027	10.5	182°	N24	3	500	1	1	NEW	*dβfd*	10.3	N27	3	9-15		11207
47	23																																	
48	Dec. 14	2210	2400		1	N34E07	1													3055	Dec. 15.5	81°	N31	2.5	2500	1	1	NEW	*dβpℓ*	Dec. 15.4	N34	27	14-21		11212
49	17																																	
1955 1	1955 Jan. 06	1725	1825	1749	2	N18E30	1			1742	43		2	9 6 4	1732 1744 1753	12 9 137	1745	6 >104 10	Ott	3063	1955 Jan. 08	131°	N18	3.5	5000	6	1	NEW	*dβpℓ*	1955 Jan. 08.5	N21	33	4-14		11215
2	08																																	
3	10	1229	1310		1	N33E33	1			1220	55		3							3065	13	65°	N36	4	4500	9	2	3055	* *dχℓ*	13.3	N36	35	7-19		11218
4	11																																	
5	16	*2130	2220	≤2130	3	N33W41	1							6	2105	>30		>133	Ott	3065														
6	16																																	
7	17																																	
8	27																																	
9	Feb. 04																																	
10	11																																	
11	23																																	
12	24																																	
13	28																																	
14	Mar. 06																																	
15	09																																	
16	22																																	
17	30																																	
18	Apr. 24																																	
19	26	1614	1659	1632	1	N35E90	1			1705	10		2							3150	May 02.5	62°	N34	3.5	1500	2	1	NEW	*ℓβpℓ*	May 02.9	N35	14	27- 6		11242
20	27																																	
21	May 05																																	
22	21																			3161	21.5	170°	N26	3	1400	10	1	NEW	*ℓβpℓ*	21.4	N24	29	15-26		11246
23	25																																	

36 - See last note on page 1.

45.

44. This event describes the single flare of Imp.1 which occurred in plage region 3030. No known SWF, and no known events at any radio frequencies, are reported at the time of the flare on November 9, at 2302 UT.

45. Although the sun was under observation, no flare is reported at the time of the 10cm. burst on November 12, at 1930 UT. No. SWF is reported in association with the burst, and no events are reported at any other single radio frequencies.

46. This event describes the single flare of Imp. 1 which occurred in plage region 3027. No SWF, and no known events at any radio frequencies, are reported at the time of the flare on November 13, at 2332 UT.

47. This Sc storm of November 23 is not associated with any known solar flare or other form of solar activity. It may perhaps be a sequential storm, since it follows the storm of event No 42 by an interval of 27 days.

48. This event describes the single flare of Imp. 1 which occurred in plage region 3055. No SWF, and no known events at any radio frequencies, are reported at the time of the flare on December 14 at 2210 UT.

1955

1. The 10 cm. event accompanying the SWF on January 6, at 1742 UT, consists of a large burst which was followed by a long-enduring postburst increase in flux. No dynamic spectrum observations exist at the time of the SWF. At the single radio frequencies, only minor bursts at 200 Mc were reported.

3. No 10 cm. observations and no dynamic spectrum observations were being made at the time of the SWF on January 10, at 1220 UT. The related flare occurs in a new cycle high latitude plage which is large and very bright, and which contains the first γ spot of the new cycle.

5. The plage and spot data for this event are the same as that given for event No. 3. This major optical event is the first large flare of importance 3 that has been reported since November 1952. No SWF is reported with the flare, and the 10 cm. burst is only partially recorded, since it occurs in the midst of sunset oscillations at Ottawa. Continuum emission is reported in the dynamic spectrum, and a large burst of long duration occurs at meter wavelengths. It is possible that these latter events may indicate that Type IV radio emission has occurred.

9. This gradual storm of February 4 occurs 27 days after the storm of January 8 (event No. 2).

11. This minor gradual disturbance of February 23 occurs 27 days after the storm of January 27 (event No. 8).

12. No known flare or SWF is reported at the time of the Type II burst on February 24, at 0104 UT., therefore plage and spot

21-1

21-2

OF MAJOR SOLAR EVENTS FOR 1954 - 1956

Event No.	DYNAMIC SPECTRUM DATA: Type I Time/ Max. Int.	Type III Time/Int.	Type II Time/Int.	TypeIV Time/Int.	Obs.	Freq. Range	200 MC DATA: Type	Beg. UT	Dur. Min.	Max. UT	Peak Flux	Obs.	OTHER RADIO DATA: Freq. Mc/s	Type	Beg. UT	Dur. Min.	Max. UT	Peak Flux	Obs.	POLAR CAP ABSORPTION: Gr. Day	Onset. UT	Rise to Peak	Dur.	Peak Int.	Obs.	GEOMAGNETIC STORMS: Gr. Day	Beg. UT	Dur.	Type	Int.	No. Sta. Report	Max. Kp
																											1954 Jan.						
1																										02	0000	0.8d	g	m	5	5
2																										18	20xx	2.5d	g	m	5	5
																										Feb.						
3																										01	04xx	1.5d	g	m	4	4
4																										15	05xx	2.8d	g	m	10	5
5																										21	1000	2.6d	g	ms	14	6
6																										26	0600	2d	g	ms	10	6
7																																
8																																
9																										Mar.						
10																										13	12xx	3.1d	g	m	8	5
11																										13	12xx	3.1d	g	m	8	5
12																																
13													460	M	2224	23		32	NBS													
14																																
15																										22	1717	2.8d	Sc	ms	10	6
16																										Apr.						
17																										11	15xx	1.5d	g	ms	15	7
18																										26	21xx	0.6d	g	m	2	5
19																																
20																																
21																										July						
22																										17	2339	0.2d	Sc	m	1	5
23													460	CE	1243	9.3		55	NBS													
24																																
25																																
26																																
27																																
28																																
29								1327	2			C	460	CE	1324	35		50	NBS													
								1329	120				81	SD	1327	1.5		4	Cav													
													81	E		>60			Cav													
30							CD	0437	22			480 Syd	3750	SD	0434	3		(10)	Nag													
													3750	CD	0440	30		(135)	Nag													
													1200	CD	0439	17		20	Syd													
													600	CA	0441	15		30	Syd													
													100	CD	0441	10		300	Tok													
													60	CD	0441	31		>600	Tok													
31																										28	2330	0.6d	g	m	1	4
32																										Sept.						
33																										01	12xx	1d	g	ms	5	6
34																										03	11xx	1.4d	?	m	2	5
35																										06	15xx	0.8d	g	ms	2	6
																										13	2050	1.1d	g	ms	9	6

the time of the burst.

20. This SWF was not accompanied by any known flare event, nor were there any distinctive events reported at any of the single readio frequencies.

21. This very brief disturbance of July 17 was reported as a storm by only one station. It follows a long interval of several months of geomagnetically quiet conditions, and interesting enough it is in phase with the minor sequential storm of Event No. 18.

22. These events describe the 3 flares of Imp. 1 which occurred
23. in plage region 2973. Plage and spot data for events No. 23
24. and 24 are the same as that for event No. 22. Plage 2973 is the first return of a new cycle plage and spot since the start of the new cycle of solar activity in April of 1954. The αp spot No. 11186 is a return of the βp spot No. 11182 in region 2960. As far as is known, none of the flares was accompanied by any reported SWF or radio burst at cm. and meter wavelengths.

25. No flare observations were being made at the time of the 10 cm. burst, August 9 at 2154 UT., therefore plage and spot data are not available. No SWF & no known radio events at any other radio frequencies are reported at the time of the 10cm. burst

26, There events describe the 4 flares of Imp. 1 which occurred
27, in plage region 2982. Plage and spot data for events No. 27,
29, 29 and 30 are the same as that for event No. 26. This new
30. cycle plage and spot appear on the disk, near the central meridian, on August 20. No SWF is reported in association with any of the flares. Events at radio frequencies are reported only with events No. 29 and 30. The radio event for No. 29 consisted of a burst followed by a rise & fall in flux at all frequencies. The radio event for No. 30 is evidently a major radio outburst which sweeps through the entire range of frequencies, from high to low. One suspects that this event is probably like a "type IV" burst.

31- These events consist of a series of 13 geomagnetic storms
43. that occurred between August 28 and November 1. Event No. 31 is a minor disturbance on August 28 perhaps related to the solar event on August 26. With this one exception, none of these storms (Nos. 32-43) have any association with flares or other forms of solar activity. The storms of events No. 32, 37 and 42 are separated by an interval of 28^{d}, and may be sequential.

VIII - 1R-1

1. VIII -1R

VIII - 1R-2

TABLE VIII

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	Obs.	PLAGE DATA MCM Plage No.	CMP Gr.	Day	Mean Long.	Mean Lat.	Ave. Inl.	Max. Area	No. Flares	Age in Rotation	Ident.	SPOT DATA Mt. Wilson Type	CMP Gr.	Day	Mean Lat.	H	When Seen	Area	Mt. Wilson No.
24	May 27																																			
25	27	1540	1605	1546	1	N31E21	2			1545	45		3	6	1543	9	1544.5	84	0H	3168	29.5	65°	N30	3	3000	6	3	3148	dp_p	May 29.3	N30	25	25- 4		11253
26	June 06													4	1552	63		11.5	0H																	
27	09																																			
28	15																																			
29	18	*1218	1315	1233	3	S23W25	4	G	1	1227	48		2	9	1215.5	6		5	0H	*3182	June 17.0	180°	S22	4	6300	41	1	NEW	* $Jp_z\lambda$	June 17.1	S23	21	9-23		11259
30	18	1905	1940	1910	3	S22W21	2	S	2+	1903	47		4	6	1221.5	53.5	1244.5	84	0H																
														4	1315	230		10	0H																
														9	1905	1.5		112		3182																
														*2	1906.5	30.5	1907.8	1582	0H																
31	21																																			
32	22																																			
33	July 02																																			
34	04	0932	1030	0935	2	S33E09	4			0932	34		2							3195	July 05.0	302°	S32	4	5000	3	3	3176	$fop\lambda$	July 05.0	S34	26	28-10		11266
35	05																																			
36	07																																			
37	26																																			
38	Aug. 01																																			
39	03																																			
40	06	1320	1350	1328	1+	N16E30	3			1321	27		3	2	1320	7	1324.5	25	0H	3240	11.0	172°	N16	4	3300	10	2	3212	$fp_p\lambda$	10.7	N16	33	5-16		11290
41	11													4	1327	63		9	0H																	
42	16																			3241	11.0	172°	S24	4	4000	11	3	206	$fp\lambda$	10.9	S23	29	5-16		11291
43	26																			3246	18.0	80°	N22	3	700	11	1	NEW	$dp_p\lambda$	17.8	N20	17	13-23		11294
44	28																																			
45	Sept. 01																			3249	28.0	307°	N42	3	1100	14	1	NEW	$dp_p\lambda$	27.7	N42	10	24- 3		11296
46	10																																			
47	12																																			
48	19																																			
49	27													CD	0146	7	0148	108	Tok																
50	29																																			
51	Oct. 05																																			
52	07																																			
53	07																			3292	Oct. 07.0	166°	N20	3.5	4600	11	1	NEW	$fop\lambda$	Oct. 07.8	N22	31	30-13		11331
54	25																																			
55	25	1849	2033	1900	2	S22E42	3	*S	3	1855	70	5	6	9	1849	4.5		17	0H	3309	29.0	209°	S22	3.5	4600	16	1	NEW	$fp_p\lambda$	28.6	S23	39	22- 3		11353
														2	1853.5	5.5	1855.3	44												$d\beta\lambda$	29.6	S22	12	28- 4		11339
														4	1859	86		12																		

27. The sun was not being observed optically, at the time of the Type II burst on June 9, at 0001 UT., therefore no flare observations exist, and plage and spot data are not available. No SWF and no 10cm. events were reported at the time of the Type II. At the single radio frequencies, no known radio events are reported, except for a brief but strong burst at meter wavelengths.

28. No flare observations were being made at the time of the Type II burst on June 15, at 0400 UT., therefore plage and spot data are not available. No. SWF and no 10 cm. events were reported at the time of the Type II. The single radio frequency reports indicate, however, that a strong burst appparently occurred throughout the entire spectrum range, from cm. to decameter wavelengths.

29. No dynamic spectrum observations exist at the time of the major flare on June 18, at 1218 UT. The flare occurred in a large, very bright and active plage which contained a 5gspot. The 10 cm. burst which accompanied the flare consists of a modest but very long-enduring burst, apparently superposed on a gradual rise and fall in flux of tremendously long duration. At meter wavelengths the radio event is evidently a major - burst of long duration.

30. This major flare on June 18, at 1905 UT, occurred in the same region which produced the large flare of event No. 29. (Plage and spot data are the same.) The flare was accompanied by a very large 10 cm. burst, and a major burst (with no second part) at meter wavelengths. Dynamic spectrum observations at Sydney did not begin until 2140 UT., therefore information about the dynamic spectrum at the start of the flare is not available. It is interesting to note that a noise storm with continuums was in progress at 2140 UT., and continued to the end of the observations period. Perhaps the enhanced flux and noise were a consequence of the large flare which occurred earlier.

31. No flare observations were being made at the time of the Type II burst on June 21, at 2329 UT, therefore plage and spot data are not available. No SWF and no 10 cm. bursts were reported at the time of the Type II burst. The events reported at the time of the Type II burst. The strongest event occurs at the very low frequencies where a very large burst is reported.

32. This 5± storm of June 22 has a resurgence on the 23rd, and the maximum 3-hour Kp value is reached on that day.

33. Dynamic spectrum observations and 10 cm. observations were not being make at the time of the SWF on July 4, at 0932 UT. No known radio events at any of the single frequencies were reported at the time of the SWF.

34. Dynamic spectrum observations and 10 cm. observations were not being made at the time of the SWF on July 4, at 0932 UT. No known radio events at any of the single frequencies were reported at the time of the SWF.

35. No flare observations were being made at the time of the Type II burst on July 5, at 0215 UT., therefore plage and spot data are not available. No SWF and no 10 cm. bursts were reported at the time of the Type II. The large burst at meter wavelengths is appparently related to the Type III burst.

36. Flare observations do not exist at the time of the Type II burst on July 7, at 0206 UT., therefore plage and spot data are not available. No SWF and no 10 cm. bursts were reported. At the single radio frequencies, only bursts of very short duration are reported, and these occur several minutes earlier than the Type II, at all frequencies.

37. This minor disturbance of July 26, reported by only 2 stations, occurs during a long interval of extremely quiet geomagnetic conditions.

38. This event appears in the catalogue only because it represents a plage in which 10 flares occurred as it traversed the disk. None of these were major flares, and none produced any related major events which would warrant a place in this catalogue.

39. Three of the eleven stations start this gradual storm of August 3 a day earlier, on August 2 at 21 UT., when there occurs a first increase in the K_p's after an interval of about six days of extremely quiet geomagnetic conditions. This storm, which apparently does not have its origin in any known isolated solar event, appears to be the initial storm of a small sequence of about three storms.

37-1

79-1-2

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 DATA: Type	Beg. UT	Dur. Min.	Max. UT	Peak Flux	Obs.	OTHER RADIO DATA: Freq. Mc/s	Type	Beg. UT	Dur. Min.	Max. UT	Peak Flux	Obs.	POLAR CAP ABSORPTION: Gr. Day	Onset UT	Rise to Peak	Dur.	Peak Int.	Obs.	GEOMAGNETIC STORMS: Gr. Day	Beg. UT	Dur.	Type	Int.	No. Sta. Report	Max. Kp
36																											Sept. 20	02xx	2d	g	ms	8	7
37																											29	19xx	2.4d	g	ms	8	6
38																											Oct. 02	20xx	1.6d	g	ms	2	6
39																											06	0700	0.7d	g	m	2	5
40																											18	01xx	1.7d	g	ms	10	6
41																											23	0723	2.1d	?	ms	12	6
42																											27	0746	0.4d	Sc	m	4	5
43																											Nov. 01	14xx	2.4d	g	ms	3	6
44																																	
45																																	
46																																	
47																											23	1145	0.5d	Sc	m	4	5
48																											Dec. 17	03xx	1.3d	g	m	7	5
49																																	
1955																																	
1							CA CA	1750 1750	1.8 1.5		149 >156	C C																					
2																											1955 Jan. 08	1800	1.1d	g	m	4	5
3							CD	1210	40		150	N	175 81	CD CD	1216 1230	20 15		24 30	Cav Cav													
4																											11	1219	0.8d	Sc	m	4	5
5	C2150- 2215/2				Syd		CD	2107	46.5		>287	C																					
6																				1955 Jan. 16	2230		2d	16	B							
7																											17	0322	3.1d	Sc	s	18	8
8																											27	0852	0.8d	sc	m	2	4
9																											Feb. 04	06xx	0.9d	g	m	3	5
10																											11	1500	0.6d	g	m	3	5
11																											23	08xx	0.6d	g	m	6	4
12	*0104- 0124/3				Syd		CD	0104	4		3600	Tok	3750 98 62	CD CD CD	0102 0105 0105	2.5 6.7 7.2		(1470) 16500 >860	Nag Syd Syd													
13																											28	00xx	0.7d	g	ms	9	6
14																											Mar. 06	20xx	1.2d	g	ms	3	6
15																											09	0545	2.8d	?	m	4	5
16																											22	08xx	1.9d	g	ms	12	6
17																											30	1040	2d	g	ms	14	6
18																											Apr. 24	00xx	1d	g	m	5	5
19																																	
20																											27	1623	1.6d	sc	s	16	8
21																											May 05	15xx	3.5d	g	ms	11	6
22																																	
23																											25	1433	1d	sc	ms	17	7

data are not available. No 10 cm. event is reported at 3000 Mc, but the record for 3750 Mc indicates that a large microwave burst of short duration occurred before the start of the Type II burst. The strong events at the lower frequencies fit well with the start and the intensity of the Type II.

13. This gradual geomagnetic storm was called "sudden commencement" by three of the nine stations reporting the storm.

15. Two stations call this storm a gradual one, and two designate it as "Sc."

16. This gradual storm of March 22 occurs 27 days after the storm of February 23 (event No. 11) and is apparently a member of a small sequence that began on January 27 (event No. 8).

19. The flare event listed here is not well-associated in time with the SWF on April 26 at 1705 UT. However, it is the only candidate, and is a flare at the limb -- some of which are often followed by additional activity in the form of the development of loops. No dynamic spectrum observations were being made at the time of the SWF, nor were there any distinctive events reported at any of the single radio frequencies.

20. This storm of April 27 occurs 27 days after the storm of March 30 (event No. 17), and 24 hours after the SWF of event No. 19.

22. This event appears in the catalogue only because it represents a plage in which 10 flares occurred as it traversed the disk.

23. This strong Sc storm of May 25 was not preceded by any known major solar events such as those listed in this catalogue. The storm may, however, be the third member of a sequence which began on March 30 (event No. 17).

25. No dynamic spectrum observations exist at the time of the SWF on May 27 at 1545 UT. The related 10 cm. event consists of a modest burst which is followed by a lengthy post-burst increase in flux, but at meter wavelengths the event is only a brief minor burst. No other known radio events are reported at the time of the SWF.

2R-1

2R-2

62. Flare observations were not being made at the time of the large 10 cm. burst on November 15, at 1734 UT.. Therefore plage and spot data are not available. Dynamic spectrum observations do not exist at the time of the large microwave burst at centimeter wavelengths. The events reported at single radio frequencies indicate that a strong burst of approximately the same duration occurs throughout the entire range of frequencies.

63. Although the sun was under observation, no known flare was reported at the time of the Type II burst on November 15, at 2205 UT., therefore plage and spot data are not available. No SWF, no 10 cm. events, and no known 200 Mc event are reported in association with the Type II burst.

64. No known flare was reported at the time of the Type II burst on November 18, at 0242 UT.. therefore plage and spot data are not available. No known event at meter wavelengths is reported in association with the Type II burst, although strong bursts at the very low frequencies occur prior to the start of the Type II.

65. This Sc storm of November 19 begins while the preceding gradual storm (event No. 63) is still in progress.

66. Although the sun was under observation, no known flare was reported at the time of the Type II burst on November 15, at 2205 UT., therefore plage and spot data are not available. No SWF, no 10 cm. events, and no known 200 Mc event are reported in association with the Type II burst.

67. No flare observations exist at the time of the Type II burst on November 24, at 0442 UT., therefore plage and spot data are not available. No known SWF, 10 cm. burst, or 200 Mc radio events are reported at the time of the Type II.

68. Flare observations were not being made at the time of the large SWF on November 28, at 2230 UT., therefore plage and spot data are not available. No distinctive radio events either at centimeter or at meter wavelengths are reported at the time of the SWF, and in the dynamic spectrum there is only a noise storm in progress.

69. Flare observations do not exist at the time of the Type II burst on November 30, at 0544 UT., therefore plage and spot data are not available. No SWF, and no radio events at meter wavelengths are reported in association with the Type II burst.

71. This major flare and major SWF on December 3, at 1058 UT. occurred in a large and moderately bright plage which contained two Hp spot groups. Spot No. 11366 may possibly be a return of the Sp spot No. 11366 in plage region 3320. No dynamic spectrum observations exist at the time of the flare, and no distinctive events were reported at either centimeter or meter wavelengths. The single radio events at intermediate wavelengths resemble a major - burst.

73. These two intervals of storminess, on December 24 and 26, only a few stations.

74. are quite real, but are reported as geomagnetic storms by

1956

2. This rather long storm of January 10 has two maxima. The first maximum occurs on January 11, the second on January 12, after the K_p's decline and then undergo a resurgence.

3. Although the sun was under observation, no known flare was reported at the time of the Type II burst on January 16, at 0031 UT., therefore plage and spot data are not available. No known SWF, and no radio events at any of the single frequencies, are reported in association with the Type II burst.

TABLE VIII

Event No.	Gr. Day	FLARE DATA						SHORT-WAVE RADIO FADEOUTS					10 CM. EVENTS				MeM Plage No.	PLAGE DATA								SPOT DATA			
		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	Obs.	Cmp. Day	Mean Long.	Mean Lat.	Ave. Int.	Max. Area	No. Flares	Age in Rotation	Ident.	Mt. Wilson No.	Type	Cmp. Day	Mean Lat.	H	When Seen	Area	Mt. Wilson No.
56	Oct. 25																																	
57	31																																	
58	Nov. 12																																	
59	12	*1118	1159	1133	3	N27E27	2	S	2+	1127	23	4	4																					
60	15	0428	0458		1+	N26W09	1	S	2	0441	28	5	3						3326	Nov. 15.0	345°	N27	3	7500	13	1	NEW	* $\mathcal{L}\beta p\chi$	Nov. 14.9	N24	29	7-20	(1026) Greenwich	11367
61	15																		3326	Oct. 25.0	262°	N18	3	2000	13	1	NEW	$\mathcal{A}\beta\mathcal{A}$	Oct. 25.1	N18	30	18-31		11349
62	15							S	2+	1735	22	5	6	*6	1734.3	5	1737	565	OH															
63	15													4	1739.3	11		10																
64	18							S	1+	0240	20	5	1	CD	0238	3.5	0239	183	Tok															
65	18																																	
66	19																																	
67	24																																	
68	28							S	3-	2230	115	3	2																					
69	30													CD	0539	3	0540.8	148	Tok															
70	Dec. 01																																	
71	03	*1058	1245	1112	3	N20E08	3	*S	3	1105	20	5	4						3342	Dec. 03.5	10I°	N23	3	7000	6	2	3320	$d\beta p\chi$	Dec. 04.4	N23	20	28-10		11388
72	05																												03.7	N22	12	26- 3		11386
73	24																																	
74	26																																	

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 DATA: Type	Beg. UT	Dur. Min.	Max. UT	Peak Flux	Obs.	OTHER RADIO DATA: Freq. Mc/s	Type	Beg. UT	Dur. Min.	Max. UT	Peak Flux	Obs.	POLAR CAP ABSORPTION: Gr. Day	Onset UT	Rise to Peak	Dur.	Peak Int.	Obs.	GEOMAGNETIC STORMS: Gr. Day	Beg. UT	Dur.	Type	Int.	No. Sta. Report	Max. Kp
24																										May 27	12xx	1.2d	g	m	4	5
25							CA	1549	1.5		>38	C																			
26																										June 06	1728	2.2d	sc	m	6	5
27			*0001-0033/1		Syd		CD	0000	0.7		750	S																			
28			*0400-0408/1		Syd		CD	0402	2.5		660	S	3750 1200 600 62	CD CD CD CD	0359 0402 0402 0404	13.7 5 7 0.8		(400) 63 >58 800	Nag Syd Syd Syd													
29							CA	1222	73		400	N	545	CD	1223	37		600	N													
30	I_s in progress <2140->0610/1 Cont. in progress <2140 ->0625/1				Syd		CA	1905	7		900	C	545	CD	1905	15		>250	N													
31		G2316-2321/3	*2329-2354/3		Syd		CD	2330	-			Syd	3750 3750 62	SD CD CD	**2318** **2330** **2311**	7 9 34		(4) (40) 8880	Nag Nag Syd													
32																										22	1039	3.1d	sc	m	6	5
33																										July 02	15xx	0.7d	g	m	3	5
34																															
35	I_s in progress all day	G0203-0213/3 g0227/2	*0215-0224/3		Syd		CD	0203	10		400	Tok	3750 62	CD CD	**0209** **0205**	3 16		(172) >13510	Nag Syd													
36	I_s in progress all day		*0206-0213/2		Syd		CA	0200	0.7		540	Syd	3750 62	SD CD	**020** **020**	4.5 0.5		(6) 8110	Nag Syd													
37																										26	04xx	1.0d	g	m	2	4
38																										Aug. 03	21xx	4.7d	g	m	11	5
39																															
40																															
41																															
42																															
43																															
44																															
45																															
46			*0509-0520/1		Syd								3750	SD	**0448**	4		(6)	Nag													
47																															
48		G0146-0148/1	*0152-0202/1		Syd		CD	0146	2.5		140	Tok	3750 62	CD CD	**0146** **0147**	13 2.5		(11) 510	Nag Syd													
49																															
50																															
51																															
52																															
53																															
54																															
55													460 460	CD SA	1842 1909	14 10		**230** **45**	NBS NBS													

40. Dynamic spectrum observations do not exist at the time of the SWF on August 8, at 1321 UT. The 10 cm. event consists of a small burst followed by a lengthy but small post-burst increase in flux. No other radio events are reported at any other single radio frequencies at the time of the SWF.

41. These events appear in this catalogue only because they
42. represent plages in which more than 10 flares occurred.
43. See note No. 38.

44. This brief storm could have been produced by flare activity in region 3249, which was the source of numerous flares on August 25, 26 and 27.

45. This gradual storm of September 1 may be the second member of a brief sequence which began with event No. 39, with an interval of about 28 days.

46. Flare observations were not being made at the time of the Type II burst on September 10, at 0509 UT., therefore plage and spot data are not available. No SWF is reported at the time of the Type II. Among the single radio frequencies, no distinctive events are reported at either centimeter or meter wavelengths. The 3750 Mc burst which is given in the table of radio data may have no relationship at all to the Type II burst, because the time association is rather poor.

48. No flare observations exist, and no SWF is reported, at the time of the Type II burst on September 19, at 0152 UT., therefore plage and spot data are not available. The single frequency radio events all occur simultaneously with the Type III burst which precedes the Type II.

50. This gradual storm of September 29 may perhaps be a sequential storm. It follows the storm of event No. 45 by an interval of 28 days.

52. This event appears in the catalogue only because it represents a plage in which more than 10 flares occurred. See comment No. 38.

53. This Sc storm is not associated with any known major solar flare events. However, flare activity in plage region 3292 on October 2, 3, 4 and 5 may be responsible for the storms of October 5 and 7.

54. This gradual storm of October 25 follows, by an interval of 28 days, the small gradual storm of September 27 (event No. 49).

55. This major SWF on October 25, at 1855 UT, is associated with only a very modest 10 cm. burst, which is followed by a long-enduring but small post-burst increse in flux. No dynamic spectum observations exist at the time of the SWF, and no distinctive event is reported at meter wavelengths. Although the large SWF and flare of October 25 are not followed by a separate and discrete geomagnetic storm, it should be noted that the storm reported as event No. 54 above has two maxima in the 3-hour K_p's, and the second maximum of K_p= 6 is reached on October 26 at 21xx UT., about 26 hours after the SWF and flare.

56. This event appears in the catalogue only because it represents a plage in which more than 10 flares occurred. See comment No. 38.

59. The major flare of November 12 at 1116 UT, occurs in a large bright plage which contains a very large spot. Mt. Wilson spot No. 11367 is the only spot during 1955 which attained an area >1000 millionths of the hemisphere. No dynamic spectrum observations exist at the hemisphere. No dynamic and no known radio event is reported at centimeter wavelengths. At meter wavelengths, the radio event is a strong pre-maximum burst.

60. The Type II burst on November 15, at 0441 UT. is associated with flare activity in region 3326. Plage and spot data are similar to that given for event No. 59. No 10 cm. event is reported at the time of the Type II burst. At meter wavelengths, the radio event consists of a strong but brief burst which is apparently related to a group of Type III bursts preceding the start of the Type II.

11. Two of the six stations that report this storm start the storm earlier, with a sudden commencement, on 11, at 0055 UT. At this time there is a real increase in the 3-hour K_P's, but not to a maximum value of 4.

12. The plage and spot data for this event are the same as that given for event No. 10. No dynamic spectrum observations exist at the time of the major SWF on February 13, at 1440 UT. However, the events at the single radio frequencies seem to indicate that some form of continuum emission was present with this event. At meter wavelengths, the event consists of a major burst with is followed by a very long post-burst increase in flux. At meter wavelengths the event consists of a great outburst observed by a direct examination of the Cornell record). An initial burst-of-state from 1448-1455 UT. is followed by a long period of increased flux that lasts until about 1700 UT. During this interval there is a large rise and all in base level between 1600-1650 UT. The large radio event evidently progresses through the frequencies starting at the high-frequencies simultaneously with the flare and SWF and reaching the lowest frequency (81 Mc) some 12 minutes later.

13. The plage and spot data for this event are the same as that given for event No. 10. The major SWF on February 14, at 0532 UT. is accompanied by a very great 10 cm. burst and by a strong Type II burst in the dynamic spectrum. The major flare that is associated with the SWF was rated as important 3 by one of the three stations. At meter wavelengths, the radio event consists of a great and strong burst which occurs simultaneously with the Type II.

14. This major SWF on February 16, at 1802 UT., and great 10 cm. burst, like event No. 13, are associated with flare activity in plage 3400. This remarkable plage is responsible for 12 events in the catalogue -- Nos. 9, 12, 13, 14, 16, 18, 21, 22 and most likely also Nos. 11, 17, 20, and 23. Plage and spot data are the same as that given for event No. 10. Dynamic spectrum observations do not exist at the time of the SWF. At centimeter wavelengths, the radio event consists of a very great burst followed by a very long-enduring post-burst increase in flux. This 10 cm. burst is associated with a flare and SWF in another plage region. At meter wavelengths, the radio event is also very great burst.

15. This major flare on February 17, at 0446 UT. occurs in a large, bright and active region that is the return of a plage that formed at the west limb during the previous rotation. The 9p spot No. 11467 is one of the largest spots of the year 1913 UT. All of the events at the single radio frequencies indicate that some form of continuum radiation probably occurred (possibly Type IV).

16. No known 10 cm. event is reported at the time of the large flare and SWF on February 17, at 1100 UT. Plage and spot data are the same as that given for event No. 10. Dynamic spectrum observations do not exist at the time of the flare.

17. This weak Sc storm of February 19 was reported as a storm by only two stations (BINZA and ALIBAG). A similar weak storm, for which the maximum K_P also was only 4, occurred on February 16, at 0300 UT. The latter, however, never was reported as a true storm event by any of the reporting stations.

18. The plage and spot data for this event are the same as that given for event No. 10. The major SWF on February 19, at 1429 UT. is accompanied by a large 10 cm. burst that is preceded by a "precursor" and is followed by a very long-enduring post-burst increase in flux. No dynamic spectrum observations exist at the time of the SWF. At meter wavelengths, the record indicates that a very high base level exists at 1420 UT. -- which may have begun at about 1400 UT. as a large rise in flux. The other single radio events indicate that a strong burst accompanied by some form of continuum radiation apparently has occurred at all frequencies, degenerating into a noise storm at the very low frequencies.

19. This major flare on February 21, at 1330 UT., reported by only one station, occurs in a relatively small and inactive plage that is situated at an unusually high latitude. The plage is not known to have possessed any spots -- no spots were reported at this location by the Mt. Wilson observers. No SWF is reported in association with the flare in progress on February 16, at 0300 UT. The latter, however, never was reported as a true storm event by any of the reporting stations.

20. The plage and spot data for this event on February 23, at 0330 UT. are the same as that given for event No. 10. This flare, at the time of the SWF, At meter wavelengths--is one of those rare solar events that is accompanied by an increase in cosmic rays at ground level. No dynamic spectrum observations exist at the time of the great flare. However, the great events at the single radio frequencies imply that Type

Event No.	Gr. Day	FLARE DATA						SHORT-WAVE RADIO FADEOUTS						10 CM. EVENTS					PLAGE DATA								SPOT DATA				
		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. TU	Dur. Min.	Max. UT	Peak Flux	Obs.	McM Plage No.	Cmp.	Gr. Day	Mean Long.	Mean Lat.	Ave. Int.	Max. Area	No. Flares	Age in Rotation	Ident.	Mt. Wilson Type	Cmp. Gr. Day	Mean Lat.	H	When Seen	Area	Mt. Wilson No.
11	Feb. 11																																		
12	13	1438	1558	1450	2	N19E44	2	*S	3	1440	48	5	7	6	1437.5	21.5	1452.5	353	OH	3400														
13	14	0538	0730	0557	2+	N21E32	3	*SL	3	0532	116	5	3	*CD	0541	80	0631	1080	TK	3400														
14	16	1805	2039		2+	N20E08	3	*SL	3	1802	93	5	6	9	1746	10		23	OH	3400														
														*6	1756	51	1811.5	623	OH															
														4	1847	153		40	OH															
15	17	*0446	0652	0452	3	S20E25	2	*S	3	0443	77	4	2	CD	0449	6	0450.5	325	TK	3403	Feb. 19.0	161°	S22	3.5	6000	17	2	3380a	* kpk	Feb. 19.1	S21	25	Feb. 12-25	1500	11467
16	17	*1100	1242	1120	3	N20W04	8	*S	3	1102	44	4	3							3400															
17	19																																		
18	19	1430	1627	1445	1+	N25W23	2	*S	3	1429	151	5	6	9	1405	20		15	@H	3400														
														*2	1425	29	1434.5	643	OH															
														4	1454	156		40	OH															
19	21	*1330	1338		3	N40W72	1							2	1302	4.5	1303	8	OH	3401	16.0	200°	N41	2	40	2	1	NEW						
20	21																																		
21	23	*0331	0510		3	N23W80	3	*S	3+	0330	160	5	2	*CD	0333	50		>4700	TK	3400														
22	23																																		
23	25																																		
24	27																																		
25	29	*2220	2335		3	S29W24	3	S	3-	2228	72	5	6	*2	2217	>23	2224	525	OH	3413	28.5	35°	S27	2.5	3500	2	1	NEW	$kapd$	27.8	S29	4	20-29		11482
																														$dfpfd$	29.2	S26	11	27- 2		11491
26	Mar. 01	1730	1745		2	N20W55	1	S	2	1726	22	5	7	9	1717	4		4		3412	25.5	75°	N24	3.5	9000	14	5	3385	$kapf$	25.2	N25	22	19- 2		11480
														*2	1721	5	1724	610											$dfpf$	26.2	N18	10	28- 3		11495
														4	1726	>289		-10											$kapd$	26.6	N26	17	20- 1		11481
27	02	*1220	1314		3	N21W64	1	S	2	1158	34	1	1	3412																					
28	02																																		
29	04													3419	Mar. 04.5	330°	S24	3.5	3500	22	2	3391	* $kfpf$	Mar. 04.8	S23	29	27-10	1200	11493
30	08																																		
31	10	0515	0640		2	N16E88	2	SL	3-	0438	117	5	2	*CD	0443	80	0518	850	TK	3431	16.0	178°	N22	3	3500	3	3	Part of 3400	$dapd$	15.3	N18	3	13-18		11514
32	10																													$dfpd$	16.1	N25	2	14-18		11518
33	10																																		
34	13	1453	1529		2	N21E50	3	S	3-	1452	118	5	7	*2	1450.5	14.5	1454	860	OH	3432	17.0	165°	N22	3	9000	23	4	3404	$fpfk$	17.2	N23	17	10-23		11508
														4	1505	87		13	OH										$fapk$	17.3	N20	34	11-23		11511
35	15	1625	1745	1635	2+	N22E21	5	*S	3	1623	120	5	9	9	1617	3.5		5	OH	3432														
														*2	1620.5	23.5	1627	1320	OH															
														2	1644	33	1652	195	OH															
36	19							*G	3	2133	117	3	2	4	1717	48		9	OH																
37	20	0235	0410	0250	1	S17W04	1	*S	3	0228	74	5	2	CD	0224	10	0229	285	TK	3435	20.0	125°	S25	2.5	3500	9	2	3405	$fapf$	19.6	S20	21	13-25		11516
38	20																																		

TABLE VIII

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 DATA: Type	Beg. UT	Dur. Min.	Max. UT	Peak Flux	Obs.	OTHER RADIO DATA: Freq. Mc/s	Type	Beg. UT	Dur. Min.	Max. UT	Peak Flux	Obs.	POLAR CAP ABSORPTION: Gr. Day	Onset UT	Rise to Rise	Dur.	Peak Int.	Obs.	GEOMAGNETIC STORMS: Gr. Day	Beg. UT	Dur.	Type	Int.	No. Sta. Report	Max. Kp
56																																
57																										Oct. 31	12xx	1d	g	m	2	5
58																										Nov. 12	07xx	1d	g	m	2	5
59							CD	1128	7		>1700	Osl	545	CD	1128	10		>120	N													
60	I_S in progress all day	G0424-0430/1 G0437-0441/1	*0441-0505/1		Syd		CD	0439	2		720	Syd	3750 3750	SD SD	0427 0445	3 0.7		(96) (20)	Nag Nag													
61																										15	06xx	2d	g	m	5	5
62							CD	1734	5		-	C	460	CD	1736	5.7		>1300	NBS													
63	I_S 2150-0755/1	IIIs 2150-0640/1	*2205-2208/2		Syd								460	CD	2204	2		740	NBS													
64	I_S in progress all day	g0238-0240/2 III_S0130-0552/1	*0242-0253/2		Syd								98 62	CD SD	0229 0223	6 0.3		1970 700	Syd Syd													
65																										18	03xx	>1d	g	ms	13	6
66																										19	1319	2d	sc	s	17	8
67			*0442-0513/2		Syd								62	CD	0444	5		290	Syd													
68	I_S in progress 2133-0845/1				Syd								98	CD	2252	0.3		210	Syd													
69	I_S0102->0836/1	G0541/1	*0544-0549/2		Syd								62	CD	0541	1		780	Syd													
70																										Dec. 01	09xx	1.2d	g	m	7	5
71													545 545 175	CD CD CA	1108 1136 1107	20 34 140		350 340 >120	N N Cav													
72																										05	2216	0.5d	sc	m	2	4
73																										24	16xx	1.2d	g	m	2	5
74																										26	20xx	0.8d	g	m	1	5
1																										1956 Jan. 01	12xx	1.5d	g	m	2	5
2																										10	0400	3.2d	g	ms	13	6
3			*0031-0049/2		S																											
4																										17	2342	2.2d	sc	ms	13	6
5	I_S in progress all day	g0023/1 Also IIIs in progress all day	*0026-0031/3		S		CD CA	0024 0030	6 50		>750 >500	Tok Tok	3750	CD	0023	1.8		(426)	Nag													
6	I_S in progress all day	G0530.8-0531.8, 2 G0532.6-0535.4/3 g0538/3 g0544/2 Also IIIs in progress all day			S																											
7																										21	1644	1.4d	sc	ms	12	6
8																										23	15xx	1.7d	g	ms	7	6
9																										27	0900	2.8d	sc	ms	15	6
10													460	CD	2116	180	2117.3	>1800	NBS													

In the dynamic spectrum, however, in addition to the Type II Sydney also reported unclassified burst activity of intensity 1 between 0049 - 0055 UT, and 0100 - 0104 UT.

4. Although there are no known major flares prior to the start of this storm, it should be pointed out that a very active and radio-noisy region, plage 3379, had been having flares of Imp. 2 and 1 (some with SWF's) since its east limb appearance on January 13.

5. No flare observations exist at the time of the Type II burst on January 19, at 0026 UT., therefore plage and spot data are not available. No known 10 cm. event is reported in association with the Type II but a burst of short duration at 3750 Mc occurs simultaneously with the group of Type III bursts that precedes the Type II. At meter wavelengths, the radio event consists of a strong major burst. It is worthy of note that a radio-noisy region, capable of production Type III noise storms, is present on the disk from January 17-26.

6. This major flare on January 19, at 0535 UT., which was reported by only one station, occurs in a very large, very bright, and very active plage -- region 3379. This region is undoubtedly the source of the radio noise mentioned in note No. 5. It contains a γ spot (Mt. Wilson No. 11440) which is one of the largest spots of the year -- area equal to 2000 millionths of the hemisphere (Mt. Wilson data). This unusual region is the predecessor of the plage that produces the great cosmic ray flare of February 23, during the next solar rotation. In the dynamic spectrum, only several groups of Type III bursts, superposed on an already noisy record, are reported in association with the large flare. No known radio events are reported at any of the single radio frequencies.

7. Prior to this Sc storm of January 27, there have been no known great solar events -- but it should be pointed out that plage region 3379 had numerous flares of Imp. 2 on January 23 and 24, with accompanying SWF's and radio bursts of high intensity.

10. This flare on February 10, at 2110 UT. was a major limb event. Although it was called a flare of Imp. 1 by Mt. Wilson, observers at the McMath-Hulbert Observatory rated it as a flare of Imp. 3 on the basis of its explosive nature, the bright loop observed visually, and the bright emission which was present in many spectrum lines. The flare occured in a very large, bright and active plage that is a return of part of the active plage described in Note No. 6. The plage contains three major spots (in addition to numerous other lesser spots). The αp spot No. 11461 is a return of αp spot No. 11439 in region 3379, and the γ spot No. 11465 is a return of γ spot No. 11440. In addition, γ spot No. 11467 and β spot No. 11470 are two of the largest spots of the year -- the former has and area of 1800 millionths of the solar hemisphere, and the latter an area of 1600 millionths (Mt. Wilson data). No. dynamic spectrum observations exist at the time of the large flare, and no known distinctive events are reported at meter wavelengths among the single radio frequencies. The 10 cm. event obviously consists of a major burst, for it is off-scale in the sunset oscillations near the close of the day (for Ottawa), and is followed by the start of a post-burst increase in flux. One suspects that this might probably be interpreted as continuum radiation, possible Type IV. (Also see note No. 35).

TABLE VIII

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	Obs.
39	Mar. 24																		
40	28																		
41	30																		
42	31	1350	1430		1	N30W80	1	*S	3	1350	68	5	8	3	1343	177	1510	12	Ott
														2	1351	11	1352	176	Ott
43	Apr. 02																		
44	09	*0940	1101		3	N33E27	6	S	2	0945	70	3	2						
45	12	0530	0557		2	N19E65	2	S	2	0530	20	4	2						
46	21																		
47	25																		
48	26																		
49	27	2050	2150	2100	1+	N16W27	2	SL	1+	2053	24	3	3	9	2049	2		5	Ott
														2	2051	10	2056	375	Ott
														4	2101	13		17	Ott
50	27																		
51	28																		
52	30																		
53	May 06																		
54	11																		
55	15																		
56	16																		
57	17	*2230	2404	2305	3	S24W18	1							3	2230	50	2252	35	Ot
														1	2252	0.5		14	
														2	2310	4.5	2311.5	14	
														2	2326.5	4	2328.5	9	
58	18	1600	1610		1-	S26E45	1	S	1	1605	15	5	5	9	1603.3	1		6	Ott
														*2	1604.3	15.7	1604.4	515	Ott
59	20																		
60	23																		
61	25																		
62	30							*S	3+	0230	95	5	4	*CD	0232.5	14.5	0235	690	Tk
63	30	2320	2357	2330	1	S20E02	1												
64	31	0752	0838	0753	2+	N24E38	5	*S	3+	0747	81	5	4						
65	June 14							*S	3+	0356	60	4	2						
66	14																		
67	20																		
68	20																		
69	23																		

Event No.	PLAGE DATA: McM Plage No.	CMP Gr. Day	Mean Long.	Mean Lat.	Ave. Int.	Max. Area	No. Flares	Age in Rotation	Ident.	SPOT DATA: Mt. Wilson Type	CMP Gr. Day	Mean Lat.	H	When Seen	Area	Mt. Wilson No.
39																
40																
41																
42	3440	Mar. 25.0	59°	N26	2.5	8500	9	6,1	Partly new and partly 3412	$\ell\alpha pd$	Mar. 24.0	N17	13	17-25		11526
										$d\beta f\ell$	25.2	N30	19	27-31		
										$\ell\alpha p\ell$	25.4	N32	26	19-31		
43																
44	3457	Apr. 11.0	195°	N24	3.5	8000	6	4	3431	$\ell\beta f\ell$	Apr. 11.1	N24	21	5-16		11553
45	3464	17.5	109°	N19	3.5	4500	15	2	3437 and 3438	$\ell\alpha pd$	17.4	N20	12	12-20		11567
46																
47																
48																
49	3474	26.0	357°	N18	2.5	3000	8	1	NEW	$\ell\alpha p\ell$	25.4	N17	17	19-30		11581
50																
51																
52																
53	3481	May 06.5	218°	N18	3.5	8000	20	1	NEW	• $\ell\beta p\ell$	May 06.5	N16	29	30-12	1200	11603
54																
55																
56																
57	3497	16.5	86°	S24	3	3000	4	3	3465	$\ell\alpha p\ell$	16.1	S21	34	10-22		11622
58	3503	22.5	6°	S24	3.5	6000	26	1	NEW	$\ell\beta p\ell$	22.5	S24	17	16-28		11627
59																
60																
61																
62	*3506	25	334°	S20	3.5	7000	41	2	3477	• $d\beta p\ell$	25.0	S20	28	21-31	1400	11636
63	3513	31	254°	S16	2.5	2000	1	2	3484	$\ell\beta pd$	30.7	S16	6	24- 2		11640
64	*3518	June 03.5	208°	N22	3.5	9000	33	2	3481	$\ell\alpha p\ell$	June 03.0	N17	22	27- 9		11643
										$\ell\beta p$	03.1	N24	14	28- 2		11644
										• $\ell\beta p\ell$	03.6	N23	27	28- 9	1100	11645
65																
66																
67	3541	20	349°	N12	3.5	1500	12	1	NEW	• $d\beta f\ell$	20.2	N13	21	20-26	1300	11673
68	*3543	20.5	356°	S20	3.5	10000	34	3	3506	$\ell\beta f\ell$	21.3	S20	22	14-27		11667
69																

42. The major SWF on March 31, at 1350 UT, is associated with an average flare which occurred in region 3440 near the west limb of the sun. Plage 3440 extends north and south over about 20° of latitude, and the lower or southern portion of the plage is a return of plage region 3412, while the upper portion at higher latitude represents the appearance of a new part of the plage. The αp spot No. 11526 is a return of the βp spot No. 11495 in region 3412. No dynamic spectrum observations exist at the time of the SWF. The 10 cm. event consists of a burst superposed on a very long-enduring but modest rise and fall in flux. At meter wavelengths, there is no distinctive event at the time of the SWF, and no radio events reported at any of the other single radio frequencies.

43. Although this Sc storm of April 2 was reported by only one station, it represents a real change in the 3-hour K_p values to storm level.

44. No 10 cm. observations and no dynamic spectrum observations exist at the time of the major flare on April 9, at 0940 UT. Major bursts are reported at meter wavelengths and at lower frequencies. From the starting times of these bursts, one may conclude that a large burst of radiation has swept slowly through all frequencies, reaching the lowest frequency (81 Mc) about 8 minutes after the start of the optical flare.

45. The Type II burst on April 12, at 0536 UT, is associated with flare activity near the east limb, in plage region 3464. The αp spot No. 11567 is a return of the βp spot No. 11524 in region 3438. No known radio events are reported at any of the single radio frequencies at the time of the Type II burst.

46. Four of the 18 stations start this Sc storm earlier, on 21st, at 0800 UT., and classify it as a gradual storm.

47. Although the sun was under observation, no known flare is reported at the time of the Type II burst on April 25, at 2348 UT. Therefore plage and spot data are not available. No SWF is reported in association with the Type II, and no radio bursts at centimeter or meter wavelengths.

48. This severe Sc storm of April 26 is one of the rare geomagnetic storms for which the 3-hour Kp value reaches a maximum of 9.

49. This event on April 27, at 2050 UT, 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. 50). No dynamic spectrum observations exist at the time of the flare. The single frequency reports indicate that a large radio burst has occurred at all wavelengths. The 200 Mc record from Cornell shows a great major + burst, for which the second part is a large increase in flux.

50. This PCA event of April 27 (CF. NASA Proton Manual) for which no starting time is given, is from the list of events prepared by Collins, Jelly and Matthews from their study of vertical-incidence ionosonde data from high latitude stations. Since the event occurs during a period when the magnetic indices are very high, and a severe magnetic storm is in progress, some doubt may be cast upon the reality of the event as truly polar cap absorption. (It may perhaps be due to the more usual form of auroral absorption.)

53. This event is a part of this catalogue only because the plage region contains a very large spot. Plage No. 3481 is primarily a new plage, but it is near the position of old plage 3456. Although the region is very large and very bright, and contains a very large spot, it does not have the kind of activity necessary to produce any great solar optical and radio events such as those listed in the catalogue. The βp spot No. 11603 is one of the largest spots of the year -- area equal to 1200 millionths of the hemisphere (Mt. Wilson data).

55. While the gradual storm of May 15 is in progress, seven stations report a "sudden commencement" start on May 16, at 0418 UT. The maximum 3-hour K_p value of 8 is reached, following this second aspect of the storm.

56. No known flare is reported at the time of the Type II burst on May 16, at 0007 UT., therefore plage and spot data are not available. No known SWF., and no radio events at any of the single radio frequencies, are reported in association with the Type II burst.

57. No known SWF is reported in association with the major flare on May 17, at 2230 UT. No dynamic spectrum observations

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
11						
12						
13			*0554.6-0620.3		S	
14						
15	I_g in progress all day				S	
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30		IIIs in progress all day	*0321-0342.3		S	
31						
32						
33						
34						
35						
36						
37						
38						

Event No.	200 MC DATA: Type	Beg. UT	Dur. Min.	Max. UT	Peak Flux	Obs.
11	CD	1446	13	INDET.	>71	C
12	CD	1600	50	1625		C
13	CD	0554.5	>45		>2400	Tok
14	CD	1805	15.5		>199	C
	CD	1913	97		>199	C
15						
16	CD	1115	27		480	Osl
	CD	1153	57		220	Osl
17		<1420	>340		>199	C
18						
19						
20	CD	0335	25		>20000	Tok
21	CA	0400	>120		>5000	Tok
22						
23						
24						
25						
26	CD	1720	17.5		>67	c
27						
28						
29	SD	1216	1		280	Osl
30	CD	0319	12		>3500	Tok
31						
32						
33	CA	1452	14			C
34						
35	CD	1623	120		>560	C, Osl
36						
37	CD	0235	>60		>2000	Tok
38						

Event No.	OTHER RADIO DATA: Freq. Mc/s	Type	Beg. UT	Dur. Min.	Max. UT	Peak Flux	Obs.
11	536	CD	1443	21		220	PR
	460	CD	1442	123	1448	460	NBS
12	175	SD	1452	15		>150	Cav
	81	E	1450	>30		(>20)	Cav
13	3750	SD	0538	0.7		(15)	Nag
	3750	CD	0541	75		(2720)	Nag
14	460	CD	1758	385	2020	420	NBS
	167	CD	1804	439	1930	>620	NBS
15							
16	545	CD	1111	28		1200	Ner
	175	CA	1100	90		(>180)	Cav
	81	E	1110			(>180)	Cav
17	536	CD	1420	29		>280	PRA
	536	CD	1449	27		180	PRA
18	536	CD	1516	11		56	PRA
	460	CD	1420	67	1436	>2200	NBS
	175	E	1420	>90		>150	Cav
	167	CD	1430	7		>1300	NBS
	81	E	1428	>120			Cav
	460	E	<1346	>642			NBS
	167	E	<1346	>642			NBS
19							
20	3750	CD	0334	15.5		(18000)	Nag
21							
22							
23							
24	460	CD	2222	134	2228.6	410	NBS
	167	CD	2224	132	2225	>1000	NBS
25	460	CD	1722	6	1724	50	NBS
	167	CD	1721	15	1722	>1900	NBS
26							
27	81	M	1140	80		>75	Cav
28							
29	3750	CD	0320	29.5		(421)	Nag
30							
31							
32							
33	545	SD	1454	0.5		95	N
34							
35	460	CD	1626	91	1627	>1900	NBS
	167	CD	1623	>480	1640	>1500	
36							
37	3750	SD	0226	45		(57)	Nag
38							

Event No.	POLAR CAP ABSORPTION: Gr. Day	Onset UT	Rise to Peak	Dur.	Peak Int.	Obs.
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21	Feb. 23	0400	18h	123	104	B
22						
23						
24						
25						
26						
27						
28						
29						
30						
31	Mar. 10	0900	38h	160	28	B
32						
33						
34						
35						
36						
37						
38						

Event No.	GEOMAGNETIC STORMS: Gr. Day	Beg. UT	Dur.	Type	Int.	No. Sta. Report	Max. Kp
11	Feb. 11	1800	1.2d	g	m	6	5
12							
13							
14							
15							
16							
17	19	0220	1d	sc	m	2	4
18							
19							
20	21	2002	1d	sc	m	4	4
21							
22	25	0307	2.2d	sc	s	16	8
23	27	19xx	2.2d	g	m	6	5
24							
25							
26							
27	Mar. 02	2343	1.8d	sc	ms	19	7
28							
29							
30							
31	10	18xx	0.6d	g	ms	4	6
32							
33							
34							
35							
36							
37	20	1146	3d	g	ms	18	7
38							

IV radiation undoubtedly occurred. It was for this major flare, which occurred near the west limb of the sun, that the event now known as "Polar Cap Absorption" was first detected, by Bailey.

25. No dynamic spectrum observations exist at the time of the large flare on February 29, at 2220 UT. At centimeter wavelengths, a large burst occurs at the time of the flare, but no known distinctive event is reported at meter wavelengths.

26. The large 10 cm. burst on March 1, at 1721 UT, is associated with flare activity that was observed visually at the McMath-Hulbert Observatory. The flare was accompanied by a very extensive and active dark flocculus, which first moved outward from the sun with large negative radial velocity, then fell back (-R,V,). The flare occurred in a very large and very bright plage that contains several spots. The ap spot No. 11480 is a return of spot No. 11453 in region 3385. The long post-burst 10 cm. event represents a decrease in flux, instead of the more usual increase. Such "negative" bursts are rare, and apparently represent the effects of absorption. No dynamic spectrum observations exist at the time of the large 10 cm. burst, but major bursts are reported at the single radio frequencies simultaneously with the 10 cm. event.

27. The plage and spot data for this event are the same as that given for event No. 26. No dynamic spectrum observations exist at the time of the flare on March 2, at 1220 UT., and no known 10 cm. events are reported.

29. This event is a part of this catalogue only because the plage region contained a very large spot. The βp spot No. 11492 is one of the largest spots of the year -- area equal to 1200 millionths of the hemisphere (Mt. Wilson data). Solar activity in this plage, with its large spot, did not produce any major events of sufficient importance to warrant inclusion in the catalogue.

30. Flare observations do not exist at the time of the Type II burst on March 8, at 0321 UT., therefore plage and spot data are not available. No known SWF or 10 cm. events are reported at the time of the Type II burst.

31. A major flare in progress near the east limb at 0515 UT. is undoubtedly associated with the large 10 cm. burst and SWF on March 10, at 0443 UT. The great burst is of long duration, and reaches maximum intensity a few minutes after the start of the flare observations. The flare occurred in a plage that is a return of part of the complexity of plage and spots associated with the great comic ray event near the west limb on February 23. No dynamic spectrum observations exist at the time of the large centimeter burst (which may possibly indicate that Type IV radiation has occurred), and no distinctive events are reported at any of the single radio frequencies.

34. The 10 cm. event on March 13, at 1450 UT, consists of a very large burst, followed by a long post-burst increase in flux. No dynamic spectrum observations exist at the time of the large centimeter burst. At meter wavelengths, however, the radio event consist of a temporary rise in base level superposed on a noisy record.

35. This very great 10 cm. burst on March 15, at 1620 UT. is followed by a long post-burst increase in flux. No dynamic spectrum observations exist at the time of the large centimeter burst. However, the single radio frequency reports indicate that a large major burst occurred. At meter wavelengths the record consists of a very great event -- resembling a great rise and fall in flux on which are superposed periodic variations (also like R and F's). Events No. 34 and 35 are both associated with flare activity in the same plage region (McMath No. 3432). The ap spot No. 11511 is a return of ap spot No. 11466 in region 3404. It should be noted that plage 3404 (during the previous rotation) is situated on the solar disk immediately following the position of plage 3406 (the active plage described in note No. 10). Indeed, the two plages merge into each other to form a great and complex plage entity extending over 70 of solar longitude, and containing seven major separate spot groups. Plage 3432 is a return of region 3404, while plage 3400 returns as regions 3428 and 3431.

36. Although the sun was under observation, no known flare is reported at the time of the large SWF on March 19, at 2133 UT., therefore plage and spot data are not available. No dynamic spectrum observations exist at the time of the SWF, and no radio events are reported at any of the single radio frequencies.

37. The major SWF on March 20, at 0228 UT. is associated with an average flare in an average plage. The ap spot No. 11516 is a return of the βp spot No. 11473 in region 3405. No dynamic spectrum observations exist at the time of the SWF. At meter wavelengths, the radio event obviously is a very great burst.

38. Six of the 18 stations designate this storm as "sudden commencement" rather than gradual. Three stations start this Sc on 20th, at 1146 UT., and the other three stations start the storm with an Sc on the next day. on the 21st, at 1615 UT.

70. Flare data at the time of the major SWF on June 24, at 1255 UT. Is fragmentary, but the SWF is apparently associated with a minor limb-flare that occurred in plage region 3535 at the west limb of the sun. The $_{e}p$ spot No. 11660 is a return of the $_{f}p$ spot No. 11626 in region 3501. No dynamic spectrum observations exist at the time of the major SWF.

71. The Type II burst reported on July 6, at 0246 UT, continues until 0309 UT, at reduced intensity.

72. The large 10 cm. event reported on July 22, at 1638 UT, consists of two great bursts followed by a long interval of rise and fall in flux. No dynamic spectrum observations exist at the time of the large centimeter burst. At meter wavelengths, the radio event consists only of a very minor burst, and no other events are reported at any of the other single frequencies. This event is listed as a "possible Type IV" by Mme. Pick-Gutmann.

73. This very long period of storminess, beginning on July 23, has a maximum, in the 3-hour K_{p}s, of 6 on the 24th and 26th, and another maximum of 5 on the 28th.

74. No known flare is reported at the time of the large SWF on July 25, at 0010 UT., therefore plage and spot data are not available. No dynamic spectrum observations exist at the time of the major SWF. In the neighborhood of 10 cm., the radio event consists of a microwave burst of short duration, but at the lower frequencies it seems evident that a major +burst has occurred.

75. The large 10 cm. event reported on July 6, at 0246 UT, consists of two great bursts followed by a long interval of rise and fall in flux. No dynamic spectrum observations exist at the time of the large centimeter burst. At meter wavelengths, the radio event consists only of a very minor burst, and no other events are reported at any of the other single frequencies. This event is listed as a "possible Type IV" by Mme. Pick-Gutmann.

76. This very long period of storminess, beginning on July 23, has a maximum, in the 3-hour K_{p}s, of 6 on the 24th and 26th, and another maximum of 5 on the 28th.

77. No known flare is reported at the time of the large SWF on July 25, at 0010 UT., therefore plage and spot data are not available. No dynamic spectrum observations exist at the time of the major SWF. In the neighborhood of 10 cm., the radio event consists of a microwave burst of short duration, but at the lower frequencies it seems evident that a major +burst has occurred.

78. The plage and spot data for this event are the same as that given for event No. 75. There is some ambiguity in assigning the proper flare associated with the major SWF on July 25, at 0525 UT. Another flare (Imp. 1) is reported by another station, in progress at the same time as the flare which we have listed. We have chosen the more important flare, since it has a better time association with the SWF. No dynamic spectrum observations exist at the time of the SWF. No known radio event is reported at meter wavelengths in association with the SWF.

79. These events are a part of this catalogue only because they occurred during their transit across the solar disk. In addition, the former plage (region 3586) also contained a very large spot. The $_{f}p$ spot No. 11717 was one of the largest spots of the year -- area equal to 1400 millionths of the hemisphere (Mt. Wilson data). These very large bright and active plages were not responsible for any major solar- optical and radio events such as those listed in the catalogue.

80. Dynamic spectrum observations exist at the time of the major SWF on August 9, at 0140 UT. No known radio event is reported at meter wavelengths, but the other single frequency reports indicate that a microwave-type burst occurs simultaneously with the SWF and the associated flare. This burst is strongest at centimeter wavelengths, and tapers off at lower frequencies.

81. No dynamic spectrum observations exist at the time of the major SWF on August 19, at 0117 UT. The SWF is associated with an average flare of Imp. 1, that occurred in a region located very near to the east limb of the sun. The $_{e}p$ spot No. 11754, in this plage region, is a return of the larger $_{f}p$ spot No. 11717 in region 3586 (described in not No. 79). No known radio event at meter wavelengths is reported in association with the SWF.

82. No flare observations exist at the time of the major SWF on August 21, at 0140 UT., therefore plage and spot data are not available. No known radio event at meter wavelengths is reported in association with the SWF.

83. No dynamic spectrum observations exist at the time of the major SWF on August 23, at 0208 UT. The radio events listed in the table of 500 Mc data are the only events at meter wavelengths which are reported during the time of the large SWF. Since they occur rather late in the course of the SWF, these

TABLE VIII

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	Obs.	PLAGE DATA McM Plage No.	Gr.	Day	CMP	Mean Long.	Mean Lat.	Ave. Int.	Max. Area	No. Flares	Age in Rotation	Ident.	SPOT DATA Mt. Wilson Type	Gr.	Day	CMP	Mean Lat.	H	When Seen	Area	Mt. Wilson No.
70	June 24	1300			1-	N30W90	1	*S	3	1255	60	5	6	6	1254.3	8.7	1256.7	115	Dh	3535	June 17	29°	N28	3.5	4500	18	4	3501	$d/p/f$	June 16.8	N31	17	19-23		11670
71	26																														$f/p/d$	16.9	N22	16	10-20		11659
72	29																														$f_{a}p_{d}$	17.0	N24	17	10-21		11660
73	July 06	0246	0300		1	N20E47	1	S	2	0235	33	4	2	CD	0244	4.5	0246	264	Tk	3565	July 09.5	91°	N20	3	2500	22	1	NEW	$f_{a}p_{d}$	July 09.2	N20	14	3-11		11696
74	13																														$d/p/f$	09.6	N20	28	5-16		11700
75	22	1624	1720		2	N28W54	5	*2		1538		8.5	1641.8	660	Dh	*3577	18.5	332°	N26	4	2000	39	1	NEW	d/p_{f}	18.4	N26	17	16-23		11714
								S	2+	1635	110	5	6	3	1707	88	1743	13	Dh																		
76	23																																				
77	25							*S	3	0310	29	4	2																								
78	25	0535	0545	0537	1+	N27W90	1	*S	3	0525	36	5	4							3577																	
79	27																			*3586	27	220°	S24	3.5	7500	45	1	NEW	* f/p_{f}	Aug. 27.3	S22	30	20- 2	1400	11717
80	Aug. 06																			*3598	Aug. 06	87°	N18	3.5	12000	36	2	3565	f/p_{f}	Aug. 05.8	N17	29	30-11		11729
81	09	0141	0204	0145	2	N21E48	1	*S	3	0140	45	5	4	CD	0140	9.3	0143	469	Tk	3607	12.5	1°	N20	3.5	5500	29	3	Part of 3574	$f_{a}p_{f}$	06.2	N13	32	30-12		11730
82	09																														f/p_{f}	12.5	N23	29	5-18		11735
83	11																																				
84	17																																				
85	19	0120	0129		1	S21E67	1	*S	3	0117	33	1	1	CD	0114.5	9	0118	249	Tk	3630	34	210°	S23	3.5	7500	21	2	3586	$f_{a}p_{f}$	23.9	S24	33	17-29		11734
86	21							*SL	3	0140	84	1	1	CD	0145	2.3	0146.3	279	Tk												d/p_{d}	24.3	S27	20	18-29		11758
87	21																																				
88	23	0215	0220		1	S19W35	1	*S	3	0208	34	5	2	SD	0210	13	0211	403	Tk	3625	20.5	256°	S19	3.5	3500	22	1	NEW	d/p_{f}	20.1	S19	25	17-25		11751
89	23																																				
90	27	0942	1018		1+	N30W35	5	*S	3	0945	35	1	1							3629	23.5	216°	N24	3	5000	21	2, 5	3564 and 3587	d/p_{d}	22.5	N21	10	18-27		11757
91	29	*0937	1033	0956	3	N30W69	8	S	2	0938	80	2	2							3629											$f_{a}p_{d}$	24.4	N30	21	20-31		11763
92	30							*S	3+	0157	71	5	2	CD	0153.5	10.5	0155.6	371	Tk																		
93	31																																				
94	31	*1226	1526	1243	3	N15E15	11	*S	3	1239	81	5	7	2	1231	39	-	>340	Oh	*3643	Sept. 02.0	91°	N16	3.5	10000	30	3	3598	* $f_{f}p$	Sept. 01.8	N17	28	26- 7		11777
95	31													4	1310	110		40	Oh												$f_{a}p_{d}$	02.0	N17	26	26- 6		11779
96	Sept. 02																														$f_{a}p_{f}$	02.6	N14	25	27- 6		11781

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 DATA: Type	Beg. UT	Dur. Min.	Max. UT	Peak Flux	Obs.	OTHER RADIO DATA: Freq. Mc/s	Type	Beg. UT	Dur. Min.	Max. UT	Peak Flux	Obs.	POLAR CAP ABSORPTION: Gr. Day	Onset UT	Rise to Peak	Dur.	Peak Int.	Obs.	GEOMAGNETIC STORMS: Gr. Day	Beg. UT	Dur.	Type	Int.	No. Sta. Report	Max. Kp
39																											24	10xx	0.8d	g	ms	3	6
40																											28	02xx	1.5d	g	ms	7	6
41																											30	17xx	0.6d	g	m	1	5
42																																
43																											Apr. 02	0721	1d	sc	m	1	5
44							CD	0942	18		>300	N	545 175 81	CD SD SA	0939 0945 0948	12 10 13		260 65 >800	N Cav Cav													
45		b0529/2 b0555.2	*0536- 0552/1		S																											
46																											21	1101	2d	sc	ms	18	7
47		b2313.1	*2348- 2419.1		S								167	CD	2353	1.8		>1900	NBS													
48																											26	2112	1.6d	sc	s	18	9
49							CD	2052	38			C	460 167	CD CD	2051 2054	63 280	2059	>3000 >2800	NBS NBS													
50																				Apr. 27			-48	Weak	C						
51																											28	1727	1d	sc	s	17	8
52																											30	0138	1.7d	sc	ms	18	6
53																																
54																											May 11	2342	1.9d	sc	ms	14	7
55																											15	00xx	2.8d	g	s	18	8
56			*0007- 0039.1		S																						16	0418		sc			
57													460 167	CD CD	2232 2233.6	118 92	2312.8 2250	>1900 590	NBS NBS													
58							CD	1604	5		>240	N	460 167	CD CD	1604 1603.3	39 12	1604.7 1604.5	120 >2600	NBS NBS													
59																											20	0637	1.1d	sc	ms	13	6
60																											23	09xx	2.2d	g	ms	17	7
61																																
62		g0234.2 g0235.2 G0238- 0240.2 b0242.2			S		CD CD	0233.5 0235.5	0.5 0.7		140 140	Tok Tok	3750	CD	0234	7.3		(444)	Nag													
63		b2329.2 b2334.2	*2331- 2333.2		S																											
64							CD CD CD	0746 0753 0756	3 1.5 0.5		>340 200 >340	N N N	536	CD	0751	26		230	PRA													
65													3750	SD	0353	3.5		(12)	Nag													
66																											June 14	1940	1.7d	g	m	5	5-
67																																
68																																
69																											23	1806	2.1d	sc	ms	11	7

exist at the time of the flare. The 10 cm. event consists of several small bursts superposed on a lengthy rise and fall in flux. No known radio event is reported at 200 Mc, but the events at the other single radio frequencies consist of large major burst.

58. The only known flare association with the large 10 cm. burst at 1604 UT, is a minor flare of importance 1- that occurred in the large, bright and active plage region 3503. This plage is primarily new, but is in the same position as old plage 3472, which faded away as it went across the solar disk during the previous rotation. No dynamic spectrum observations exist at the time of the large 10 cm. burst. The radio events which are reported at the single radio frequencies indicate that a major burst occurred at the longer wavelengths almost simultaneously with the 10 cm. event.

61. This event is a part of this catalogue only because the plage region contained a very large spot, and had 41 flares during its transit across the solar disk. Although the plage is very large, very bright, and active, it did not produce any major solar optical and radio events such as those included in the catalogue. The βp spot No. 11636 is one of the largest spots of the year -- area equal to 1400 millionths of the hemisphere (Mt. Wilson data).

62. No flare observations exist at the time of the large SWF and 10cm. burst on May 30, at 0230 UT., therefore plage and spot data are not available. The brief radio bursts reported at meter wavelengths occur simultaneously with the groups of Type III bursts that appear in the dynamic spectrum in association with the large SWF.

63. The Type II burst on May 30, at 2331 UT, is associated with the only flare (Imp, 1) that was reported to have occurred in plage region 3513. No known SWF and no radio events at any of the signle frequencies are reported in association with the Type II.

64. The large SWF on May 31, at 0747 UT, is associated with major flare activity in a very large, bright and active plage. The αp spot No. 11643 is a return of the large βp spot No. 11603 in region 3481. The βp spot No. 11645 is one of the largest spots of the year -- area equal to 1100 millionths of the hemisphere (Mt. Wilson data). No dynamic spectrum observations exist, and no known 10 cm. events are reported, at the time of the major SWF.

65. Although the sun was under observation, no known flare is reported at the time of the large SWF on June 14, at 0354 UT., therefore plage and spot data are not available. No dynamic spectrum events were reported by Sydney at the time of the SWF, although radio observations were in progress at the time. Among the single radio frequencies records, the only reported event is a minor burst at 3750 Mc.

67. These events are a part of the catalogue only because the former is a plage region which contains a very large spot, and the latter is a very large bright plage which had 34 flares during its transit across the solar disk. Neither of these plages produced any major solar optical and radio events such as those included in this catalogue. The βf spot No. 11673 in plage region 3541 is one of the largest spots of the year -- area equal to 1300 millionths of the solar hemisphere (Mt. Wilson data).

TABLE VIII

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	Obs.	PLAGE DATA: McM Plage No.	CMP Gr. Day	Mean Long.	Mean Lat.	Ave. Int.	Max. Area	No. Flares	Age in Rotation	Ident.	SPOT DATA: Mt. Wilson Type	CMP Gr. Day	Mean Lat.	H	When Seen	Area	Mt. Wilson No.
97	Sept. 05	*1445	1507		3	S25E77	1													*3658	Sept. 11.5	338°	S22	3.5	10000	53	2	3615	* $\ell\beta\gamma\ell$	Sept. 11.6	S25	26	5-17	2400	11797
98	05	1645	1800	1650	1+	S24E82	4	*SL	3	1640	100	5	6							3658															
99	08																																		
100	10																																		
101	14	*0813	0907		3	S22E29	3													*3666	16.5	259°	S21	4	20000	45	2	3625 and 3631	$\ell\alpha p\ell$ $d\beta d$ $\ell\beta p\ell$ $\ell\beta p\ell$	15.7 16.3 16.4 16.8	S25 S22 S21 S17	17 10 17 23	9-21 11-17 9-22 10-22		11807 11815 11809 11811
102	17	1942	2120	1950	2+	S20W17	2	S	3-	1941	81	5	7	3 2	1934 1944.5	>207 10	2003 1947	42 440	Ott Ott	3666															
103	20																																		
104	Oct. 01	*0755	0855		3	N45W48	1													3691	27	121°	N45	3	1500	12	1	NEW	$d\beta p\ell$	26.9	N44	21	28- 3		11868
105	02																																		
106	07	*0400	0502		3	N24E07	1					No SWF is Reported at the time of the flare.		CD CD CD CD CD CD	0329 0338 0348 0354.5 0411 0446	6.2 7.3 5.4 0.4 5 6	0332 0342 0351 0354.7 0413.5 0447	271 295 372 271 273 363	Tk Tk Tk Tk Tk Tk	*3694	Oct. 07.0	349°	N18	4	6000	40	1	NEW	* $d\beta\gamma\ell$	Oct. 06.8	N20	34	1-13	1300	11878
107	11	*0955	1113	1013	3	N22W58	5	SL	3-	1012	50	4	3							3694															
108	20																																		
109	22	0700	0903	0712	2	N17E25	8	G	1	0703	19	4	2							3719	24.5	118°	N17	3.5	5000	6	3, 5	3682 and 3685	$\ell\alpha pd$ $\ell\alpha pd$	24.5 24.5	N18 N15	19 11	18-27 18-27		11910 11911
110	26																																		
111	Nov. 07	*1119	1354	1135	3+	S17E32	6	S	2	1106	21	2	2							3751	Nov. 10	260°	S18	3.5	4000	21	1	NEW	$\ell\beta p\ell$	Nov. 09.7	S19	26	3-15		11949
112	08	0231	0248	0242	1	N14E62	1	S	1	0243	17	1	2	*CD	0238	10	0245	538	Tk	3753	13	221°	N16	3.5	4000	22	2	3709	$\ell\beta\ell$	12.9	N16	15	6-18		11958
113	09																																		
114	10							*SL	3	0300	90	4	2																						
115	10	0840	0904		1	N27W07	1	*S	3	0840	42	1	1							3750	10.5	254°	N25	3	2500	8	1	NEW	$\ell\alpha p\ell$	10.0	N24	16	3-16		11948
116	11																			3752	11.5	240°	S21	3	7000	14	4	3704	* $\ell\beta\gamma\ell$ * $d\beta p\ell$	11.5 12.6	S22 S18	22 23	4-17 10-18	1700 1100	11953 11961
117	12																																		
118	13	0157	0254	0203	3-	N28W58	1	S	2+	0158	62	4	2	CD CD	0200.5 0211	7 14	0203 0212	417 359	Tk Tk	3747	09	273°	N27	3.5	3000	4	1	NEW	$\ell\beta p\ell$	09.2	N28	14	2-15		11946

97. Very little is known about any events related to the major flare in progress on September 5, at 1445 UT. No dynamic spectrum observations exist at the time of the flare, and no SWF's, as well as no radio events at centimeter and at meter wavelengths were reported in association with the flare. The flare occurred in a plage very near the east limb of the sun. This very large, very bright and extremely active plage contains a large $\beta\gamma$ spot (No. 11797) which is the largest spot of the year -- area equal to 2400 millionths of the solar hemisphere (Mt. Wilson data). It should be noted that this event very likely is not a real flare of importance 3. Observations were being made at this same time at the McMath-Hulbert Ovservatory, and no event of this magnitude was observed.

98. The plage and spot data for this event are the same as that given for event No. 97. The major SWF on September 5, at 1640 UT. is associated with a flare of Imp. 1+, that occurred near the east limb of the sun. However, although observations existed, no distinctive events were reported in the dynamic spectrum, or at any of the single radio frequencies.

100. No flare observations exist at the time of the Type II burst on September 10, at 0134 UT., therefore plage and spot data are not available. No known SWF occurs in association with the Type II burst, and no radio events at any of the single radio frequencies are reported at the time of the Type II.

101. The major flare in progress on September 14, at 0813 UT., occurred in an extremely large, bright and active plage, which contained many spot groups. The αp spot No. 11807 is a return of the βp spot No. 11756 in region 3631, and βp spot No. 11809 is a return of the βp spot No. 11751 in region 3625. In addition to the four major spots listed in the table of spot data, the large bright plage (region 3666) also contained 10 other transient spot groups with life-times of only a few days (Mt. Wilson data). No dynamic spectrum observations exist at the time of the large flare, and no known SWF's or 10 cm. bursts are reported. Except for the two minor 200 Mc events that occurred near the time when the flare observations began, there were no other radio events reported at any of the single radio frequencies.

102. The major flare event on September 17, at 1942 UT., was observed by two stations. Mt. Wilson saw the beginning of the flare and called it importance 2, while Sacremento Peak observed it in progress at 2012 UT., and called it importance 3. The plage and spot data are the same as that given for event No. 101. At centimeter wavelengths, the radio event consists of a very large burst which is superposed on a long-enduring rise and fall in flux. At meter wavelengths, a similar situation prevails, but the burst is not as large. Although dynamic spectrum observations do not exist at the time of the large flare, it seems likely that Type IV radio emission may have occurred. Mme. Pick-Gatmann lists a "probable" Type IV, based on the large 10 cm. event.

104. It is difficult to find any events related to the major flare reported in progress on October 1, at 0755 UT. No dynamic spectrum observations exist at this time, and no SWF, as well as no radio events at any of the single radio frequencies, are reported in association with the flare. It should be noted that this may not be a real flare of importance 3, but perhaps only a very bright plage. The flare was reported by only one station, but three other stations, observing the sun at the same time, make no mention of it.

106. No SWF is reported in association with the major flare in progress on October 7, at 0400 UT. The flare occurred in a very large, very bright and active plage (region 3694) that contains a large, $\beta\gamma$ spot, No. 11878. This spot is one of the largest spots of the year - area equal to 1300 millionths of the hemisphere (Mt. Wilson data). No dynamic spectrum observations exist at the time of the flare, and no SWF is reported. A group of strong 10 cm. radio bursts that occurred at about the time of the flare seems to be related to activity in region 3694. Another station which was observing the sun earlier than 0400 UT., reports a flare of importance 1+ in progress at the same position, between 0320 and 0340 UT.

107. The plage and spot data for this event are the same as that given for event No. 106. No dynamic spectrum observations exist at the time of the large flare on Octover 11, at 0955 UT., and no known radio events are reported at centimeter or at meter wavelengths, but this may be due to a lack of observations. This major solar event did not cause any geomagnetic disturbance.

8-1-1

8-1-2

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 DATA: Type	Beg. UT	Dur. Min.	Max. UT	Peak Flux	Ob.s
70							CD	1253	5		>150	N
71												
72												
73	I_S in progress	b 0235/1	*0246-0300/3		S		CD	0246	7		>4000	Tok
74												
75							CD	1647	1			C
76												
77							CD	0320	2		>1150	Tok
							CA	0330	90		>900	Tok
78												
79												
80												
81												
82												
83												
84												
85												
86	I_S in progress all day III_S in progress g 0149/2 g 0152/2 G 0201-0202/2	b 0140/2			S							
87												
88							CD	0230	0.3		430	Tok
							CD	0231	0.3		1050	Tok
							CD	0236	0.5		750	Tok
89												
90												
91												
92							CD	0155.5	2		>850	Tok
93												
94							CD	1231	3		610	N,C
							CD	1237	56		22500	N,C
95												
96												

Event No.	OTHER RADIO DATA: Freq. Mc/s	Type	Beg. UT	Dur. Min.	Max. UT	Peak Flux	Obs.
70	81	M	1245	36		>6	Cav
71							
72							
73	9400	SD	0244	2.8		(172)	Nag
	3750	SD	0244	3		(121)	Nag
	1420	CD	0243	4		182	Syd
	600	CD	0244	3		>89	Syd
74							
75							
76							
77	3750	-	0311	2.8		(28)	Nag
	1420	CD	0310	3		170	Syd
	1420	-	0320	70		-	Syd
	600	-	0320	70		64	Syd
78	9400	SD	0528	2.6		(151)	Nag
	3750	SD	0528	2.3		(20)	Nag
79							
80							
81	9400	CD	0140	7		(271)	Nag
	1420	SD	0142	4.5		194	Syd
	600	SD	0141	8		51	Syd
82							
83							
84							
85	3750	CD	0115	8		(29)	Nag
	460	SD	0117	0.9	0117.4	>1600	NBS
86	3750	CD	0144	2		(15)	Nag
87							
88	3750	SD	0210	1.6		(437)	Nag
89							
90	1500	CD	0945	3		(155)	HHI
	536	CD	0945	4.5		235	PRA
91	545	CD	0937	7		140	N
92	1420	SD	0155	3.5		177	Syd
	600	SD	0159	4		55	Syd
93							
94	1500	CD	1230	85		(4920)	HHI
	545	CD	1231	3		-	N
	545	CD	1237	80		6500	N
	460	CD	1237	113	1328	>5400	NBS
	175	CD	1231	3		-	Cav
	175	CD	1240	75		>800	Cav
	167	CD	1237	>600	1328	>5900	NBS
	81	E	1238			>100	Cav
95							
96							

Event No.	POLAR CAP ABSORPTION: Gr. Day	Onset UT	Rise to Peak	Dur.	Peak Int.	Ob.s
70						
71						
72						
73						
74						
75						
76						
77						
78						
79						
80						
81						
82						
83						
84						
85						
86						
87						
88						
89						
90						
91						
92						
93						
94						
95	Aug. 31	1430	14[h]	69	39	V
96						

Event No.	GEOMAGNETIC STORMS: Gr. Day	Beg. UT	Dur.	Type	Int.	No. Sta. Report	Max. Kp
70							
71	June 26	06xx	1.2d	g	m	3	5
72	29	05xx	1.5d	g	m	1	5
73							
74	July 13	12xx	0.6d	g	m	1	5
75							
76	23	12xx	6d	g	ms	12	6
77							
78							
79							
80							
81							
82	Aug. 09	1040	0.8d	sc	m	4	5
83	11	0044	2.0d	sc	m	14	5
84	17	00xx	0.7d	g	m	2	5
85							
86							
87	21	0508	0.8d	sc	ms	5	6
88							
89	23	08xx	3.6d	g	s	15	8
90							
91							
92							
93	31	1016	0.7d	sc	m	5	5
94							
95							
96	Sept. 02	0230	1.8d	sc	s	17	8

bursts may bear no relation to it.

89. The majority of the stations classify this storm of August 23 as a gradual storm. However, five of the 15 stations start the storm later, with a sudden commencement, on 23, at 2202 UT.

90. No dynamic spectrum observations exist at the time of the large SWF on August 27, at 0945 UT. No known radio events at centimeter and meter wavelengths are reported at this time, but it is a time when such observations at the single radio frequencies are often lacking.

91. No dynamic spectrum observations exist at the time of the large flare of importance 3 on August 29, at 0937 UT. The plage and spot data for this event are the same as that given for event No. 90. No known radio events in association with the flare are reported at centimeter and meter wavelengths, but this may be due to lack of observations.

92. Flare observations were not being made at the time of the large SWF on August 30, at 0157 UT., therefore plage and spot data are not available. No dynamic spectrum observations exist at the time of the SWF.

94. The major flare on August 31, at 1226 UT, occurred in a very large, bright and active plage (region 3643) near the central meridian of the sun. The plage which is a return of the region described in event No 80, contains a complex γ-type spot. In addition, the αp spot No. 11779 is a return of the βp spot No. 11729 in region 3598, and the αp spot No. 11781 is a return of the αp spot No. 11730, also in region 3598. No dynamic spectrum observations exist for August 31 at the time of the flare. At centimeter wavelengths, the radio event consists of a large off-scale burst, followed by a long post-burst increase in flux. At meter wavelenghts, the radio event consists of a great major + burst -- the second part being a great rise in base level. Indeed, all of the single radio frequency reports indicate that a very great major + burst has occurred at all wavelengths. It is therefore very probable that Type II radio emission accompanied the flare. (Mme. Pick-Gutmann also lists this event as a possible Type IV). This major solar event (like event No. 21) is one of those rare solar events which is accompanied by an increase in cosmic rays at ground level.

96. The majority of the stations classify this storm of September 2 as a sudden commencement storm. However, six of the 17 stations start the storm earlier, with a gradual beginning, about 0115 UT., on Sept. 2.

7-R-1

7-R-2

TABLE VIII

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	Obs.	PLAGE DATA: McM Plage No.	CMP Gr. Day	Mean Long.	Mean Lat.	Ave. Int.	Max. Area	No. Flares	Age in Rotation	Ident.	SPOT DATA: Mt. Wilson Type	CMP Gr. Day	Mean Lat.	H	When Seen	Area	Mt. Wilson No.
119		1430	1555	1501	2	N16W10	2	SL	2+	1430	120	5	6	9	1416	15		9	Ott	3753														
														2	1431	17	1439	175	Ott															
														4	1448	102		50	Ott															
120	Nov. 13																																	
121	14																																	
122	14	*1037	1400	1055	3	S20W55	3	SL	2+	1037	78	4	3							3751														
123	19													CD	0136.5	33	0156.5	299	Tk															
														CD	0225.5	20	0232	277	Tk															
124	20																																	
125	20	*1002	1318	1014	3	S15W56	6	S	3-	1007	59	5	5							3755	Nov. 16	181°	S13	3	6000	22	1	NEW	* ℓγℓ	Nov. 16.4	S14	23	10-22	1400	11963
126	22	1312	1415	1341	2	S15W84	3																											
127	22							*S	3	1330	65	5	7	3	1323	280	1332.5	64	Ott	3755														
														2	1333	3	1334.7	17	Ott															
														*2	1336	20.3	1339	1000	Ott															
														2	1356.3	7	1357.9	29	Ott															
														2	1405.7	12.3	1408	140	Ott															
														6	1420	9	1424.9	67	Ott															
128	24																			3767	24	76°	S23	3	6000	20	1	NEW	* ℓβpℓ	23.9	S25	31	17-29	1200	11974
129	25																																	
130	27																																	
131	Dec. 02	1400	1406		1+	S15E81	1	SL	3-	1359	126	5	7	2	1354	24	1401	360	Ott	*3785	Dec. 09.5	231°	S20	3	12000	41	5	3752	ℓαpℓ	Dec. 08.2	S25	26	1-14		12003
														6	1419.5	10	1426	47	Ott										ℓβpℓ	09.3	S16	14	2-15		12006
																													* ℓβpℓ	10.2	S19	37	3-16	1200	12009
132	06	*1405	1415		3	S21E41	1	S	3-	1338	38	5	5	2	1336	6	1339.5	127	Ott	3785														
														4	1342	95		10	Ott															
133	07							*SL	3	0457	91	1	1	CD	0459	17.5	0512	322	Tk															
134	10																																	
135	15	0520	0545	0525	2	S25W30	1	*S	3	0522	48	4	2	CD	0527	10	0532	313	Tk	*3788	13	185°	S18	3.5	10000	37	2	3755 and 3757	* dβfℓ	13.3	S25	25	8-19	1300	12016
136	17	*1535	1705	1551	3	S24W52	1	*SL	3	1545	70	5	7	9	1535.5	3		12	Ott	3788														
														2	1538.5	16.5	1545.5	335	Ott															
														4	1555	100		50	Ott															
137	18	0830	1020	0835	2	S25W69	10	*S	3	0826	40	5	3							3788														
138	18	2045	2313		2	S22W78	2	*G	3	2040	60	5	6	2	2039.5	11	2044.7	240	Ott	3788														
														4	2050.5	>20		50	Ott															
139	19	0725	0810		2	S22W72	1	*S	3	0603	60	5	4							3788														
140	19	0835	0930	0853	2	S15E84	4	*S	3	0839	62	5	3							3800	25.5	21°	S15	3.5	3000	21	1	NEW	* ℓβγℓ	25.4	S16	26	18-31		12039
141	20	0456	0523		1+	S25W90	2	*S	3	0442	81	5	3	*CD	0444	24	0451	530	Tk	3788														
142	21																			3795	21.5	73°	N15	3.5	5000	17	1	NEW	* ℓβγℓ	21.0	N14	27	14-26	1400	12030
																													ℓβpℓ	23.6	N13	21	20-28		12042
143	22	*0955	1058		3	N32E90	1													3804	30	321°	N33	3.5	1500	4	1	NEW	ℓβpℓ	29.6	N35	33	23- 3		12046
144	25																																	
145	25																			3801	25.5	21°	N15	3	4000	10	2	3774	* ℓβpℓ	26.4	N16	37	19-31	1700	12040

119. The plage and spot data for this event are the same as that given for event No. 112. This event on November 13, at 1430 UT. is included here (like event No. 109) because it appears in Mme. Pick-Gutmann's list of "probable" Type IV events. The single frequency reports indicate that strong bursts have occurred at all wavelengths. The 10 cm. event consists of a large burst followed by a lengthy post-burst increase in flux, and at meter wavelengths the burst consists of a great rise in base level that occurs while a noise storm is in progress. No dynamic spectrum observations were being made at the time of the event (Ft. Davis was not observing between 1400 - 1527 UT.). Based on the large bursts at the high frequencies, Mme. Pick-Gutmann concludes that Type IV emission probably occurred.

121. Five of the 14 stations classify this storm of November 14 as a gradual, instead of a sudden commencement storm. Four stations continue the storm for an additional 1-1/2 days, during which time the 3-hour K_p's fluctuate and reach a secondary maximum value of 5.

122. No known 10 cm. burst is reported at the time of the major flare on November 14, at 1037 UT., but this may be due to lack of observations. The plage and spot data for this event are the same as that given for event No. 111. No dynamic spectrum observations exist at the time of the flare. Observations at Ft. Davis did not begin until 1337 UT., at which time a noise storm was in progress. The great bursts of long duration that occurred throughout the entire wavelength range among the single radio frequency reports apparently indicate the existence of Type IV radio emission. At meter wavelengths the radio event consists of a major + burst, the second part being a great rise in flux. Mme. Pick-Gutmann lists a "probable" Type IV, based on the strong burst at centimeter wavelengths.

123. No flare observations exist at the time of the Type II burst on November 19, at 0219 UT., therefore plage and spot data are not available. No SWF is reported in association with the Type II, and no radio events at any of the single frequencies with the exception of a minor burst at a frequency of 3750 Mc.

125. No 10 cm. event is reported at the time of the major flare on November 20, at 1002 UT., but this may be due to lack of observations. The flare occurred in a large, bright and active plage that contains a complex γ spot. This spot, No. 11963, is one of the largest spots of the year - area equal to 1400 millionths of the solar hemisphere (Mt. Wilson data). Although no dynamic spectrum observations exist at the time of the flare, the great radio bursts that are reported at all of the single radio frequencies may indicate the existence of Type IV radio emission. Mme. Pick-Gutmann lists this event as a "probable" Type IV, on the basis of the strong emission at the very high frequencies.

127. The plage and spot data for this event are similar to that given for event No. 125. No dynamic spectrum observations exist at the time of the major SWF and great 10 cm. burst on November 22, at 1330 UT. The great radio bursts which are reported at all of the single radio frequencies indicate that Type IV radio emission may have occurred. The 10 cm. radio event consists of many bursts, one of which is a very great burst, superposed on a long-enduring rise and fall in flux. Mme. Pick-Gutmann includes this event in her list of "probable" Type IV bursts.

128. This large bright plage, with a large spot, is not responsible for any of the major solar events listed in this catalogue. The βp spot No. 11974 is one of the largest spots of the year - area equal to 1200 millionths of the hemisphere (Mt. Wilson data).

129. Four of the 13 stations that report this storm on November 25 classify it as a sudden commencement storm, rather than gradual.

131. This event on December 2, at 1354 UT. is included here because it appears in Mme. Pick-Gutmann's list of "probable" Type IV events. The associated flare occurs near the east limb of the sun, in a very large and bright plage (No. 3785). This region contains an interesting large sunspot. The βp spot No. 12009 is one of the largest spots of the year - area equal to 1200 millionths of the solar hemisphere (Mt. Wilson data). It is also the return of the large βp spot No. 11961 in region 3752, described in event No. 116. Although Ft. Davis was observing after 1418 UT., no form of continuum emission was reported in the dynamic spectrum at this time - only a noise storm in progress at the start of the observations.

132. The plage and spot data for this event are similar to that given for event No. 131. No dynamic spectrum observations exist at the time of the major flare in progress on December 6, at 1405 UT. The SWF and the 10 cm. burst indicate that the solar event began about 1336 UT. At centimeter wavelengths, the radio event consists of a burst followed by a lengthy post-burst increase in flux. Only very brief and probably minor bursts occur at other single radio fre-

9L-1

9L-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 DATA: Type	Beg. UT	Dur. Min.	Max. UT	Peak Flux	Obs.	OTHER RADIO DATA: Freq. Mc/s	Type	Beg. UT	Dur. Min.	Max. UT	Peak Flux	Obs.	POLAR CAP ABSORPTION: Gr. Day	Onset UT	Rise to Peak	Dur.	Peak Int.	Obs.	GEOMAGNETIC STORMS: Gr. Day	Beg. UT	Dur.	Type	Int.	No. Sta. Report	Max. Kp
97													460	M	1445	1.1		190	NBS												
98							No Event on the Cornell Record - Except a small series of bursts.																									
99																										Sept. 08	1006	1.8d	sc	ms	15	
100			*0134-0141/2		S																											
101							CD CD	0757 0807	1 2		1500 250	N N																				
102							- CD	1937 1947	23 1.5		>88	C C	460	CD	1943.1	10	1945.9	720	NBS												
103																										20	0437	3.4d	sc	ms	14	6
104																																
105																										Oct. 02	04xx	2.0d	g	m	5	5
106							CA	0325	80		310	Tok	9400 9400 3750 3750 3750 600	CD CD SD CD SD CD	0331 0351 0332 0350 0446 0331	- 2.2 0.5 2.3 1.8 9		- (20) (12) (32) (80) 66	Nag Nag Nag Nag Nag Syd												
107													545	CD	1016	0.5		150	N												
108																										20	03xx	2.1d	g	m	9	5
109							CD CD	0703 0710	1 11.5		250 1400	N N	9400 3750 1420 600 536 536 536	CD CD CD CD CD CD CD	0710 0710 0707 0707 0704 0723 0821	>17 - - 33 20 58 15		(55) - - 264 100 >210 185	Nag Nag Syd Syd PRA PRA PRA												
110																										26	1312	2.2d	sc	ms	17	7
111							CD	1115	45		2200	N	9400 1500 600 536 81	CD CD CA CD E	1103 1106 1117 1100 1115	142 113 64 114.5 -		(640) (465) >60 >235 -	HHI HHI Uc PRA Cav												
112	I_S in progress all day	g0233/2 G0239-0241/2 G0241-0246/1			S		CD	0239	1		380	Tok	9400 3750	CD CD	0242 0241	4.8 4.8		(100) (74)	Nag Nag												
113																										Nov. 09	2030	3.5d	sc	ms	15	7
114	I_S and Cont. in progress all day	b 0326/1 b 0405.2 III_S0421->0805/3			S																											
115							CD CD	0841 0856	1.5 1		550 420	N N	9400 600 536 536	SD SD SD CD	0857 0855 0839 0858	0.5 1 1 7		(303) >60 >320 >320	HHI Uci PRA PRA												
116																																
117			*2309-2323/1		S																											
118		b0203/2 g0204/1 b0206,0209,0211/1 g0216,0217,0218/1	*0207-0220/3		S								9400 600	SD CD	0210 0201	2.3 9		33 61	Nag Syd												

108. This gradual storm of October 20, was preceded by an interval of 10 days of unusually quiet geomagnetic conditions. The storm was not caused by any solar event of sufficient magnitude to be listed as a "major event" in this catalogue.

109. This event on October 22, at 0710 UT., is included here because it appears in Mme. Pick-Gutmann's list of "probable" Type IV events. The single frequency reports indicate that the radio event consists of a great burst of long duration and high flux. The ap spot No. 11910 (in region 3719 in which the associated flare occurs) is a return of the β spot No. 11872 in region 3685.

110. Five of the 17 stations, which report this sudden commencement storm of October 26, start the storm earlier, with an Sc, at 0027 UT.

111. No known 10 cm. event is reported at the time of the great flare on November 7, at 1119 UT., but this may be due to lack of observations. No dynamic spectrum observations exist at the time of the large flare, but the available single frequency reports indicate that a very great burst has occurred at all wavelengths. Mme. Pick-Gutmann indicates that Type IV emission probably occurred, because of the large bursts that were reported, especially at millimeter wavelengths.

112. The large 10 cm. burst on November 8, at 0238 UT. is not associated with any other major solar activity.

114. Although the sun was under observation, no known flare was reported at the time of the large SWF on November 10, at 0330 UT., therefore plage and spot data are not available. No radio events are reported at any of the single radio frequencies at the time of the SWF.

115. The major SWF on November 10, at 0840 UT. is associated with a flare of importance 1 in plage 3750, near the central meridian. This region (3750) is primarily a new plage, but part of it is a return of a part of an old plage (3702). The ap spot No. 11948 is a return of the p spot No. 11887 in region 3702. No dynamic spectrum observations exist at the time of the large SWF, and no known 10 cm. event is reported, but this may be due to a lack of observations. The single frequency reports indicate that a burst of short duration but high flux occurred at all wavelengths.

116. This very large and bright plage contains a $\beta\gamma$ spot, and two very large spots, yet it does not produce any activity in the form of "major solar events" such as those listed in this catalogue. The $\beta\gamma$ spot No. 11953, and βp spot No. 11961, are two of the largest spots of the year - the former has an area of 1700, and the latter an area of 1100 millionths of the solar hemisphere (Mt. Wilson data).

117. Although the sun was under observation, no known flare was reported at the time of the Type II burst on November 12, at 2309 UT., therefore plage and spot data are not available. No SWF is reported in association with the Type II, and no radio events at any of the single radio frequencies.

118. No radio event at meter wavelengths was reported at the time of the Type II burst on November 13, at 0207 UT.

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 DATA: Type	Beg. U	Dur. Min.	Max. UT	Peak Flux	Obs.	OTHER RADIO DATA: Freq. Mc/s	Type	Beg. UT	Dur. Min.	Max. UT	Peak Flux	Obs.	POLAR CAP ABSORPTION: Gr. Day	Onset UT	Rise to Peak	Dur.	Peak Int.	Obs.	GEOMAGNETIC STORMS: Gr. Day	Beg. UT	Dur.	Type	Int.	No. Sta. Report	Max. Kp
119								1429	>10			C	9400	CD	1433	>12		(325)	HHI												
													1500	SD	1429	>18		(256)	HHI												
													545	CD	1425	20		940	N												
													169	E	1431	>90		>70	Ucl												
120																				Nov. 13	2000	27h	63	43	B						
121																										Nov. 14	0200	3d	sc	s	14	8
122	I_S 1340-1615/1				H		CD	1037	2.5		>180	N	9400	CD	1035	115		(1145)	HHI												
							CD	1040	30		4000	N	1500	CD	1032	73		(820)	HHI												
													600	E	1038	42		>60	Ucl												
													545	CD	1033	1.5		220	N												
													545	CD	1035	>70		>300	N												
													175	CD	1050	60		>500	Cav												
123		III_S in progress all day	*<0219-0225/1		S								3750	CD	0135	10		(12)	Nag												
124																																
125							CD	1017	80		>4000	N	9400	CD	1000	202		(>5000)	HHI							20	09xx	2d	g	m	6	5
													1500	CD	1010	215		(>1500)	HHI												
													600	E	1014	150		>60	Ucl												
													545	CD	1011	120		300	N												
													169	E	1016	174		>70	Ucl												
													81	CD	1018	120		(>80)	Cav												
126																																
127							CD	1451	2		1200	N	9400	CD	1245	>90		(610)	HHI							22	12xx	1.4d	g	ms	10	6
													1500	CD	1328	>45		(419)	HHI												
													545	CD	1330	4		>180													
													545	CD	1337	8		>180	N												
													545	CD	1422	19		>200													
													460	CD	1422	158	1451	>630	NBS												
128																																
129																																
130																										25	1135	0.7d	g	ms	13	7
																										27	18xx	0.7d	g	m	1	5
131	I_S in progress <1418-2100/1	G1425/3			E		CD	1358	12		>89	C	169	E	1348	19		>100	Ucl												
132							CD	1333	1.5		350	N	1500	SD	1338	2.6		(124)	HHI												
133													3750	CD	0506	8.3		(28)	Nag												
134																																
135																										Dec. 10	02xx	1d	g	m	2	5
136		b1524/1 g1527/1 g1550/2			H		CD CD CD	1527 1550 1602	0.3 1 100			C C C																				
137													9400 536	CD SD	0837 0909	128 0.5		(632) 100	HHI PRA												
138		g2033/1 g2035/1			H																											
139													3750	SD	0608	3.8		(390)	Nag												
140							CD	0845	15		>540	N	536	CD	0840	20		235	PRA												
141		b0439/1			S								9400	CD	0444	7.5		3650	Nag												
142																																
143																																
144																																
145																										25	0754	1.2d	sc	m	5	5

quencies.

133. Although the sun was under observation, no known flare is reported at the time of the large SWF on December 7, at 0457 UT., therefore plage and spot data are not available. No dynamic spectrum observations exist at the time of the SWF. No radio events at meter wavelengths or at any low radio frequencies are reported in association with the SWF - but this may be due to lack of observations.

134. This storm of December 10 was reported as a moderately severe storm by only two stations, located at high geomagnetic latitudes.

135. No dynamic spectrum observations exist at the time of the large SWF on December 15, at 0522 UT. The associated flare occurred in a very large, very bright and active plage which was responsible for six events in the catalogue - Nos. 135, 136, 137, 138, 139 and 141. The βf spot No. 12016 is one of the largest spots of the year - area equal to 1300 millionths of the solar hemisphere (Mt. Wilson data). With the exception of the related 10 cm. burst, no radio events are reported at any of the single radio frequencies in association with the SWF.

136. The plage and spot data for this event are similar to that given for event No. 135. In the dynamic spectrum, only several groups of Type III bursts are reported in association with the major flare and large SWF on December 17, at 1535 UT. At centimeter wavelengths, the radio event consists of a large burst, followed by a long period of increased flux, while at meter wavelengths the event consists of several minor bursts (which agree in time with the occurrence of the Type III bursts), followed by the onset of a noise storm with increased flux.

137. The plage and spot data for this event are similar to that given for event No. 135. No radio events at centimeter and meter wavelengths are reported at the time of the large SWF on December 18, at 0826 UT., but this may be due to lack of observations. No dynamic spectrum observations exists at the time of the major SWF, Mme. Pick-Gutmann deduces that Type IV radio emission was "probable", based on the occurrence of a very strong burst at centimeter wavelengths.

138. The plage and spot data for this event are similar to that given for event No. 135. The 10 cm. event accompanying the major SWF on December 18, at 2040 UT. consists of a large burst, followed by a period of increased flux. No events at any other single radio frequencies are reported in association with the major SWF.

139. The plage and spot data for this event are similar to that given for event No. 135, although the association of the major SWF on December 19, at 0603 UT. with flare activity in plage region 3788 is subject to question, since the flare data are incomplete. An association also could exist with a flare in another plage, region 3795. No dynamic spectrum observations exist at the time of the large SWF, and no radio events at any of the single radio frequencies are reported, except for the burst of short duration at 3750 Mc.

140. No dynamic spectrum observations exist at the time of the major SWF on December 19, at 0839 UT. No 10 cm. bursts are reported, but this may be due to lack of observations. The large SWF is associated with a flare that occurred in a region very close to the east limb of the sun.

141. The plage and spot data for this event are similar to that given for event No. 135. The major SWF and large 10 cm. burst on December 20, at 0442 UT. are associated with a limb-flare in progress at 0456 UT. in plage region 3788. No radio events at meter wavelengths are reported in association with the SWF, etc. Only a minor Type III burst is reported in the dynamic spectrum, and no form of continuum emission is reported by Sydney at this time. However, on the basis of the large radio bursts at centimeter wavelengths, this event is listed by Mme. Pick-Gutmann as a "probable" Type IV event.

142. This large, bright and active plage, with large β_γ spot, is not responsible for any of the major solar events listed in the catalogue. The β_γ spot No. 12030 is one of the largest spots of the year - area equal to 1400 millionths of the solar hemisphere (Mt. Wilson data).

143. It is difficult to find any solar data associated with the major flare in progress on December 22, at 0955 UT. at the east limb of the sun. No dynamic spectrum observations exist at the time of the flare. No SWF, and no radio events at any of the single radio frequencies are reported in association with the flare.

145. This event appears here in the catalogue only because of the existence of a very large spot. The β_D spot No. 12040 is one of the largest spots of the year - area equal to 1700 millionths of the hemisphere (Mt. Wilson data), and otherwise is not responsible for any of the major solar events included in the catalogue.

G-R-1

G-R-2

TABLE VIII 1954 - 1956 (CONTINUED)

		FLARE DATA						SHORT-WAVE RADIO FADEOUTS						10 CM. EVENTS						PLAGE DATA									SPOT DATA						
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	Obs.	McM Plage No.	Gr. Day	Mean Long.	Mean Lat.	Ave. Int.	Max. Area	No. Flares	Age in Rotation	Ident.	Mt. Wilson Type	Gr. Day	Mean Lat.	H	When Seen	Area	Mt. Wilson No.
146	Dec. 26	0507	0626	0539	2	S15W06	1	*S	3+	0447	93	5	3	SD CD	0444.5 0532	13.5 22	0451 0535	469 360	TK TK	3800														
147	26	1401	1508	1412	2	S17W11	3	SL	3-	1403	97	5	6	*GB	1403	165	1411 1429 1454	182 102 800	OTT OTT OTT	3800														
148	27																																	
149	29	0040	0255	0045	1+	N16E59	2	*S	3+	0044	106	1	1	*CD	0043	90	0056	1150	Tk	3808	1957 Jan. 02.5	275°	N20	3.5	5000	28	1	NEW	* $l\beta\gamma l$	1957 Jan. 03	N18	35	27- 8		12054
150	30																																	

1. VIII -10L

								200 MC DATA						OTHER RADIO DATA						POLAR CAP ABSORPTION						GEOMAGNETIC STORMS						
Event No.	Gr. Day	Type I Time/Max. Int.	Type III Time/Int.	Type II Time/Int.	Type IV Time/Int.	Obs.	Freq. Range.	Type	Beg. UT	Due. Min.	Max. UT	Peak Flux	Obs.	Freq. Mc/s	Type	Beg. UT	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. Report	Max. Kp
146	Dec. 26													9400 9400 9400 9400	CD SD SD CD	0445 0459 0507 0534	8.5 1 4.8 4.6		(92) (28) (23) (148)	Nag Nag Nag Nag													
147	26		G1410-1412/2 G1423-1500/2		*1423-1508/2	H		CD	<1438	>46		>15	C	169 169	CD E	1409 1415	6 >60		>70 >100	Ucl Ucl														
148	27													9400	CD	0045	15		2110	Nag							Dec. 27	1502	1.6d	sc	m	10	5
149	29																																	
150	30																										30	0632	0.5d	sc	m	3	3

146. The plage and spot data for this event are similar to that given for event No. 140. No dynamic spectrum observations exist at the time of the major SWF on December 26, at 0447 UT. No radio event is reported at meter wavelengths, or at any of the lower radio frequencies.

147. The plage and spot data for this event are similar to that given for event No. 140. The 10 cm. event on December 26, at 1403 UT. consists of a great complex burst, with a late maximum. On the basis of this very strong burst, Mme. Pick-Gutmann infers that Type IV emission was "probable". We may perhaps assume that the continuum emission reported by Ft. Davis is also probably Type IV. At meter wavelengths, the radio event in progress at 1438 UT. indicates that the decline of a great increase in flux is in progress.

149. The major SWF and very great 10 cm. burst on December 29, at 0043 UT. are associated with flare activity in a region near the east limb of the sun. No dynamic spectrum observations exist at this time. No radio events are reported at any of the lower radio frequencies, in association with the SWF. However, because of the strong radio bursts at centimeter wavelengths, this event is listed as a "probable" Type IV by Mme. Pick-Gutmann.

1. VIII -10R

MSC 3252-65