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Upper Atmosphere Geophysics

REPORT UAG - 2

A REEVALUATION OF SOLAR FLARES 1964-1966

August 1968

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A REEVALUATION OF SOLAR FLARES, 1964-1966

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INTRODUCTION

In efforts to understand the cosmic environment of the earth, geophysicists often turn to tabulations of solar flares prepared by solar astronomers and Solar World Data Centers. The tabulations vary in time of issue and in degrees of completeness and reliability. All too often the user of flare data is confronted with conflicting reports or with disconcerting words of caution from solar astronomers who are especially aware of the many difficulties in the primary measurements and evaluations of the solar events.

Through international cooperation, reports of solar flares from 45 or more different solar observatories are assembled in three Solar World Data Centers, and at one of them, the Meudon Observatory, final summaries are prepared with the utmost care. The Quarterly Bulletin on Solar Activity contains the published tabulation of the flare summaries. Through 1967, the Quarterly Bulletin tables have included entries for all solar events for which any one observer reported the importance of the flare to be at least as great as one. Since 1963 many of the entries have been evaluated as subflares (flares of importance 1-) on the basis of the data from all of the reporting stations. Events reported unambiguously as subflares do not appear in the Quarterly Bulletin lists.

EFFORTS TO IMPROVE FLARE DATA

It has been known for a long time that worldwide flare lists, even in the Quarterly Bulletin, contain serious systematic errors, (Dodson and Hedeman, 1960) and genuine efforts have been made to reduce the faults. During the years 1961 to 1964 a working group from the Commission on Solar Activity of the International Astronomical Union developed recommendations for improvement in the assignment of Hα flare importance (Report, IAU, Comm. 10, published, Meudon Obs. 1964). In 1964, at the 12th General Assembly of the International Astronomical Union, solar astronomers agreed to take steps to improve the measurement of the area of flares so that the assigned importance for an event would be a more meaningful quantity. In subsequent years there has been real improvement in the reports from a number of observatories. Efforts also have been made to correct the faults of the published flare lists. Systematic station peculiarities were determined statistically by C. Warwick (1962, 1966) at CRPL-ESSA and were used to derive standard or normalized lists of flares for the IGY (1957-58) and for the years 1959-61. Statistical studies at Air Force Cambridge Research Laboratories by D. C. Jensen and H. J. E. Fischer (1966, 1967_a 1967_b) have assembled a great many facts about the worldwide flare patrol, 1954-64, and the characteristics of each station reporting flares.

In spite of these efforts, systematic errors or inhomogeneities continue to exist in the worldwide flare data. (Dodson and Hedeman, 1968). The principal fault is a vast preponderance of apparently important flares (importance ≥ 1) between approximately 7^h and 10^h UT. (See Figure 1A). In an attempt to provide improved flare data for the International Years of the Quiet Sun (1964-65) the flares listed in the Quarterly Bulletins were reevaluated against the information represented by the times of Hα patrol for each of the 45 observing stations (Michard, Dodson, and Hedeman 1968). The results of the reevaluation were so drastic, and so informative, that the reevaluation was continued through 1966, and the results for the three years are here described.

FLARES OF "IMPORTANCE ZERO"

According to the agreements of the international flare patrol, a station is said to be conducting a "patrol" if it either sees or photographs the sun at least once in every five-minute interval.

Stations participating in the international flare patrol report to world data centers all flare-like brightenings for which the importance is judged to be ≥1, (i.e., area ≥100 millionths of the solar hemisphere). There is no general agreement or practice in reporting the thousands of smaller brightenings called subflares. Therefore, in principle, there should be as many reports of flares of importance ≥1 as there are stations conducting valid patrols at the time the flare breaks out and reaches maximum development. If a station indicates that it was patrolling at the time of a supposed flare of importance ≥1, but fails to report either flare or subflare for the time in question, the event can be said to be a flare of "importance 0" for the station in question. For stations not reporting subflares, the evaluation "importance 0" may be the equivalent of "subflare". In all cases, if the patrol is valid, the assigned evaluation "importance 0" indicates that in the judgment of the station in question, there was an absence of a transient increase in Hα brightness covering an area ≥100 millionths of the solar hemisphere, the minimum requirement for a flare of importance 1.

The present survey of flares versus total flare patrol data was undertaken because many of the flares, even flares of importance 2, occur in the Quarterly Bulletins through the report of only a single station. Of the 1110 flares of importance ≥1 in the Quarterly Bulletin, 1964-66, 512 were reported by only one station. In the past, it has been tacitly assumed that other stations were not conducting patrols for the times in question. This proves to be an incorrect assumption. Of the 85 flares of importance ≥2 in the Quarterly Bulletins for 1964-66, 34 were reported by only one station. However there was not one instance in which the reporting observatory was the only one observing. (See Table 1.) For more than 85% of the cases, 2 to 9 additional observatories were patrolling and reported neither flare nor subflare. For the same three years 480 flares of importance 1 are included in the Quarterly Bulletin through the report of a single station. Of these, only 27 occurred at times when only one station was patrolling.

THE FINDING LIST OF FLARES, 1964-66

Preparation of the Finding List

In order to obtain the needed information about individual flare patrols at the time of each flare, graphical representations were prepared of the reported times of patrol hours for each station for each day of the three-year period, with ten minutes as

the smallest time interval considered. From such graphs, the number of patrolling stations has been determined for the time of each flare, importance ≥1, in the Quarterly Bulletins. Due regard has been given to the problem of stations that had only intermittent patrols or began observing late in a flare. In an effort to separate the bona fide flares of importance ≥1 from the subflares, we have required that at least half of the stations conducting patrols near the time of supposed start and maximum of the event, report a flare of importance ≥1. On the basis of these principles and reevaluations, a "Finding List of Flares, Importance ≥1, 1964-66" has been prepared (see Table 2).

The list is in two parts. The first is a tabulation of the 306 flare events in 1964-1966 for which the evaluation "importance ≥1" was assigned by at least two observatories with concurrence from more than half of all the actually patrolling stations, or from the principal cinematographic stations. These events can be considered as confirmed flares of importance ≥1. The second part of the list includes (a) the 27 flares reported when only one station was patrolling, and (b) the 58 flares for which the evaluation on the basis of all reports still remains ambiguous. The latter are cases for which the evaluations subflare or "zero" equal in number the reports of "importance ≥1".

Reduction in Number of Flares, Importance ≥1.

The reevaluation of flares 1964-66 on the basis of total patrol hours has modified significantly the flare-data as given in the Quarterly Bulletins, (see Table 3). The number of flares of importance ≥1 is sharply lowered. The Finding List contains only 391 flares of importance ≥1 for the three-year interval whereas the Quarterly Bulletins originally listed 1087 such flares. Approximately two-thirds of the 1002 flares called importance 1, and one-third of the 85 flares listed as of importance 2 in the Quarterly Bulletins did not hold up under the scrutiny of patrol hours. (See Table 3.)

Flares of Importance 2.

Since flares of importance ≥2 are of especial interest for investigators, we have included in Table 4 evaluations from all of the individual stations for the 85 such flares in the Quarterly Bulletins, 1964-66. For about one-half of the events there was general agreement that a major flare had taken place. For the other half of the

cases, the events are of two types, a small number of marginal cases for which the observers divide their evaluations between importance 0, 1, and 2, and a large number of cases (34) in which the flare was denied by all observers other than the single reporting station.

The flares of importance ≥2 in the Finding List differ from such flares in the Quarterly Bulletins primarily by the omission of those flares of importance ≥2 that were reported by one station and denied by all other observing stations. Unless one is familiar with the details of the flare reports it is hard to understand how major discrepancies of this kind can occur for flares of importance ≥2. The present survey has made it clear that many of the apparently "false flares" of importance ≥2 occurred at the very beginning of a station's observing period. It seems that the observer, frequently a visual observer, mistakes a bright plage for a large flare in progress. Users of flare data should develop an attitude of caution with respect to reports by single stations of major flares "in progress".

Of the 51 flares of importance ≥2 in the Quarterly Bulletins with observations from more than one station, only three failed to qualify for a similar evaluation in the Finding List. This result gives gratifying assurance that an abnormally large and real flare on the sun is generally recognized as such by the majority of observing stations. In the present reevaluation of flares, it has seemed appropriate to assign importance ≥2 to ten flares evaluated as of importance 1 in the Quarterly Bulletins. These flares are identified by asterisks in the Finding List. The increased importance evaluation stemmed from new flare reports, a reexamination of our own films, and simple differences in judgment. Unfortunately, marginal situations frequently prevail in the evaluation of flare data.

Number of Patrolling Stations

Figure 2 has been prepared to show the number of stations actually conducting Hα patrols in the winter and summer months, January and June, in the three years 1964-66. The diagram can serve as a guide in estimating the probable number of flare-patrols in progress at a specific time. During these intervals, the sun was unobserved less than 2 per cent of the time, and the patrol was limited to one station for only an additional 8 per cent of the six months. In June it was not unusual to have 6-12 stations simultaneously observing the sun during the middle half of the Universal Day. A number of these stations were making visual observations only. The user of flare data, when trying to evaluate the certainty of a specific flare report should remember that in recent years the number of patrolling stations has been a function of both the season of the year and Universal Time.

Distribution of Flares versus Universal Time

The flares in the Finding List show a gratifyingly uniform distribution with respect to Universal Time (see Figure 1B). The large maximum from 07^h to 10^h UT. has been practically eliminated. Although 09^h UT. continues to be a somewhat "favorite" time for important flares, the distribution versus Universal Time of flares in the Finding List seems reasonably uniform.

The cause of the inhomogeneities in primary flare data is apparent if the numbers of flares per hour of patrol are derived for individual stations. Figure 3 presents this information graphically for the 23 stations that conducted the principal flare patrols during the months July-September 1966. For each station, the number of flares (Importance ≥ 1) per hour of patrol is given for (a) the original reports from the observatory, (b) the summaries in the Quarterly Bulletins and (c) the Finding List. For some stations the intercomparison of reports and the study of patrol times resulted in very little change; for others the reduction was great. Data for each station are entered at the approximate U.T. of local noon. Cinematographic stations are indicated by the letter C. The clustering of non-cinematographic stations (visual and/or photographic) with a high rate of flares per hour of patrol contributed significantly to the high maximum in flare counts in the middle hours of the Universal Day.

Distribution of Flares versus Central Meridian Distance

Flare lists for earlier years usually have shown a diminution in numbers of flares with increasing central meridian distance. (C. S. Warwick, 1962) For 1964-66 the flares of importance ≥ 1 in the Quarterly Bulletin exhibit a marked increase in numbers from center to limb. (See Figure 4A). This change may reflect overcorrection in application of recommendations in the 1964 IAU report on flare importance (Report IAU, Com. 10, published Meudon 1964). The flares in the Finding List for 1964-66 show reduced numbers at 80°-89°, but addition of flares at 90° to this group makes the distribution reasonably uniform (see Figure 4B). Continued center-to-limb effects in original flare data indicate that the very difficult task of evaluating phenomena near the edge of the sun remains one of the major problems in the reporting of solar flares.

Number of Flares per Month: 1964-1966

The number of flares per month in the Finding List shows clearly the course of flare development in the early years of solar cycle 20 (see Figure 5). The paucity of flares ≥ 1 in 1964

is evident. The formation of the first significant centers of activity in May and October 1965 is accompanied by major enhancements in the number of flares ≥1, and the 1966 March-April and July-August flare-rich regions likewise yield new levels of flare production.

The difference between the development of the cycle as shown by monthly sunspot numbers and 2800 MHz flux, and by flares is striking (see Figure 5). A relatively small number of flare-rich regions developed on the sun in 1965 and 1966, and the times of their transits can be identified by the isolated high ordinates in the plot of number of flares (Finding List) versus month. The occurrence of flare-rich regions apparently was followed by the outbreak of numerous lesser centers of activity that contributed to the spot number and 2800 MHz flux but failed to add significantly to the number of flares of importance ≥1. In 1965 and 1966 the lesser centers of activity comprised the first manifestations of the encircling "zones royales" so characteristic of the active sun.

CONCLUSION

Consideration of total patrol information adds enormously to the burden of preparing worldwide Hα flare summaries, but the need for increased reliability in flare-data suggests that it should be attempted. As of January 1968 the flare lists prepared at Meudon Observatory for the Quarterly Bulletin will be screened against patrol times when fewer than two stations report an event. This should provide a big step toward the elimination of spurious reports of important flares. The problem of stations that report long hours of uninterrupted patrol but fail to "see" or report flares well observed at other stations also must be explored.

The Finding Lists here tabulated represent a conservative reevaluation of flares in 1964-66 on the basis of patrol times. Although certain faults and uncertainties still remain, it is hoped that the Finding List will provide useful guidance to the major Hα flares in the three-year interval. Many of the residual uncertainties could be resolved by requesting cinematographic stations to reexamine their records for specific events. This has been done for the events for which cinematographic records existed at the McMath-Hulbert Observatory. If a list of important flares that can be defended on the basis of the totality of known facts is a goal for the future, it may be necessary to develop a worldwide cooperative system of checking ambiguous flares against cinematographic records before publication of definitive flare data.

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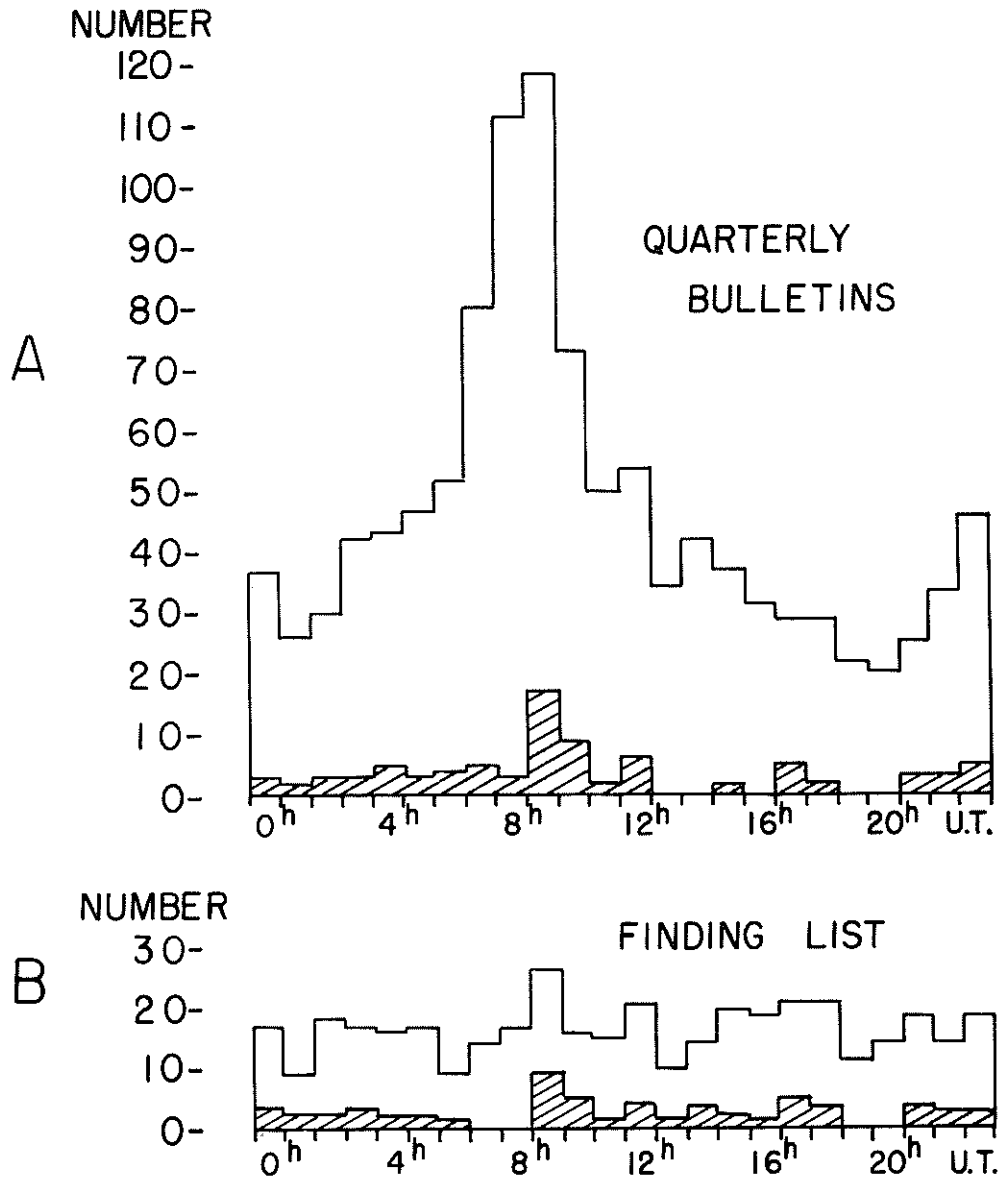

FIGURE 1. Number of flares, importance ≥1, 1964-1966, according to Universal Time, of time of start or of first observation.
A. Quarterly Bulletins on Solar Activity.
B. Finding List of Flares.

The shaded areas indicate flares of importance ≥2.

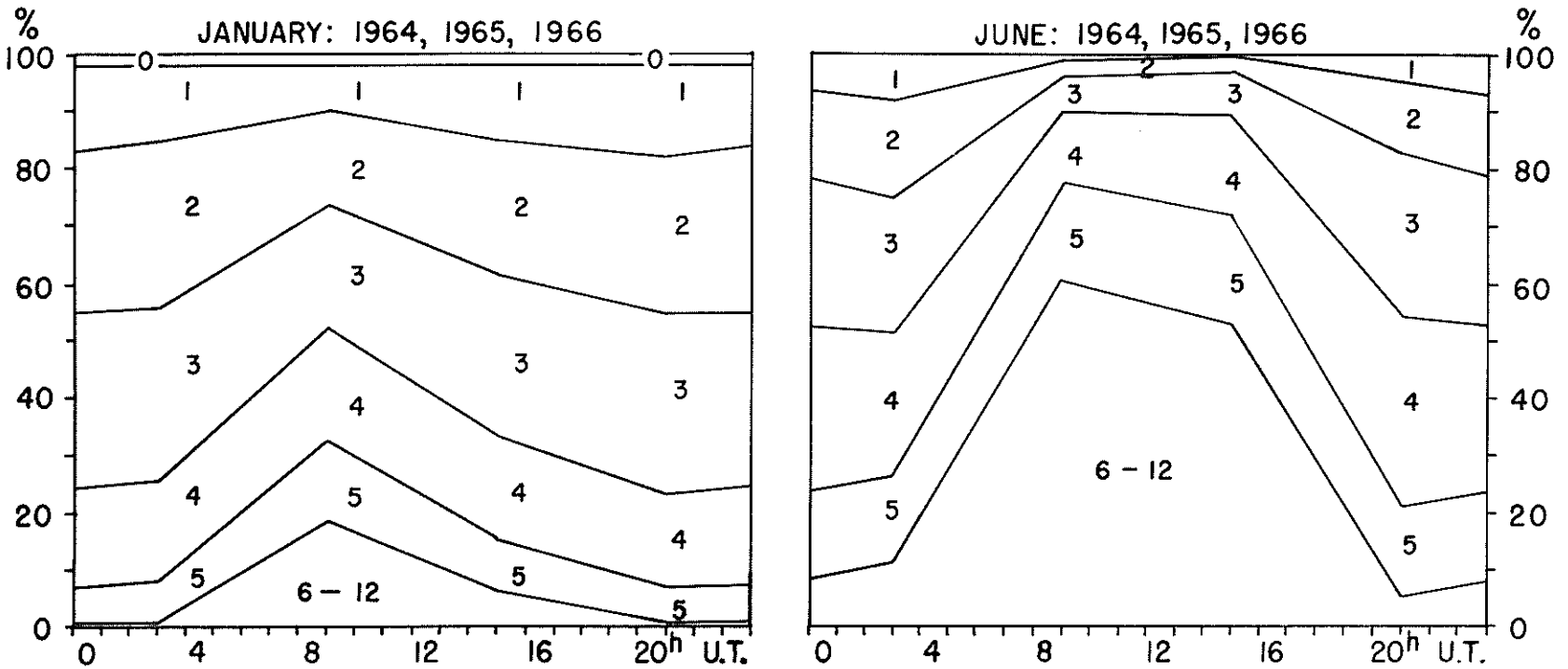

FIGURE 2. Average number of observatories actually conducting Hα flare-patrols during a typical winter month (January) and a typical summer month (June), 1964-1966.

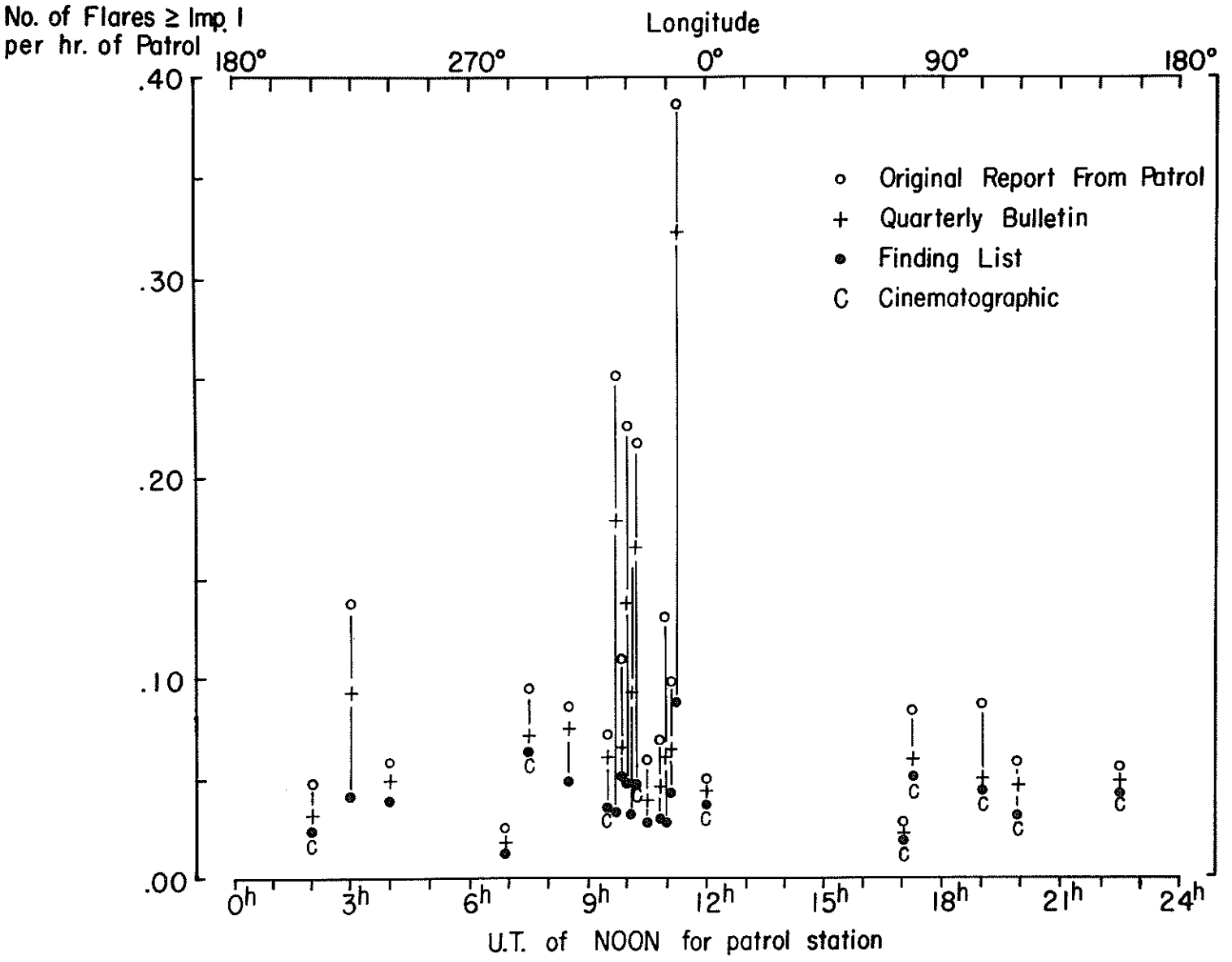

FIGURE 3. Number of flares, importance ≥1, per hour of patrol for 23 observing stations, July - September, 1966.

Data are given for flares listed in (1) the original reports of the stations and for flares as evaluated in (2) the Quarterly Bulletins and (3) in the Finding List.

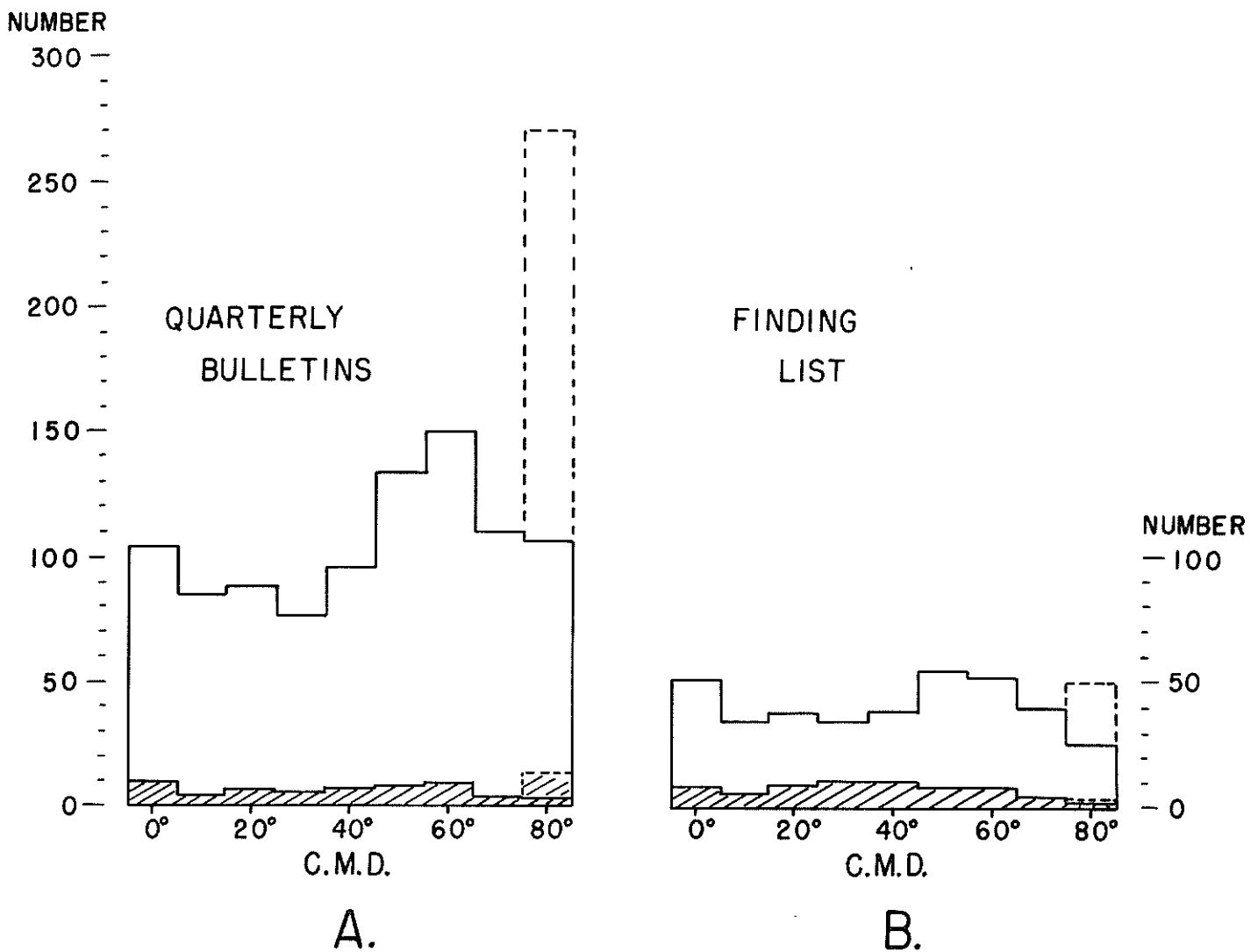

FIGURE 4. Number of flares, importance ≥1, according to distance from the central meridian.
A. Quarterly Bulletin of Solar Activity.
B. Finding List of Flares.

The shaded areas indicate flares of importance ≥2. The dotted lines provide data for flares reported as 90° from the central meridian.

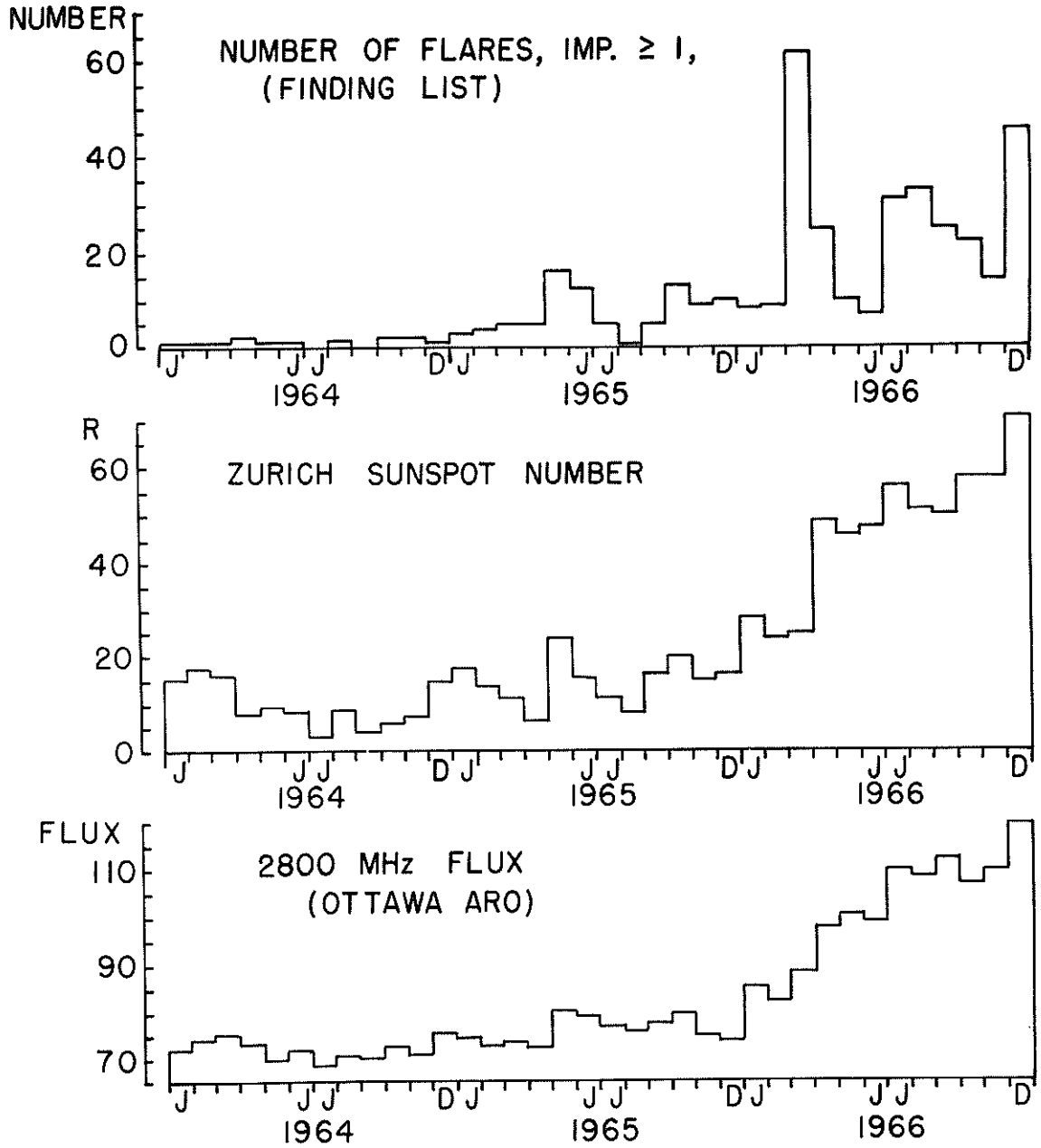

FIGURE 5. Development of the ascending branch of Solar Cycle 20 according to the number of flares, importance ≥1 in the Finding List, Zurich Sunspot Number, and 2800 MHz Flux (Ottawa, ARO).

TABLE 1

Summary of Importance Evaluations on Basis of Total Patrol Data, for Flares of Importance ≥ 1 Reported by only One Station in Quarterly Bulletin, 1964-1966

Importance Evaluation	Number of Cases	Importance Evaluation	Number of Cases
1	27	2	0
1 0	36	2 0	4
1 0 0	64	2 0 0	6
1 0 0 0	106	2 0 0 0	4
1 0 0 0 0	70	2 0 0 0 0	8
1 0 0 0 0 0	56	2 0 0 0 0 0	3
1 0 0 0 0 0 0	40	2 0 0 0 0 0 0	6
1 0 0 0 0 0 0 0	41	2 0 0 0 0 0 0 0	2
1 0 0 0 0 0 0 0 0	17	2 0 0 0 0 0 0 0 0	0
1 0 0 0 0 0 0 0 0 0	14	2 0 0 0 0 0 0 0 0 0	1
1 0 0 0 0 0 0 0 0 0 0	6		
1 0 0 0 0 0 0 0 0 0 0 0	2		
1 0 0 0 0 0 0 0 0 0 0 0 0	1		
TOTAL	480	TOTAL	34

TABLE 2

McMath-Hulbert Observatory Finding List of Flares of Importance ≥ 1, 1964-1966

Date	Beg. UT	End UT	Max. UT	Imp.	Position	Individual Station Importance Ratings											
1964																	
Jan. 26	1238	1550	1310	2	N10 W08	2	2	2	2	2	1+	1+	1				
Feb. 21	1011	1040	1024	1	N07 E44	1+	1	1	1	1	0	0	0	0			
Mar. 16	1553	1700	1608	1+	N05 W73	2	1+	1+	1	1	1						
Apr. 7	0125	0300	0147	2	N18 E67	3	2	1+	1								
Apr. 14	0750	0814	0753	1	N10 E55	1	1	1	1	1-	0	0	0	0			
May 21	0807	0916	(0823 0840)	1	N07 W22	2	1+	1+	1	1	1	1	1-	1-	0	0	0
June 21	2330	2430	2340	1	N27 W39	1	1	1	1	0							
Aug. 25	1013	1049	1019	1	N01 E62	1	1	1	1-	0							
Oct. 8	1231	1310	1234	1	N25 W67	1+	0										
Nov. 22	2333	2430		1	N37 W86	1	1	1-									
1965																	
Jan. 3	1427	1520	1440	1	N23 E70	1+	1	1	1	0							
Feb. 5	1750	2024	1810	2	N08 W25	2+	2	2									
Feb. 7	1819	1848	1826	1	N09 W51	1	1										
Feb. 27	0932	1020	0936	1	N20 E45	1	1	1	1	1-	0	0	0	0	0		
Mar. 26	0505	0612	0513	1	N09 E54	1	1	1	0								
Apr. 14	0542	0607	0550	1	N05 E52	1	1										
Apr. 15	2352	2420	2357	1	N04 E29	2	1	1	1	1	1-	1-					
Apr. 16	0942	1105	1006	1	N04 E20	2	2	1	0	0							
May 2	1207	1244	1214	1	N28 E68	1+	1	1-									
May 8	1412	1510	1438	1	N36 W64	1	1	1	1-	1-							
May 16	0755	0942		1+	N25 E90	2	2	2	1+	1+	0	0	0	0	0		
May 16	1127	1156		1	N25 E90	2	2	1+	1								
May 16	1217	1538		1	N24 E90	2+	1+	1+	1	1	1-						
May 16	2214	2338	(2226 2312)	1	N24 E90	2	1	1	1-	0							
May 17	0030	0119	(0037 0103)	1	N24 E89	1+	1	1	1	0	0						
May 17	0240	0502	0257	1	N25 E83	1	1	1	1	0	0	0					
May 20	0556	0639		1	N20 W46	1	1	1	1-	0							
May 20	2320	2440	(2323 2430)	1	N20 W59	1	1	1	1-	0							
May 22	1940	2009	1944	1	N26 W20	1	1	1	1-								
May 25	2239	2253	2243	1	N19 W73	1+	1	1									

Table 2 - cont.

Date	Beg. UT	End UT	Max. UT	Imp.	Position	Individual Station Importance Ratings
1965						
June 6	0620	0733	0705	1	N20 E85	2 1 1 1 1- 0 0
June 7	1031	1100	1037	1	S13 W47	2 1+ 1 1 1 1 0
June 8	2238	2321		1	N22 E56	1 1 1 1
June 9	0600	0720	0638	2	N21 E49	3 3 2+ 2+ 2 2 2 1 1 0
June 9	0740	0808	0744	1	N26 W88	1+ 1 1 1 1 0 0 0 0
June 12	1748	1918	(1800 1848)	1	N22 E02	1 1 1 1-
June 13	0257	0430		1	N23 W03	2 1+ 1 0
June 15	0735	0932		1	N22 W30	2 1+ 1 1 1 1 1 1- 1- 1- 1-0 0 0 0
June 17	1133	1158	1139	1	N24 W59	1 1
June 18	1142	1215	1151	1	N22 W73	1 1 1 0
June 28	1018	1140	1027	2	N30 E42	2+ 2 2 2 1+ 1 1 1 1- 1-
July 6	2301	2523	(2318 2504)	1	N18 E28	1+ 1 1 1 1-
July 8	0704	0800		1	N19 E11	2 1+ 1+ 1 1- 0 0 0
July 10	0940	1041	0952	1	N19 W18	1+ 1+ 1 1 1 1- 1- 0 0
July 13	1048	1220	1105	1	N22 W55	2 1+ 1 1 1 1 1 1 1- 0 0
July 19	0812	0915		1	N20 W72	1+ 1 1 1 1 0 0
Aug. 3	2020	2035	2023	1	N27 E80	1+ 1 1-
Sept.10	1055	1122		1	N25 W31	2 1+ 1- 0 0
Sept.21	1207	1248		1	N26 W43	1+ 1 0
Sept.30	1313	1504		2	N21 E34	2 2 2 2 1 1 1 1 0
Sept.30	1513	1700	1550	1	N20 E30	2 2 2 1 1- 1- 0
Sept.30	1921	2018	1938	1+	N20 E30	2 1+ 1+ 1
Oct. 1	0340	0400		1	N20 E26	1 1 1-
Oct. 1	1140	1317		1	N20 E23	2 2 1+ 1 1 1- 0 0 0
Oct. 1	2024	2205	2037	1+	N20 E16	2 1+ 1+ 1 0
Oct. 2	0403	0439	0413	2	N22 E12	2+ 2+ 1 1-
Oct. 2	1604	1720	1622	1	N20 E05	1+ 1+ 1+ 1 1 1
Oct. 2	1749	1835	1812	1	N19 E04	1 1 1 1 0 0
Oct. 3	0430	0520		1	N20 W05	1 1 1 1 0 0
Oct. 4	0937	1026	0955	2	S21 W30	2+ 2+ 2 2 2 2 2 2 2 2 2 1+ 1+ 1 0 0
Oct. 12	0710	0900	0720	1	N22 E43	2 2 2 1+ 1+ 1+ 1+ 1 1 1 1 1 0 0
Oct. 14	0445	0548	0502	1	N22 E18	1 1 1 0
Nov. 7	0710	0738	0714	1	N27 W03	1+ 1 1 0
Nov. 7	1558	1640	1605	1	N27 W09	1 1 1 1-
Nov. 7	1704	1805		1	N28 W09	1 1 1- 1-
Nov. 7	1959	2045	2015	1	N27 W10	1+ 1 1 1-
Nov. 8	0008	0018	0017	1	N27 W15	1 1 0

Table 2 - cont.

Date	Beg. UT	End UT	Max. UT	Imp.	Position	Individual Station Importance Ratings											
1965																	
Dec. 17	2146	2151		1	N25 W90	1+	1	1-									
Dec. 29	1123	1235	1150	1+	N11 W60	2	2	1+	1+	1	1						
Dec. 29	2132	2146	2138	1	N08 W75	1+	1										
1966																	
Jan. 17	1029	1250	1123	2b	N19 E27	3	2	2	2	2	2	1	1				
Jan. 18	2253	2515	2328	2b	N20 E07	2	2	2	2	1	1						
Jan. 20	0023	0050	0025	1n	N28 W08	1	1	1-	1-								
Jan. 20	0303	0320	0308	1n	N28 W10	1	1	1	1	1-							
Jan. 29	1800	1837	1811	1n	S23 W56	1	1	1	1	1							
Feb. 2	1510	1607	1525	1n	N26 E27	2	1	1	1	1							
Feb. 11	1641	1725	1653	1n	N32 W58	1	1	1	1	1-							
Feb. 11	2335	2407	2343	1b	N33 W60	1	1	1									
Feb. 28	0351	0425	0403	1n	N21 E70	2	1	1	0								
Mar. 2	0334	0358	0342	1n	N20 W90	2	1	0									
Mar. 15	1636	1722	1638	1n	N23 E75	2	1	1	1-	1-	1-						
Mar. 16	0912	1007	0914	2b	N22 E65	4	3	2	2	1	1	1	0	0	0		
Mar. 16	1918	1950	(1923 1937)	1b	N18 E58	1	1	1	1	1							
Mar. 16	2147	2206	2153	1b	N20 E55	1	1	1									
Mar. 17	0425	0458	0431	1n	N23 E53	2	1	1	1								
Mar. 17	1359	1440	1410	1n	N20 E48	2	2	1	1	1	1	1	1-	0			
Mar. 17	1746	1830	1802	1n	N21 E48	1	1	1	1								
Mar. 18	0420	0510	0427	1n	N16 E40	1	1	1-									
Mar. 18	1257	1430		1n	N20 E35	2	1	1	1	1	1-	1-	1-				
Mar. 18	2345	2410	2355	1n	N15 E27	1	1	1	1	1-							
Mar. 19	0338	0527	0348	3n	N21 E33	4	3	3	2								
Mar. 19	1422	1444	1431	1n	N14 E20	1	1	1	1	1							
Mar. 19	2131	2240	(2157 2209)	1b	N15 E15	2	1	1	1-								
Mar. 20	0226	0320		1n	N21 E20	2	1	1-	0								
* Mar. 20	0928	1255	0957	2b	N21 E25	3	3	3	3	2	2	2	2	2	1-	0	
* Mar. 20	1011	1130	(1015 1037)	2b	N15 E08	2	2	2	2	1	1	0	0				
Mar. 20	1848	2026	(1857 2008)	1n	N19 E07	1	1										
Mar. 21	0925	1125	(0944 1100)	2b	N21 W02	2	2	2	2	2	2	1	1	1	1	1	1- 0
Mar. 21	1504	1535	1510	1n	N20 E01	1	1	1	1	1	1	1	1-	1-	1-		
Mar. 21	1544	1624	(1550 1618)	1n	N21 W04	2	1	1	1	1	1	1-	1-	1-			
Mar. 21	1820	1930	(1826 1855)	1b	N21 W08	1	1	1	1-	0							

* A "double" event.

Table 2 - cont.

Date	Beg. UT	End UT	Max. UT	Imp.	Position	Individual Station Importance Ratings											
1966																	
Mar. 21	2138	2358	(2203 2230)	2b	N19 W10	3	2	2	1								
Mar. 22	0743	0820	0755	1n	N15 W15	2	1	1	1	1	1	1	1-	1-	1-	0	0
Mar. 22	1112	1150	1120	1n	N20 W18	2	2	1	1	1	1	0	0				
Mar. 22	1407	1430	1411	1n	N20 W12	2	2	1	1	1	1	0					
Mar. 23	2248	2335	(2259 2323)	1n	N16 W33	2	1	1-									
Mar. 24	0225	0414	0237	2n	N20 W42	3	2	2	2								
Mar. 24	0910	1005	(0916 0956)	1b	N17 W43	1	1	1	1-	1-							
Mar. 24	2230	2340	(2241 2326)	1n	N17 W50	1	1	0									
Mar. 25	0009	0133	(0040 0122)	1b	N20 W51	2	1										
Mar. 25	0145	0340	0200	2n	N20 W54	4	3	2	1								
Mar. 25	0513	0540	0518	2b	N14 W54	3	2	2	1-								
Mar. 25	1525	1555	1541	1b	N16 W62	3	1	1	1-								
Mar. 25	1616	1703	(1635 1654)	1b	N13 W58	1	1										
Mar. 26	0021	0120	(0027 0057)	2n	N16 W64	2	2	2	1	1-	0	0					
Mar. 26	1221	1320		1n	N18 W70	1	1	1	1-	0							
Mar. 26	1709	1733	1719	1n	N16 W71	1	1	1-	0								
Mar. 26	1843	1916	1852	2b	N15 W70	2	2	1	1	1-							
Mar. 27	0805	0836	0810	1n	N17 W82	2	1	1	0	0							
Mar. 28	0442	0509		1b	N28 E80	2	1	1	0								
Mar. 28	1149	1202	1153	1b	N26 E80	1	1	1	1	0	0						
Mar. 28	1459	1521	1506	1n	N15 W90	2	2	1	1	0	0						
Mar. 28	1910	1936	1917	1b	N29 E70	1	1	1	0								
Mar. 29	0324	0404	0329	2b	N28 E66	3	3	2	2	1-							
Mar. 29	0940	1020		1n	N27 E62	2	1	1	1	1	1	1	1-	0			
Mar. 29	1053	1215	(1055 1200)	1n	N27 E60	2	2	2	1	1	1	1-	1-	1-	0		
Mar. 29	1344	1410	(1348 1401)	1n	N27 E57	1	1	1	1	1-	1-	0					
Mar. 29	1504	1535	(1507 1526)	1n	N27 E60	1	1	1	1-								
Mar. 29	1746	1844		1b	N28 E60	2	1	1	1								
Mar. 30	1241	1423	(1252 1330)	2n	N28 E50	2	2	2	2	2	1	1	1	1	1	1-	0
Mar. 30	1930	2148		1n	N28 E50	1	1	1-	0	0	0						
Mar. 31	1808	2042	(1830 1907)	2n	N28 E35	2	2	2	2	1	1						
Apr. 1	1736	1900	1750	2n	N28 E22	2	2	1	1-	0							
Apr. 2	0058	0135	0103	1b	N27 E19	2	2	1	1	1	1	1	1				
Apr. 2	0805	0845	0815	1f	N26 E14	2	2	1	1	1	1-	0	0	0			

Table 2 - cont.

Date	Beg. UT	End UT	Max. UT	Imp.	Position	Individual Station Importance Ratings												
1966																		
Apr. 2	1135	1225	1139	1b	N27 E12	2	2	2	2	1	1	1	1					
Apr. 2	2213	2238	2216	1n	N29 E10	1	1	1	1	1-	1-	0						
Apr. 3	1301	1330	1307	1n	N28 W01	1	1											
Apr. 4	0143	0230	0157	1b	N28 W07	1	1	1										
Apr. 4	0407	0450	(0412 0435)	1n	N27 W08	1	1	1-	0									
Apr. 4	0641	0703	0646	1n	N28 W08	1	1	1	1-									
Apr. 4	0733	0820	0745	1n	N27 W08	2	1	1	0	0								
Apr. 4	2107	2244	2121	2n	N27 W21	2	2	2	1	1	0							
Apr. 6	2320	2347	2324	1n	N28 W47	1	1	1	1	1								
Apr. 9	0021	0050	0025	1n	N21 W30	2	1	1	1	1-	0	0						
Apr. 10	1218	1248		1n	N22 W48	1	1	1-										
Apr. 11	0948	1055	1005	1b	N21 W60	2	2	1	1	1	1	1	1-	0				
Apr. 11	1225	1315	(1234 1253)	1n	N21 W62	2	1	1	1	1	1	1	1					
Apr. 12	1621	1643	1631	1n	N21 W83	1	1	1	1-	1-	0							
Apr. 12	1717	1745	1720	1n	N21 W80	1	1	1	1-									
Apr. 13	0804	0835		1n	N21 W87	1	1	1	1	1-	0	0						
Apr. 13	0846	0932	(0853 0912)	1n	N21 W90	1	1	1	1	0	0							
Apr. 15	0956	1106	1007	2b	N19 E40	3	3	2	2	2	2	1						
Apr. 17	0842	0858	0847	1n	N22 E12	2	1	1	1	1	1-	1-	1-					
Apr. 17	1746	1823	1754	1n	N23 E12	1	1	1	1-	1-								
Apr. 21	0910	0935	0913	1n	N21 W40	1	1	1	1-	0								
May 1	1609	1700	1640	1n	N22 E62	1	1	1	1	1-	1-	1-						
May 13	0954	1028	1005	1n	N23 E82	1	1	1	1	0	0							
May 15	0755	0832	(0813 0827)	1n	N22 W31	1	1	1	1	1-	0	0	0					
May 21	0634	0700	0645	1n	N18 W66	1	1	1-										
May 22	1838	1942	1849	1n	N38 E61	1	1	1-										
May 25	0625	0650	0634	1n	S20 W60	1	1	1	1	0	0	0						
May 25	1042	1230	1116	2n	N28 E20	3	2	2	2	1	0	0	0					
May 25	1530	1554	1535	1b	N12 E04	1	1	1	1	1	1-	0						
May 28	1532	1830	1622	2b	N15 W40	2	2	2	2	2	2	2	1-	0				
June 13	0238	0312	(0241 0301)	1n	N23 E04	1	1	1	1	1								
June 13	0640	0740	0703	1n	N22 E01	2	2	2	2	1	1	1	1	1	1	1	1	0
June 25	1525	1639	1543	1b	S24 W09	2	1	1	1	1	1	1	1					
June 27	1453	1542	1501	1n	N26 W46	2	1	1	1	1-								
June 27	2358	2520	2420	2n	N25 W58	2	2	0										
June 30	0228	0243		1n	S23 W66	1	1	1	1	1-	1-							

Table 2 - cont.

Date	Beg. UT	End UT	Max. UT	Imp.	Position	Individual Station Importance Ratings										
1966																
July 1	0954	1008		1n	N30 W90	2	2	1	1-	0	0					
July 3	0714	0745		1n	N33 W20	1	2	1	1	1	1	1	1-	1-	0	
July 6	0533	0548	0534	1n	N34 W38	1	1	1	1	1-	0					
July 6	2030	2053	2032	1n	N34 W45	1	1	0	0	0						
July 7	0025	0135	0040	2b	N35 W48	3	2	2	2	2	2	2				
July 7	0715	0814		1n	N35 W50	2	1	1	1	1	0	0				
July 8	0514	0520	0516	1n	N35 W64	1	1	1	1	0						
July 8	1238	1330	1249	2b	N34 W68	2	2	2	2	2	1	1	1	1-	0	0
July 8	1650	1730	(1659 1715)	1n	N35 W70	2	2	1	1	1	1-					
July 8	2227	2300	2240	1n	N34 W70	1	1	1	1-							
July 9	0232	0302	0233	1b	N35 W75	3	1	1								
July 9	0310	0435	(0313 0330)	2b	N35 W75	2	3	3	2	1						
July 10	0338	0401	0342	1b	N31 W90	1	1	1								
July 10	1935	2055	(1942 2028)	1n	N36 W90	1	1	0	0							
July 11	0900	1030		3n	N35 W90	4	4	3	2	0	0	0	0	0		
July 21	1523	1543	1529	1n	N20 E72	1	1	1	1	1	1	0				
July 22	2043	2057	2047	1n	N33 E90	1	1	1	0	0						
July 23	0542	0601	0552	1n	N38 E38	1	1	1	0							
July 23	0931	1012	0940	1n	N38 E38	2	2	1	1	1	1	1-	1-	0		
July 25	0457	0535	0501	1b	N38 E15	2	1	1	1	1						
July 26	0030	0110	0037	1n	N38 E05	1	1	1	1	1	1-	1-				
July 26	0623	0709	0629	1n	N34 E55	2	1	1	1	1	1	1	1	1	1-	1-
July 26	0734	0815	0744	1n	N33 E54	2	1	1	1	1	1	1	1	0	0	0
July 26	0905	1005	0910	1n	N23 E90	2	2	2	2	1	1	1	1-	1-	1-	0	0
July 27	2013	2036	2017	1n	N25 E69	1	1	1	1-							
July 28	2214	2450	(2245 2330)	3b	N36 E33	3	3	3	2	2	2	2	2			
July 29	0737	0748	0740	1n	N26 E50	1	1	1	1	1	1	1-	0	0	0	
Aug. 1	1810	1830	1818	1n	N29 W02	1	1-									
Aug. 3	0635	0710	0648	1b	N20 E30	1	1	1	1	1-	1-					
Aug. 3	1415	1540	1420	1n	N32 W22	1	1	1	1	1-	1-	0				
Aug. 5	1220	1252	(1231 1244)	1n	N34 W53	1	1	1	1	1-	0	0	0			
Aug. 5	1255	1450	1327	1n	N26 W44	2	2	1	1	1	1	1	1-	0		
Aug. 7	0010	0110	0028	1n	N34 W66	1	1	0								
Aug. 17	0030	0045	0034	1b	S22 W66	1	1	1								
Aug. 17	0933	1040	0943	2n	N23 W10	2	2	2	2	2	1	1	1	1	1-	0	0
Aug. 19	0433	0445	0437	1n	N23 W40	1	1	1	1	0						

Table 2 - cont.

Date	Beg. UT	End UT	Max. UT	Imp.	Position	Individual Station Importance Ratings											
1966																	
Aug. 21	1553	1640	(1601 1618)	1n	N35 W88	1	1										
Aug. 22	2125	2220	2145	1n	N29 E59	2	1	1	1-	1-							
Aug. 23	0950	1150	1004	1n	N23 E67	2	1	1	1	1	0	0	0				
Aug. 25	0620	0645	0622	1b	N06 W20	1	1	1	1-	1-							
Aug. 26	1805	1900	1820	2n	N23 E22	2	2	2	1	1							
Aug. 26	2153	2240	2212	2n	N24 E30	2	2	1-									
Aug. 27	1855	1927		1n	N07 W52	1	1	1-	0								
Aug. 28	0512	0532	0516	1n	N07 W55	1	1	1	1								
Aug. 28	0946	1025	(0957 1008)	1n	N06 W64	1	1	1	1	1	1	1	1	1-	0		
Aug. 28	1153	1209	1157	1n	N05 W59	1	1	1	1	1-	0						
Aug. 28	1523	1700	1529	3b	N22 E05	4	3	3	2	2	2	2	2	1			
Aug. 28	1638	1657	1643	1n	N08 W62	1	1	1	1	1-	1-						
Aug. 29	0533	0625	0539	1n	N22 W07	2	1	1	1	1	1	1-	1-	1-			
Aug. 29	1324	1430	1335	1n	N21 W11	2	2	1	1	1	1	1	1-	0	0		
Aug. 29	2022	2201	2037	1b	N24 W18	2	1	1	0								
Aug. 29	2223	2250	2235	1n	N06 W83	2	1	1-									
Aug. 30	0231	0250	0236	1n	N24 W23	2	1	1	1-	0							
Aug. 30	1450	1600	(1458 1548)	2n	N23 W26	2	2	2	2	1	1						
Aug. 31	0037	0123	0111	2b	N21 W30	2	2	2	2	1							
Aug. 31	0154	0235	0210	1n	N22 W30	2	1	1-	0								
Aug. 31	0250	0421	(0256 0353)	1n	N22 W30	2	2	1	1	1-							
Aug. 31	1104	1213	(1132 1145)	1n	N23 W36	2	1	1	1	1	0						
Aug. 31	1831	1922	(1832 1908)	1n	N24 W36	2	2	1	1	1-							
Sep. 1	1522	1542	1528	1n	N22 W54	2	1	1	1-	1-	0						
Sep. 2	0542	0800	0600	3b	N24 W56	3	3	3	3	3	3	2	2	2	2	0	0
Sep. 4	0407	0519		3n	N21 W87	3	3	3	2	1	1	0	0				
Sep. 7	2105	2153	2120	1n	N23 E62	1	1	1	1-	1-							
Sep. 8	1615	1628	1620	1n	N22 E51	1	1	1-	0								
Sep. 10	1813	1935	1834	1n	N22 E25	2	1	1	1								
Sep. 14	0310	0345	0314	1b	N07 E78	1	1	1-	0								
Sep. 16	0120	0210	(0125 0136)	1n	N06 E49	2	2	1	1-	0							
Sep. 16	1637	2120	(1702 1815)	2n	N05 E36	2	2	2	1	1-							
Sep. 16	1740	1840	(1744 1828)	1n	N22 E67	2	1	1	1	1-							
Sep. 17	0940	1045	1005	2n	N24 W63	4	3	2	2	2	2	2	1	1	1	1	0
Sep. 18	1452	1522	1500	2b	N22 E42	2	2	2	1	1	1-	1-					
Sep. 19	1157	1244	(1157 1210)	2b	N22 E30	2	2	2	2	2	1	1	1	0	0		

Table 2 - cont.

Date	Beg. UT	End UT	Max. UT	Imp.	Position	Individual Station Importance Ratings											
1966																	
Sep. 19	1803	1828	1812	1n	N24 E25	1	1	1-									
Sep. 19	2134	2245	(2138 2159)	1n	N06 W08	1	1	1	1-	0							
Sep. 20	0255	0328	0300	1n	N24 E19	2	2	1	1	0							
Sep. 20	0332	0420	0337	1b	N10 W10	2	1	1	1-								
Sep. 20	0823	0840	0827	1n	N22 E19	2	2	2	1	1	1	1	1	1	1-	0	0
Sep. 20	0850	0920	0900	1n	N24 E18	2	2	2	1	1	1	1	1-	1-			
Sep. 20	1045	1120	1051	2n	N10 W14	3	2	2	2	2	2	1	1	1	1-	0	
Sep. 20	1738	2100	1805	2b	N06 W14	2	2	2	2								
Sep. 21	1812	2015	1831	1n	N26 E40	1	1	0									
Sep. 23	1553	1630	1600	1n	N24 E50	1	1	1	1-	1-	1-	0					
Oct. 1	0208	0333	0234	2n	N27 W61	2	2	2	1-								
Oct. 6	1539	1700	(1548 1603)	1n	N22 E36	2	2	1	1								
Oct. 9	1045	1150	1102	3n	N21 W00	4	3	3	3	3	3	2	2	2	1		
Oct. 9	2106	2150	2129	1f	S24 W57	1	1										
Oct. 12	1132	1153	1142	1n	N21 E70	2	1	1	1	1	1-						
Oct. 13	1330	1353	1341	1n	N21 E59	1	1	1	1	1-	1-						
Oct. 13	1645	1800	(1709 1746)	1n	N20 E50	1	1										
Oct. 14	1250	1358		2n	N22 E41	3	2	2	2	2	1	1					
Oct. 15	0500	0600	0526	1n	N20 E37	1	1	0									
Oct. 15	1851	2030	1925	1n	N21 E25	2	1	1	1								
Oct. 16	1204	1251	1222	1n	N20 E17	1	1	1	1-	0							
Oct. 17	1010	1101	1024	1n	N21 E06	2	1	1	1-	1-							
Oct. 23	1422	1500	1428	1n	N13 W76	1	1	1	1	1	1	1-					
Oct. 26	2053	2120	2111	1n	S26 W41	1	1	1-									
Oct. 27	1420	1520	(1425 1444)	1n	N13 W27	1	1	1	1	1	1-						
Nov. 5	0425	0524	0432	1f	N23 E06	2	2	1	0	0							
Nov. 6	1334	1500		1n	N19 E47	1	1	1	1-	1-							
Nov. 7	0734	0755	0737	1n	N12 E76	2	2	1	0								
Nov. 12	2211	2240	2217	1n	N19 E04	1	1	1-									
Nov. 14	1215	1335	1227	2n	N21 E75	3	2	2	2	1	1	1	1				
Nov. 14	2039	2200	2054	1n	N22 W12	1	1	1-									
Nov. 19	0820	0830	0823	1f	N28 E54	1	1	0									
Nov. 22	1835	2000	1848	1b	N30 E18	1	1	1									
Nov. 26	0914	1010	0935	1b	N21 W67	2	1	1	1	1	1	0	0	0			
Nov. 29	2009	2038	2013	1n	N33 W77	1	1										
Nov. 30	1628	1715	1634	1n	N16 W05	1	1	1									
Dec. 7	0322	0350	0330	1n	N13 E37	1	1-										
Dec. 8	1920	1958	(1935 1946)	1n	N23 E65	1	1	1-									

Table 2 - cont.

Date	Beg. UT	End UT	Max. UT	Imp.	Position	Individual Station Importance Ratings
1966						
Dec. 9	0258	0320	0307	1n	N23 E59	1 1 1- 0
Dec. 9	0922	1000	0925	1n	N21 E58	2 1 1 1 1- 0 0 0
Dec. 9	1755	1907	1805	2b	N22 E50	2 2
Dec. 10	1208	1330		1n	N23 E43	2 1 1 0
Dec. 10	1419	1553	(1425 1440)	2n	N23 E40	2 2 2 1
Dec. 10	1736	1817	1747	1f	S24 E08	1 1 1-
Dec. 11	1911	1941	1921	1n	S22 W09	1 1 1-
Dec. 11	2345	2359	2354	1n	S20 W09	1 1 1- 0
Dec. 13	2300	2350	2310	2b	N24 E56	2 2
Dec. 15	0522	0649	0539	1n	N20 E25	1 1 1 1 1
Dec. 15	1945	2155	2052	1n	N20 E26	1 1
Dec. 17	0808	0853	0816	1b	N18 W02	2 1 1 1 0
Dec. 17	0948	1110	(0957 1010)	2b	N20 W03	3 3 2 2 1 0
Dec. 17	1226	1318	1237	1n	N20 E03	2 1 1 0
Dec. 17	1634	1745		1f	N22 W05	1 1-
Dec. 18	1820	1920	1854	1n	N25 W09	2 1 1-
Dec. 23	0800	0912		1n	N29 E25	1 1 1 1 1 1- 0
Dec. 23	1639	1732		1n	N22 E76	1 1 1 1 1-
Dec. 23	1925	1945	1928	1n	N22 E69	1 1 1-
Dec. 24	0346	0417	0354	1n	N21 E65	1 1 1-
Dec. 24	0444	0600	0503	1n	N22 E65	2 1 1
Dec. 25	0205	0318	0224	1b	N22 E54	1 1 0
Dec. 28	1758	1830	1802	2b	N25 W63	2 2 1
Dec. 31	0842	0900	0845	1b	S20 E27	1 1 1 1 1- 0 0
Dec. 31	1610	1700	1625	1n	N24 W29	1 1 1-

? Flares for McMath-Hulbert Observatory Finding List, 1964-1966.

Date	Beg. UT	End UT	Max. UT	Imp.	Position	Individual Station Importance Ratings
1964						
Oct. 8	0424	0443	0429	1?	N25 W64	1 0
Nov. 21	0334	0347	0339	1?	N21 W75	1 0
Dec. 4	0827	1015	0831	1?	N32 E81	2 2 2 1+ 1- 0 0 0 0 0
1965						
Jan. 1	1827	1848	1834	1?	N22 E90	1
Jan. 1	2210	2232	2215	1?	N10 E90	1

Table 2 - cont.

Date	Beg. UT	End UT	Max. UT	Imp.	Position	Individual Station Importance Ratings
1965						
Feb. 9	2255	2327	2305	1?	N25 E38	2 0
Mar. 7	0307	0324	0311	1?	N25 W55	1 0
Mar. 18	1225	1240	1228	1?	N29 W26	1 1 0 0
Mar. 21	2119	2133	2127	1?	N28 W70	1 0
Mar. 26	0323	0359	0337	1?	N10 E52	1 1 0 0
Apr. 12	2232	2302	2243	1?	N06 E70	1 0
Apr. 15	2109	2147	2116	1?	N04 E30	2 1 1 1- 1- 1-
May 3	0248	0305	0254	1?	N28 E62	1 0
May 3	0412	0416	0413	1?	N28 E63	1 0
May 23	0542	0552	0545	1?	N24 W07	1 0
May 26	0500	0510		1?	N21 W78	1 1-
June 18	1035	1100	1041	1?	N25 W68	1+ 1 1- 0
Oct. 22	1558	1612	1602	1?	S17 E76	1 0
Oct. 22	1706	1730	1715	1?	S17 E77	1 1 1- 0
Oct. 22	2352	2406		1?	S17 E76	1 1 1- 0
Nov. 6	1756	1839	1818	1?	N27 E04	1 1-
Nov. 28	2139	2213	2142	1?	N28 E82	1 1-
Nov. 29	0011	0022	0015	1?	N28 E80	1
Nov. 29	0103	0128	0116	1?	N28 E83	1 0
Dec. 17	1635	1642		1?	N25 W90	1 1-
Dec. 17	2349	2354		1?	N25 W90	1 1 1- 0
Dec. 28	1358	1406		1?	N09 W48	1 0
Dec. 29	1205	1230	1210	1?	S29 E26	1+ 1 0 0
Dec. 30	0006	0130	0040	1?	N09 W70	1+ 1-
Dec. 31	1740	1753	1744	1?	N13 W90	1
Dec. 31	1850	1928	1900	1?	N10 W90	1 0
1966						
Jan. 10	1126	1140		1n?	N24 W02	1
Jan. 15	1040	1058		1n?	N17 E58	1 0
Jan. 19	1110	1145	1125	1f?	N30 E34	1 1 0 0
Feb. 12	1331	1347	1333	1b?	N32 E90	1
Feb. 27	0015	0154	0043	1b?	N20 W50	1 1-
Feb. 27	2140	2213	2152	1n?	N19 W68	1 1-
Feb. 28	2026	2043	2032	1n?	N21 W86	1 1 1- 0
Feb. 28	2102	2117	2110	1n?	N20 W86	1 1 1- 0

Table 2 - cont.

Date	Beg. UT	End UT	Max. UT	Imp.	Position	Individual Station Importance Ratings
1966						
Mar. 16	0045	0100	0053	1n?	N21 E69	1 1 0 0
Mar. 16	0219	0239	0221	1n?	N21 E70	1 0
Mar. 17	0559	0628	0602	1n?	N16 E54	1 1 0 0
Mar. 20	1757	1816	1805	1n?	N19 E12	1 1-
Mar. 21	0110	0140	0118	1n?	N21 E03	1 1 1- 0
Mar. 24	1733	1807		1n?	N14 W48	1
Mar. 24	2032	2051	2041	1b?	N14 W56	1
Mar. 29	2358	2458	(2410 2440)	1n?	N27 E62	2 1 1 0 0 0
Apr. 11	0117	0200	0123	1b?	N21 W56	1 1-
May 31	1030	1050	1034	1f?	S21 E68	1 1 0 0
June 2	0412	0442	0418	1f?	N30 E22	1
July 8	2347	2355	2350	1f?	N34 W69	1 0
July 10	0227	0245	0233	1n?	N37 W83	1
July 27	2329	2336	2333	1n?	N24 E73	1 0
July 30	2356	2410	2401	1n?	N27 E49	1 1 1- 0
Aug. 29	0805	0820	0807	1n?	N06 W69	1 1 1 1- 0
Sep. 6	0329	0343	0331	1f?	N22 E90	1
Sep. 19	1840	1901	1854	1n?	N10 W00	1 0
Oct. 6	0209	0224	0220	1f?	N23 E35	1
Oct. 9	1950	2021	2000	1f?	S24 W56	1 0
Oct. 15	0412	0448	0418	1n?	N21 E37	1
Oct. 16	2045	2110	2055	1b?	N21 E11	1 0
Oct. 17	0246	0302	0247	1n?	N22 E09	1
Oct. 20	0113	0223	0143	1n?	N24 E48	1
Oct. 20	0935	1005	0942	1n?	N26 E75	2 1 1- 0
Nov. 11	0812	0822	0816	1n?	N13 E40	1
Nov. 28	0345	0409	0350	1f?	N25 W42	1
Nov. 28	0823	0900	0833	1b?	N26 W41	2 1 1- 1-
Dec. 6	0339	0425	0345	1n?	N12 E49	1
Dec. 7	1457	1502		1n?	N23 E82	1
Dec. 7	1633	1645	1637	1n?	N25 E75	1 0
Dec. 7	2100	2121	2102	1n?	N23 E71	1
Dec. 8	1655	1725	1703	1f?	N22 E66	1 0
Dec. 11	0021	0033	0025	1n?	N16 E85	1 1 0 0
Dec. 11	0537	0609	0542	1n?	N18 E77	1 0
Dec. 12	1242	1305	1242	1n?	N20 E15	1

Table 2 - cont.

Date	Beg. UT	End UT	Max. UT	Imp.	Position	Individual Station Importance Ratings
1966						
Dec. 14	1742	1754	1750	1n?	S20 W53	1 0
Dec. 19	1419	1444	1424	1n?	N13 W67	1
Dec. 21	0534	0600		1n?	N29 E56	1
Dec. 23	1112	1130		1f?	S27 E70	1 0
Dec. 23	1506	1550	1509	1n?	N21 E71	1
Dec. 25	0944	1042	(0947 1003)	1n?	N24 E51	1 1 0 0
Dec. 30	2135	2220	2152	1n?	N25 W22	1
Dec. 30	2231	2254	2235	1b?	S23 E32	1
Dec. 30	2305	2332	2313	1f?	N11 E90	1
Dec. 31	1836	1917	1842	1b?	S23 E22	1 1-

TABLE 3.

Importance of Flares in Quarterly Bulletin before and after Reevaluation on Basis of all Observing Stations, 1964-66.

Month	Total Number	Importance in Q.B.						Importance after Reevaluation					
		S, 1-	1	1+	2	3	?	S, 1-	1	1?	1+	2	3
1964 Jan.	15	3	8	2	2			14				1	
Feb.	6	2	4					5	1				
Mar.	27	5	20	1			1	26			1		
Apr.	23	6	14	1	1		1	21	1			1	
May	19	8	8	2			1	18	1				
June	17	5	9	1			2	16	1				
July	3	2	1					3					
Aug.	15	6	7				2	14	1				
Sept.	8	1	5		1		1	8					
Oct.	12	1	9	1	1			10	1	1			
Nov.	9	2	5		1		1	7	1	1			
Dec.	21	4	14	1	1		1	20		1			
1965 Jan.	26	5	17	1			3	23	1	2			
Feb.	12	1	8		3			8	2	1		1	
Mar.	28	6	19				3	23	1	4			
Apr.	19	3	13	1	2			14	3	2			
May	64*	16	38	3	3		4*	50	11	4	1		
June	53	9	39	2	2		1	41	9	1		2	
July	16	6	8	2				11	5				
Aug.	21	9	9	2	1			20	1				
Sept.	31	12	18				1	26	3		1	1	
Oct.	40	10	27	1	2			27	7	3	1	2	
Nov.	34	12	22					25	5	4			
Dec.	39	4	34	1				29	2	7	1		
1966 Jan.	30	5	22	†	2		1	22	3	3	†	2	
Feb.	53	13	39		1			44	4	5			
Mar.	167	50	102		14	1		106	39	8		13	1
Apr.	107	50	52		5			82	21	1		3	
May	87	36	48		3			77	7	1		2	
June	60	30	28		2			53	5	1		1	
July	135	51	77		6	1		104	22	4		3	2
Aug.	122	42	73		7			89	26	1		5	1
Sept.	124	71	48		4	1		99	15	2		6	2
Oct.	91	40	46		5			69	12	7		2	1
Nov.	49	23	23		3			35	10	3		1	
Dec.	108	32	66		10			63	22	18		5	
Totals:													
1964	175	45	104	9	7	-	10	162	7	3	1	2	
1965	383*	93	252	13	13	-	12*	297	50	28	4	6	
1966	1133	443	624		62	3	1	843	186	54		43	7
1964-1966	1691	581	980	22	82	3	23	1302	243	85	5	51	7

*One event in the Quarterly Bulletin lasting 6 hours has been reevaluated as 3 events of importance 1+, 1, and 1- respectively.

†Importance 1+ was discontinued in 1966.

TABLE 4

Importance Evaluations by all Patrolling Stations for the 85 Flares of Importance ≥ 2 in Quarterly Bulletins, 1964-1966

Importance Evaluation	Number of Cases	
2 0	4	34
2 0 0	6	
2 0 0 0	4	
2 0 0 0 0	8	
2 0 0 0 0 0	3	
2 0 0 0 0 0 0	6	
2 0 0 0 0 0 0 0	2	
2 0 0 0 0 0 0 0 0	1	
2 1 1 0 0	1	
2 2	2	
2 2 0	1	
2 2 1	1	
2 2 1 0	1	
2 2 1 1- 0	1	
2 2 1 0 0	1	
2 2 2	1	
2 2 2 1	1	
2 2 2 1 1	1	
2 2 2 1-	2	
2 2 2 1 1 0	1	
2 2 2 2	1	
2 2 2 2 1	1	
2 2 2 2 1 1	2	
2+ 2 2 2 1+ 1 1 1 1 1- 1-	1	
2 2 2 2 2 1+ 1+ 1	1	
2 2 2 2 2 1 1 1 1- 0 0	1	
2 2 2 2 2 1 1 1 1 1- 0	1	
2 2 2 2 2 1 1 1 1 1 1- 0	1	
2 2 2 2 2 2 2 1-	1	
2+ 2+ 2 2 2 2 2 2 2 2 2 1+ 1+ 1 0 0	1	

Importance Evaluation	Number of Cases
3 2 1+ 1	1
3 2 2 1	1
3 2 2 1-	1
3 2 2 2	1
3 2 2 2 1 1 1 1	1
3 2 2 2 1 0 0	1
3 2 2 2 2 1 1	1
3 2 2 2 2 2 1 1	1
3 2 2 2 2 2 2	1
3 2 2 2 2 2 2 1 1 0	1
3 3 2 2 1	2
3 3 2 2 1-	1
3 3 2 2 2 2 1	1
3 3 2+ 2+ 2 2 2 1 1 0	1
3 3 3 2 1 1 0	1
3 3 3 2 2 2 2 2	1
3 3 3 3 2 2 2 2 2 1- 0	1
3 3 3 3 3 3 2 2 2 2 0 0	1
4 3 2 1	1
4 3 2 2 1 1 1 0 0 0	1
4 3 2 2 2 2 2 2 1 1 1 1	1
4 3 3 2	1
4 3 3 2 2 2 2 2 1	1
4 3 3 3 3 3 2 2 2 1	1
4 4 3 2 0 0 0 0 0 0	1
TOTAL	85

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