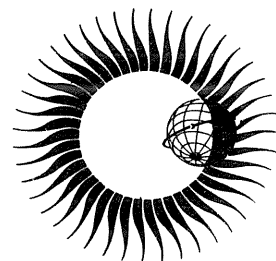


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REEVALUATION OF SOLAR FLARES 1967



June 1972

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WORLD DATA CENTER A for Solar-Terrestrial Physics



REPORT UAG-19

REEVALUATION OF SOLAR FLARES 1967

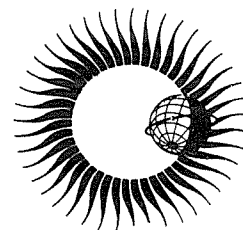
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Reevaluation of Solar Flares

1967

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Introduction

Several years ago an effort was made to remove certain apparently serious inhomogeneities from world-wide solar flare data [Dodson and Hedeman, 1968; Michard *et al.*, 1970]. The principal fault was a systematic relationship between the number of reported flares of importance ≥ 1 and time in the Universal Day. Specifically, for the years 1964-66, a very high maximum existed in the number of flares evaluated as of importance ≥ 1 between approximately 0700 and 1000 UT. See Figure 1A. It had been known for a number of years that an inhomogeneity of this type existed in world-wide flare lists [Dodson and Hedeman, 1960]. Over the years, genuine efforts had been made to reduce these faults at the observing level but the efforts apparently were not successful. Therefore, for the years of IQSY (1964-65) and for 1966 an actual reevaluation of Quarterly Bulletin data was undertaken.

Reevaluation, 1964-1966

In the reevaluation of the 1964-66 flares, the importance of each event was judged by giving consideration to the full information represented by the total H α patrol data of the more than 45 observing stations. For example, if a station indicated that it was patrolling at the time of a supposed flare of importance ≥ 1 , but failed to report either flare or subflare for the time in question, the event was considered to be a flare of "importance 0" for the station in question (a "negative report" in the current terminology of the Quarterly Bulletin). In the hope of separating the bona fide flares of importance ≥ 1 from the many subflares, it was 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 , in order for the event to be included in the Finding List of Flares of Importance ≥ 1 . The results of the reevaluation for 1964-66 were published by World Data Center A for Solar-Terrestrial Physics in Report UAG-2 [Dodson and Hedeman, 1968], and are summarized in Figure 1B.

Quarterly Bulletin Data, 1968-1970

After studying and checking the above results, World Data Center B for Solar Activity at Meudon, adopted a system of "filtering" of flare-reports as part of the preparation of flare-data for the Quarterly Bulletin on Solar Activity. These techniques were applied to flare-data beginning in January 1968. The distributions of flares of importance ≥ 1 in the Quarterly Bulletins for 1968-70 are shown in Figure 2. It is clear that the longstanding peak in flare counts centered at ~0800 UT has been eliminated from the Quarterly Bulletin data in these years.

1967 Flare Data and Reevaluation

In solar cycle 20 (to date), it is only for 1967 that gross inhomogeneities of the type here described still remain in all currently available flare data. The extent of the problem in 1967 is evident from the diagram in Figure 3A. In this year, two to three times as many flares per hour were reported as of importance ≥ 1 from 0600 to 1400 UT as during the remainder of the Universal Day. Accordingly, to bring all flare data for cycle 20 to a reasonably common basis, a reevaluation of flares in 1967 has been carried out at the McMath-Hulbert Observatory using the methods developed for the 1964-66 flare lists. Table 1 of this report presents the resultant Finding List of Flares of Importance ≥ 1 , 1967. The distribution of these flares as a function of Universal Time is shown in Figure 3B. The broad high maximum from 0600 to 1400 UT of the original data no longer appears. The total number of flares of importance ≥ 1 has been reduced from 1189 to 523. In this Finding List a question mark has been placed beside the importance evaluation for all flares that occurred when only one station was observing the sun, or for which the importance evaluation still remains ambiguous. The latter are cases for which the evaluations "subflare" or "zero" equal in number the reports of "importance ≥ 1 ."

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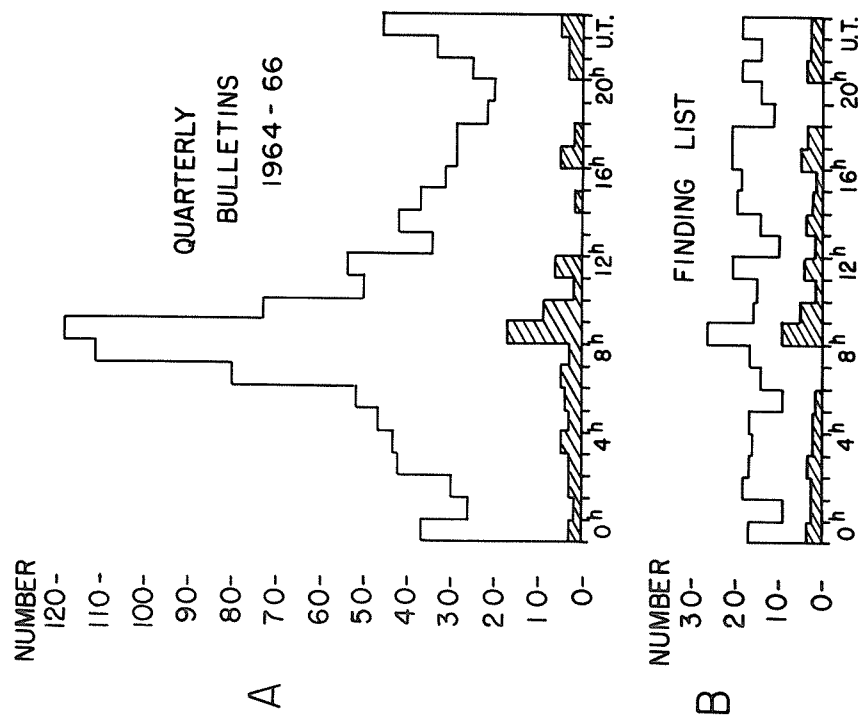


Fig. 1. Number of flares, importance ≥ 1 , 1964-1966, according to Universal Time of start or of first observation.
A. Quarterly Bulletins on Solar Activity
B. Finding List of Flares
The shaded areas indicate flares of importance ≥ 2 .

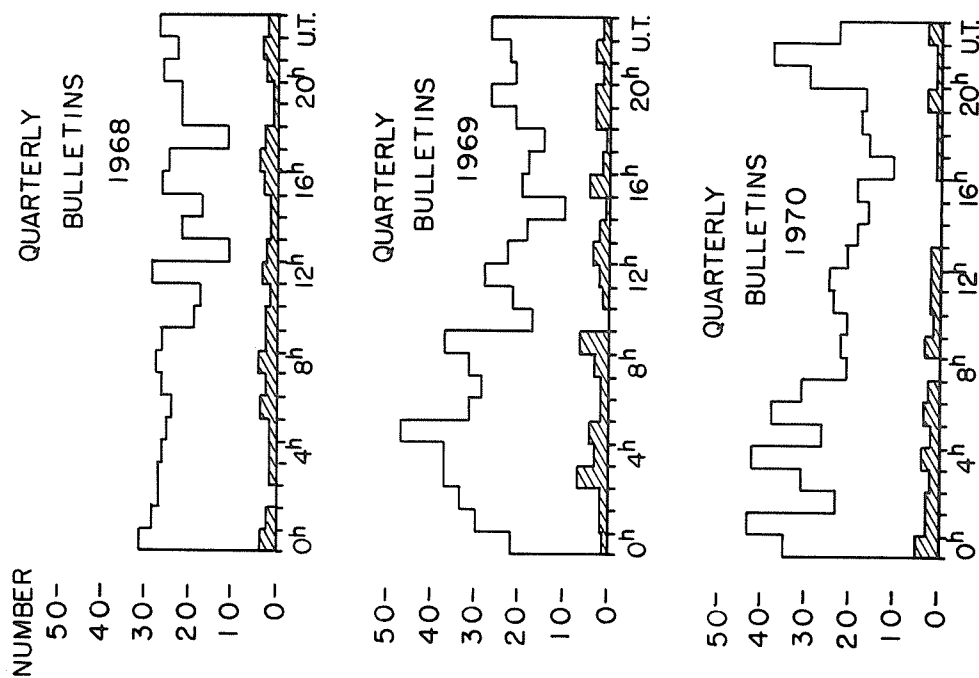


Fig. 2. Number of flares in the Quarterly Bulletins, importance ≥ 1 , according to Universal Time of start or of first observation, 1968-1970.

The shaded areas indicate flares of importance ≥ 2 .

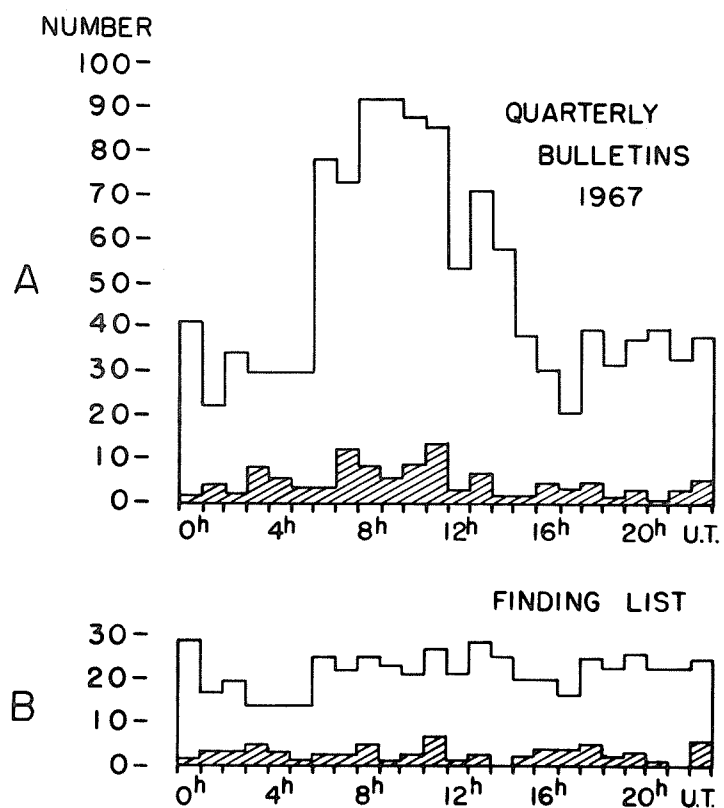


Fig. 3. Number of flares, importance ≥ 1 , 1967, according to Universal Time of start or of first observation.

A. Quarterly Bulletins on Solar Activity

B. Finding List of Flares.

The shaded areas indicate flares of importance ≥ 2 .

Table 1

McMath-Hulbert Observatory Finding List of Flares of Importance ≥ 1 , 1967

Date		Begin UT	End UT	Max. UT	IMP.	POSITION	INDIVIDUAL STATION IMPORTANCE RATINGS				
1967											
Jan	1	1030	1100		1b	N16 E57	1b	1b	1b	Sn	Sn
Jan	2	0354	0419	0405	1n?	S21 W01	1n				
Jan	2	1733	1753	1737	1f?	S28 E67	1f	0			
Jan	3	1131	1200	1138	1n	N16 E26	1n	1n	1f	Sn	Sn
Jan	3	1736	1814	1754	1n	S21 W28	1n	1n	1n	1f	
Jan	4	0204	0217	0208	1n?	S22 W33	1n	Sn			
Jan	4	0325	0340	0326	2f?	S25 W34	2f	0			
Jan	4	1530	1630	1540	1n	N15 E11	1b	1n	1f	1f	
Jan	4	1822	1845	1830	1f?	N35 E82	1f	0			
Jan	4	1825	1842	1830	1n?	N34 E57	1n	0			
Jan	5	0117	0342		1f?	S26 E34	2n	2f	0	0	
Jan	5	0440	0505	0445	1n?	N16 E03	1n	0			
Jan	5	1326	1414	1334	1n?	N15 E02	1n	0			
Jan	7	0540	0627	0552	1n?	S24 W77	2f	1n	0	0	
Jan	8	1745	1821		1n?	N22 E12	1n	1n	Sn	Sf	
Jan	11	0131	0317	0259	3b?	S26 W47	3b				
Jan	11	0232	0317	0251	1b?	N20 W76	1b				
Jan	11	0344	0510		2f?	S28 W42	2f				
Jan	11	0348	0352		1n?	N10 W38	1n				
Jan	11	0542	0554	0544	1n?	N16 W87	1n				
Jan	11	1423	1445	1427	1n	S19 W75	1n	1n			
Jan	12	0231	0305		1f?	N16 W90	1f				
Jan	12	1120	1150		1n?	S22 E50	1n				
Jan	12	1320	1340	1326	1n?	S21 W85	1n				
Jan	13	1220	1235		1b?	N28 W60	1b	0			
Jan	13	1819	1940	1830	1n	S31 W80	1n	1n	1n	Sf	
Jan	14	1027	1050	1031	1n	N13 W80	1b	1n	0		
Jan	14	1636	1723	1702	1n	N28 E83	2n	1n	Sn		
Jan	14	1738	1845		1n	N15 W40	1b	1n	1n		
Jan	14	2317	2405	2325	2n	N23 W70	2b	2n	Sn		
Jan	16	0032	0101	0041	1n	N16 W57	1b	1n			
Jan	17	0036	0041	0038	1f?	N15 W82	1f				
Jan	18	0030	0049		1f?	N19 E59	1f	0			
Jan	18	0616	0700	0623	1n	N17 E57	2n	1b	1b	1n	1f
Jan	18	2003	2022	2009	1n	N21 E89	1b	1b	1n	Sn	
Jan	19	0606	0648		1n	N17 E44	2n	2n	1b	1b	1n
Jan	20	1512	1554	(1527) (1542)	1n	N16 E62	1b	1n	1f		
Jan	20	2044	2130	2050	1n	N23 E63	1b	1n	1n	Sn	
Jan	21	2131	2230	2149	1b	N22 E48	2n	1b	1b	1b	1n
Jan	22	2054	2119	2108	1n?	N13 E27	1n	0			
Jan	23	0717	0731	0722	1f?	N12 E27	1f	0			
Jan	23	1214	1224		1b?	N14 E25	1b				
Jan	24	0609	0644	0614	1n	N22 E16	1b	1n	1n	1f	0
Jan	24	2023	2108	2027	1b?	N22 E09	1b	Sb			
Jan	25	2015	2045	2023	1f?	N20 E90	1f				
Jan	26	1143	1205	1148	1n	N15 W18	1b	1b	1n	Sn	
Jan	26	1250	1300		1n?	N10 W46	1n				
Jan	26	2100	2122		1n	N28 E70	1n	1f			
Jan	27	1511	1550	1520	1n?	N20 W59	1n				
Jan	27	2319	2400	2330	1n	N16 W32	1n	1n	1n	Sb	
Jan	29	1612	1730	1620	2n	S26 E02	2b	2n	2n	2n	1n
Jan	31	0037	0114		1n	N19 W60	1b	1f			
Jan	31	0204	0222	0213	3f?	N28 E90	3f				
Jan	31	1600	1616	1605	1f?	N26 E74	1f				
Feb	1	0745	0805		1n?	S25 W37	1n	0			
Feb	1	0750	0805		1n?	N25 W90	1n	0			
Feb	2	0110	0125	0112	1f?	S26 E21	1f	0			
Feb	2	0145	0228	0154	1n	N29 E62	1n	1n			
Feb	3	0252	0400	0306	2b	N13 E61	2b	2b	1b		
Feb	4	1641	1916	1659	2b	N11 E40	2b	2b	1b		
Feb	5	0408	0425		1n	N14 W37	1n	1f	Sn		
Feb	5	1410	1535	1410	1n	S18 E13	2n	1n			

Table 1 (continued)

McMath-Hulbert Observatory Finding List of Flares of Importance ≥ 1 , 1967

Date	Begin UT	End UT	Max. UT	IMP.	POSITION	INDIVIDUAL STATION IMPORTANCE RATINGS
1967 (continued)						
Feb 5	<u>1430</u>	<u>1520</u>		1n?	S25 W02	1n 0
Feb 6	<u>1825</u>	<u>1915</u>	1849	2n	N26 E85	2n 2n 1b Sf
Feb 6	<u>2022</u>	<u>2045</u>	2030	1n	N20 E81	1n 1f
Feb 7	<u>0130</u>	<u>0153</u>	0137	1b	N18 E34	1b 1b 1n
Feb 7	<u>0624</u>	<u>0640</u>	0630	1n	N18 E32	1b 1f 0
Feb 7	<u>0720</u>	<u>0755</u>		1f?	N16 E30	2f 0 0
Feb 7	<u>1025</u>	<u>1125</u>	1037	1b	N18 E30	2b 1n 0
Feb 7	<u>1136</u>	<u>1212</u>		2n?	N18 E74	2n 0
Feb 7	<u>1148</u>	<u>1223</u>		1n?	N13 E10	1n 0
Feb 7	<u>1255</u>	<u>1333</u>		2f?	N17 E73	2f
Feb 8	<u>0840</u>	<u>0935</u>		1n	N12 W05	2n 1b 1b 1n 1n Sn
Feb 8	<u>2233</u>	<u>2303</u>	2242	1f	N13 W63	1n 1f 1f 0
Feb 12	<u>1233</u>	<u>1330</u>	1245	1n	N15 E29	2f 2f 1n 1n 1n
Feb 13	<u>1747</u>	<u>2130</u>	1820	3b	N21 W11	4b 3b 3b 3b 2b 2f
Feb 13	<u>2214</u>	<u>2230</u>		1n?	N18 W85	1b 1n Sn Sn
Feb 15	<u>2303</u>	<u>2350</u>	2309	1n	N14 E67	1n 1n
Feb 16	<u>2204</u>	<u>2240</u>	(2207) (2225)	1n?	N29 E61	1n Sf
Feb 17	<u>1936</u>	<u>1950</u>	1941	1b	N25 E65	1b 1b 1n Sb
Feb 17	<u>2212</u>	<u>2230</u>	2217	1b	N24 E56	1b 1b Sb
Feb 18	<u>0943</u>	<u>1200</u>	1035	3n	N22 E55	4n 4n 4n 3b 2n 2n 2n 1n 0
Feb 20	<u>1631</u>	<u>1648</u>	1637	1n?	N22 E90	1n
Feb 21	<u>0250</u>	<u>0313</u>	0300	1b?	N23 E82	1b 1b 1n Sb 0 0
Feb 21	<u>0628</u>	<u>0747</u>	(0634) (0715)	1n	N25 E80	1n 1n 1f Sb Sb
Feb 21	<u>1609</u>	<u>1617</u>	1609	1n	N25 E70	1b 1n 1n Sn
Feb 22	<u>0501</u>	<u>0517</u>	0510	1b	N24 E61	1b 1b 1b 1n
Feb 22	<u>0621</u>	<u>0633</u>	0625	2n	N24 E66	2b 2n 2f 1b
Feb 22	<u>0916</u>	<u>0955</u>	(0918) (0928)	1n?	N23 E87	3n 2b 1n 0
Feb 22	<u>1232</u>	<u>1250</u>		1n?	N25 E63	1n 0
Feb 22	<u>1325</u>	<u>1339</u>		1b?	N23 E58	1b 0
Feb 22	<u>1401</u>	<u>1535</u>	(1425) (1455)	1b	N26 E62	2b 2n 1b 1f Sn
Feb 22	<u>1440</u>	<u>1604</u>		1n	N23 W01	2b 2b 1n 1f 0
Feb 22	<u>1807</u>	<u>1954</u>	(1821) (1850)	2b	N25 E63	2b 2b 2b 2b 2n
Feb 22	<u>2310</u>	<u>2359</u>		1f?	N25 E56	2f Sn 0
Feb 23	<u>0828</u>	<u>0848</u>		2b?	N24 E44	3b 3b 1b
Feb 23	<u>1143</u>	<u>1218</u>	1150	2n?	N24 E51	3b 2f 0
Feb 23	<u>1417</u>	<u>1445</u>		1n	N24 E49	1n 1n 0
Feb 23	<u>1609</u>	<u>1659</u>	(1615) (1630)	1b?	N24 E40	1b 1n Sb 0
Feb 24	<u>0607</u>	<u>0739</u>	0617	1n?	N23 E40	2n 2n 1n Sn 0
Feb 24	<u>1900</u>	<u>1940</u>	1906	1b	N24 E29	2b 1b 1b 1n 1n
Feb 24	<u>2303</u>	<u>2357</u>	2334	1b?	N19 E38	1b 0
Feb 25	<u>0735</u>	<u>0850</u>		1b	N24 E24	1b 1b 1b 1n Sn 0 0
Feb 25	<u>1309</u>	<u>1405</u>		1n	N25 E26	1b 1n 1n 1f Sf 0
Feb 25	<u>1806</u>	<u>1830</u>	1810	1b	N27 E13	1b 1b 1n Sn
Feb 25	<u>1848</u>	<u>2015</u>	(1910) (1956)	1b	N26 E25	2b 1b 1n Sn
Feb 26	<u>0855</u>	<u>0930</u>	0905	1n	N26 E19	1b 1b 1n 1n 1n 1n Sb Sb Sn 0
Feb 27	<u>1637</u>	<u>1830</u>	1644	2n	N27 E02	2b 2n 1n
Feb 27	<u>2048</u>	<u>2240</u>	(2055) (2129)	1b	N23 W06	2n 1b
Feb 28	<u>1600</u>	<u>1631</u>		1n	N28 W09	1b 1n 1n Sb
Feb 28	<u>2020</u>	<u>2125</u>		1n?	N17 E13	2n Sb Sn
Mar 1	<u>0416</u>	<u>0449</u>	(0420) (0430)	1b	N17 E12	2b 1b Sb
Mar 2	<u>0442</u>	<u>0505</u>		1b	N26 W35	1b 1b 1b Sb
Mar 2	<u>1010</u>	<u>1032</u>	1011	1n	N19 E90	2n 1b 1n Sn 0 0
Mar 2	<u>1108</u>	<u>1123</u>		1n	N27 W37	1b 1n 1n Sn Sn
Mar 2	<u>1543</u>	<u>1627</u>	1553	1n	N29 W38	2n 2n 1b 1b 1n 1n Sf

Table 1 (continued)

McMath-Hulbert Observatory Finding List of Flares of Importance ≥ 1 , 1967

Date		Begin UT	End UT	Max. UT	IMP.	POSITION	INDIVIDUAL STATION IMPORTANCE RATINGS											
1967 (continued)																		
Mar	3	0621	0724	0630	1n	N23 W49	2b	1b	1b	1n	1n	1n	Sn					
Mar	3	0900	0940	0903	1n	N16 W20	1b	1b	1n	1n	1n	1n	Sb	Sn				
Mar	3	0944	1002	0949	1n	S21 E24	1n	1n	1n	1n	1f	Sn	Sn	0				
Mar	3	2137	2202	2141	1b?	N20 W68	1b	1n	Sb	Sb								
Mar	3	2303	2323	2309	1n?	N23 W72	1n											
Mar	4	0624	0645		1n	N20 W78	1b	1n	0									
Mar	4	0718	0733	0725	1b	N22 W76	1b	1b	1b	1n	1n	0	0					
Mar	4	0824	0850	0831	1n	N21 W78	2b	2n	2n	1n	1n	1n	0	0				
Mar	4	1321	1358	1326	1b	S18 E68	2b	1b	1b	1b	1n	Sb	Sn					
Mar	4	1425	1500	1428	1n	N21 W80	2n	1n	1n	1n	Sn	Sf	0	0	0			
Mar	4	1716	1734	(1717)	1b	N24 W68	1b	1b										
				(1723)														
Mar	4	1910	1955	1922	1n	S22 E06	2n	1n	Sb									
Mar	4	2102	2127	2108	1b	S24 E03	2b	1b	1b									
Mar	5	1006	1058	1015	1n	N24 W80	1n	1n	1n	1n	Sb	Sn						
Mar	6	0918	0926	0920	1n	N17 W73	2f	1n	1n	Sb	0							
Mar	6	1308	1430	1316	2b	N17 E32	3f	2b	2n	1n	Sf							
Mar	6	2255	2400	2311	1n	N17 E08	2n	1n	1n	Sn								
Mar	8	2214	2300	2232	1f	S22 W50	1n	1f	Sf									
Mar	9	1015	1106	(1019)	1n	N24 W04	1b	1n	1n	1f	Sb	Sn						
				(1029)														
Mar	12	1236	1302	1239	1n?	N15 W63	1n											
Mar	15	2051	2110	2056	1n	S17 E36	1b	1n	Sn									
Mar	16	2342	2402		1n	N18 E79	1b	1n	0									
Mar	17	2152	2222	2202	1f	N24 E53	1n	1f	1f	Sn								
Mar	18	0835	0948	0853	1f	S15 E08	2b	1f	1f	Sf								
Mar	19	0244	0340	0252	1n	N23 E36	1b	1b	1n	1n	1n	Sn						
Mar	20	0850	1000	0904	1n	N18 E90	1n	1n	1n	1b	0	0	0					
Mar	20	2310	2420	2345	1n	N23 E21	1n	1n	1f	Sn								
Mar	21	1814	1835	1820	1n	N20 E77	1n	1n										
Mar	21	1825	1849	1832	1n	N25 E58	1n	1f	Sn									
Mar	22	0022	0240	(0033)	3b	N24 E68	3b	3b	3f	2b	2b	1f						
				(0155)														
Mar	23	1917	2017	1932	1b	N24 E31	2b	1b	1b	1b								
Mar	23	2328	2400	2332	1b	N25 E44	1b	1b	1n	Sb	0							
Mar	25	0709	0730		1n	N23 E26	1b	1b	1n	1n	1f	Sn	Sn	0				
Mar	25	1856	2024	1914	1n	N26 E20	1b	1n	1n	Sn								
Mar	25	2151	2231	2203	1n?	N23 E01	1n	0										
Mar	26	0458	0540	0509	2n	N23 W01	3b	2n	2f	1n	1n							
Mar	26	0649	0728	0706	1n	N24 W42	1b	1n	1n	1f	1f	1f	Sn	Sf	0	0	0	
Mar	26	0651	0720	0703	1n?	S20 E71	1b	1n	1n	1n	1f	Sb	Sb	Sn	0	0		
Mar	26	1402	1428		1n	S19 E67	1n	1n	1n	1n	1f	Sb	Sn	0				
Mar	26	1448	1510	1451	1n	N21 W08	2b	2n	1b	1n	1n							
Mar	26	1603	1619	1605	1b	N24 E02	1b	1b	1n	Sb	0							
Mar	26	1630	1750	1652	3n	N26 E05	3b	3n	2b	2n								
Mar	27	1444	1508	1454	1n	N23 W05	1n	1n	1n	0								
Mar	27	1558	1650	1614	1n	N24 W06	2n	1n	1n	1n	Sn							
Mar	27	1718	1800	1730	1n?	N25 W23	1n	1n	Sn	Sn								
Mar	27	2107	2205	(2113)	1b	N23 W24	1b	1n	1n	Sb								
				(2129)														
Mar	28	0615	0626	0618	1n	N24 W29	1b	1n	1n									
Mar	28	1732	1806	1740	1n	N23 W37	1b	1n	Sb									
Mar	28	1909	1934	1916	1n?	N25 W33	1n	0										
Mar	29	1726	1820	1740	1b	N21 W30	1b	1b	1b	1b	Sb							
Mar	30	0756	0835	0800	1n	N22 W40	1b	1b	1b	1n	1n	1n	1f	Sn	Sn	Sn	0	
Mar	30	0851	0930	0902	2n	N24 W49	3n	2b	2b	2n	2n	2n	2n	1b	1n	0	0	
Mar	30	1143	1210	1149	1b	N22 W41	2n	2f	1b	1b	1b	0						
Mar	30	2336	2420		1n	N24 W59	1n	1n										
Mar	31	0351	0444	0412	1n	N25 W63	4f	2n	1b	1b	1f							
Mar	31	1158	1243	1204	2n	N25 E40	3n	2b	2f	1b	1n							
Mar	31	1258	1420	1305	1n	N18 W32	1n	1n	1f									
Mar	31	1333	1356	1336	1b	S22 W60	1b	1f	0									
Mar	31	1622	1648		1n	N23 W68	1b	1n	1n									

Table 1 (continued)

McMath-Hulbert Observatory Finding List of Flares of Importance ≥ 1 , 1967

Date	Begin UT	End UT	Max. UT	IMP.	POSITION	INDIVIDUAL STATION IMPORTANCE RATINGS
1967 (continued)						
Mar 31	2059	2110	2059	1n?	N19 W65	1n
Mar 31	2212	2300	(2218) (2232)	1n	N18 W63	1n 1n Sn
Mar 31	2347	2430	2406	1n?	N22 W67	1b 1n 0 0
Apr 1	0003	0051	0016	1n	S23 W68	2n 1b 1n Sn 0 0
Apr 1	0119	0140	0122	1n	N24 W75	1b 1n 1f 0
Apr 1	0238	0257	0244	1n?	N18 W69	1n 1n 0 0
Apr 1	0347	0402	0350	1b?	N20 W70	1b 1b Sb 0
Apr 1	0618	0632	0621	1b	N19 W70	1b 1b 1b 1b 1n 0 0
Apr 1	0632	0720	(0638) (0654)	1n	S20 W06	2n 2n 2f 1n 1f 0 0 0
Apr 1	1023	1102	1025	2n	S22 W72	2b 2f 2f 1n 0
Apr 1	1410	1433		1b	N21 W80	1b 1b 1n 1n Sb
Apr 1	1414	1427		1n?	S24 W74	2n 1n 0 0
Apr 1	2058	2220	2130	1n	N28 E11	2n 1n 1f
Apr 1	2236	2315	(2240) (2252)	1n	S24 W78	1b 1n 1f 0
Apr 2	0407	0440	(0418) (0424)	1n	N24 W86	1n 1n 1n 0 0
Apr 2	0818	0840	0823		S24 W79	2n 2n 2n 1b 1n 1n Sb 0 0
Apr 2	1116	1150	1120	1n	S23 W81	2n 1b 1n Sn 0
Apr 9	0912	0938		1f?	S20 W40	1n 1f 1f 0 0
Apr 11	0745	0820	(0749) (0753)	1n	S19 W64	2n 1b 1n 1n Sn 0
Apr 11	1112	1142	(1119) (1124)	1n?	S21 W65	2n 2n 2n 1b 1f Sn 0
Apr 11	1336	1440	1344	1b	N22 W24	2n 1b 1b 1b 1n 1n 1n 1n
Apr 11	2101	2154	(2110) (2124)	1b	S23 W72	2b 1b 1n
Apr 12	0533	0558		1b	S22 W74	1b 1n 0
Apr 12	1103	1125	1110	1n	S20 W75	1n 1n 1n 1f
Apr 13	1926	2026	1942	1f?	N23 W53	1f
Apr 14	1703	1737	1715	2n	N24 W71	2b 2n Sb
Apr 14	2236	2256	2241	1f?	N21 W66	1n 1f Sn 0
Apr 15	1807	1836	1810	1f?	N30 E49	1f
Apr 20	2116	2215		1n	N21 E55	2n 1b 1n 1n 1n
Apr 23	0020	0050		1n	S22 W67	2f 1b 1n 1n Sn
Apr 25	0500	0532		1n?	S14 W08	2f 1b 1n 1n Sn 0 0 0 0
Apr 25	0926	1000	0932	1b	S26 W75	2n 1b 1b 1b 1b 1n Sn Sn
Apr 25	1038	1051	1041	1n	S21 W27	1n 1n 1f Sn
Apr 27	1602	1620	1606	1n	S22 E80	1b 1b 1n 1n 1n Sb
Apr 29	1954	2020	2000	1f?	N18 W82	1f 0
Apr 30	0938	1010	0945	1n	S20 E42	2n 2n 1b 1b 1b 1f Sn Sn 0 0 0
Apr 30	1044	1135	(1057) (1121)	1n	S21 E42	2n 1b 1b 1n Sn Sf 0 0
Apr 30	1304	1333	1309	1n	S22 E40	2n 1b 1n 1n 1n Sn Sn 0
Apr 30	2318	2337	2326	1n?	N15 E85	1n 1n 0 0
May 1	0745	0815		1n	S22 E30	2f 1n 1n 1n 1n 1n 1f Sf 0 0
May 2	1418	1444	1425	1n	N17 E61	1n 1n
May 3	1536	1830	(1550) (1645)	2b	N22 E50	3n 2b 2b 2b 2b 2b 2b 2b 2n 0
May 4	0126	0320	0214	2n?	N32 E24	2n 2n 0 0 0 0
May 6	0435	0545	0439	2n?	S20 W34	3n 3f 2b 2n 1b 0
May 8	1124	1440	1136	2n	S21 W60	3b 3n 3f 2b 2b 2n 2n 1n 1n 1n Sn 0 0 0 0
May 10	1145	1240	1153	2n	S22 W87	2n 2n 2n 2n 2n 1n Sb Sb 0
May 12	1755	1830	1802	1n	N24 W68	2n 1b 1n Sb Sn
May 14	1533	1640	1547	1n	S27 E08	1n 1n 1n 1n 1n 1n 1n Sn Sn
May 15	0855	0921		1n?	S13 E79	1b 1n 1n Sn 0 0
May 18	1934	1951	1938	1n	N25 E80	1n 1n 1n 0
May 19	1239	1310	1257	1b?	N24 E65	1b 1b 1n 1n Sb Sb Sn Sn
May 19	1524	1615	1538	1b	N24 E70	2b 2n 1b 1b 1n 1n 0 0
May 20	1005	1025	1009	1b	N25 E53	1b 1b 1b Sn 0
May 20	1508	1615		1b	N23 E51	2b 1b 1b 1n 1n 1n Sb 0

Table 1 (continued)

McMath-Hulbert Observatory Finding List of Flares of Importance ≥ 1 , 1967

Date	Begin UT	End UT	Max. UT	IMP.	POSITION	INDIVIDUAL STATION IMPORTANCE RATINGS
1967 (continued)						
May 21	<u>1300</u>	<u>1316</u>	1302	1n	N26 E61	2n 1b 1n 1n 0
May 21	<u>1535</u>	<u>1600</u>	1539	1b	N23 E58	1b 1n Sb
May 21	<u>1919</u>	<u>2025</u>	1926	2n	N24 E39	2b 2b 2f Sn
May 21	<u>2354</u>	<u>2427</u>	2411	2b	N24 E55	3b 2b 2b 2n 1b 1b 1b 1n 1n Sn
May 23	<u>1802</u>	<u>1831</u>	1814	2b	N29 E25	2b 2b 2b 2b 2b
May 23	<u>1835</u>	<u>1930</u>	1844	2b	N27 E25	3b 2b 2b 2b
May 23	<u>1932</u>	<u>2200</u>	1947	2b	N28 E28	2b 2b 2b 2b 1b Sn
May 24	<u>0300</u>	<u>0420</u>	0321	1n	N22 E10	2n 1b 1b 1b 1n 1n Sn Sf
May 25	<u>0222</u>	<u>0313</u>		1n	S20 E15	2n 1b 1n 1f Sn
May 25	<u>0632</u>	<u>0720</u>	0646	1b	N28 E11	2b 2b 1b 1b 1b 1n 0
May 25	<u>1039</u>	<u>1225</u>	1053	1b	N22 W06	2b 2n 2n 2n 1b 1b 1b 1n 1f 0
May 25	<u>2043</u>	<u>2125</u>	2054	1n?	N27 E05	1b 1n Sn Sn
May 25	<u>2250</u>	<u>2414</u>		1b	N26 W04	1b 1b 1n 1f
May 26	<u>0152</u>	<u>0240</u>	0207	2n	N14 E19	3n 3n 2n 2n 1n
May 26	<u>0859</u>	<u>0920</u>	0904	1n	N19 W23	1b 1b 1b 1n 1n 1f 1f Sb 0 0
May 26	<u>1228</u>	<u>1315</u>	1238	1b	N30 W04	2b 2b 1b 1n 1n 1n 1n Sb
May 26	<u>1338</u>	<u>1450</u>		1n	N30 W05	2b 2f 1n 1n 1n 1f Sb Sn 0 0 0 0
May 26	<u>1516</u>	<u>1700</u>	(1531) (1555)	1n	N30 W05	2n 2n 1n 1n 1n 1f 0 0 0
May 27	<u>0000</u>	<u>0007</u>	0003	1n?	N24 E43	1n 0
May 27	<u>0129</u>	<u>0257</u>	0203	1n	N26 W18	3f 1n 1n Sn Sn
May 27	<u>1212</u>	<u>1257</u>	(1216) (1235)	1n	N12 E02	2n 1n 1n Sn Sn 0 0
May 27	<u>2353</u>	<u>2415</u>		1n?	N26 W27	1n 0
May 28	<u>0022</u>	<u>0112</u>	0035	1n	N28 W28	1b 1n 1n 1n
May 28	<u>0529</u>	<u>0700</u>	0543	3b	N28 W32	4b 3b 3b 3b 3b 3b 2b 2b 2n 1n Sn
May 28	<u>0714</u>	<u>0820</u>	(0732) (0750)	1n	N24 W44	2b 2b 2b 2n 1b 1n 1n 1n 1n 1f 0 0
May 29	<u>1856</u>	<u>1930</u>		1n	N30 W68	1n 1n 1n Sn Sn
June 1	<u>1451</u>	<u>1512</u>	1457	1n	N24 E27	1n 1n 1n 1f Sn 0 0
June 1	<u>1552</u>	<u>1630</u>	1554	1b	N21 W33	2b 2n 1b 1n 1n Sb 0
June 2	<u>0056</u>	<u>0142</u>	0105	1n	N21 W39	1n 1n 1n 1n Sn Sn
June 2	<u>0825</u>	<u>0856</u>	0832	1n	N10 W77	2n 1b 1n 1n 1n 1n Sn 0
June 2	<u>0847</u>	<u>0920</u>	0852	2n?	N20 W45	3n 2b 2n 2n 1b 1b 1b 1n 1n 1f Sn 0 0 0
June 2	<u>1633</u>	<u>1732</u>	(1638) (1710)	1n	N24 E20	2n 1b 1n Sb Sn Sf 0
June 2	<u>2302</u>	<u>2345</u>	2306	1b	N20 W53	1b 1n 1n
June 3	<u>0226</u>	<u>0352</u>	0304	1n	N23 E12	3f 1b 1n 1n 1n Sn Sn
June 3	<u>0758</u>	<u>0830</u>		1n	S17 W26	2n 2n 2n 2n 2f 1b 1b 1b 1n Sb Sb Sn Sn
June 4	<u>0753</u>	<u>0840</u>	0758	1n	S17 W39	2n 2n 2n 1b 1n 1n 1n 1n 0 0 0
June 5	<u>1839</u>	<u>2032</u>	(1844) (1938)	2n	S18 W58	2b 2b 2n 2n 2n
June 6	<u>1206</u>	<u>1255</u>	1218	1n	N23 W42	2n 2f 1b 1b 1b 1n 1f 1f 1f Sf 0 0
June 11	<u>1107</u>	<u>1155</u>	1115	1n	N19 E58	2n 1b 1n 1n 1n Sf 0
June 16	<u>0021</u>	<u>0040</u>	0026	1f?	S16 W90	1n 1n 1f 0 0 0
June 17	<u>2120</u>	<u>2220</u>	2125	1n	N28 E63	1b 1n 1n Sn 0
June 18	<u>0119</u>	<u>0215</u>	0126	1n	N27 E62	2b 1b 1f 0
June 18	<u>1306</u>	<u>1415</u>	1315	1n	N26 E55	2b 2n 1b 1n 1n 1n Sn 0
June 18	<u>1551</u>	<u>1612</u>	1554	1b	N29 E46	1b 1b 1b 1n 1n Sb 0 0
June 22	<u>1347</u>	<u>1410</u>	(1348) (1354)	1n?	S24 E61	1b 1b 1n 1n 1n Sb Sn Sn Sf Sf 0
June 23	<u>0037</u>	<u>0110</u>	(0039) (0052)	1n	N15 E33	1b 1n 1n Sb Sn
June 25	<u>0105</u>	<u>0200</u>	0135	1n	N22 E16	1b 1b 1n 1n Sn
June 27	<u>2001</u>	<u>2033</u>	2013	1b	S20 E89	2n 1b 0 0
June 29	<u>0042</u>	<u>0125</u>	0100	1f	N18 W46	2f 2f Sf 0
June 29	<u>2331</u>	<u>2359</u>	2339	1n	N15 W57	1b 1n 1n 0
July 2	<u>0920</u>	<u>0945</u>		1b?	N20 W90	2n 1b 1b 1n 1n Sb 0 0 0 0
July 2	<u>1647</u>	<u>1720</u>	1707	1n	N16 E90	2n 1n 1f 0
July 3	<u>0750</u>	<u>0830</u>		1n	S22 E14	1b 1b 1b 1b 1b 1n 1n 1n Sn Sn Sn
July 4	<u>0940</u>	<u>0955</u>	0946	1n	S22 W01	1b 1b 1n 1n 1n 1f Sn Sn 0 0
July 4	<u>0958</u>	<u>1035</u>	1015	1n	S21 00	2b 2n 1b 1b 1n 1f Sn 0 0 0
July 5	<u>1832</u>	<u>1935</u>	1855	1b	S21 W18	1b 1b 1n Sb Sb

Table 1 (continued)

McMath-Hulbert Observatory Finding List of Flares of Importance ≥ 1 , 1967

Date	Begin UT	End Ut	Max. UT	IMP.	POSITION	INDIVIDUAL STATION IMPORTANCE RATING
1967 (continued)						
July 6	<u>2359</u>	<u>2423</u>	2403	1b?	N27 W82	1b 0
July 7	<u>1526</u>	<u>1555</u>	(1531) (1547)	1f	N28 W77	1n 1n 1n 1f Sn Sf 0 0
July 7	<u>1946</u>	<u>2016</u>	1953	1n	N27 E24	1n 1n 1f
July 7	<u>2040</u>	<u>2120</u>	(2046) (2057)	1f	N25 E24	1f 1f 1f Sf
July 8	<u>2237</u>	<u>2330</u>	2244	1f?	N30 W90	1f
July 9	<u>0313</u>	<u>0332</u>	0318	1n?	N27 E09	1n 1f 0 0
July 20	<u>0547</u>	<u>0630</u>	0551	1n	S22 E50	2n 2f 2f 1b 1b 1n 1n 1n Sn 0
July 20	<u>0717</u>	<u>0810</u>	0724	1n	S22 E49	2n 2n 2n 1b 1n 1n 1n 1f Sn 0 0
July 20	<u>2206</u>	<u>2230</u>	2212	1n?	S21 W50	1n 0
July 21	<u>2250</u>	<u>2340</u>	2303	1f?	N24 E82	1f 0
July 22	<u>1418</u>	<u>1500</u>	1420	1n	N13 E90	2n 1b 1b 1b 1n 1n Sn 0 0 0
July 22	<u>2152</u>	<u>2227</u>	2211	1f?	N14 E90	1f
July 23	<u>0010</u>	<u>0145</u>	(0032) (0115)	1f?	N16 E90	1f
July 23	<u>0440</u>	<u>0449</u>	0443	1n	N12 E80	1b 1n 0 0
July 23	<u>0538</u>	<u>0600</u>	0543	1n?	N12 E84	2n 1n 1f Sb 0 0
July 23	<u>1244</u>	<u>1310</u>	1302	1b	N12 E75	2b 1b 1b 1b 1n 1n 1n 1n
July 23	<u>1809</u>	<u>1840</u>	(1814) (1825)	1b?	N11 E72	1b Sb
July 24	<u>0024</u>	<u>0050</u>	0035	1n	N11 E66	2n 1b 1n
July 24	<u>0415</u>	<u>0430</u>	0422	1n?	N10 E65	1b Sf
July 24	<u>0928</u>	<u>1015</u>		1n	N27 E54	2n 2n 1b 1b 1n 1n Sb Sb 0 0
July 24	<u>0959</u>	<u>1008</u>	1000	1b	N10 E63	1b 1b 1b 1n 1n 1n Sb Sb 0 0
July 24	<u>1152</u>	<u>1220</u>		1n	N27 E53	1b 1n 1n 1n 1n 1n Sb Sb Sn Sn
July 24	<u>2015</u>	<u>2140</u>	(2020) (2104)	2b	N26 E47	2b 2b 1b 1b Sf 0 0
July 25	<u>0010</u>	<u>0100</u>	(0014) (0039)	1f?	N29 E43	1n 1n Sf 0
July 25	<u>1055</u>	<u>1130</u>	(1058) (1120)	1b	N27 E38	2b 2b 2b 1b 1b 1f Sn Sn Sn
July 25	<u>1213</u>	<u>1230</u>	1216	1n	N27 E40	2n 1b 1b 1n 1n Sn Sn 0 0
July 25	<u>1338</u>	<u>1408</u>	1349	1n	N27 E39	1b 1b 1n 1n 1n Sb Sf 0 0
July 25	<u>1425</u>	<u>1500</u>	1429	1b	N28 E39	2b 1b 1b 1b 1b 1n Sn Sn
July 25	<u>1720</u>	<u>1740</u>	1728	1n	N27 E37	1b 1n 1n 1n Sn 0
July 25	<u>1910</u>	<u>1925</u>	1914	1n?	N28 E34	1n 0
July 26	<u>0225</u>	<u>0300</u>	0227	1n	N27 E33	1n 1n 1n Sb Sb
July 26	<u>0654</u>	<u>0720</u>	0700	1n	N26 E30	2b 2f 2f 1b 1b 1b 1b 1n Sn
July 26	<u>0918</u>	<u>0955</u>	(0921) (0940)	1n	N13 E36	1b 1n 1n 1n 1n Sn Sf 0 0 0
July 26	<u>1344</u>	<u>1430</u>	1347	1n	N27 E27	2n 1b 1b 1n 1n 1n 1n Sn Sn Sn 0
July 28	<u>1849</u>	<u>1910</u>	1854	1n	N12 E02	1b 1n 1n 1n 1n Sb
July 29	<u>0242</u>	<u>0320</u>	0246	1b	N16 E19	3f 1b 1b 1n
July 29	<u>0402</u>	<u>0511</u>	0432	2n	S26 W63	3n 2b 2f Sf 0
July 29	<u>1453</u>	<u>1553</u>	1508	1n	N25 W16	2b 1b 1n 1n 1n 1n Sb Sn 0
July 29	<u>1927</u>	<u>2020</u>	1948	1b	N24 W22	1b 1b 1n 1n Sb Sn
July 30	<u>0508</u>	<u>0532</u>	0513	1b	N24 W27	2b 2b 1b 1b 1b 1n 1n Sn
July 30	<u>0615</u>	<u>0700</u>	0620	1b	N26 W29	2b 2b 2n 1b 1b 1n Sn
July 30	<u>1410</u>	<u>1445</u>	1417	1b	N15 W10	1b 1b 1b 1b 1b 1f Sb 0 0
July 30	<u>1612</u>	<u>1654</u>	1635	1n	N26 W36	1n 1n 1n 1n Sb Sn
July 31	<u>0045</u>	<u>0130</u>	0055	1b	N22 W39	1b 1b
July 31	<u>0808</u>	<u>0850</u>		1n	N25 W42	2b 1b 1b 1b 1b 1n 1n 1n 1n 1n 1n Sn Sn Sf
July 31	<u>0855</u>	<u>0920</u>	0857	1n?	N13 E11	1b 1b 1b 1n 1n 1n 1n Sn Sn 0 0 0 0 0
July 31	<u>1225</u>	<u>1250</u>	1228	1b	N23 W44	2b 2b 2n 1b 1b 1n 1n Sb Sn Sn 0 0
July 31	<u>1950</u>	<u>2040</u>	2004	1n?	N27 W45	1n 1n 1n Sb Sn Sf
July 31	<u>2047</u>	<u>2140</u>	2114	1b	N23 W50	2b 2b 1b 1b Sb
Aug 1	<u>0535</u>	<u>0655</u>	(0555) (0641)	1n	N25 W53	2b 2n 1b 1n 1n Sn 0
Aug 1	<u>1721</u>	<u>1810</u>	1738	2b	N27 W62	2b 2b 2b 2b 2b 2n
Aug 1	<u>1744</u>	<u>1822</u>	1753	1n?	S25 E18	1n 1n 1n Sn Sn Sn
Aug 2	<u>0043</u>	<u>0102</u>	0048	1n	N26 W58	1n 1n 1n
Aug 2	<u>1516</u>	<u>1544</u>	1522	1n	N20 W06	1b 1n 1n 1n 1n Sn Sn Sn 0

Table 1 (continued)

McMath-Hulbert Observatory Finding List of Flares of Importance ≥ 1 , 1967

Date	Begin UT	End UT	Max. UT	IMP.	POSITION	INDIVIDUAL STATION IMPORTANCE RATING
1967 (continued)						
Aug 3	<u>0918</u>	<u>0950</u>	(0920) (0930)	1b	N27 W85	2b 2b 2n 1b 1n 1n 1n 1n 0
Aug 4	<u>0135</u>	<u>0150</u>	0139	1n?	N28 W76	1n 0
Aug 4	<u>0318</u>	<u>0417</u>		2f?	N20 E76	2f 0
Aug 4	<u>1511</u>	<u>1550</u>	1515	1n	N31 W87	2n 2n 1b 1b 1n 1n Sb 0
Aug 5	<u>2346</u>	<u>2445</u>	2358	1n?	N20 W64	1b Sf
Aug 6	<u>1433</u>	<u>1520</u>	1449	1n	S23 E75	1n 1n 1n 1n 1f Sn 0
Aug 9	<u>0812</u>	<u>0930</u>		1n	N25 W38	2n 2n 1b 1n 1n 1f 1f 0 0
Aug 9	<u>1758</u>	<u>1930</u>	(1813) (1830)	2b	S24 E32	2b 2n 1b 1b Sn
Aug 12	<u>1547</u>	<u>1720</u>	1610	2n	S24 W06	2b 2b 2b 2b 2n 2n 1b 1n 1f Sn 0
Aug 15	<u>0653</u>	<u>0735</u>	0712	1n	S23 W41	1b 1n 1n 0 0
Aug 15	<u>2138</u>	<u>2205</u>	2145	1n	S23 W28	1b 1b 1n Sf Sf
Aug 17	<u>1206</u>	<u>1245</u>	1214	1n	S22 W77	2b 2b 1n 1n 1n 1n Sn Sf 0
Aug 17	<u>2101</u>	<u>2128</u>	2106	1b	N09 W15	1b 1b 1n
Aug 18	<u>0043</u>	<u>0130</u>	0046	1n	N08 W17	2b 1b 1n 1n Sn
Aug 18	<u>1955</u>	<u>2050</u>	(1958) (2026)	1n	N24 E87	2n 1n 1n Sn
Aug 18	<u>2053</u>	<u>2116</u>	2100	1n	N25 E89	2n 1n 1n Sb
Aug 18	<u>2131</u>	<u>2156</u>	2138	1n	N26 E90	2n 1b Sn
Aug 18	<u>2357</u>	<u>2430</u>	2405	2n	N16 E80	2n 2n 2f 0
Aug 19	<u>0530</u>	<u>0620</u>	0530	1b?	N16 E85	2b 2b Sn 0 0 0
Aug 19	<u>0729</u>	<u>0800</u>	0735	1n?	N20 E83	3n 2n 1b 0 0 0
Aug 20	<u>0025</u>	<u>0048</u>	(0026) (0037)	1n	N22 E79	1b 1n
Aug 20	<u>1610</u>	<u>1645</u>	1615	1n	N18 E64	2n 1n 1n Sn 0
Aug 21	<u>0057</u>	<u>0140</u>	0110	1n	N15 E54	1n 1n Sn
Aug 21	<u>1830</u>	<u>2000</u>	1844	1n	N23 E48	2b 2n 1n 1n 1n
Aug 22	<u>0156</u>	<u>0255</u>	0206	1n	N22 E52	1n 1n Sn
Aug 22	<u>2147</u>	<u>2230</u>	(2150) (2204)	1n?	N22 E42	1n Sn
Aug 23	<u>0515</u>	<u>0540</u>		1b	N23 E36	1b 1b Sb
Aug 24	<u>0016</u>	<u>0043</u>	0029	1n?	N24 E20	1n 0
Aug 24	<u>0051</u>	<u>0107</u>	0053	1n?	N26 E21	1n 0
Aug 24	<u>0138</u>	<u>0217</u>	0154	1n?	N25 E22	1n
Aug 24	<u>1425</u>	<u>1500</u>	1429	1n	N19 E20	2n 2n 1b 1b 1n 1n 1n 1f Sn
Aug 25	<u>1405</u>	<u>1500</u>	1418	1b	S20 E07	2b 1b 1b 1b 1b 1n 1n 1n
Aug 26	<u>0014</u>	<u>0108</u>	0023	1b	S19 00	1b 1b 1n Sn Sn
Aug 26	<u>0940</u>	<u>1022</u>	0947	1n?	N22 W05	1b 1n 1n 1f Sn Sn Sf 0
Aug 26	<u>2101</u>	<u>2140</u>	2111	1n	N13 W06	1n 1n 1n Sn
Aug 27	<u>0449</u>	<u>0515</u>		1n	N17 W11	1b 1n 0
Aug 28	<u>1206</u>	<u>1300</u>	1214	1b	S20 W32	2b 2b 2b 1b 1b 1n
Aug 28	<u>1402</u>	<u>1430</u>	(1404) (1414)	1n	S22 W32	1b 1b 1b 1n 1n Sb Sf Sf
Aug 29	<u>1154</u>	<u>1320</u>		2b	N22 W45	2b 2b 2b 2b 2b 1b 1b 1n 1n 1n 1n
Aug 29	<u>1330</u>	<u>1444</u>	1335	2b	N22 W46	2b 2b 2b 2b 2b 2b 2f 1b 1b
Aug 29	<u>1942</u>	<u>2020</u>	1948	1b	N22 W50	1b 1b 1b 1n Sb Sf
Aug 29	<u>2036</u>	<u>2135</u>	2053	1b	N22 W50	1b 1b 1b 1n
Aug 30	<u>0020</u>	<u>0122</u>	0030	1n	N22 W52	1b 1n Sn
Aug 30	<u>0458</u>	<u>0528</u>	0503	1b	N24 W53	1b 1n 0
Aug 31	<u>0826</u>	<u>0840</u>	0827	1f	N18 W68	2b 1n 1f 0
Sept 1	<u>0229</u>	<u>0250</u>	0231	1n	N13 W84	1n 1n Sb 0
Sept 1	<u>0810</u>	<u>0830</u>		1n	N23 W85	1n 1n 1n Sn 0
Sept 2	<u>2030</u>	<u>2105</u>	2040	1n	N27 E23	1b 1n 1n
Sept 3	<u>1029</u>	<u>1100</u>	1039	1n	N25 E08	1b 1n 1n 1f Sb Sb Sn
Sept 5	<u>2008</u>	<u>2029</u>	2015	1n?	S19 E79	1n Sn
Sept 6	<u>0635</u>	<u>0725</u>	0650	1n	S20 E63	2n 2f 1b 1n 1n 1f 0
Sept 9	<u>0255</u>	<u>0408</u>		1f?	N12 E70	1n 1n Sf 0
Sept 10	<u>1156</u>	<u>1338</u>	(1215) (1318)	1n	N25 W33	2b 1b 1b 1n 1f 1f Sb
Sept 17	<u>0353</u>	<u>0420</u>	0359	2b	N15 E61	2b 2b
Sept 18	<u>2316</u>	<u>2545</u>	2344	2b	N16 W60	2b 2b
Sept 22	<u>2216</u>	<u>2250</u>	2225	1n?	N17 W17	1b Sn

Table 1 (continued)

McMath-Hulbert Observatory Finding List of Flares of Importance ≥ 1 , 1967

Date	Begin UT	End UT	Max. UT	IMP.	POSITION	INDIVIDUAL	STATION	IMPORTANCE	RATING
1967 (continued)									
Sept 25	<u>2030</u>	<u>2044</u>	2034	1n?	N09 E78	1n 1n Sn Sn			
Sept 25	<u>2157</u>	<u>2235</u>	2206	1n	N12 E77	1n 1n 1n 1n Sn			
Sept 28	<u>0338</u>	<u>0407</u>	0342	1n?	N19 E55	1b 1n Sn 0			
Sept 28	<u>1127</u>	<u>1245</u>		1n?	N14 E41	3n 2b 2f 1b 1n 1n 1n 0			
Sept 30	<u>1300</u>	<u>1345</u>	1305	1n	N17 E17	2f 1n 1n 1n Sb 0			
Oct 1	<u>0838</u>	<u>0925</u>	0847	1n	N22 E19	2b 2b 2n 2n 2n 1b 1n 1n 1n 1f			
Oct 1	<u>0935</u>	<u>1035</u>		1n	N12 E03	2n 2f 2f 1b 1n 1n 1n 1n Sb Sn 0			
Oct 2	<u>0756</u>	<u>0815</u>	0758	1n	N16 W34	1n 1n 1n 1n Sb Sn			
Oct 2	<u>2151</u>	<u>2212</u>	2154	1n	S20 E46	1b 1n Sn 0			
Oct 4	<u>0600</u>	<u>0633</u>		1n	N17 W31	1n 1n 0			
Oct 5	<u>1354</u>	<u>1428</u>		1n	S17 W25	2n 1n 1n 1n 1n Sn 0			
Oct 6	<u>1102</u>	<u>1130</u>	(1103) (1116)	1n?	S18 W36	1b 1n 1n 1f Sb Sn Sn Sn			
Oct 6	<u>1218</u>	<u>1245</u>	1225	1n	S17 W37	2b 2n 1b 1b 1n 1n Sn			
Oct 6	<u>1317</u>	<u>1420</u>	1320	1n	S17 W38	2b 2n 1b 1n Sn 0 0			
Oct 7	<u>0231</u>	<u>0359</u>	(0240) (0347)	1b?	S16 W47	1b 0			
Oct 7	<u>1130</u>	<u>1151</u>	1133	1f	S17 W57	2f 1n 1n 1f 0 0 0			
Oct 7	<u>2044</u>	<u>2110</u>	2050	2b	S18 W62	2b 2n 1b 1b			
Oct 8	<u>0758</u>	<u>0837</u>	0810	2n	S14 W63	2n 2n 2n Sn			
Oct 8	<u>2029</u>	<u>2106</u>		1n	S17 W69	1n 1f Sn 0			
Oct 14	<u>0935</u>	<u>1002</u>	0945	1n	N14 W47	1b 1n 1n 1n 1n 1n 1n 1n Sb Sn Sn Sn			
Oct 14	<u>1225</u>	<u>1315</u>	1233	1n	N16 W45	2n 2n 1b 1n 1n 1n 1n 0			
Oct 14	<u>2120</u>	<u>2225</u>		1n	N17 W49	1b 1b Sf			
Oct 20	<u>0004</u>	<u>0035</u>	0009	1b	N16 E27	1b 1b 1n Sb			
Oct 20	<u>1050</u>	<u>1138</u>	1114	1n?	N17 E21	2b 1n 1n Sn Sn Sf 0			
Oct 21	<u>1945</u>	<u>2035</u>	(1954) (2005)	1n	N14 E58	2b 1b Sn Sf			
Oct 22	<u>1005</u>	<u>1100</u>	1010	1b	N11 E22	2b 2n 1b 1b 1f Sb Sf			
Oct 22	<u>2211</u>	<u>2310</u>	2218	1b	N10 E15	1b 1b Sn			
Oct 23	<u>0536</u>	<u>0554</u>	0543	1n?	N14 E10	1b 1n 0 0			
Oct 24	<u>0740</u>	<u>0820</u>	0750	1n	N20 E29	1b 1b 1n 1n 1n 1f Sn 0 0 0			
Oct 24	<u>1607</u>	<u>1700</u>	1614	1b	N09 W13	2b 1b 1n Sb Sn			
Oct 24	<u>2014</u>	<u>2200</u>		1n	S21 W01	2f 1n Sf			
Oct 25	<u>1327</u>	<u>1445</u>	(1335) (1350)	1n	N09 W24	2n 2n 1b 1b 1b 1n Sn Sn 0			
Oct 25	<u>2312</u>	<u>2400</u>	(2328) (2347)	1b	N10 W28	2b 1b 1n			
Oct 26	<u>0608</u>	<u>0640</u>	0614	1b	N10 W38	1b 1b 1b 0			
Oct 26	<u>1012</u>	<u>1030</u>	1015	1n	N10 W42	2n 2f 2f 1b 1n Sn 0 0 0			
Oct 27	<u>0917</u>	<u>0945</u>	0920	1n?	N09 W50	1b 1b 1n 1n 1n Sn Sn Sn Sn			
Oct 27	<u>1945</u>	<u>1956</u>	1949	1f?	N16 W80	1f Sf			
Oct 28	<u>1406</u>	<u>1614</u>	1444	1f	S22 E35	2n 2f 1n 1f 1f Sn Sf 0 0			
Oct 28	<u>1846</u>	<u>1904</u>	1851	1n	N13 W71	1n 1n 1n			
Oct 28	<u>2205</u>	<u>2233</u>	2215	1n?	N13 W71	1n 0			
Oct 29	<u>0258</u>	<u>0307</u>	0302	1n	N10 W80	1n 1n			
Oct 29	<u>1842</u>	<u>1920</u>	1847	1f	S25 E70	1f 1f			
Oct 29	<u>2347</u>	<u>2500</u>	(2351) (2414)	2b	N10 W90	2b 2b 2n			
Oct 31	<u>1124</u>	<u>1200</u>	1130	2N	S19 E21	2b 2b 2n 2n 2n 1n 0 0			
Nov 2	<u>0852</u>	<u>0914</u>	0856	2b	S18 W02	2b 2b 2b 2b 2n 1b Sb 0			
Nov 2	<u>1141</u>	<u>1250</u>	(1210) (1232)	1n	N20 W59	2n 2f 1n 1n 1f 0			
Nov 3	<u>0439</u>	<u>0448</u>	0440	1f?	N17 W70	1f Sn			
Nov 3	<u>1159</u>	<u>1240</u>	1210	1n?	N18 W76	2n 1b 1n 1f Sn Sf 0 0			
Nov 3	<u>2327</u>	<u>2337</u>	2330	1n?	S17 W21	1n 0			
Nov 4	<u>1151</u>	<u>1220</u>	1154	1b	S18 W33	2n 2n 1b 1b 1b 1b 1n 0			
Nov 5	<u>0900</u>	<u>0945</u>	0906	1n	S25 W41	2n 1b 1b 1f Sf 0 0			
Nov 5	<u>2234</u>	<u>2253</u>	2238	1n	S18 W48	1n 1n Sb			
Nov 7	<u>2218</u>	<u>2325</u>	2243	1f	N25 W63	1f 1f Sn Sf			
Nov 10	<u>1317</u>	<u>1410</u>	1330	1n	S26 W82	1b 1n 1n 1n 1n 1n Sn 0 0 0			
Nov 10	<u>1517</u>	<u>1540</u>	1530	1f	S26 W84	1n 1f			
Nov 10	<u>2130</u>	<u>2140</u>	2133	1n	S25 W83	1b 1n Sn			

Table 1 (continued)

McMath-Hulbert Observatory Finding List of Flares of Importance ≥ 1 , 1967

Date	Begin UT	End UT	Max. UT	IMP.	POSITION	INDIVIDUAL STATION IMPORTANCE RATING
1967 (continued)						
Nov 11	1214	1240		1n?	S26 W90	2n 0
Nov 13	1808	1900	1816	1f	N11 E74	1n 1n 1f Sf 0
Nov 16	1002	1100	1011	2n	N10 E38	2n 2n 2n 1n 0
Nov 16	2003	2030	2008	1n	N18 E43	1b 1n 1n 1n 1f
Nov 16	2124	2318	2143	3b	N11 E33	3b 3b 2b
Nov 17	0817	0935	(0821) (0840)	2b	N10 E26	3b 2b 2b 2b 2n 2n 2n 1b 1b 1b 1b 1n 0
Nov 17	1532	1545	1534	1n	N21 E90	1n 1n 1n 1n 0
Nov 17	1714	1900		1f	N16 E47	2f 1n 1f Sf 0 0
Nov 18	2224	2344	2301	1n?	N09 W33	1n
Nov 18	2228	2242	2230	1n?	N19 E85	1n
Nov 18	2250	2322	2259	1n?	N19 E81	1n
Nov 19	1018	1130	1037	1n	N11 W38	2b 2n 2n 1n 1n 1f Sn 0 0
Nov 25	0804	0818	0809	1n	N19 W03	1b 1n 1f Sn 0
Nov 27	0315	0334	0318	1n?	N22 W38	1n 1n Sn 0
Nov 27	1602	1625	1610	1f	N25 W53	1n 1f 1f 0
Nov 29	1159	1215	1159	1n	N28 W68	2b 1n 0
Nov 29	1852	1912	(1852) (1902)	1f	S29 W54	1n 1f Sn
Nov 30	1300	1345	1305	1b?	N27 W85	1b 0
Dec 1	0335	0416	0345	1n	S27 W70	2n 1b 1n
Dec 1	0746	0746		2b?	N27 W90	2b 0
Dec 1	1250	1315	(1252) (1304)	1b	S28 W75	2b 2b 2n 1b 1b 1b 1n 0
Dec 1	1932	2014	1947	1n?	S27 W82	2n 1n
Dec 4	1302	1326	1310	1b	S19 W90	2n 1b 1b 0
Dec 5	1439	1500	1445	1n	N24 E53	1b 1n 1n 1f Sn Sf
Dec 5	1519	1536	1526	1n?	N22 E81	1n 1f Sn Sf
Dec 6	1615	1643	1621	1f	N23 E36	1n 1f 1f Sn
Dec 10	0808	0845	0815	1n	S16 E28	2f 1b 1b 1n Sn Sn 0
Dec 11	1900	1918	1905	1n	N12 W56	1n 1n 1n 0
Dec 11	2154	2235	(2200) (2215)	1b	N14 W48	1b 1b 1n Sn
Dec 11	2347	2510	2358	2b	S22 W17	2b 2n 1b 1n
Dec 12	0124	0225	0138	1b?	N24 W33	1b 1n Sb Sn
Dec 13	0051	0108	0056	1n	N12 W64	1b 1n Sn
Dec 13	0332	0341	0338	2f?	N12 W65	2f
Dec 13	0716	0734	0721	1f?	N27 E52	1f
Dec 13	0851	0905		1n	N13 W70	2f 1b 1b 1b 1f Sn Sn Sn
Dec 13	1035	1054		1f?	N09 E35	1n 1f 1f Sf 0 0
Dec 13	1340	1500		1b?	S22 W37	2b 2n 2n 2n 1b 1b 1b 1n Sf
Dec 14	1110	1200	1117	1n?	N11 E33	2n 2n 2n 1n Sb Sn 0
Dec 16	0247	0430	0255	3n	N23 E66	3b 3f 2b 1f
Dec 16	0941	1030	(0944) (0956)	1n	N20 E13	2b 2n 1b 1b 1n 1f Sn Sn 0 0
Dec 16	1803	1840		1n?	N20 E08	1n 0
Dec 17	0440	0457	0441	1f	N19 E03	1n 1n 1f 0
Dec 17	0643	0750	(0646) (0702)	1b	N19 E02	2b 1b 1b
Dec 17	0746	0755	0748	1n	N26 W37	1b 1n 0
Dec 18	0134	0215	0138	1n	N25 W50	1n 1n 0
Dec 18	0242	0320	0259	1n	N19 W11	1b 1n 1n Sn
Dec 18	0816	0830		1n	N23 E29	2n 1n 1n Sb 0
Dec 18	1015	1030		1n	N19 W19	2b 1n 1n Sb Sn
Dec 18	1026	1057	(1035) (1045)	1n	S35 W76	2n 1n Sn 0
Dec 18	1434	1530	1444	1n	N20 E32	2n 1n 1n Sn Sf
Dec 19	2226	2243	2230	1n	N23 W69	1n 1n Sn
Dec 20	1800	1825	1812	1f?	N22 W82	1f
Dec 21	0910	0940	0914	1b	N26 E04	2b 1b 1b 1n 1n Sb Sb Sn
Dec 22	0934	0950	0937	1n	S19 E52	2n 1n Sn Sn
Dec 22	1315	1330	1320	1n	N17 W70	1n 1n 1f Sn 0
Dec 23	2101	2200	2106	1n	N25 W19	2b 1b 1n 1n 0

Table 1 (continued)

McMath-Hulbert Observatory Finding List of Flares of Importance ≥ 1 , 1967

Date	Begin UT	End UT	Max. UT	IMP.	POSITION	INDIVIDUAL STATION IMPORTANCE RATING
1967 (continued)						
Dec 24	1938	1954	1942	1n	S29 W22	1n Sn
Dec 26	0611	0714	0627	1n	S16 E14	1b 1n 1n Sf 0
Dec 26	1304	1325	1309	1n	S14 E80	2b 2n 1b 1n 1n Sn
Dec 26	1335	1410	1342	1n	S24 E23	2n 1b 1n 1n 1n Sf 0
Dec 26	1927	1944	1931	1n?	S11 W79	2n 1n Sf 0
Dec 26	2023	2045	2027	2n?	S15 E73	2b 2n 1b 1f Sn
Dec 27	0616	0633	0619	1n	S11 E66	1b 1n 1f 0
Dec 27	0838	0920	(0843)	1n	S17 E59	3b 2b 2n 1b 1n 1n 1n
Dec 27	1942	2055	(0905) (1948) (2008)	1b	S16 W09	1b 1b 1n
Dec 28	0218	0304	0223	1b	S17 W12	1b 1b 0
Dec 28	0550	0606	0553	1n	S17 E56	1n 1n
Dec 28	1335	1530		1n	S21 W19	2n 1b 1b 1n 1n 1n 0
Dec 29	0047	0100	0050	1n	S27 W78	1b 1n 1n Sn
Dec 29	0106	0140	0110	1b	S15 W22	1b 1b 1n Sb
Dec 30	2222	2234	2227	1n?	S15 E72	1n Sn
Dec 31	0616	0621		2f?	S18 W90	2f

Table 2 compares, by month and importance, the flare data in the Quarterly Bulletins for 1967 and in the Finding List.

Table 2

Importance of Flares in Quarterly Bulletin before and after
Reevaluation on Basis of all Observing Stations, 1967

Month	Total Number	Importance in Q.B.						Importance after Reevaluation								
		S	1f	1n	1b	2	3	S	1f	1n	1?	1b	2	2?	3	3?
Jan.	151	64	22	46	10	7	2	97		19	27	2	2	2		2
Feb.	127	33	12	53	16	11	2	70	1	15	18	11	6	4	2	
Mar.	217	93	14	84	19	6	1	150	3	36	9	13	4		2	
Apr.	191	78	27	60	13	12	1	155		17	11	6	2			
May	169	72	21	51	11	13	1	128		16	5	8	9	2	1	
June	142	68	25	42	4	3		118	1	15	2	4	1	1		
July	253	103	38	72	25	14	1	198	2	24	15	12	2			
Aug.	186	78	13	67	14	13	1	136	1	23	10	9	6	1		
Sept.	78	35	11	26	1	5		62		8	6		2			
Oct.	149	50	21	56	11	11		110	3	19	7	6	4			
Nov.	125	50	22	40	5	7	1	95	6	10	9	1	3		1	
Dec.	203	78	19	82	16	6	2	149	2	27	11	8	1	4	1	
Total	1991	802	245	679	145	108	12	1468	19	229	130	80	42	14	7	2
Total Imp. ≥ 1			1189						523							

By combining the data from the reevaluations for 1964-66 and 1967 with the "filtered" Quarterly Bulletin data for 1968 onward, it becomes possible to prepare counts and plots of relatively homogeneous flare events, month by month, throughout the development of solar cycle 20 (to 1971). See Table 3 and Figure 4.

According to these data, the months with the highest number of flares of importance ≥ 1 were as follows: March 1966; March 1967; January, February and October 1968; May and November 1969; and February and March 1970. The highest frequency of flares of importance ≥ 2 took place in March 1966, February and May 1967, November 1969 and March 1970. The drop in flare-occurrence beginning in August 1970 is conspicuous and sharp.

Table 3

Number of Flares of Importance ≤ 1 , by Months,
1964-1971 (September) after Reevaluation or
Filtering of Reports

Month	Number of Flares					
	Imp. ≤ 1	Imp. ≤ 2	Imp. ≤ 1	Imp. ≤ 2	Imp. ≤ 1	Imp. ≤ 2
	1964		1967		1970	
Jan.	1	1	54	6	61	6
Feb.	1	-	57	12	82	5
Mar.	1	-	67	6	98	13
Apr.	2	1	36	2	56	2
May	1	-	41	12	57	4
June	1	-	24	2	71	7
July	-	-	55	2	53	1
Aug.	1	-	50	7	21	1
Sept.	-	-	16	2	23	2
Oct.	2	-	39	4	32	4
Nov.	2	-	30	4	48	6
Dec.	1	-	54	6	35	1
	1965		1968		1971	
Jan.	3	-	78	9	22	2
Feb.	4	1	69	2	17	3
Mar.	5	-	22	1	7	-
Apr.	5	-	10	-	23	2
May	16	-	27	-	11	2
June	12	2	44	3	10	-
July	5	-	32	6	15	1
Aug.	1	-	53	6	31	2
Sept.	5	1	53	4	15	-
Oct.	13	2	75	10		
Nov.	9	-	49	5		
Dec.	10	-	57	5		
	1966		1969			
Jan.	8	2	50	2		
Feb.	9	-	41	6		
Mar.	61	14	63	6		
Apr.	25	3	53	7		
May	10	2	75	5		
June	7	1	48	10		
July	31	5	35	2		
Aug.	33	6	41	1		
Sept.	25	8	47	4		
Oct.	22	3	43	3		
Nov.	14	1	83	14		
Dec.	45	5	52	4		

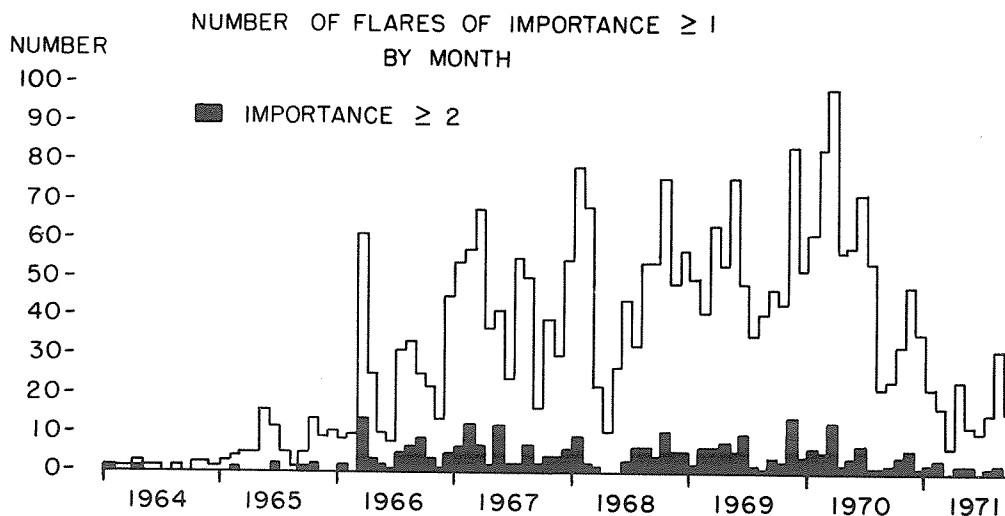


Fig. 4. Number of flares of importance ≥ 1 , by months, 1964-1971, after reevaluation or filtering of reports.

Black areas indicate flares of importance ≥ 2 .

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REFERENCES

- | | | |
|---|------|---|
| DODSON, H. W. and
E. R. HEDEMAN | 1960 | Survey of Number of Solar Flares Observed during the International Geophysical Year, <u>J. Geophys. Res.</u> , <u>65</u> , 123. |
| DODSON, H. W. and
E. R. HEDEMAN | 1968 | A Reevaluation of Solar Flares, 1964-1966, Report UAG-2, World Data Center A, ESSA, Boulder, Colorado, August 1968. |
| MICHARD, R.,
H. W. DODSON and
E. R. HEDEMAN | 1970 | IQSY Data Review: Solar Activity, <u>Annals of the IQSY</u> , <u>6</u> , 187. |

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Upper Atmosphere Geophysics Report UAG-12, "Solar-Geophysical Activity Associated with the Major Geomagnetic storm of March 8, 1970", Parts 1, 2 and 3, compiled by J. Virginia Lincoln and Dale B. Bucknam, World Data Center A, Upper Atmosphere Geophysics, NOAA, April 1971, single copy price (includes Parts 1-3) \$3.00. [Catalog NO. C55.220:12/ Pt 1, Pt 2, Pt 3]

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