The British Astronomical Association

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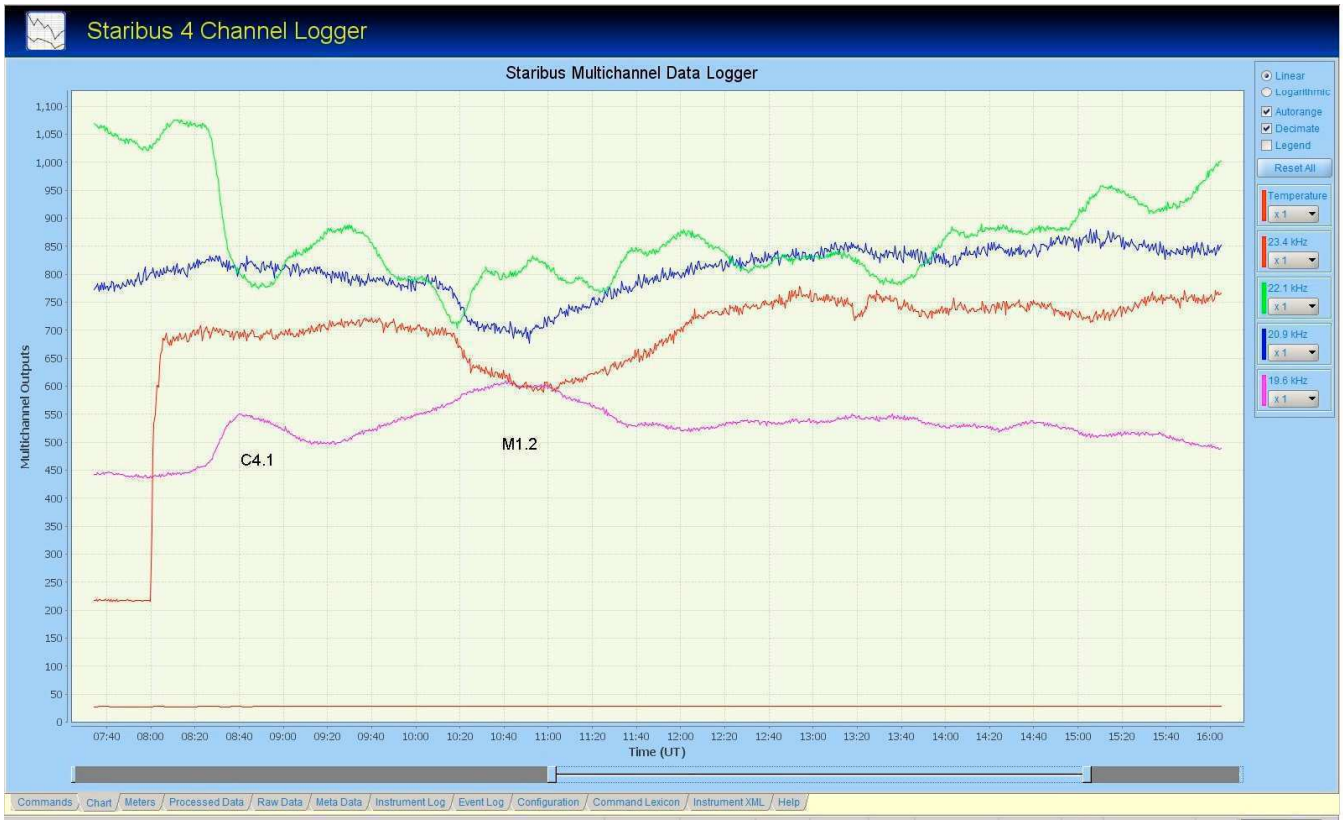
BAA Radio Astronomy Section. Director Paul Hearn.

RADIO SKY NEWS 2022 JUNE.

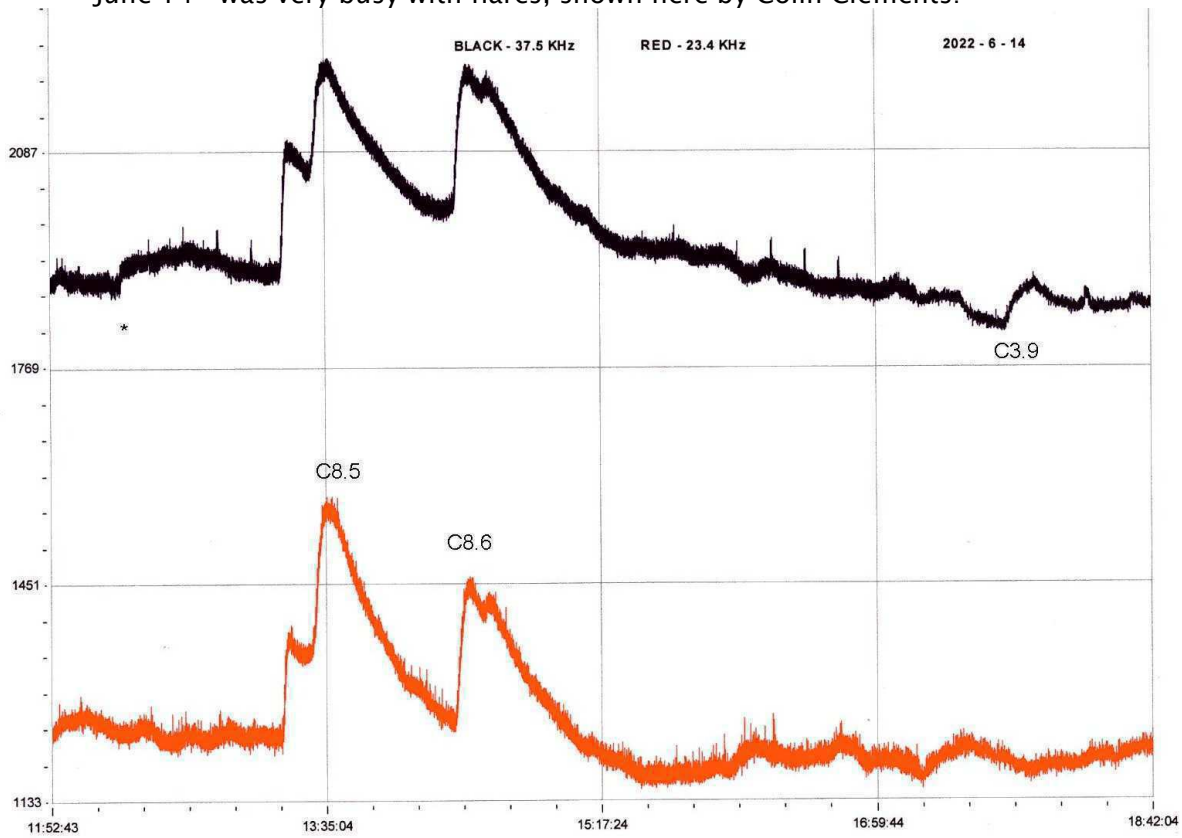
VLF SID OBSERVATIONS.

Sunspot counts in June remained high, but flares were generally much weaker than in May. The background X-ray flux also remained high, so the majority of smaller C-class flares were not recorded as SIDs. There are just two M-class flares listed in the SWPC bulletins; an M3.4 peaking at 04:07UT on the 13th was too early for us record, but we did get some recordings of the M1.2 flare on the 10th. This was quite a slow event, and so the VLF effect was not very SID-like. This recording By Steve Parkinson shows the result:

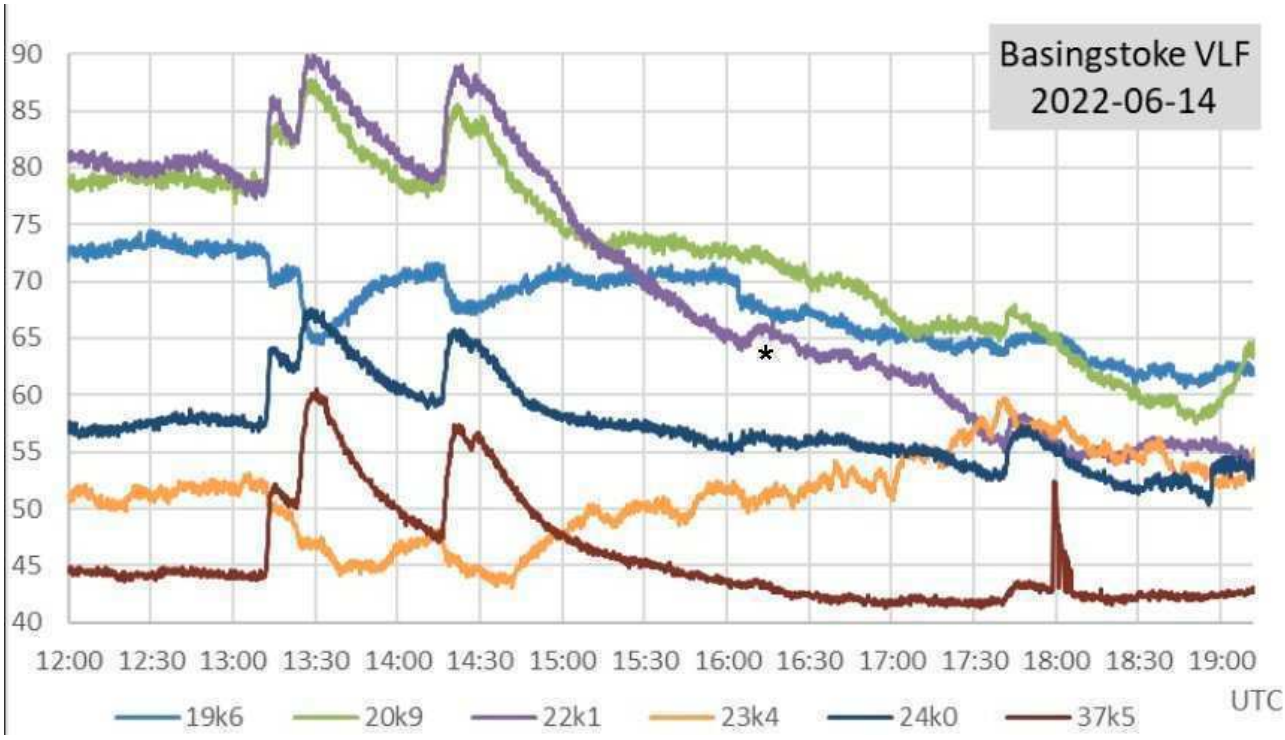


The pink trace is 19.6kHz, showing the M1.2 and C4.1 flares. Red is 23.4kHz, blue 20.9kHz and Green 22.1kHz. The timings are very tricky to determine, the tables showing a peak-time variation from 10:41to 11:02. The GOES X-ray flux is listed as start: 10:11, peak: 10:54, end: 11:14. Looking at the X-ray data, the flux still appears to be above C3 level at 12:00.

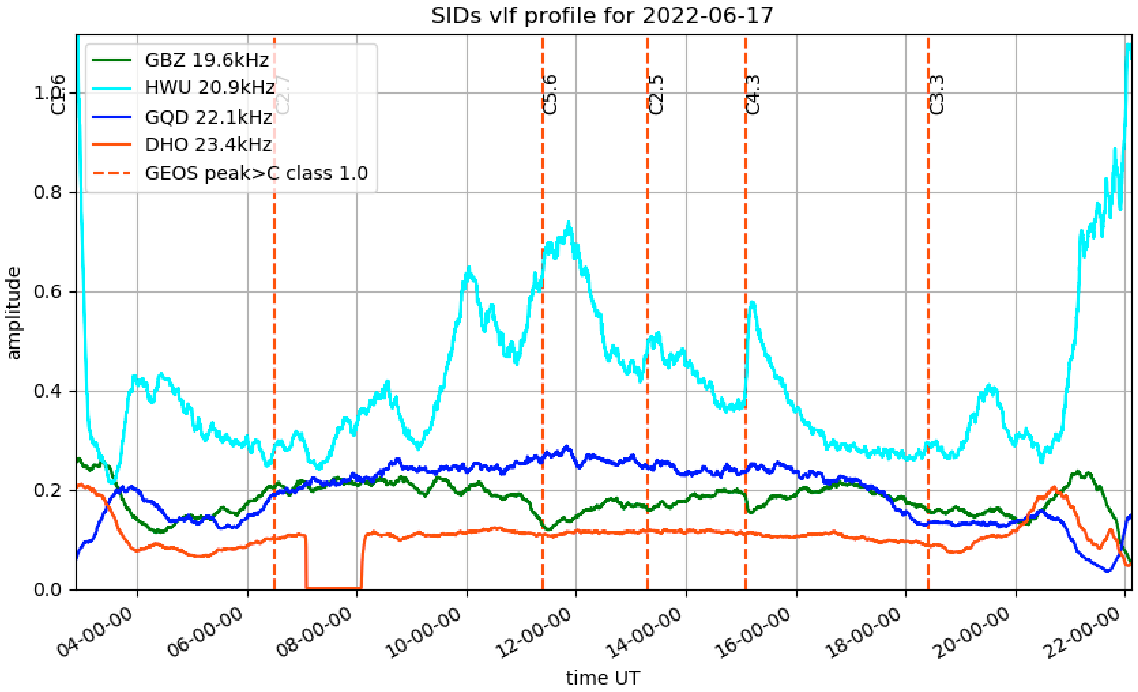
June 14th was very busy with flares, shown here by Colin Clements:



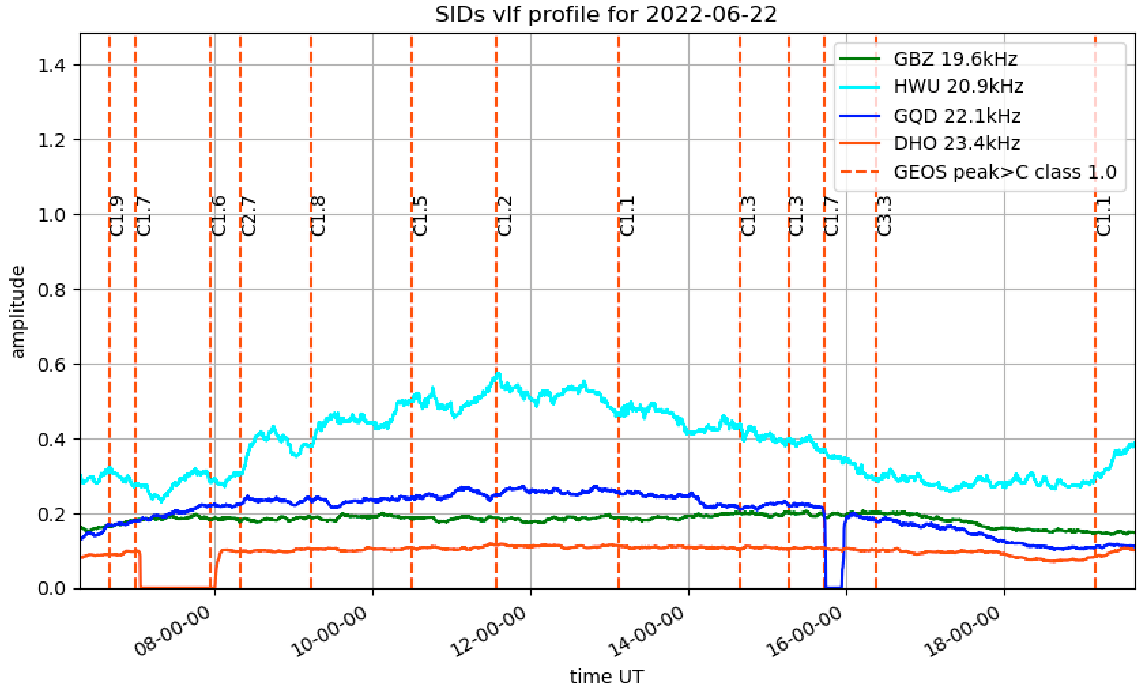
Both the C8.5 and C8.6 flares were double peaked, shown clearly at 23.4kHz and 37.5kHz. The 37.5kHz signal from Grindavik (top trace) also show evidence of the smaller unlisted flare at 12:38UT, indicated on the chart with a '*'.



This recording by Paul Hyde shows very similar SIDs, but also shows a small C1.3 flare at 16:13UT, again marked '*'. It is most clear in the 22.1kHz signal. The C3.9 flare at 17:50 is also visible on several of the signals.



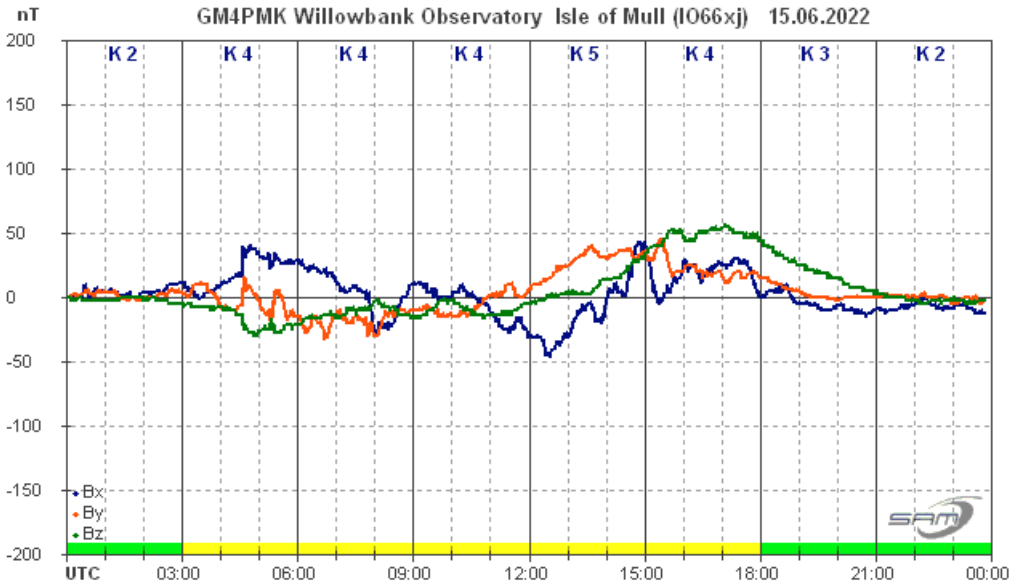
The 17th was also quite busy, shown here by Mark Prescott. 20.9kHz shows SIDs for most of the flares listed, while 23.4kHz has remained unaffected. There is also evidence of some non-solar noise on the 20.9kHz signal, with a strong rise in amplitude at 10:00 that has no X-ray counterpart. Mark's recording from the 22nd also shows some very noisy signals:



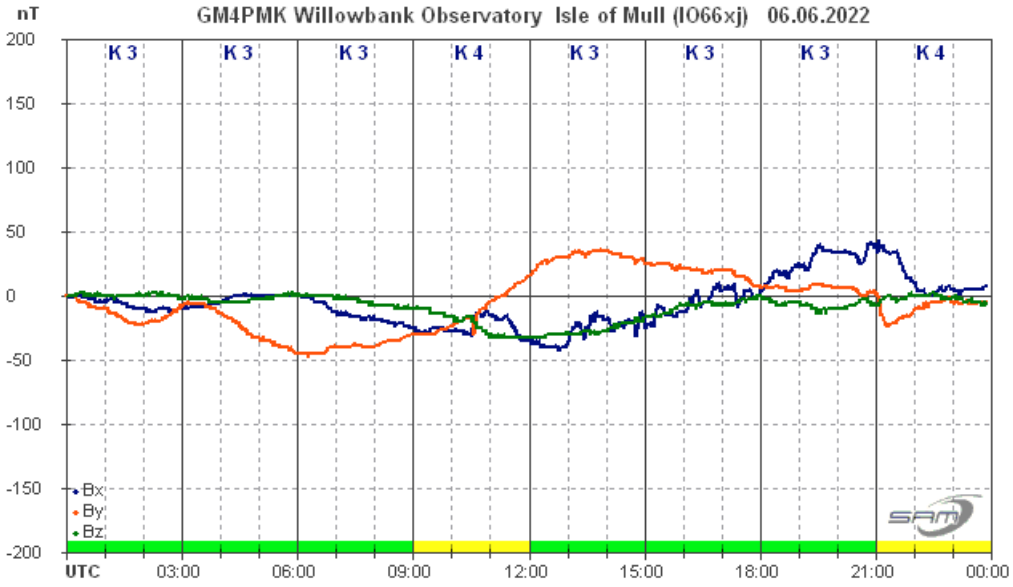
As noted at the start of this report, the high background X-ray flux made it tricky to record the smaller C-class flares. 20.9kHz here shows the problem well, with a very noisy signal and plenty of hidden flares. 23.4kHz has also remained flat throughout the day.

MAGNETIC OBSERVATIONS.

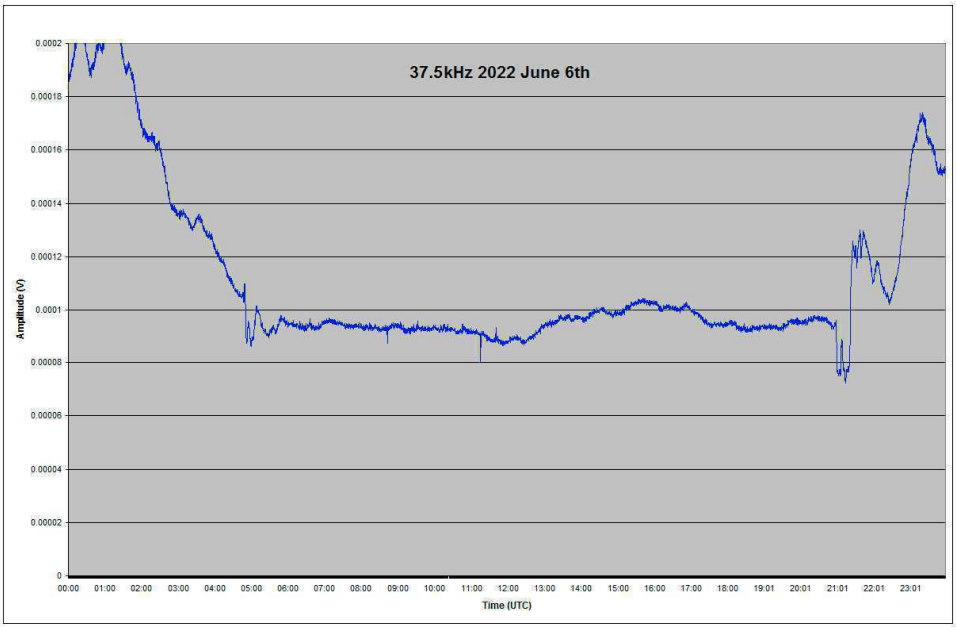
Most of the magnetic activity in June seems to have been from high speed winds, with only two CMEs that had Earth-directed components. The M3.4 flare early in the morning of the 13th did produce a CME, with fairly mild magnetic disturbances recorded on the 15th. Roger Blackwell's recording shows the disturbance during the day, along with what appears to be the arrival shock just after 04:30UT:



This was a very mild CME with only +/-50nT disturbance in the afternoon. It faded out in the evening and had very little effect into the following morning. A filament eruption on the 2nd also produced a CME that was geo-effective, arriving on the 6th.

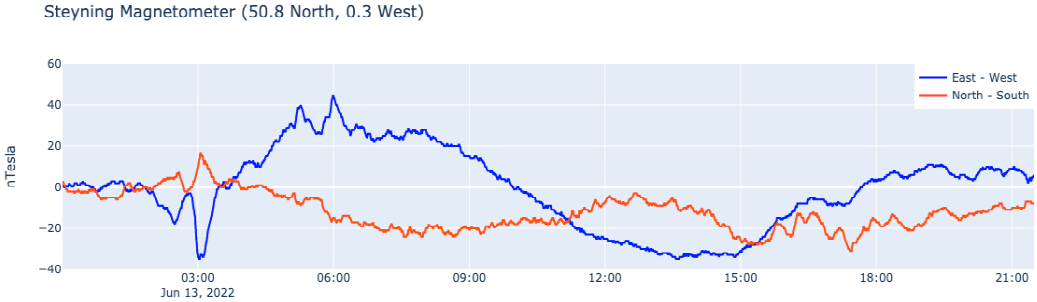


Roger Blackwell's recording shows that it had even less effect than the CME on the 15th. The sudden pulse in the Bx signal (blue) could mark its arrival at 10:30, the disturbance again fading out in the evening and with no disturbance in the morning of the 7th. The M1.2 flare recorded on the 10th does not appear to have produced a CME.

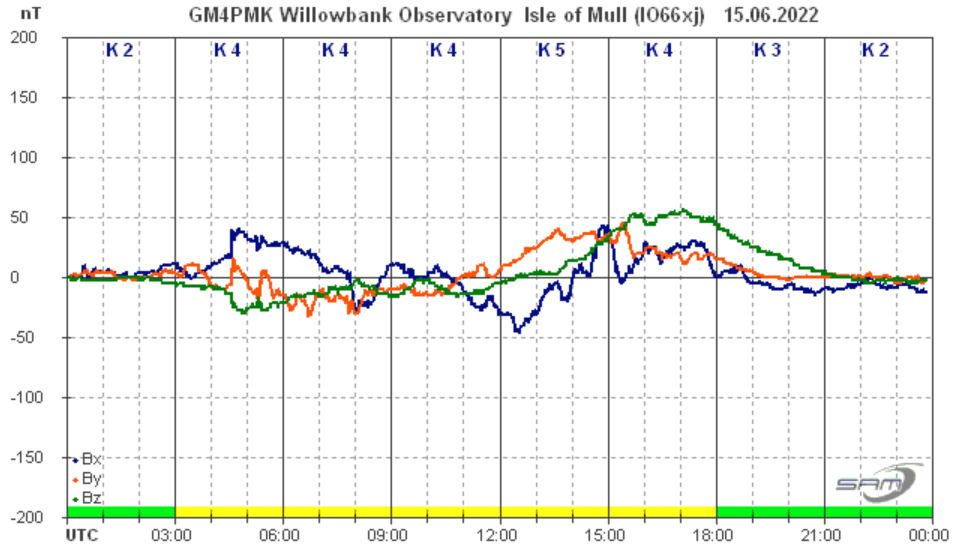


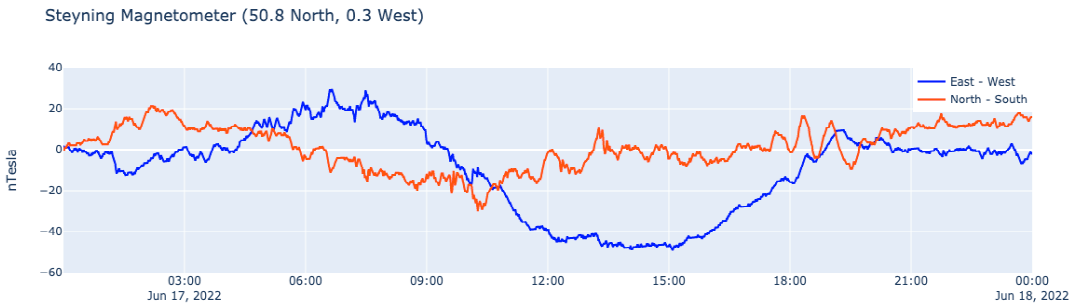
The CME could also be partly responsible for this disturbance to the 37.5kHz signal, recorded on June 6th by Mark Edwards. The early morning transient at 04:50 is well before the magnetic shock arrival, but does match magnetic disturbances recorded in other parts of the world. The pulse just before sunset at 21:00 is much larger, and matches the more widely recorded magnetic disturbances.

The remainder of the magnetic activity was from high speed solar winds, this recording by Nick Quinn shows a fairly strong change in wind speed around 3AM on the 13th:

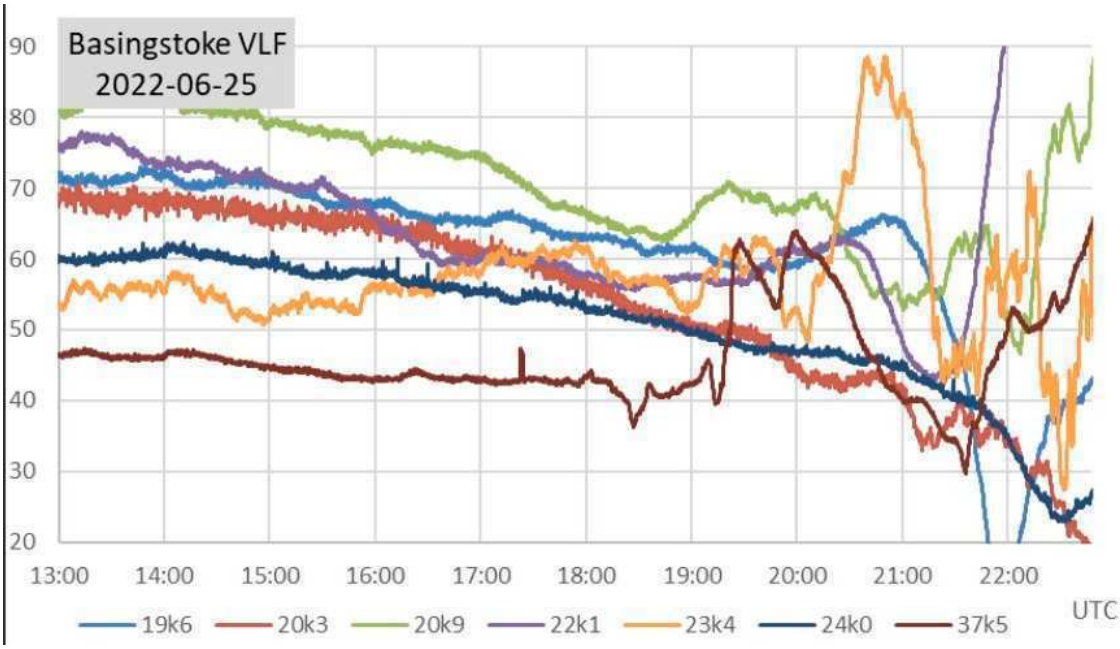


The initial transient is timed to match the M3.4 flare, but as this had very slow rise and fall times, it is unlikely to be an SFE. The following disturbance is rather mild at about +/- 40nT, but it did last for several days. The recording from the 15th is by Roger Blackwell, and the 17th by Nick Quinn:

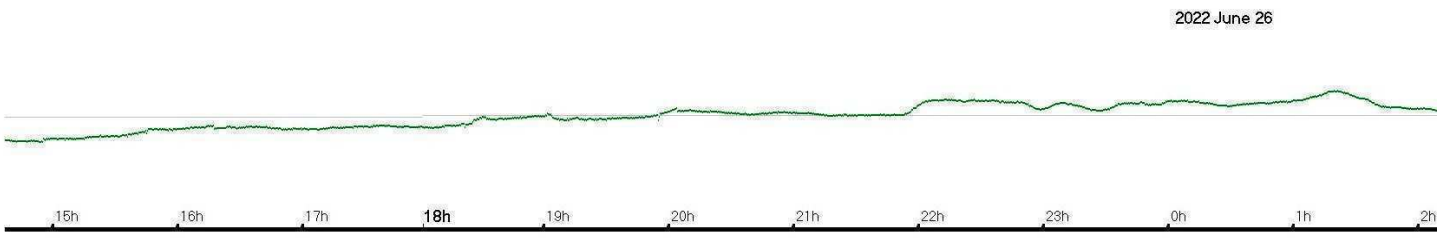




There will be some variation in intensity at these different locations, the isle of Mull and Steyning near the south coast, but +/- 50nT seems to be the maximum disturbance recorded.



This recording from Paul Hyde shows the VLF signals on the 25th. The European signals are all moving into the sunset by 19:00, the longer trans-Atlantic path at 24kHz stable for a few hours longer. Most notable is the disturbance in the 37.5kHz signal after 18:30 and leading into its local sunset. This appears to be due to the magnetic disturbance from the high speed solar wind, shown in my own recording:

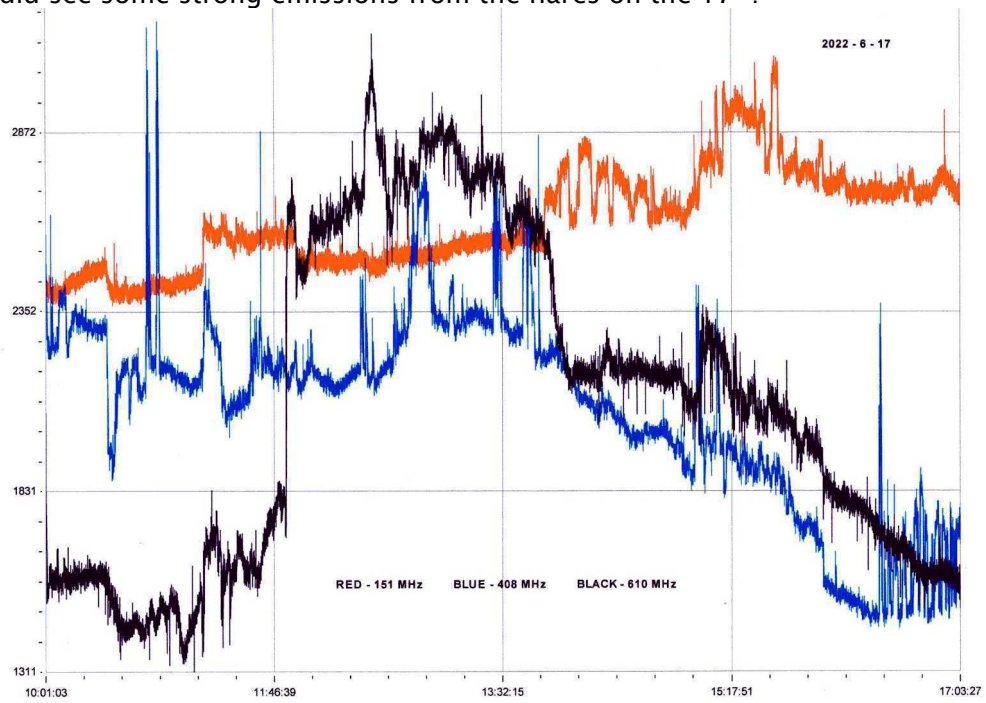


Luckily free from any local interference, a small disturbance can be seen from about 18:30 and lasting into the following morning. My single axis sensor tends to show smaller deviations compared to 2- and 3-axis sensors, with Colin Clements' and Roger Blackwell's recordings showing a stronger disturbance.

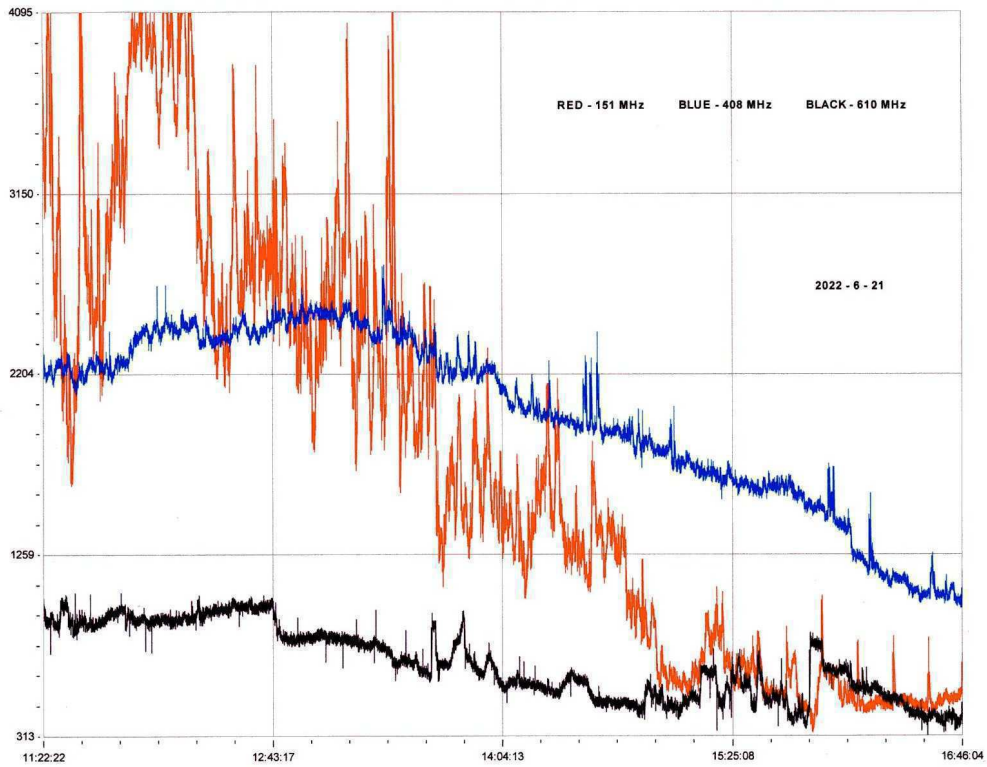
Magnetic observations received from Roger Blackwell, Colin Clements, Nick Quinn and John Cook.

SOLAR EMISSIONS.

Colin Clements did not record any significant VHF emissions following the M1.2 flare on the 10th, but did see some strong emissions from the flares on the 17th:

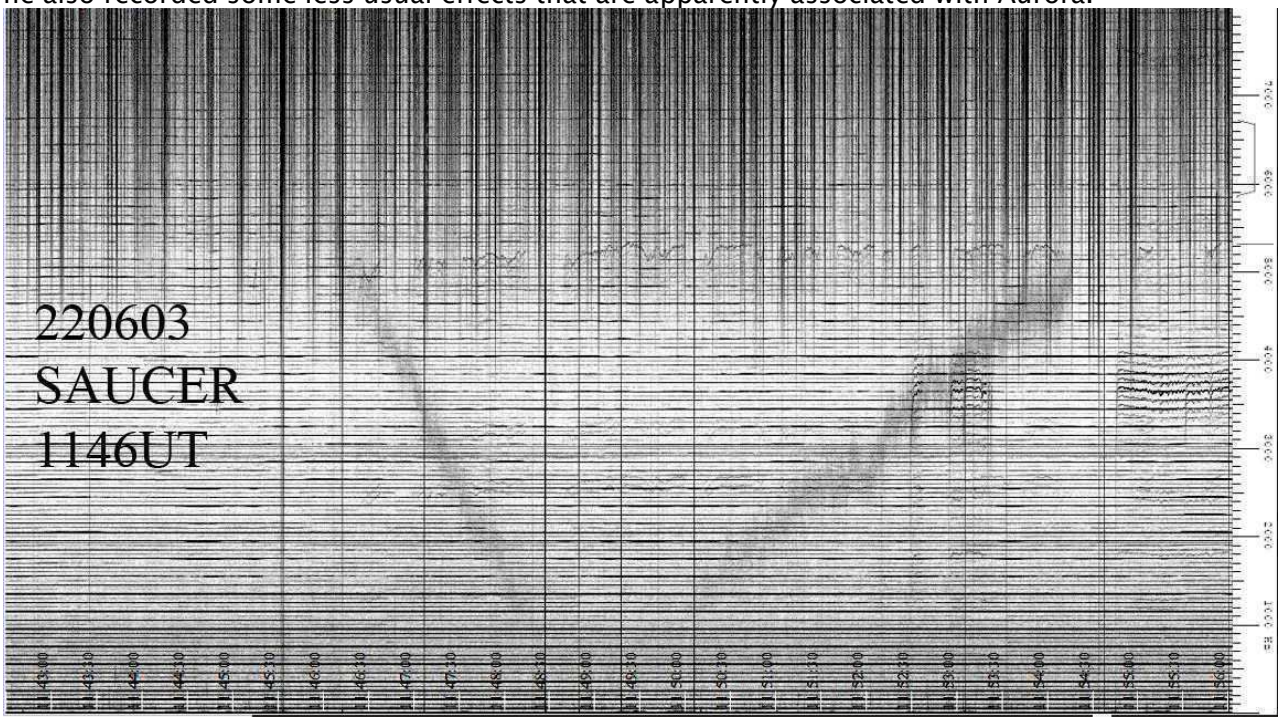


The 610MHz signal (black) shows a very strong signal during the first four flares. 408MHz (blue) is also quite strong, with a delayed signal at 151Mhz (red).

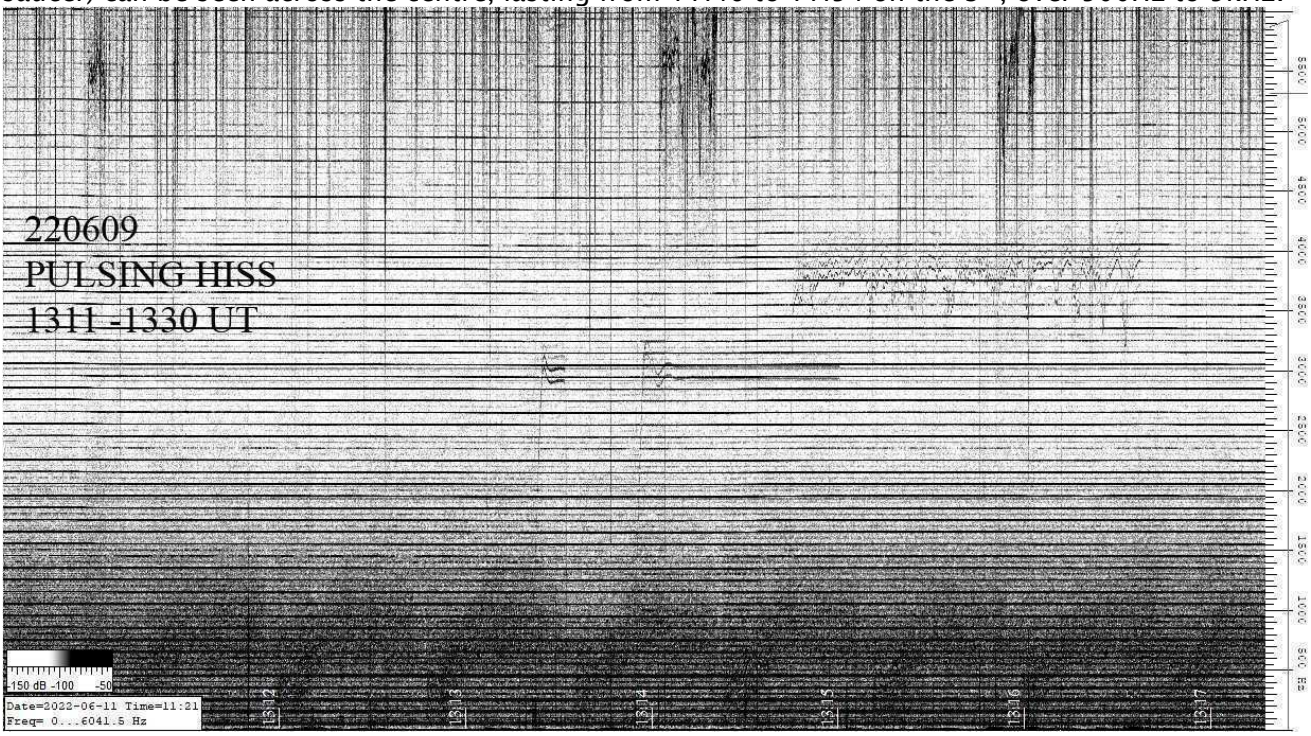


Colin's recording from the 21st is unusual, showing a very strong signal at 151MHz, with very little on the others. It does not match with our flare timings in the afternoon so may well be some interference, although it has not been seen before.

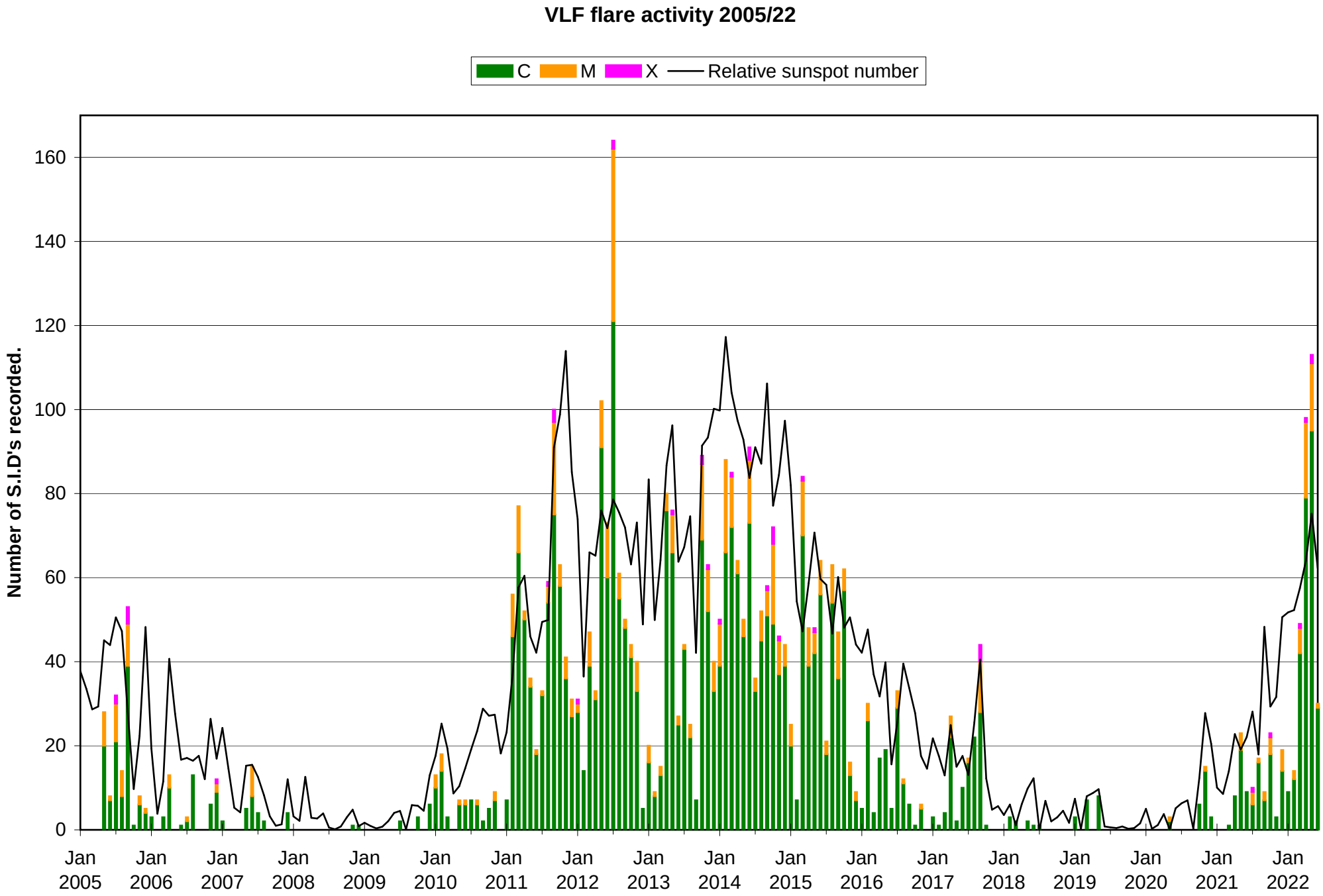
Colin Briden has been recording again at VLF, seeing the usual chirps and hooks previously reported. In June he also recorded some less usual effects that are apparently associated with Aurora.



The time and frequency markings are unfortunately not very clear in the picture. Frequency runs vertically, 0Hz at the bottom and 8kHz at the top. Time runs horizontally. A darker V-shaped pattern (known as a saucer) can be seen across the centre, lasting from 11:46 to 11:54 on the 3rd, over 500Hz to 5kHz.



This recording covers 0Hz to 6kHz, and shows a pulsing hiss between 500Hz and 1.5kHz. The period is about 50 seconds. This was seen for about 30 minutes on the 9th. There is evidence of extra noise at higher frequencies on both recordings. This was observed to be from a neighbour's lawn mower, and trains arriving and leaving a nearby railway station.


VLF flare activity 2005/22
C
M
X
Relative sunspot number
Number of S.I.D's recorded.
0
20
40
60
80
100
120
140
160
Jan 2005
Jan 2006
Jan 2007
Jan 2008
Jan 2009
Jan 2010
Jan 2011
Jan 2012
Jan 2013
Jan 2014
Jan 2015
Jan 2016
Jan 2017
Jan 2018
Jan 2019
Jan 2020
Jan 2021
Jan 2022

BAA Radio Astronomy Section. **2022 JUNE.**

	Xray class	Observers	John Cook (23.4kHz/*22.1kHz*)				Roberto Battaiola				Paul Hyde (22.1kHz/*24kHz*)				Mark Edwards (24.0/*19.6*/**37.5kHz**)				Colin Clements (37.5kHz)			
			Tuned radio frequency receiver, 0.58m frame aerial.				Modified AAVSO receiver.				Spectrum Lab / PC 1.5m frame aerial.				Spectrum Lab / PC 2m loop aerial.				Tuned Radio Frequency receivers, 0.76m screened loop aerial.			
DAY			START	PEAK	END (UT)		START	PEAK	END (UT)		START	PEAK	END (UT)		START	PEAK	END (UT)		START	PEAK	END (UT)	
9	C1.7	1													08:59	09:06	09:15	1-				
9	C1.9	2									10:08	10:21	10:53	2	10:14	10:27	10:59	2				
10	C3.7	2													*05:39*	*05:53*	*06:11*	*1+*				
10	C4.1	7	08:25	08:41	09:16	2+					08:23	08:42	09:36	2+	08:30	08:40	09:26	2+	08:32	08:50	09:39	2+
10	**M1.2**	7	10:15	10:45	12:01	3					10:14	10:42	12:00	3	10:16	10:54	12:10	3	09:39	11:02	12:07	3+
10	C2.3	2									14:24	14:35	14:47	1	14:29	14:36	15:11	2				
11	C1.2	1													14:11	14:10	14:17	1-				
13	C8.5	1													21:23	21:26	21:29	1-				
14	?	5									09:59	10:09	10:32	2	10:01	10:12	10:37	2	10:03	10:14	10:51	2+
14	?	1																				
14	?	1													**12:32**	**12:39**	**13:00**	**1+**				
14	?	6	13:13	13:15	?	-					13:10	13:17	?	-	13:13	13:16	?	-	13:19	13:21	13:28	1-
14	C8.5	8	13:24	13:30	?	-					13:23	13:31	14:11	2+	13:22	13:29	?	-	13:28	13:35	14:22	2+
14	C8.6	8	14:17	14:20	15:28	2+					14:16	14:24	?	-	14:17	14:23	14:59	2	14:22	14:28	15:31	2+
14	?	2									14:27	14:30	15:08	2	*14:28*	*14:29*	*15:19*	*2+*				
14	C1.3	1									16:06	16:13	16:28	1								
14	C3.9	3									17:41	17:47	18:30	2+	17:42	17:50	18:15	2				
16	C4.5	8	13:43	13:44	14:14	1+					13:41	13:46	14:32	2+	13:42	13:46	14:07	1	13:48	13:51	14:04	1-
17	C5.6	6	10:59	11:21	12:13	2+									10:58	11:29	?	-	10:36	11:29	11:36	2+
17	?	2													11:43	11:50	12:18	2	11:48	11:53	12:40	2+
17	C2.5	2									13:06	13:16	13:36	1+	13:10	13:26	13:57	2+				
17	C4.3	8	15:01	15:06	15:21	1					14:58	15:07	16:04	2+	15:02	15:11	15:34	1+	15:05	15:11	15:30	1
17	C3.3	1													18:25	18:27	18:46	1				
18	C1.8	2													11:38	11:46	12:11	2				
18	?	1													*11:53*	*11:57*	*12:06*	*1-*				
18	C1.8	1													13:30	13:35	13:57	1+				
18	C1.4	1													17:41	17:48	17:57	1-				
19	C4.0	1													20:00	20:09	20:36	2				
20	C5.7	2													06:17	06:20	06:25	1-				
20	?	1													14:54	14:58	15:08	1-				
20	?	3									15:19	15:31	16:01	2	15:24	15:34	16:04	2				
20	C4.5	3									16:06	16:14	16:40	2	16:08	16:13	16:27	1				
21	C5.6	6									16:12	16:27	17:32	2+	16:17	16:27	17:08	2+	16:15	16:32	17:26	2+
22	C2.7	2									08:17	08:26	08:51	2	08:18	08:23	08:43	1				
22	C3.3	1													**16:23**	**16:25**	**16:47**	**1**				
23	C4.0	1																				
23	C3.6	1													20:07	20:29	20:49	2				
24	C1.5	5	08:55	09:00	09:15	1					08:54	09:06	09:37	2	08:56	09:06	09:37	2	08:58	09:10	09:40	2
25	C1.2	1													14:01	14:03	14:16	1-				

BAA Radio Astronomy Section. **2022 JUNE.**

	Xray class		Steve Parkinson (Various)				Andrew Thomas (20.9/*22.1*/**19.6kHz**)				Phil Rourke (23.4kHz)				Mark Prescott (20.9kHz)				Christopher Bailey			
			Tuned radio frequency receiver, frame aerials.				Tuned radio frequency receiver, 0.6m frame aerial.				Spectrum Lab, 0.6m frame aerial.								Spectrum Lab			
DAY			START	PEAK	END (UT)		START	PEAK	END (UT)		START	PEAK	END (UT)		START	PEAK	END (UT)		START	PEAK	END (UT)	
9	C1.7																					
9	C1.9																					
10	C3.7						*05:40*	*05:46*	*06:00*	*1*												
10	C4.1		08:26	08:44	09:24	2+	08:26	08:43	09:29	2+					08:28	08:54	09:21	2+				
10	**M1.2**		10:15	10:54	12:10	3	09:35	10:41	12:30	3+					09:51	10:50	11:55	3				
10	C2.3																					
11	C1.2																					
13	C8.5																					
14	?						09:41	10:08	10:38	2+					09:55	10:16	10:45	2+				
14	?														11:31	11:44	11:52	1				
14	?																					
14	?		13:12	13:16	?	-	13:12	13:16	13:22	1-												
14	C8.5		13:24	13:30	?	-	13:22	13:31	14:17	2+					13:14	13:35	14:10	2+	13:10	13:30	13:44	2
14	C8.6		14:17	14:22	15:15	2+	14:17	14:21	15:57	3					14:16	14:25	14:49	2	14:00	14:22	14:50	2+
14	?																					
14	C1.3																					
14	C3.9						*17:40*	*17:46*	*18:03*	*1*												
16	C4.5		13:42	13:47	14:15	2	13:43	13:47	14:18	2					13:43	13:51	14:21	2	13:42	13:45	14:15	2
17	C5.6						10:56	11:24	12:32	3					10:59	11:53	12:35	3	10:45	11:25	12:12	3
17	?																					
17	C2.5																					
17	C4.3		15:00	15:08	15:34	2	15:01	15:07	16:02	2+					15:03	15:14	16:25	2+	15:00	15:05	15:25	1
17	C3.3																					
18	C1.8														11:43	11:56	12:11	1+				
18	?																					
18	C1.8																					
18	C1.4																					
19	C4.0																					
20	C5.7						*06:05*	*06:21*	*06:44*	*2*												
20	?																					
20	?														15:24	15:33	15:50	1+				
20	C4.5														16:09	16:16	16:31	1				
21	C5.6		16:15	16:24	16:42	1+	16:18	16:22	16:46	1+					16:17	16:29	16:54	2				
22	C2.7																					
22	C3.3																					
23	C4.0						09:38	11:26	12:08	3+												
23	C3.6																					
24	C1.5						08:54	09:11	09:45	2+												
25	C1.2																					

BAA Radio Astronomy Section.

BARTELS DIAGRAM

ROTATION	KEY:	DISTURBED.	ACTIVE	SFE	B, C, M, X = FLARE MAGNITUDE.	Synodic rotation start (carrington's).

2529
F 26 27 28 29 30 31 | 2019 January 1 2 3 4 5 6 C 7 8 9 10 11 12 13 14 15 16 | 2213 17 18 19 20 21

2530
F 22 23 24 25 26 CB 27 28 29 C 30 31 | 2019 February 1 2 3 4 5 6 7 8 9 10 11 12 | 2214 13 14 15 16 17

2531
F 18 19 20 21 22 23 24 25 26 27 28 | 2019 March 1 2 3 4 5 6 7 8 9 10 11 12 | 2215 13 14 15 16

2532
F 17 18 19 20 C 21 CCC 22 CCCB 23 B 24 25 26 27 28 29 30 31 | 2019 April 1 2 3 4 5 6 7 8 B | 2216 9 10 11 12 B

2533
F 13 14 15 16 17 18 19 20 B 21 22 23 24 25 26 27 28 29 30 | 2019 May 1 2 3 4 5 BB | 2217 6 CCCC 7 BCC 8 9 C

2534
F 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 | 2019 June 1 2 | 2218 3 4 5

2535
F 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 | 2219 30 | 2019 July 1 2

2536
F 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 | 2220 27 28 29

2537
F 30 31 | 2019 August 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 | 2221 23 24 25

2538
F 26 27 28 29 30 31 | 2019 September 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 | 2222 19 20 21

2539
F 22 23 24 25 26 27 28 29 30 | 2019 October 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 | 2223 17 18

2540
F 19 20 21 22 23 24 25 26 27 28 29 30 31 | 2019 November 1 2 3 4 5 6 7 8 9 10 11 12 | 2224 13 14

2541
F 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 | 2019 December 1 2 3 4 5 6 7 8 9 | 2225 10 11

2542
F 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 | 2020 January 1 2 3 4 5 | 2226 6 7

2543
F 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 | 2020 February 1 2 | 2227 3

2544
F 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 | 2228 1

2545
F 2020 March 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 | 2229 28

2546
F 29 30 31 | 2020 April 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

2547
F 2230 25 26 27 28 29 30 | 2020 May 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21

2548
F 2231 22 23 24 25 26 27 28 29 MCCB 30 31 | 2020 June 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

2549
F 2032 18 19 20 21 22 23 24 25 26 27 28 29 30 | 2020 July 1 2 3 4 5 6 7 8 9 10 11 12 13 14

2550
F 2033 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 | 2020 August 1 2 3 4 5 6 7 8 9 10

2551
F 11 | 2234 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 | 2020 September 1 2 3 4 5 6

2552
F 7 | 2235 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 | 2020 October 1 2 3

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F 4 | 2236 5 6 7 8 9 10 11 12 13 14 15 16 CC 17 18 19 20 21 22 23 24 25 26 27 C 28 29 BCCC 30

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F 31 | 2237 1 B 2020 November 2 3 4 B 5 CBCC 6 CBC 7 B 8 9 10 C 11 C 12 13 14 15 16 17 18 19 20 21 22 CC 23 24 25 26 C

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F 27 28 C | 2238 29 CM 30 | 2020 December 1 2 3 4 5 6 C 7 C 8 9 10 11 12 13 14 C 15 16 17 18 19 20 21 22 23

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F 24 25 | 2239 26 27 28 29 30 31 | 2021 January 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

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F 20 21 22 | 2240 23 24 25 26 27 28 29 30 31 | 2021 February 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

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F 16 17 18 | 2241 19 20 21 22 23 24 25 26 27 28 | 2021 March 1 2 3 4 5 6 7 8 9 C 10 11 12 13 14

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F 15 B 16 17 | 2242 18 19 20 21 22 23 24 25 B 26 27 28 29 30 31 | 2021 April 1 2 3 4 5 6 7 8 9 10

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F 11 12 13 | 2243 14 15 16 17 B 18 19 20 C 21 22 CCCC 23 24 25 26 27 28 29 30 | 2021 May 1 2 3 4 5 6 7 M

2561
F 8 CC 9 CC 10 | 2244 11 12 C 13 14 15 16 17 18 19 20 21 C 22 CCMM 23 CCBM 24 25 26 CCCC 27 28 C 29 30 31 | 2021 June 1 2 3

2562
F 4 5 6 7 | 2245 8 CCC 9 CCB 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 C 26 27 28 CBC 29 30 CC

2563
F 2021 July 1 2 3 MCXM 4 MC | 2246 5 6 7 8 9 CCB 10 11 12 13 14 15 16 C 17 18 C 19 20 21 22 23 24 25 26 27

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F 28 29 30 31 | 2021 August 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 CCC 21 22 C 23

2565
F 24 C 25 26 27 CCCC 28 MCCC 2248 29 CC 30 C 31 | 2021 September 1 2 3 4 5 6 7 8 CC 9 C 10 11 12 13 14 15 16 17 18 19

2566
F 20 21 C 22 23 MM 24 | 2249 25 26 C 27 28 C 29 30 C | 2021 October 1 2 3 4 5 6 7 8 9 M 10 11 12 13 14 15 16

2567
F 17 18 19 20 21 | 2250 22 23 24 25 26 CCCM 27 CCCC 28 CMMX 29 CC 30 CCC 31 | 2021 November 1 2 3 4 CC 5 6 7 8 9 10 11 12

2568
F 13 C 14 15 16 17 | 2251 18 19 20 21 22 23 24 25 26 27 28 29 30 | 2021 December 1 2 3 4 5 M 6 7 8 9

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F 10 11 12 13 14 | 2252 15 CCC 16 CC 17 C 18 19 20 CM 21 M 22 MCC 23 24 CC 25 CCCM 26 27 28 29 30 31 | 2022 January 1 2 3 4 5

2570
F 6 7 8 9 10 11 | 2253 12 13 C 14 C 15 16 17 18 19 20 21 22 23 24 25 C 26 CC 27 28 C 29 BCCC 30 31 1 C

2571
F 2022 February 2 CC 3 4 CC 5 6 7 | 2254 8 9 C 10 11 12 MCCC 13 14 CCM 15 16 17 18 19 20 21 22 23 24 25 26 27 28 C

2572
F 2022 March 1 CM 2 3 4 5 6 C | 2255 7 C 8 9 10 11 CCCC 12 C 13 14 M 15 CCMC 16 17 18 19 20 CC 21 CC 22 CC 23 CCCC 24 C 25 26 C 27 C

2573
F 28 CMC 29 MCCC 30 CCCC 31 CCCX | 2022 April 1 CCCC 2 CCMM 3 CC | 2256 4 C 5 6 C 7 8 CC 9 C 10 11 12 CBCC 13 14 15 MMCC 16 CCCM 17 CCCM 18 MMCM 19 CCCC 20 CMCC 21 CC 22 CMC 23 C

2574
F 24 25 MCCC 26 CCCC 27 CCC 28 CC 29 MCCM 30 MMXM | 2022 May 1 CCCC 2 3 MCX 4 BMCM 5 CMMC 6 CC 7 CC 8 CCC 9 C 10 CCX 11 CCMM 12 CCCM 13 CCCC 14 CCCC 15 C 16 CMC 17 CCCC 18 CCCC 19 CMMM 20 CMM

2575
F 21 CCC 22 CC 23 CC 24 CC 25 CCM 26 CC 27 CC | 2258 28 CC 29 30 31 | 2022 June 1 2 3 4 5 6 7 8 9 CC 10 CCMC 11 C 12 13 C 14 CCCC 15 16 C

2576
F 17 CCCC 18 CCC 19 C 20 CC 21 C 22 CC 23 CC | 2259 24 C 25 C 26 27 28 29 30 | 2022 July 1 2 3 4 5 6 7 8 9 10 11 12 13