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# The British Astronomical Association

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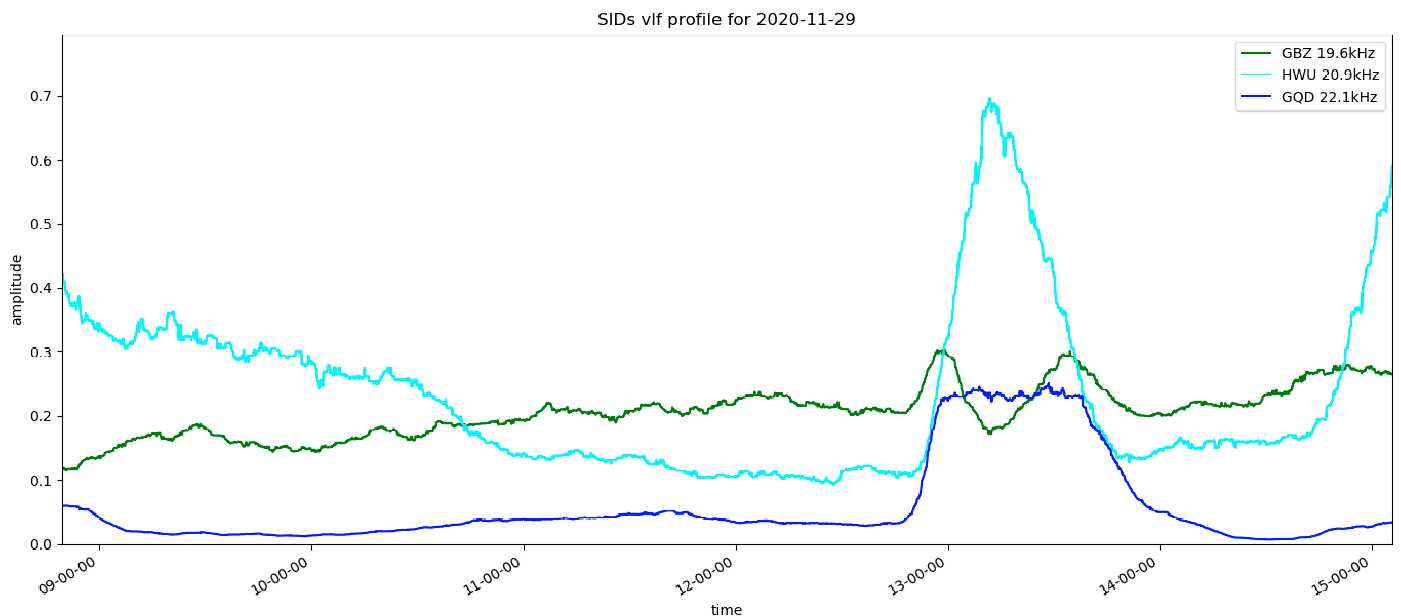


Please send all reports and observations to [jacook@jacook.plus.com](mailto:jacook@jacook.plus.com)

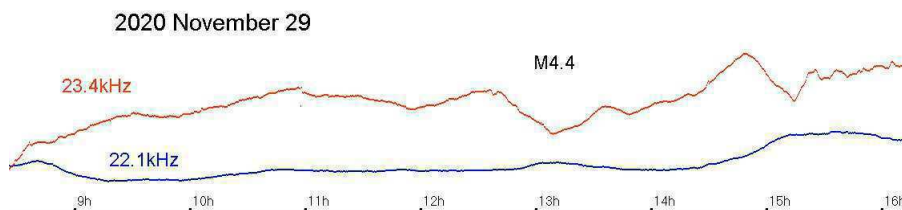
## BAA Radio Astronomy Section.

2020 NOVEMBER.

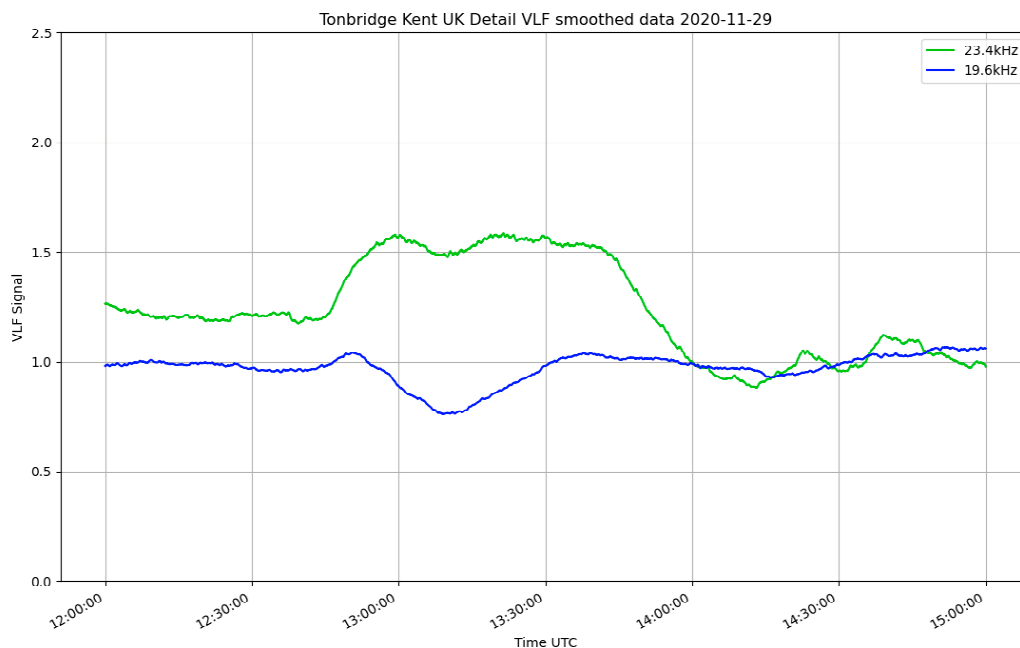
Activity in November was the highest so far recorded in 2020, and shows that solar cycle 25 is now well underway. There have been numerous B-class flares as well as plenty of smaller C-class, but we were also very lucky to catch a good M4.4 flare on the 29<sup>th</sup>. This is the second M-class flare so far, an M1.1 being recorded in May.



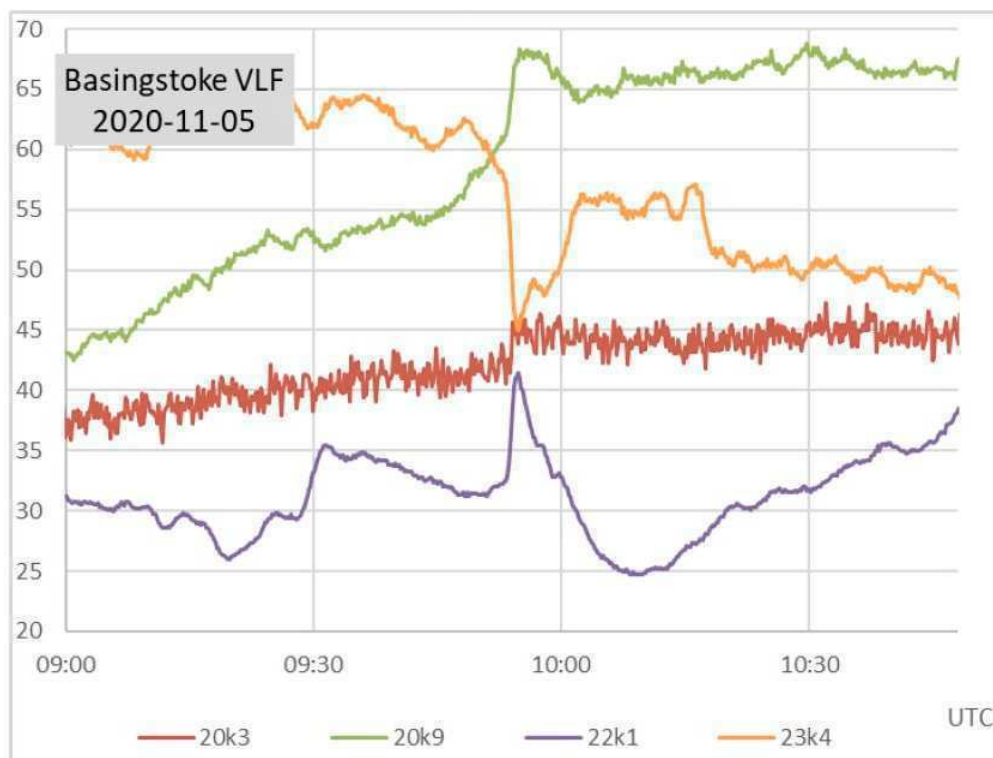
This recording by Mark Prescott shows the flare clearly, the 20.9kHz signal (light blue) showing a very symmetrical SID. 19.6kHz (green) shows a 'spike and wave' SID, often seen with stronger flares. This is due to the ground-wave / sky-wave interference pattern moving from adding to cancelling at the peak of the flare, and then reversing back again as the flare decays. The 22.1kHz SID is rather unusual, with a flat top. I have not seen one quite like that before. The flare itself had a normal peak, and a very long decay taking over four hours to drop below C-class.



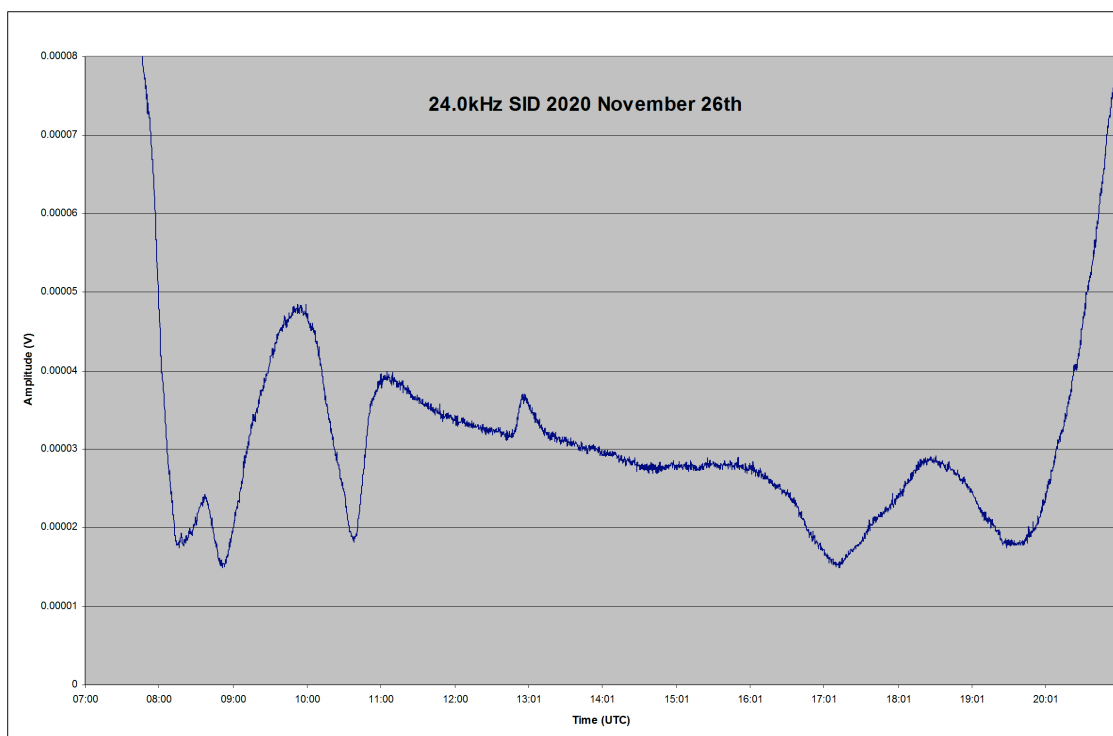
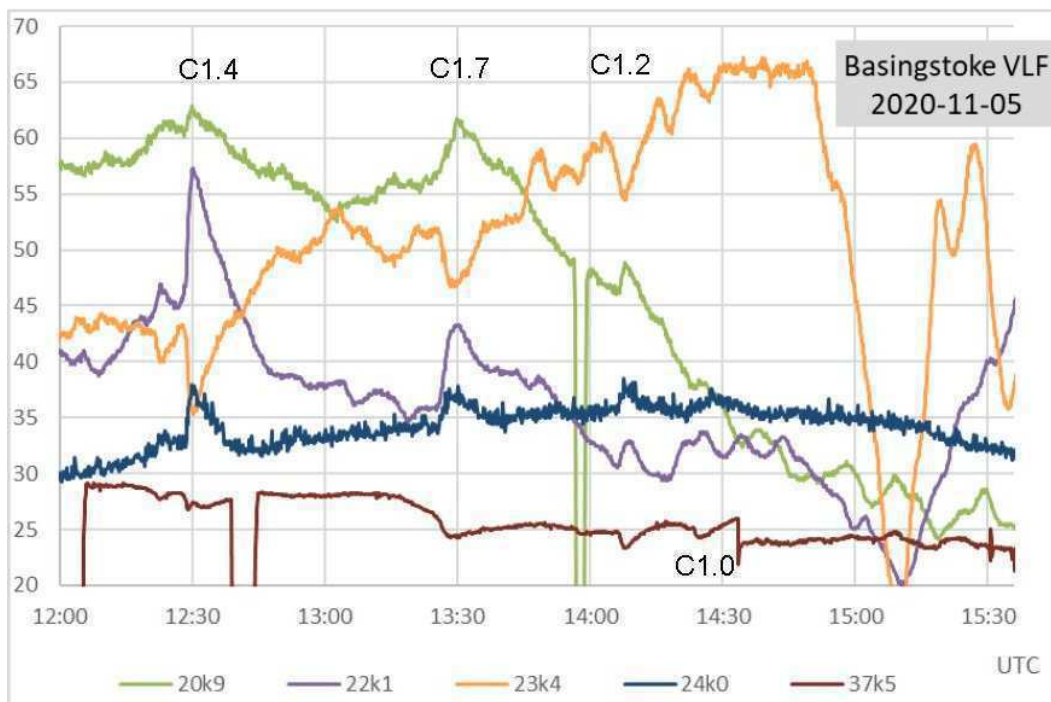
My own recording (above) shows a very weak response at 22.1kHz, but does show the long decay at 23.4kHz, the signal merging with the early sunset in late November.



This chart from Andrew Thomas shows a nearly flat top at 23.4kHz, but with a small dip around the peak time, like the 'spike and wave' SID but with a long decay time. I suspect that the 22.1kHz SID in Mark Prescott's recording may be due to the interference pattern just reaching the cancelling phase, but then remaining steady at that point until the long decay takes over.



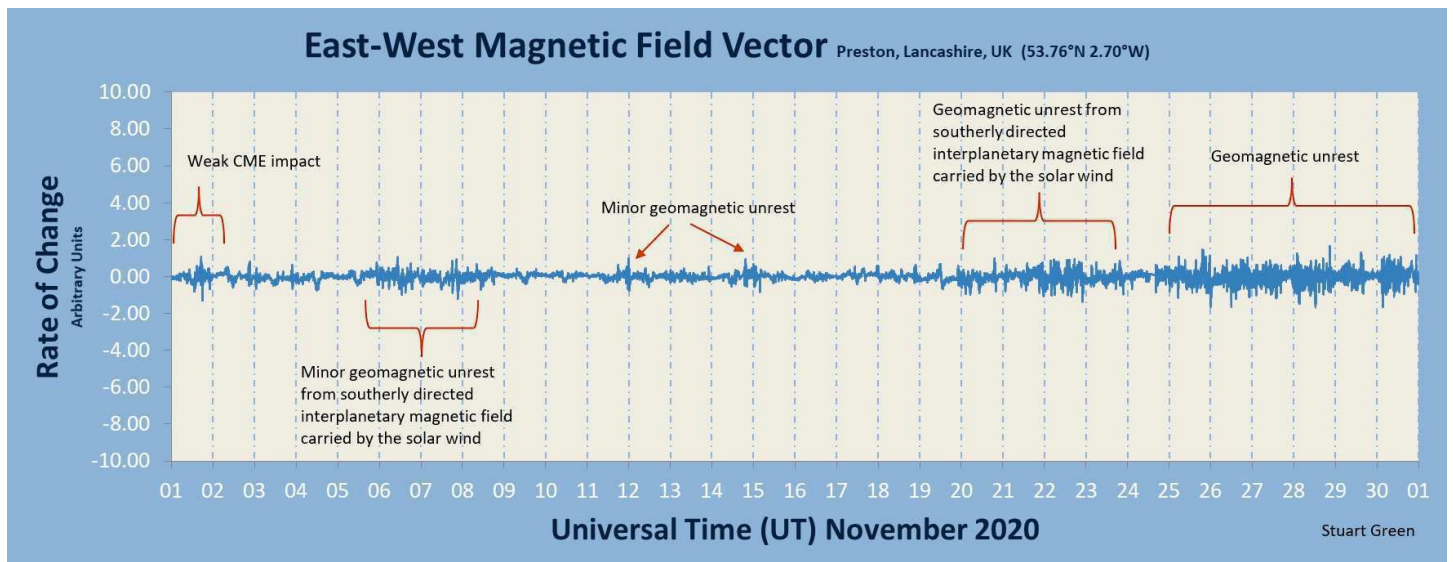
November 5<sup>th</sup> recorded the largest number of SIDs, although they were all from smaller C-class flares. This recording from Paul Hyde shows the C2.3 flare peaking at 09:55UT on four rather noisy signals. The longer path at 20.3kHz from Italy is particularly noisy, almost hiding the SID. This was the strongest flare recorded on the 5<sup>th</sup>, the remaining activity shown on the next page. The C1.4 flare at 12:30 shows a smaller peak at 12:23 that is not classified in the SWPC data. The later C1.0 flare is just visible at 37.5kHz, but well hidden on the other signals.



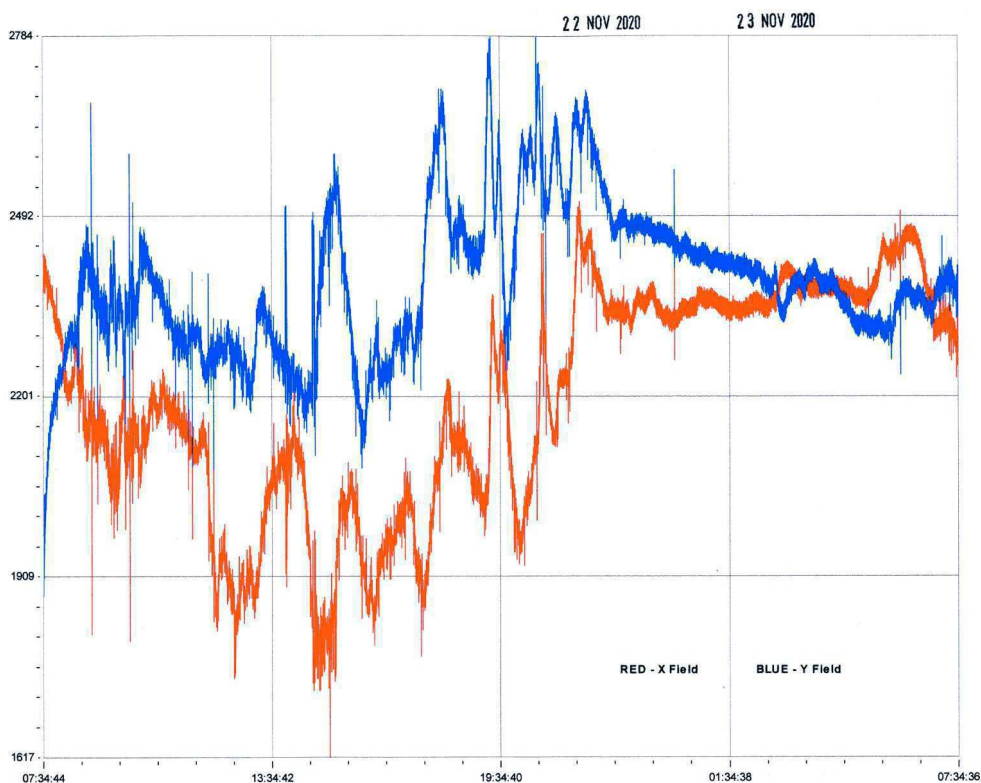
This recording by Mark Edwards shows a well defined SID peaking at 12:56UT at 24kHz, from a C2.3 flare on the 26<sup>th</sup>. For a change, we have a fairly noise-free signal all day, showing the sunrise and sunset effects.

## MAGNETIC OBSERVATIONS.

Most of the flaring activity reported above was from active regions close to the eastern limb of the sun as seen from Earth. There were a number of associated CMEs, the majority of which were aimed well away from Earth and so had little effect.

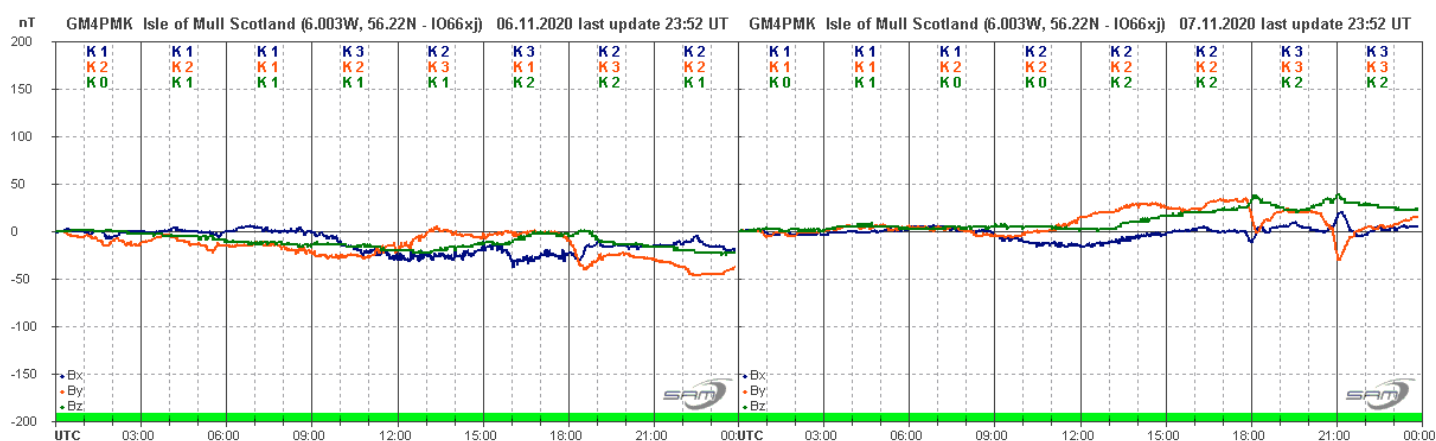


Stuart Green's summary of the month's activity shows a very weak CME impact on November 1<sup>st</sup>, with solar wind disturbances later in the month. Satellite images indicate that the CME was from a filament eruption seen on October 27<sup>th</sup>. The northern polar coronal hole seen over the last few months made another appearance on the 20<sup>th</sup> with a very mild disturbance, increasing in the evening of the 21<sup>st</sup>. The most active disturbance was on the 22<sup>nd</sup>, shown in this recording by Colin Clements:



The disturbance was particularly turbulent in the evening, with rapid variations of about  $\pm 50$  nT. This ended quite suddenly just before midnight, with only a mild disturbance recorded on the 23<sup>rd</sup>. It did recover for a while in the evening of the 25<sup>th</sup>.

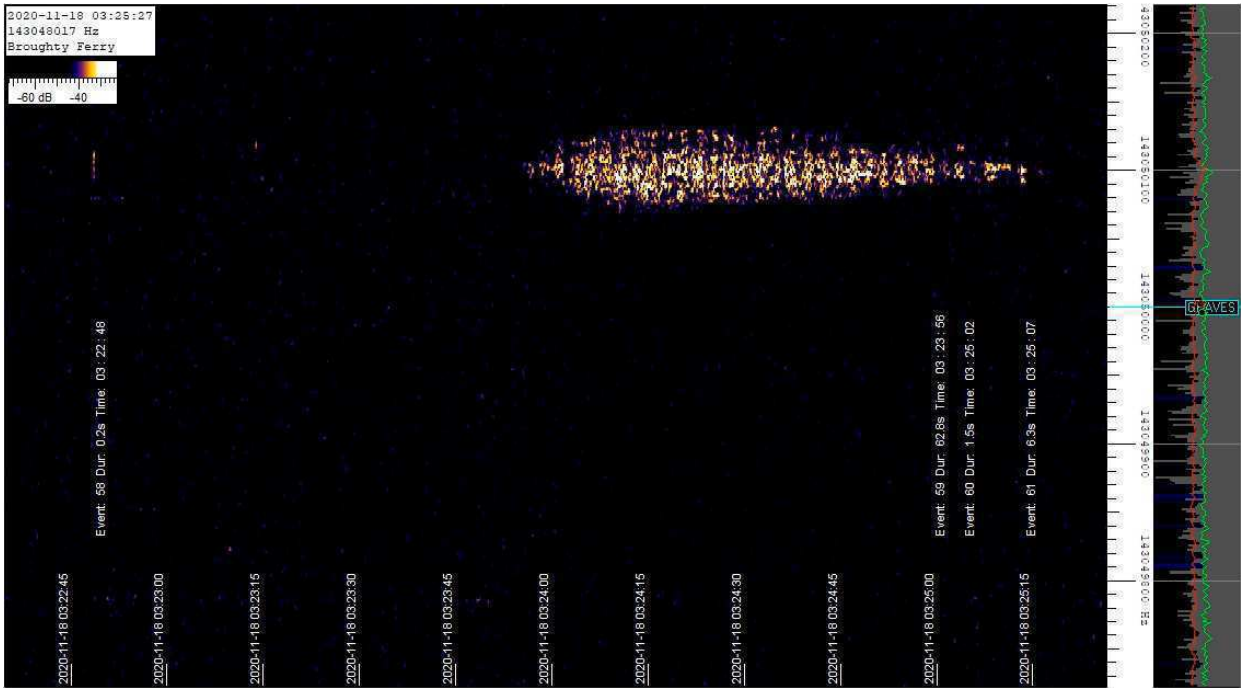
A southern coronal hole produced a relatively slow solar wind that merged with the edge of some of the eastern limb CMEs mentioned earlier. This produced some more rapid magnetic variations on the 6<sup>th</sup>, but of very low amplitude. Minor disturbances continued on the 7<sup>th</sup>, as shown in the recording by Roger Blackwell on the next page:



Magnetic observations received from Roger Blackwell, Colin Clements, Stuart Green, Andrew Thomas and John Cook.

### METEORS.

Philip Rourke sent in this unusual meteor reflection recorded on the 18<sup>th</sup> using the GRAVES radar:



The trail starts at 03:24:00, ending at 03:25:15, so lasting 75 seconds. Philip described it as ‘fish-shaped’, a good description. Leonid meteors are noted for the high speed (~70km/s), but often leave persistent trails. The timing of this event is certainly good for a Leonid, although it could also be a sporadic of course. No other Leonid reports were received.

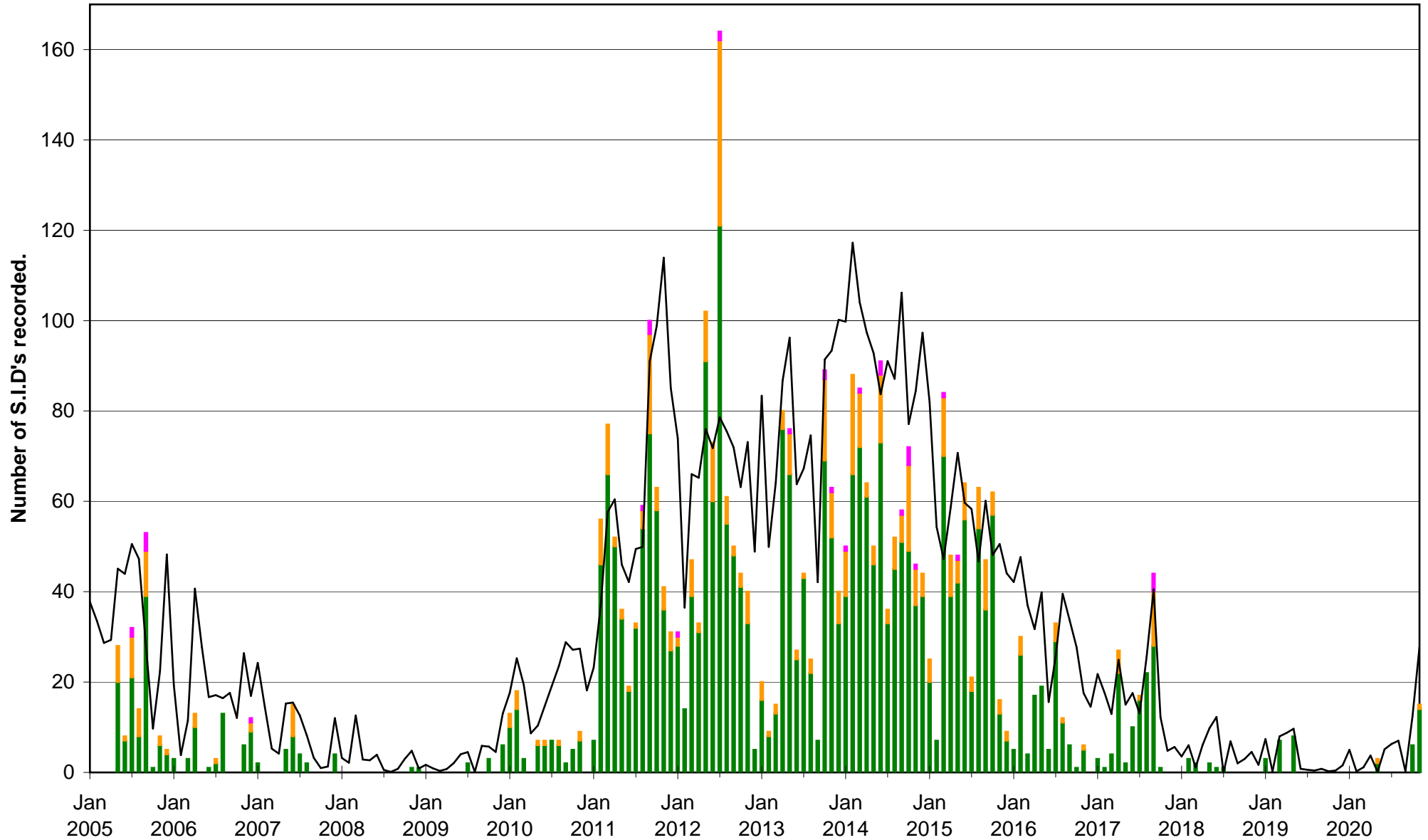
	Xray class	Observers	John Cook (23.4kHz/22.1kHz)	Roberto Battaiola 21.75kHz	Paul Hyde (22.1kHz/24kHz)	Mark Edwards (24.0/23.4/37.5kHz)	Colin Clements (23.4kHz/18.3kHz)
			Tuned radio frequency receiver, 0.58m frame aerial.	Modified AAVSO receiver.	Spectrum Lab / PC 1.5m frame aerial.	Spectrum Lab / PC 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)
1	B7.1	1					
1	B9.7	1				15:49 15:53 15:58	1-
4	B8.1	1				11:45 11:46 11:55	1-
5	C2.3	5			09:53 09:55 10:02	09:52 09:55 10:03	
5	B8.9	1				10:17 10:18 10:30	1-
5	?	3			12:20 12:23 ?	12:22 12:23 12:26	1-
5	C1.4	5			12:27 12:30 12:48	12:28 12:31 12:42	1-
5	C1.7	4			13:26 13:30 13:38	13:25 13:29 13:37	1-
5	C1.2	3			14:06 14:08 14:13	14:08 14:09 14:11	1-
5	C1.0	2				14:23 14:25 14:32	1-
6	C1.3	5			10:34 10:36 10:46	10:34 10:36 10:45	1-
6	B9.2	1					
6	C1.8	4			15:20 15:22 15:29	15:22 15:22 15:26	1-
7	B5.6	2				12:10 12:12 12:18	1-
10	C1.3	1					
11	C2.6	1					
22	C1.3	1		09:22 09:29 09:36	1-		
22	C3.3	1					
26	C3.8	7	12:50 12:55 13:05	12:44 12:53 13:15	12:49 12:55 13:22	12:46 12:56 13:14	1+
28	C2.9	4	13:32 13:36 ?	-	13:33 13:38 13:45	13:34 13:36 13:48	1-
29	C1.6	1				11:31 11:38 11:43	1-
29	M4.4	11	12:40 13:08 13:35	12:36 12:57 13:07	1+	12:42 13:08 13:44	2+
							12:36 13:12 14:34 3

	Xray class		Steve Parkinson (Various)	Andrew Thomas (19.6kHz)	Phil Rourke (23.4kHz)	John Wardle	Christopher Bailey 23.4kHz/45.9kHz
			Tuned radio frequency receiver, frame aeral.	Tuned radio frequency receiver, 0.6m frame aerial.	Tuned radio frequency receiver, 0.6m frame aerial.	SpectrumLab/Starbase, Active mini-whip aerial.	Spectrum Lab.
DAY			START PEAK END (UT)	START PEAK END (UT)	START PEAK END (UT)	START PEAK END (UT)	START PEAK END (UT)
1	B7.1						
1	B9.7						
4	B8.1						
5	C2.3		09:53 09:54 09:56	1-		09:50 09:55 10:00	
5	B8.9						
5	?						
5	C1.4		12:28 12:30 12:35	1-		12:18 12:28 12:49	1+
5	C1.7		13:25 13:28 13:42	1-			
5	C1.2						
5	C1.0						
6	C1.3		10:33 10:36 10:45	1-		10:33 10:39 10:53	1
6	B9.2					11:52 12:00 12:11	1
6	C1.8					15:20 15:27 15:34	1-
7	B5.6					12:09 12:14 12:20	1-
10	C1.3					19:44 19:57 20:11	1+
11	C2.6					18:58 19:05 19:20	1
22	C1.3						
22	C3.3					17:33 17:38 17:47	1-
26	C3.8					12:51 12:58 13:09	1-
28	C2.9					13:30 13:36 13:58	1+
29	C1.6						
29	M4.4		12:42 13:09 14:00	2+	12:50 13:10 13:35	2	12:47 13:09 ? -
						12:43 13:10 13:50	2+
							12:40 12:55 13:05 1
							12:38 13:10 14:08 3

	Xray class		Colin Briden (37.5kHz)	Andrew Lutley (23.4kHz)	Peter Meadows (23.4kHz)	John Elliott (18.3kHz)	Mark Prescott (20.9kHz)
			Spectrum Lab / PC, 1.2m frame aerial.	Tuned radio frequency receiver, 0.6m frame aerial.	Tuned radio frequency receiver, 0.6m frame aerial.	Tuned radio frequency receiver, 0.5m frame aerial.	Raspberry Pi + sound card, 1m frame aerial.
DAY			START PEAK END (UT)	START PEAK END (UT)	START PEAK END (UT)	START PEAK END (UT)	START PEAK END (UT)
1	B7.1		12:18 12:23 12:37	1			
1	B9.7						
4	B8.1						
5	C2.3		09:53 09:55 10:18	1			
5	B8.9						
5	?		12:21 12:23 12:27	1-			
5	C1.4		12:28 12:31 12:39	1-			
5	C1.7		13:25 13:30 13:43	1-			
5	C1.2		14:06 14:08 14:14	1-			
5	C1.0		14:21 14:25 14:33	1-			
6	C1.3		10:33 10:36 10:45	1-			
6	B9.2						
6	C1.8		15:20 15:22 ?	-			
7	B5.6						
10	C1.3						
11	C2.6						
22	C1.3						
22	C3.3						
26	C3.8		12:46 12:57 13:15	1+			
28	C2.9						
29	C1.6						
29	M4.4		? 13:10 13:38				12:48 13:11 13:46 2+

# VLF flare activity 2005/20

C M X — Relative sunspot number





## BARTELS DIAGRAM

ROTATION	KEY:		DISTURBED.			ACTIVE		SFE	B, C, M, X = FLARE MAGNITUDE.																	Synodic rotation start (carrington's).																
2516		9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	2200 27 28 29 30 31							2018 February 1 2 3 4															
F											B									2201 27 28 29 30 31							2018 March 1 2 3															
2517		5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	2018 March 1 2 3																
F			CC			BB	C													2202 19 20 21 22 23 24 25 26 27 28 29 30							C															
2518		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	30														
F																											C															
2519		31	2018 April		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	2203 19 20 21 22 23 24 25 26																				
F		1	B																																							
2520		27	28	29	30	2018 May		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	2204 16 17 18 19 20 21 22 23																			
F																									B	C																
2521		24	25	26	27	28	29	30	31	2018 June		1	2	3	4	5	6	7	8	9	10	11	12	2205 13 14 15 16 17 18 19																		
F		B				BC																																				
2522		20	21	22	23	24	25	26	27	28	29	30	2018 July		1	2	3	4	5	6	7	8	9	2206 10 11 12 13 14 15 16																		
F																																										
2523		17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	2018 August		1	2	3	4	5	2207 6 7 8 9 10 11 12																		
F																																										
2524		13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	2018 September 1 2 3 4 5 6 7 8																					
F																																										
2525		9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	2209		2018 October 1 2 3 4 5																	
F																							30																			
2526		6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	2210		27	28	29	30	31	1												
F																																										
2527		2018 November		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	2211		23	24	25	26	27	28										
F																																										
2528		29	30	2018 December		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	2212		21	22	23	24	25										
F																																										
2529		26	27	28	29	30	31	2019 January		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	2213		18	19	20	21										
F																																										
2530		22	23	24	25	26	27	28	29	30	31	2019 February		1	2	3	4	5	6	7	8	9	10	11	12	2214		13	14	15	16	17										
F						CB																																				
2531		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										
F																																										
2532		17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	2019 April		1	2	3	4	5	6	7	8	9	10	11	12	13											
F					C	CCC	CCCB	B																																		
2533		13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	2019 May		1	2	3	4	5	6	7	8	9	10											
F									B																																	
2534		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	3	4	5												
F																																										
2535		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	1	2												
F																																										
2536		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												
F																																										
2537		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										
F																																										
2538		26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	2222		19	20	21												
F																																										
2539		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										
F																																										
2540		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										
F																																										
2541		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										
F																																										
2542		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	6	7	2226											
F																																										
2543		8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	2020 February		1	2	3	2227		4	5	6											
F																																										
2544		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												
F																																										
2545		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	28	2229											
F																																										
2546		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												
F																																										
2547		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										
F																																										
2548		2231		22	23	24	25	26	27	28	29	30	31	2020 June		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17										
F																																										
2549		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										
F																																										
2550		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										
F																																										
2551		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										
F																																										
2552		7	2235		8	9	10	11	12	13	14	15	16	17																												