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BAA Radio Astronomy Section.

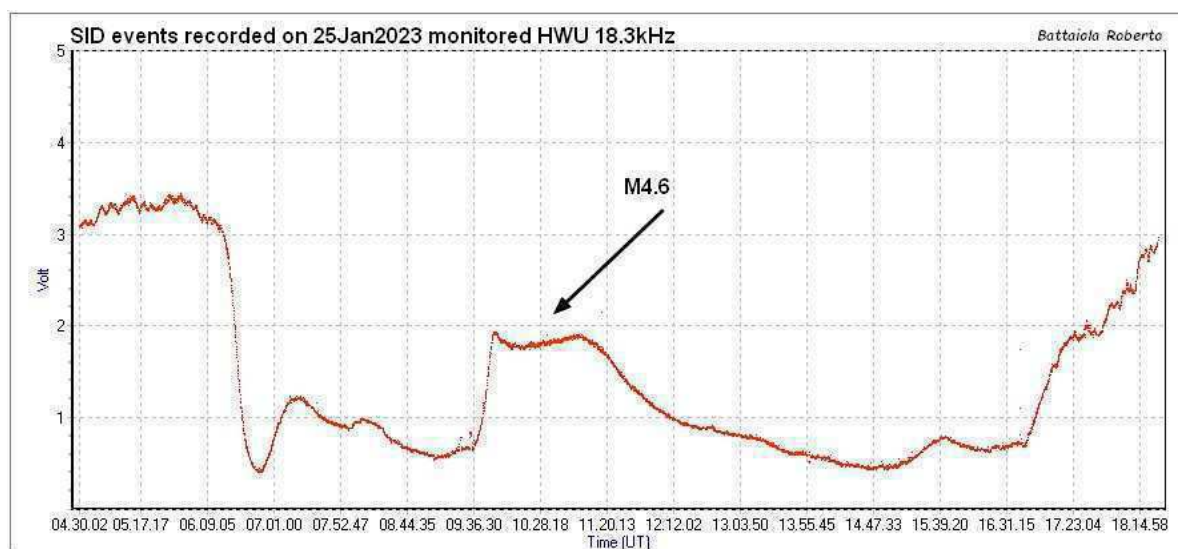
Director Paul Hearn.

RADIO SKY NEWS

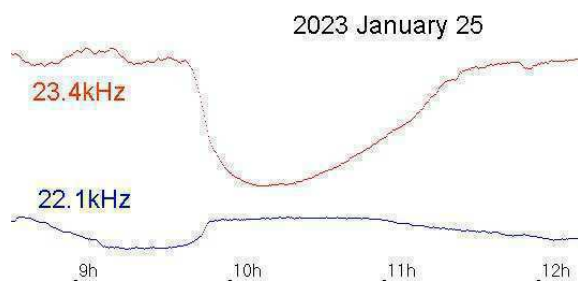
2023 JANUARY.

VLF SID OBSERVATIONS.

Solar activity in January was very similar to that in December, with another 'fireworks' display of M-class flares. Roberto Battaiola recorded one of the stronger flares on the 25th:



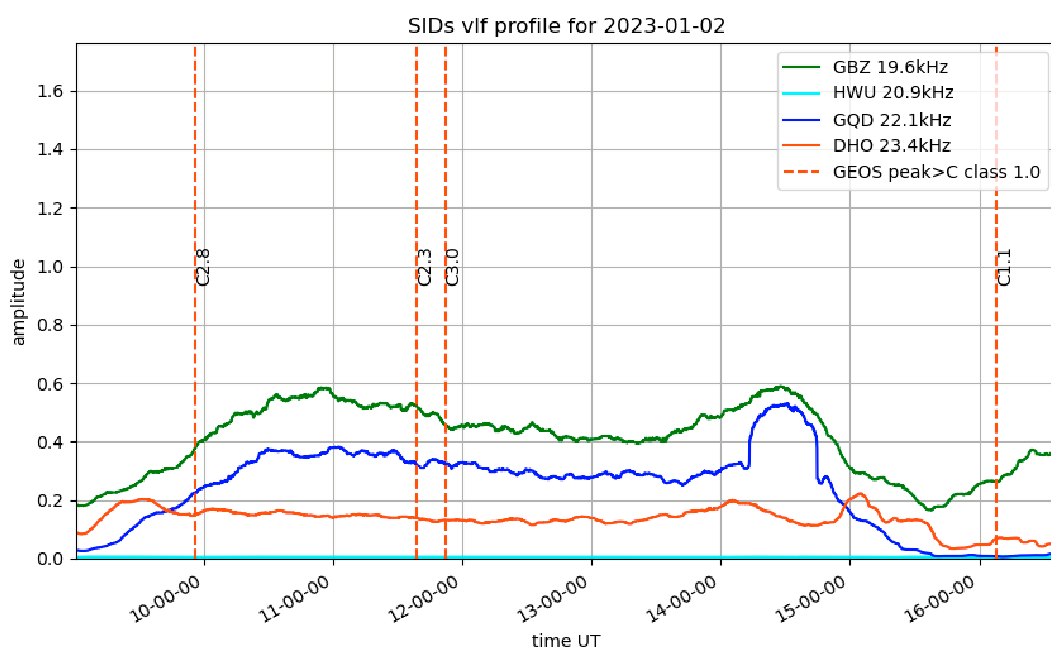
This was a very slow flare, and shows a spike and wave SID lasting well over an hour. This has caused a wide spread in our timings of the peak, from 09:47 to 10:15 UT.



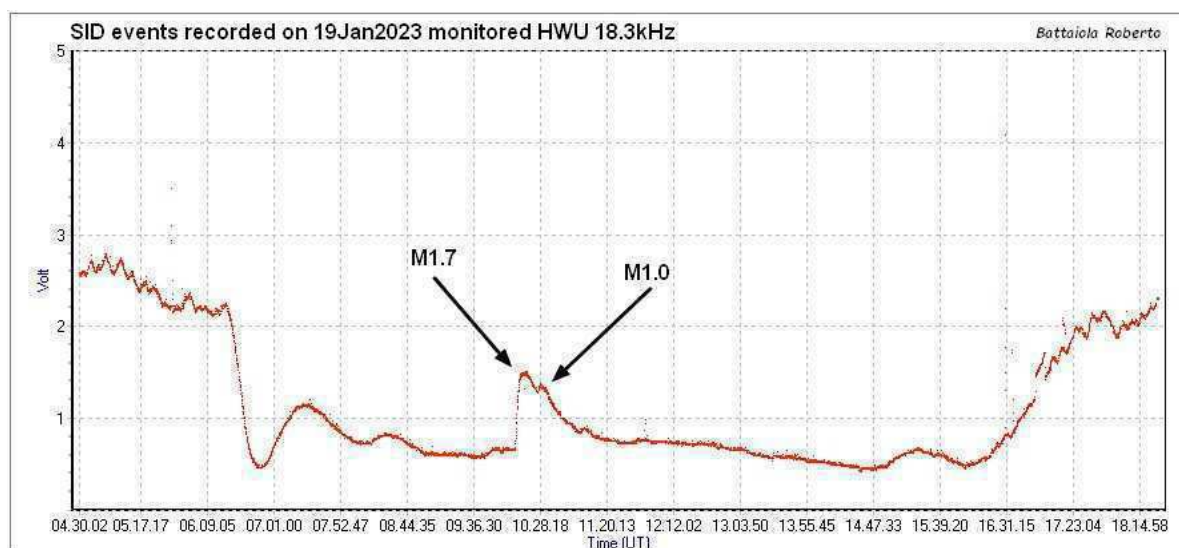
My own recording also shows how the peak of the SID appears to vary with the signal path, appearing earlier at 22.1 kHz. The background X-ray flux was also quite high at times, so that even the M-class flares often represented only a relatively small increase. Many C-class flares remained well hidden during these periods, and did not show as SIDs.



The M3.9 flare on the 13th shows well on this recording by Colin Clements. The 23.4kHz SID is very strong, while 21.75kHz is less clear with a rather noisier signal. There are also some interference spikes on all three signals, a common problem.



This recording by Mark Prescott does not show any SIDs, but does have a very unusual response to the sunset. The large 'bump' on the 22.1kHz signal is unlike any other sunset effect that we have recorded. The other two signals have a much smaller response, more as expected. It does not appear to be a transmitter effect, as it does not appear on my own recording. There is a small dip in the signal at the start and end of the bump, and these do show on my recording and so can be assumed as transmitter effects.

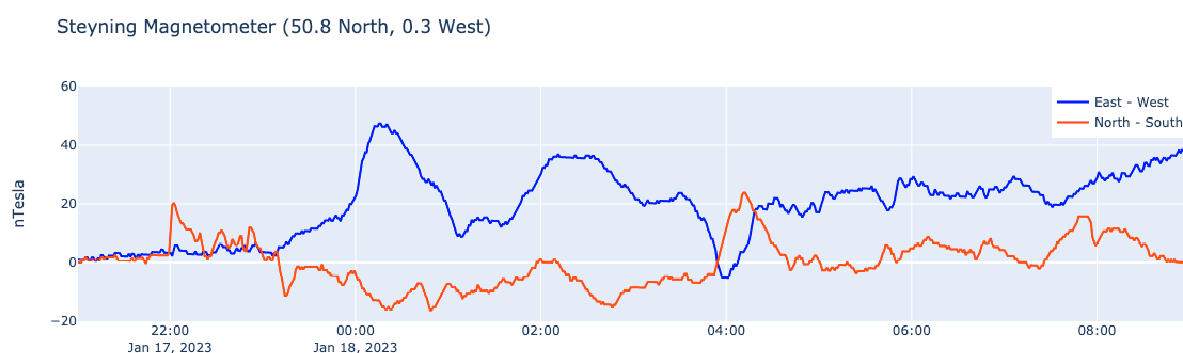


This recording by Roberto Battaiola from the 19th shows the two M-class flares overlapping. The peaks are only 15 minutes apart, although they did appear as individual SIDs on some frequencies.

MAGNETIC OBSERVATIONS.

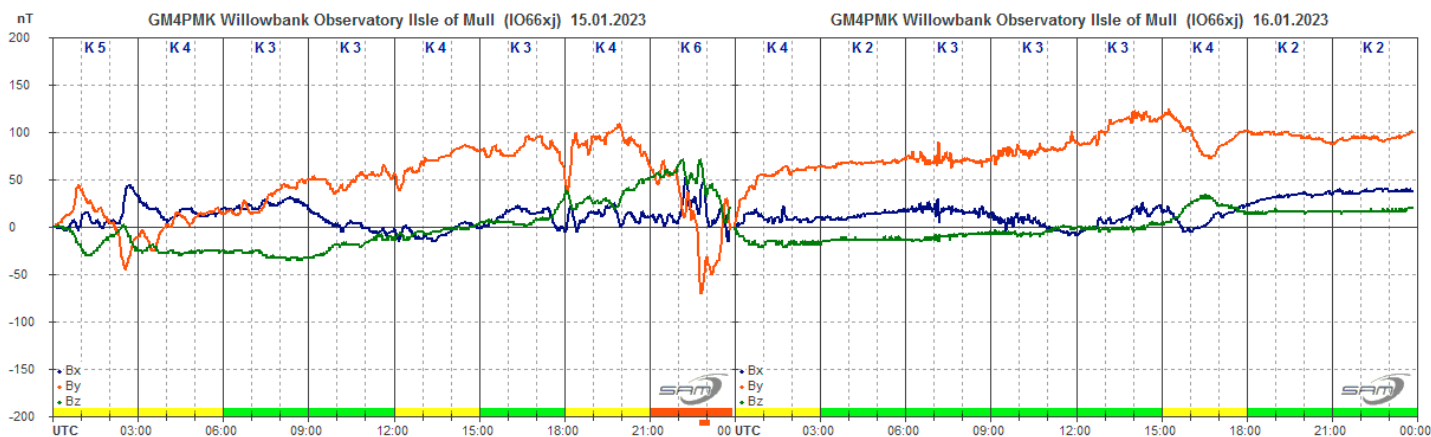
Unfortunately, Stuart Green lost most of his January data due to water getting into the sensor. Despite being in a waterproof enclosure, this has failed over time. Over the years I have heard similar stories from other observers with outdoor sensors. At one of the BAA autumn meetings, we had an opportunity to visit the BGS Eskdalemuir magnetic observatory. Their sensors are hidden deep inside a cave in one of the hills, an option not really available in our domestic garden sites.

Several of the stronger flares did produce CMEs, but the majority were again not Earth-directed. Most of the activity seems to have been from turbulent solar winds. We did record one distinct CME impact, although its source is not clear. The chart by Nick Quinn from the 17th and 18th shows a very sharp rise of about 20nT in the N-S component at 22:00UT on the 17th:

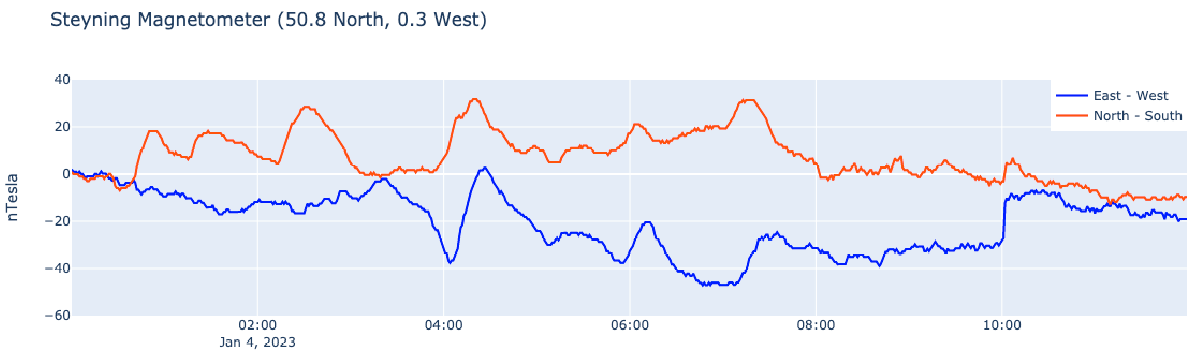


A similar transient is visible in Roger Blackwell's recording as well as my own, eliminating any local interference source. Mild disturbance of about ± 50 nT continued through to mid-afternoon on the 18th. Satellite data shows potential glancing blows from a number of CMEs, including a large filament eruption in the preceding days.

The Bartels diagram shows an extended period of mild disturbance from the 10th to the 18th, including a short active period on the 15th. It also highlights the number of flares contributing to the activity.



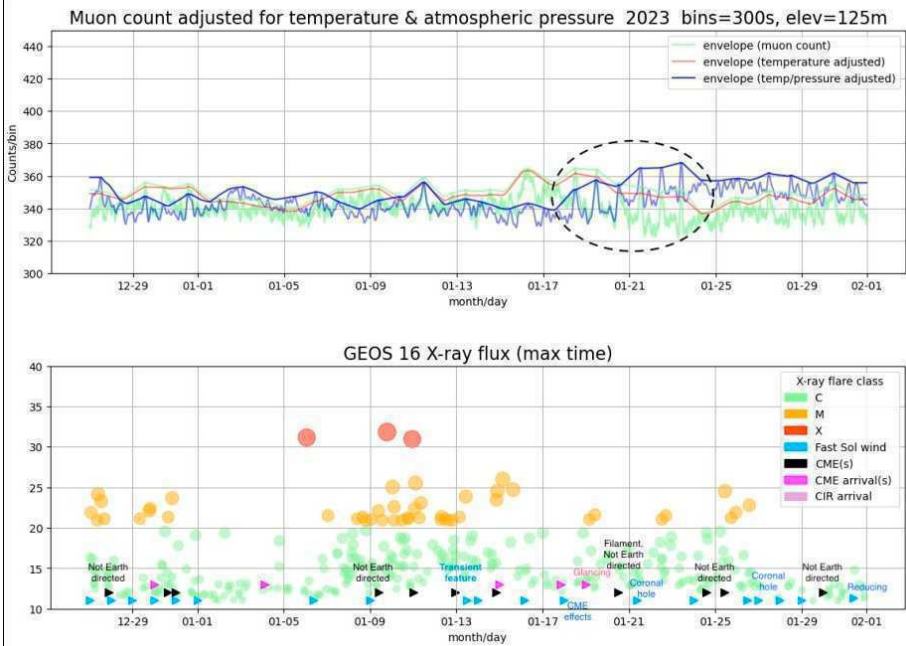
Roger Blackwell's chart shows this peak in activity. There is also a very rapid spike just after 07UT on the 16th, also visible in my own recording. It is not clear whether this is CME related, or just very rapid turbulence.



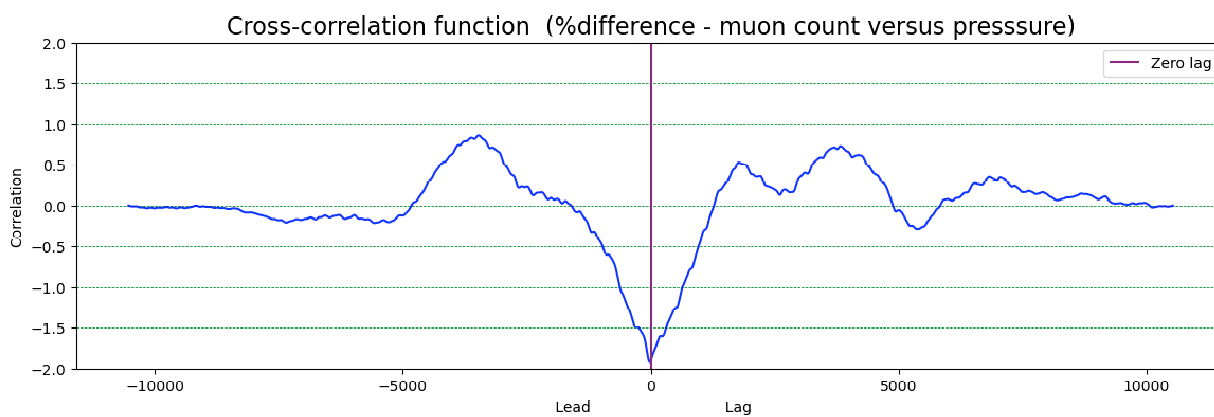
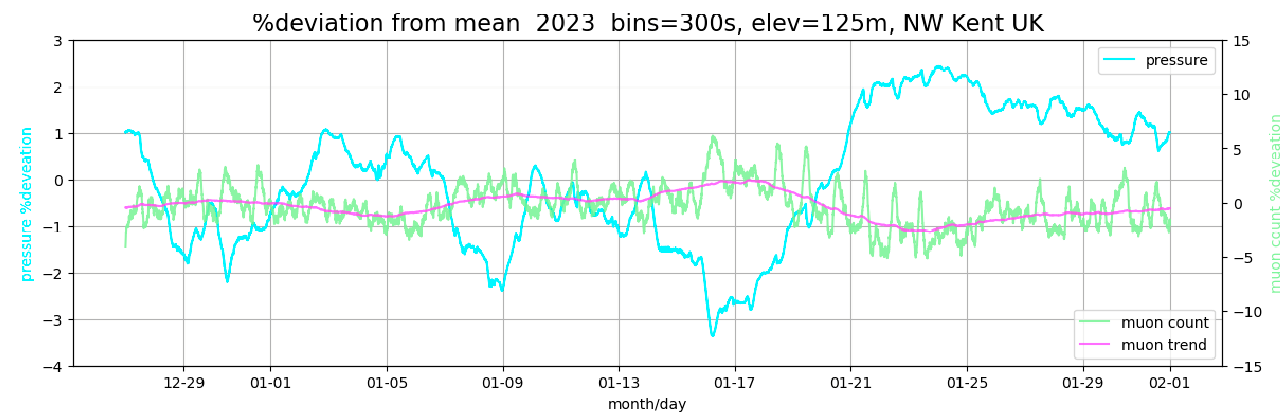
Nick Quinn's chart from the 4th shows magnetic disturbance from a fast solar wind and glancing CME. Activity faded out in the afternoon, but continued again overnight on the 5th and into the 6th.

Magnetic reports received from Roger Blackwell, Colin Clements, Stuart Green, Nick Quinn and John Cook.

MUONS.

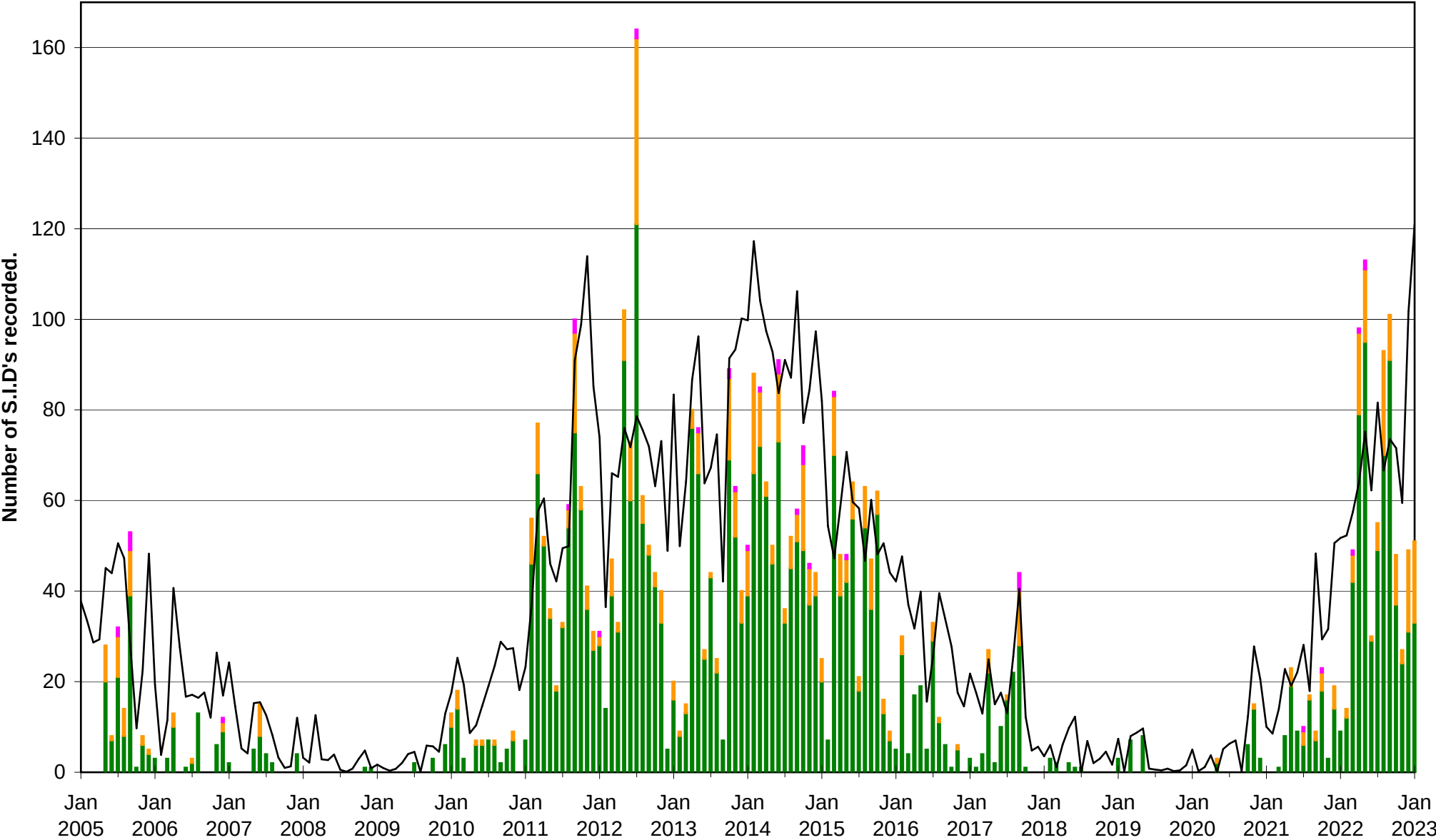
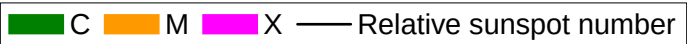


Mark Prescott's chart of Muon counts shows a distinct increase over the 18th to 23rd January when the raw data is compensated for temperature and pressure variations. This was also during the long period of magnetic disturbance.



The upper panel shows the pressure variations along with the raw muon counts and averaged trend. The 17th to 21st shows a large increase in pressure, and there were also some much colder nights. The more rapid (daily) temperature changes would not be removed using the longer term correlation applied to the data, perhaps accounting for the increased muon counts shown in the first chart. With large daily temperature variations, the muon counts would be expected to vary as explained last month. The lower panel is a cross correlation of muon count versus pressure. I am afraid that my statistical knowledge does not allow me to add further descriptions. Mark is still working on analysing his full set of data recordings.

VLF flare activity 2005/22



BARTELS DIAGRAM

ROTATION	KEY:	DISTURBED.	ACTIVE	SFE	B, C, M, X = FLARE MAGNITUDE.										Synodic rotation start (carrington's).														
2543	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	2227			
F																								1	2	3			
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	1		
F																											2228		
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	
F																											2229		
2546	2020 April	29	30	31	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	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	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	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	1	2	3	4	5	6	7	8	9	10	
F																													
2551	2234	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	
F																													
2552	2235	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	1	2	3	
F																													
2553	2236	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																													
2554	2237	31	1	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	
F																													
2555	2238	27	28	29	30	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
F																													
2556	2239	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
F																													
2557	2240	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
F																													
2558	2241	16	17	18	19	20	21	22	23	24	25	26	27	28	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
F																													
2559	2242	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	
F																													
2560	2243	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	1	2	3	4	5	6	7	
F																													
2561	2244	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	
F																													
2562	2245	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																													
2563	2021 July	1	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	
F																													
2564	2021 August	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
F																													
2565	2248	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
F																													
2566	2249	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
F																													
2567	2250	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	
F																													
2568	2251	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9
F																													
2569	2252	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	
F																													
2570	2253	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	31	1	
F																													
2571	2022 February	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	
F																													
2572	2022 March	1	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	
F																													
2573	2022 April	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
F																													
2574	2022 May	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
F																													
2575	2258	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
F																													
2576	2259	17	18	19	20	21	22	23	24	25	26	27	28	29	30	1	2	3	4	5	6	7	8	9	10	11	12	13	
F																													
2577	2260	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	
F																													
2578	2261	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	
F																													
2579	2262	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	31	1	
F																													
2580	2022 October	3	4																										

	X-ray class	Observers	John Cook (23.4kHz/22.1kHz)				Roberto Battaiola 18.3kHz				Paul Hyde (22.1kHz/24kHz)				Mark Edwards (24.0/18.3/37.5kHz)				Colin Clements (23.4kHz)			
			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)	
7	?	1													10:54	11:01	?	-				
7	C6.9	3	10:53	11:01	?	-	10:55	10:59	11:08	1-					11:05	11:09	11:39	2				
7	?	1													11:09	11:13	11:20	1-				
7	?	1													12:37	12:41	12:48	1-				
7	C8.7	1													16:48	16:50	17:10	1				
8	M1.2	2	08:31	08:40	09:05	2	08:47	08:53	09:06	1												
8	C5.3	3	12:00	12:05	12:12	1-					11:59	12:04	12:09	1-	12:03	12:05	12:14	1-				
8	C6.1	3	12:28	12:36	?	-					12:26	12:36	13:05	2	12:28	12:39	13:08	2				
8	?	1													14:07	14:10	14:24	1-				
8	C5.4	2	14:32	14:36	?	-									14:31	14:35	14:52	1				
8	M1.4	3	14:57	15:04	15:23	1+					14:54	15:10	15:33	2	14:56	15:08	15:30	2				
9	M2.1	2					08:51	09:05	09:31	2												
9	M1.0	5	13:18	13:23	13:35	1-					13:19	13:24	13:46	1+								
10	M1.0	2	11:05	11:08	11:11	1-									11:06	11:08	11:13	1-				
10	C8.5	1													12:16	12:17	12:26	1-				
10	C5.3	1													12:45	12:46	12:58	1-				
10	C5.1	1													13:09	13:11	13:25	1-				
10	C6.8	2	13:53	13:56	14:06	1-									13:57	14:00	14:07	1-				
10	?	1													14:11	14:14	14:17	1-				
10	C8.7	2									14:43	14:48	14:58	1-	14:46	14:50	?	-				
10	?	1													15:02	15:04	?	-				
10	?	1													15:15	15:23	15:37	1-				
10	M1.3	2									17:19	17:27	17:38	1	17:22	17:28	17:38	1-				
10	M1.2	1													17:48	17:51	18:02	1-				
11	M3.1	3					08:31	08:34	08:39	1-					08:32	08:35	08:43	1-				
11	C4.6	1													15:29	15:30	15:37	1-				
12	M1.2	6	11:13	11:20	11:42	1+					11:14	11:26	11:59	2	11:15	11:24	11:43	1+				
12	C4.8	1													13:51	13:52	14:09	1-				
12	M1.0	1													14:45	14:56	15:12	1+				
12	C5.1	1													15:52	15:55	16:03	1-				
13	M3.9	9	10:12	10:17	10:34	1					10:13	10:19	10:41	1+	10:12	10:18	10:41	1+	10:13	10:19	10:32	1
13	C8.4	2									15:02	15:10	15:32	1+	15:02	15:09	15:27	1				
14	C7.0	5	11:04	11:07	?	-					11:02	11:08	11:15	1-	11:04	11:08	11:13	1-				
14	C5.0	1													13:49	13:52	13:56	1-				
14	C5.7	1													14:37	14:40	14:48	1-				
14	?	1													14:48	14:59	15:19	1+				
15	C8.3	6	12:09	12:12	12:27	1-					12:06	12:13	12:30	1	12:10	12:13	12:21	1-				
15	M4.8	8	14:21	14:29	15:09	2+					14:20	14:32	15:21	2+	14:22	14:34	15:31	2+	14:24	14:33	14:44	1
16	C8.7	1	09:14	09:19	09:33	1																
18	M1.8	7	10:30	10:39	11:40	2+	10:25	10:34	11:14	2+	10:27	10:43	12:00	3	10:26	10:43	11:39	2+				
18	C5.9	1													14:39	14:42	14:52	1-				
19	M1.7	9	10:08	10:13	?	-	10:07	10:14	10:24	1-	10:08	10:17	?	-	10:09	10:15	10:26	1-				
19	M1.0	5	10:26	10:29	10:42	1-	10:25	10:27	10:46	1	10:26	10:30	11:24	2+	10:26	10:28	11:01	2				
19	C5.5	1													15:35	15:41	16:02	1+				
20	C4.8	6									12:55	13:03	13:34	2	12:56	13:01	13:20	1				
20	C5.3	2					13:56	14:04	14:29	2					14:02	14:07	14:12	1-				
21	C4.6	1					09:36	09:42	09:50	1-												
21	C3.7	1					11:19	11:27	11:43	1												
22	C8.3	5	10:46	10:51	11:40	2+	10:40	10:53	11:13	2	10:46	10:54	11:20	2	10:42	10:53	11:12	1+				
22	?	1													11:55	12:10	?	-				
22	M1.1	3	12:21	12:25	12:39	1-	11:53	12:26	12:56	2+					12:21	12:28	?	-				
22	?	1													13:14	13:18	13:30	1-				
22	C3.6	1													14:11	14:12	14:15	1-				
22	C4.7	1													15:50	15:52	16:03	1-				
22	M1.6	1													16:59	17:02	17:08	1-				
23	?	1													09:45	10:02	10:27	2				
23	C3.4	2					11:26	11:31	11:43	1-					11:25	11:33	11:52	1+				
24	C3.7	1													13:42	13:46	13:58	1-				
24	C9.4	3													14:05	14:35	15:15	2+				
24	C8.6	1													15:14	15:16	15:21	1-				
25	M4.6	9	09:43	10:11	11:36	3	09:30	09:52	12:09	3+	09:38	09:56	11:41	3	09:38	10:09	12:11	3+				
25	C6.1	1													14:49	14:58	15:09	1				
25	M1.3	1													16:56	17:01	17:10	1-				
26	C4.6	3					12:38	12:40	12:46	1-					12:39	12:40	12:44	1-				
26	M2.8	10	13:00	13:06	?	-	13:00	13:06	13:33	2	13:00	13:09	14:14	2+	13:00	13:06	?	-				
26	?	1													13:34	13:40	14:00	1+				
26	C3.2	2									14:35	14:39	14:44	1-	14:37	14:39	14:47	1-				
26	C4.7	1													14:55	15:01	15:11	1-				
28	C3.3	6	11:55	12:01	12:11	1-	11:56	12:00	12:06	1-	11:56	12:02	12:10	1-	11:55	11:57	12:22	1+				
30	C3.1	4	11:57	12:09	12:33	2	11:58	12:07	12:19	1	11:57	12:09	12:47	2+	11:59	12:08	12:36	2				
31	C4.8	7	10:52	10:59	11:16	1					10:55	11:00	11:10	1-	10:54	11:00	11:10	1-				
31	C3.1	1													16:15	16:17	16:29	1-				

2023 JANUARY.

			Steve Parkinson (Various)				Andrew Thomas (19.6kHz/22.1kHz)				Phil Rourke (23.4kHz)				Mark Prescott (22.1kHz/19.6kHz)				John Elliott (18.3kHz)			
	Xray class		Tuned radio frequency receiver, frame aerials.				Tuned radio frequency receiver, 0.6m frame aerial.				Spectrum Lab, 0.6m frame aerial.				SpetrumLab/Starbase, mini-whip aerial.		Active	Tuned radio frequency receiver, 0.5m frame aerial.				
DAY			START	PEAK	END (UT)		START	PEAK	END (UT)		START	PEAK	END (UT)		START	PEAK	END (UT)		START	PEAK	END (UT)	
7	?																					
7	C6.9																					
7	?																					
7	?																					
7	C8.7																					
8	M1.2																					
8	C5.3																					
8	C6.1																					
8	?																					
8	C5.4																					
8	M1.4																					
9	M2.1																					
9	M1.0														13:24	13:28	13:42	1-				
10	M1.0																					
10	C8.5																					
10	C5.3																					
10	C5.1																					
10	C6.8																					
10	?																					
10	C8.7																					
10	?																					
10	?																					
10	M1.3																					
10	M1.2																					
11	M3.1																					
11	C4.6																					
12	M1.2		11:13	11:22	11:40	1+	11:14	11:21	11:38	1												
12	C4.8																					
12	M1.0																					
12	C5.1																					
13	M3.9		10:13	10:17	10:36	1	10:13	10:14	11:00	2+					10:16	10:20	10:36	1				
13	C8.4																					
14	C7.0		11:04	11:08	11:15	1-																
14	C5.0																					
14	C5.7																					
14	?																					
15	C8.3		12:10	12:13	12:23	1-									12:13	12:16	12:31	1-				
15	M4.8		14:22	14:31	14:46	1	14:22	14:24	14:42	1												
16	C6.8																					
18	M1.8		10:30	10:41	11:54	2+	10:28	10:41	11:27	2+												
18	C5.9																					
19	M1.7		10:09	10:15	?	-	10:06	10:15	10:46	2	10:08	10:16	11:00	2+	10:12	10:18	10:53	2				
19	M1.0		10:25	10:29	10:49	1																
19	C5.5																					
20	C4.8		12:56	13:01	13:15	1	12:55	13:00	13:18	1	12:52	13:09	13:56	2+	12:58	13:04	13:49	2+				
20	C5.3																					
21	C4.6																					
21	C3.7																					
22	C8.3														10:48	10:55	11:05	1-				
22	?																					
22	M1.1																					
22	?																					
22	C3.6																					
22	C4.7																					
22	M1.6																					
23	?																					
23	C3.4																					
24	C3.7																					
24	C9.4						14:18	14:33	14:58	2												
24	C8.6																					
25	M4.6		09:43	09:58	11:27	3	09:39	10:12	11:32	3					09:54	10:12	11:15	2+				
25	C6.1																					
25	M1.3																					
26	C4.6						12:38	12:40	12:50	1-												
26	M2.8		13:00	13:07	13:34	2	13:00	13:06	13:32	1+	13:00	13:05	13:28	1+	13:03	13:08	?	-				
26	?																					
26	C3.2																					
26	C4.7																					
28	C3.3										11:55	12:00	12:12	1-								
30	C3.1																					
31	C4.8						10:48	11:00	11:13	1	10:53	11:01	11:21	1+	10:57	11:04	11:18	1				
31	C3.1																					

2023 JANUARY.

	X-ray class		Chris Bailey				Martin Kinder 22.6kHz/23.4kHz				Andrew Lutley (23.4kHz)				Peter Meadows (23.4kHz)							
			Spectrum Lab.				Tuned radio frequency receivers, frame arials.				Tuned radio frequency receiver, 0.6m frame aerial.				Tuned radio frequency receiver, 0.6m frame aerial.							
DAY			START	PEAK	END (UT)		START	PEAK	END (UT)		START	PEAK	END (UT)		START	PEAK	END (UT)		START	PEAK	END (UT)	
7	?																					
7	C6.9																					
7	?																					
7	?																					
7	C8.7																					
8	M1.2																					
8	C5.3																					
8	C6.1																					
8	?																					
8	C5.4																					
8	M1.4																					
9	M2.1		08:47	09:06	09:25	2																
9	M1.0		13:17	13:24	13:50	2	13:20	13:25	13:40	1												
10	M1.0																					
10	C8.5																					
10	C5.3																					
10	C5.1																					
10	C6.8																					
10	?																					
10	C8.7																					
10	?																					
10	?																					
10	M1.3																					
10	M1.2																					
11	M3.1		08:31	08:33	08:42	1-																
11	C4.6						11:15	11:30	11:48	2												
12	M1.2																					
12	C4.8																					
12	M1.0																					
12	C5.1																					
13	M3.9		10:11	10:16	10:40	1+	10:10	10:15	10:35	1												
13	C8.4						10:55	11:08	11:15	1												
14	C7.0																					
14	C5.0																					
14	C5.7																					
14	?																					
15	C8.3		14:22	14:31	15:20	2+	12:10	12:15	12:25	1-												
15	M4.8						14:20	14:25	15:05	2												
16	C6.8																					
18	M1.8		10:27	10:35	11:17	2+																
18	C5.9																					
19	M1.7		10:08	10:15	11:00	2+																
19	M1.0																					
19	C5.5																					
20	C4.8																					
20	C5.3																					
21	C4.6																					
21	C3.7																					
22	C8.3																					
22	?																					
22	M1.1																					
22	?																					
22	C3.6																					
22	C4.7																					
22	M1.6																					
23	?																					
23	C3.4																					
24	C3.7																					
24	C9.4		14:07	14:35	15:30	2+																
24	C8.6																					
25	M4.6		09:36	09:47	11:30	3	09:40	10:15	11:30	3												
25	C6.1																					
25	M1.3																					
26	C4.6		13:00	13:05	14:00	2+	13:00	13:10	13:30	1+												
26	M2.8																					
26	?																					
26	C3.2																					
26	C4.7																					
28	C3.3						11:50	12:00	12:10	1												
30	C3.1																					
31	C4.8		10:50	11:01	11:20	1+																
31	C3.1																					