Founded in 1890

The British Astronomical Association
A company limited by guarantee
Registered Charity No. 210769

PO Box 702, Tonbridge, TN9-9TX 020-7734 4145
www.britastro.org

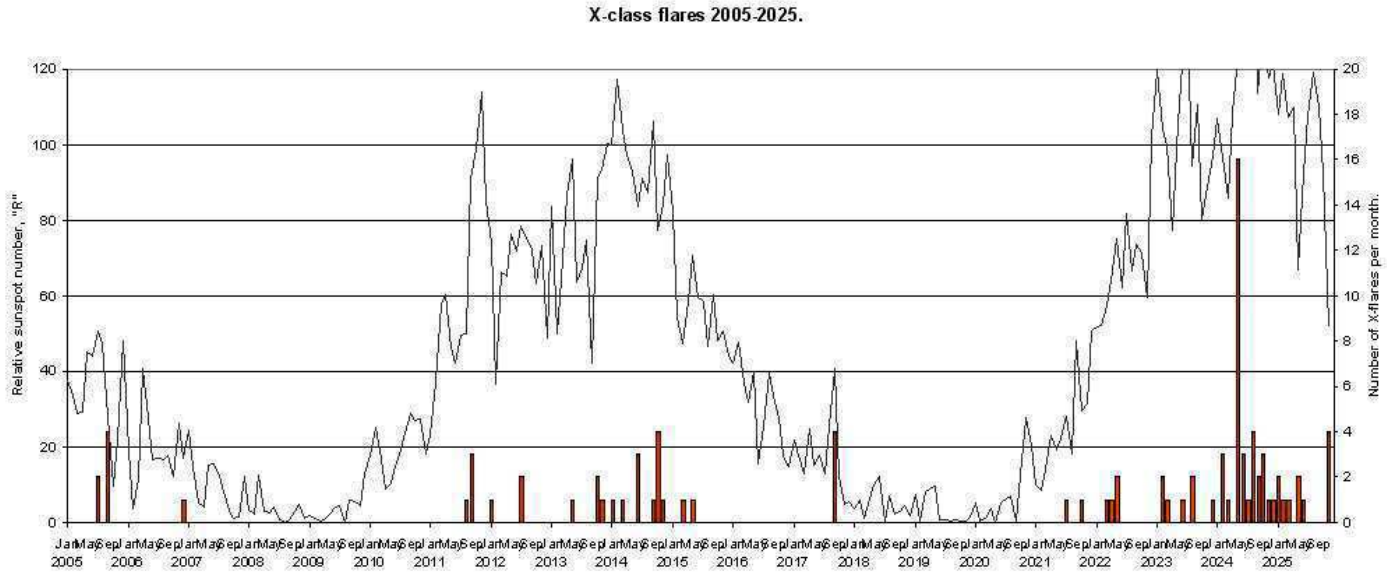
Please send all reports and observations to jacook@jacook.plus.com

BAA Radio Astronomy Section. Director Paul Hearn.

RADIO SKY NEWS 2025 NOVEMBER.

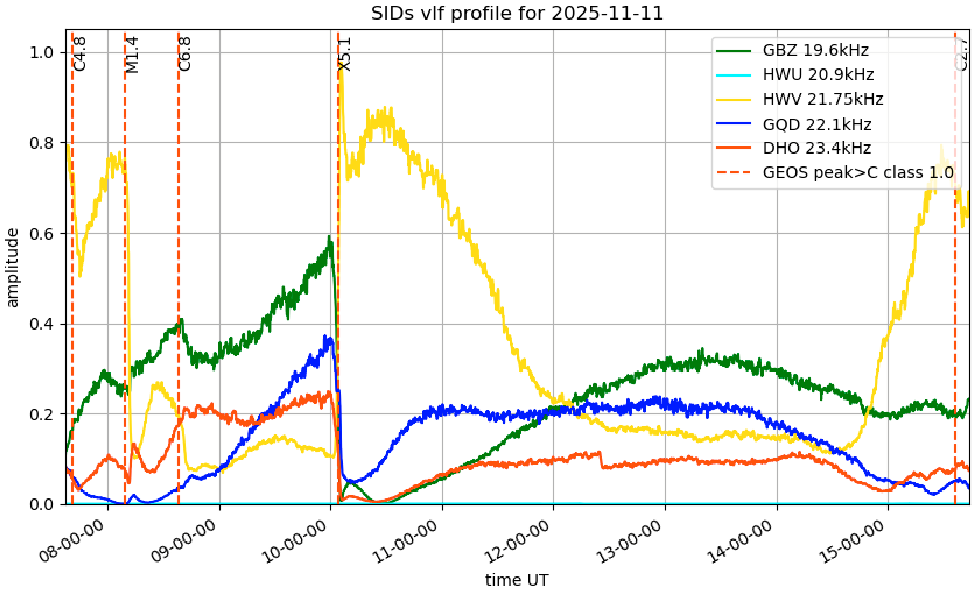
VLF SID OBSERVATIONS.

Solar flare numbers in November were slightly lower than in October, but the flares were also stronger. Four X-class flares were recorded as SIDs, with a total of six shown in the satellite data. Most of these were from AR 14274, a large and complex group of sunspots crossing the solar meridian during this activity. The current solar cycle has produced considerably more X-flares than the previous cycle:

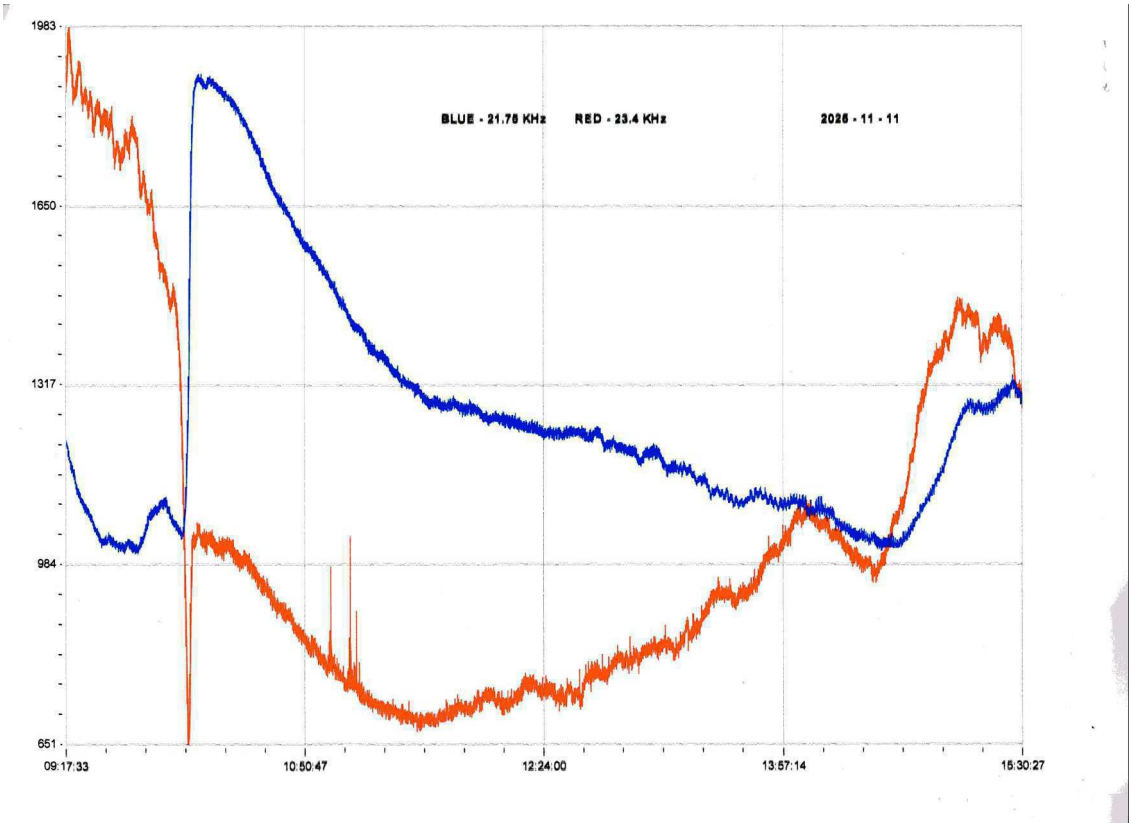


The peak in 2024 May was 16 (right-hand scale), most months being four or less. The peak of four in 2017 September marked the end of solar cycle 24, none recorded over the following four years. We appear to be near the end of the peak for the current cycle, so more X-flares could be expected over the next few years.

The strongest of the November flares was an X5.1, peaking around 10UT on the 11th. This was widely recorded with a range of different SID shapes, shown on the next page.

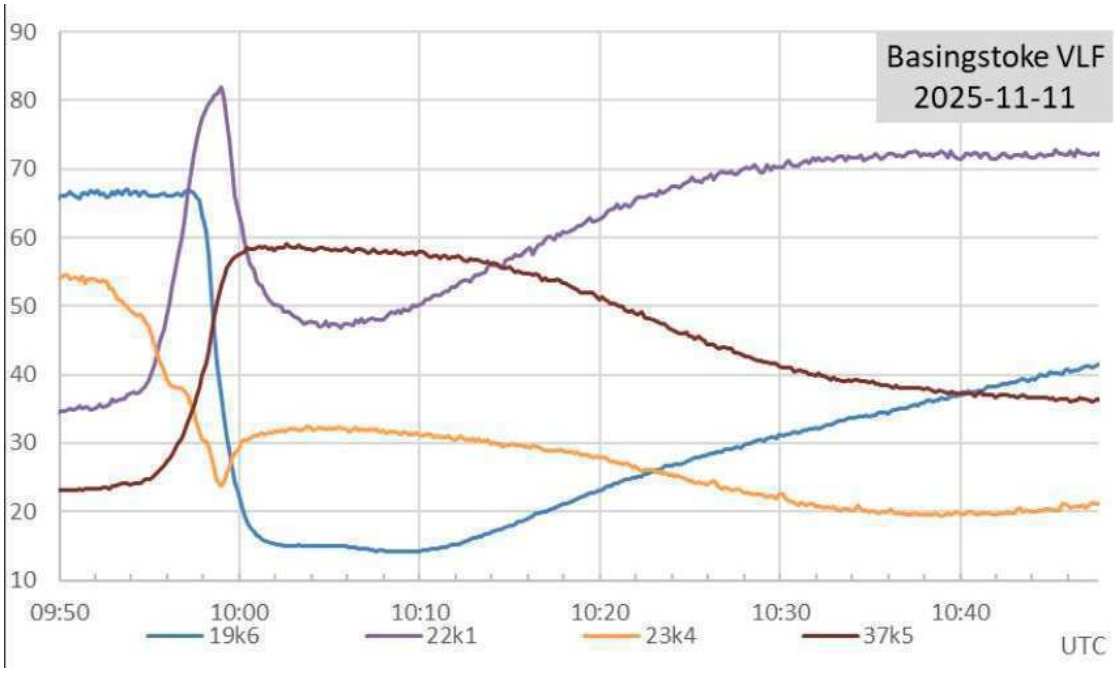


Mark Prescott's recording has a very strong 21.75kHz response with a spike and wave shape. 19.6kHz has an inverted spike and wave, as does 23.4kHz.

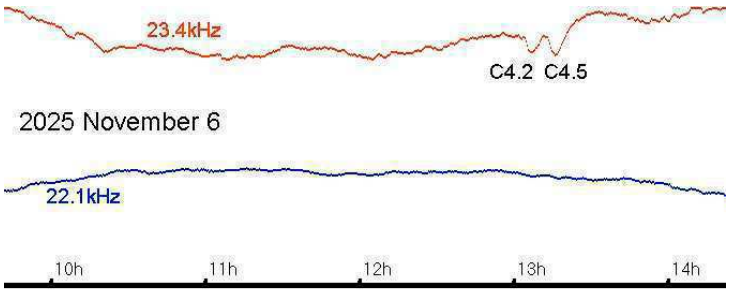


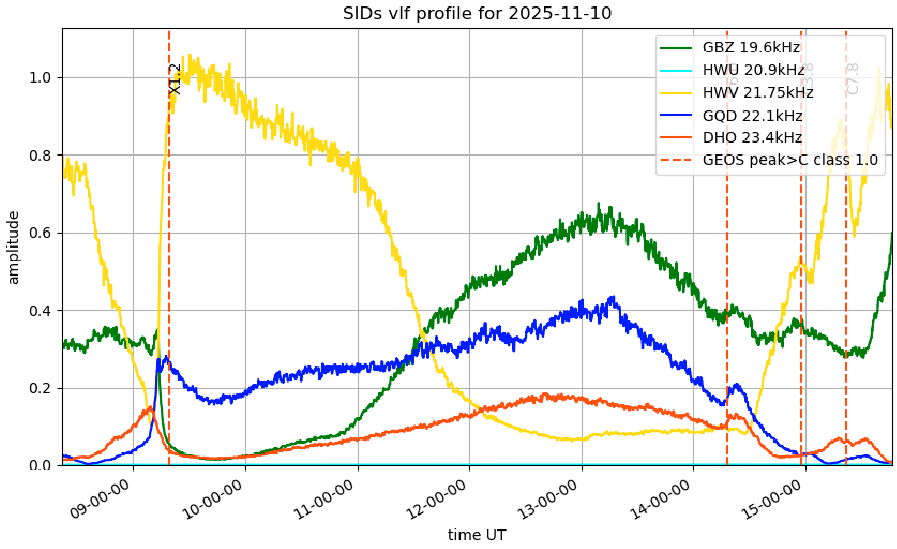
Colin Clements also recorded a spike and wave at 21.75kHz (blue trace), although the dip at its peak is much smaller. There is also a small dip in the signal just before its sharp rise. 23.4kHz (red) shows a cleaner version, helping to see the 21.75kHz shape.

Paul Hyde's recording shows spike and wave SIDs where the peak time can be hard to determine. 37.5kHz has a very flat peak lasting nearly 10 minutes. Comparing 19.6kHz and 22.1kHz gives a clearer peak between 10:04 and 10:06UT. The end of the SID is not shown in this close-up of the peak, but timings generally varied from 11:25 to 14:06, quite a significant range.

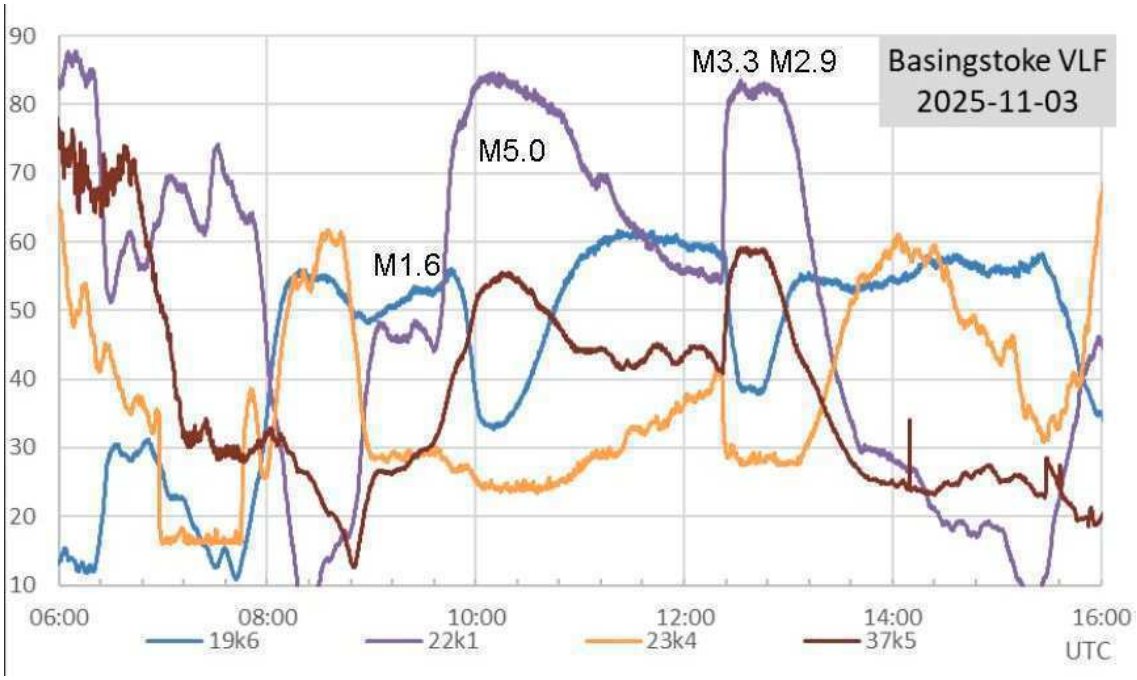


The C4.2 and C4.5 flares on the 6th were among the weaker flares recorded. My recording shows them at 23.4kHz on a very unstable signal. Often during the winter period the lower altitude of the sun leads to a less stable ionosphere, making smaller flares difficult to detect. 22.1kHz shows no response.



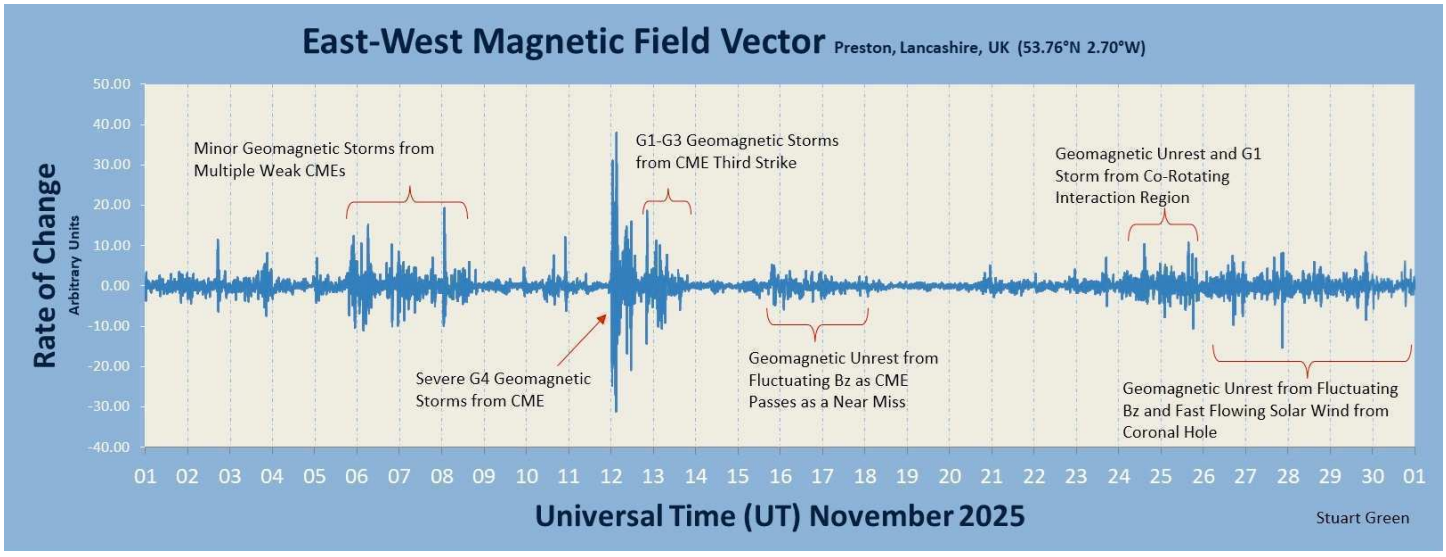


Mark Prescott's recording shows another strong set of SIDs from the X1.2 flare on the 10th. This one was a little earlier, peaking around 09:40UT. The decay phase is again very long on all of the signals, the C6.0 flare at 14:16 just visible as it merges into the sunset.



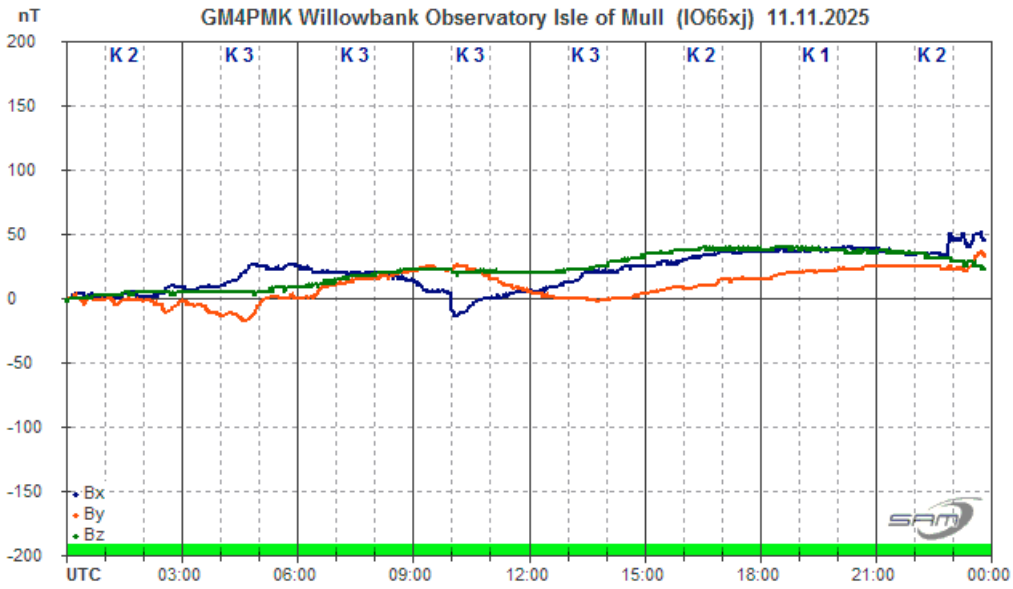
November started with a series of M-flares on the 3rd, shown in Paul Hyde's recording. 22.1kHz shows the best response to the activity. The M1.6 flare seems to show two peaks before the start of the M5.0 flare. This also has a small second peak in its decay phase. The M3.3 and M2.9 flares have merged into a single SID, ending as sunset starts. After all of this strong activity, the number and strength of flares dropped significantly, with just a few SIDs recorded between the 16th and 28th. Three stronger flares were then recorded on the 29th and 30th.

MAGNETIC OBSERVATIONS.

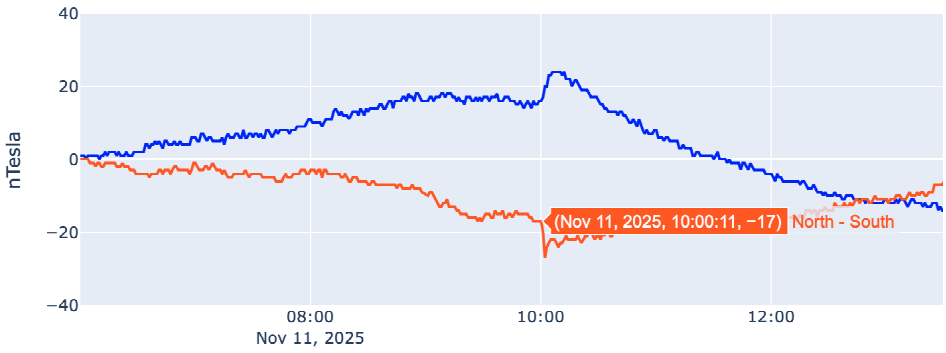


Stuart Green's summary of November's magnetic activity shows a similar pattern, with some strong activity in the first two weeks, followed by a period of low activity before it picked up again in the last week. The most active period was on the 12th-13th following the strong X-flares. There were several CMEs that combined to produce this activity. The X5.1 flare on the 11th was the only one to leave its own signature, with

an SFE (solar flare effect) at the same time as its start. This was recorded by Roger Blackwell on Mull, and Nick Quinn near the South coast:



Steyning Magnetometer (50.8 North, 0.3 West)

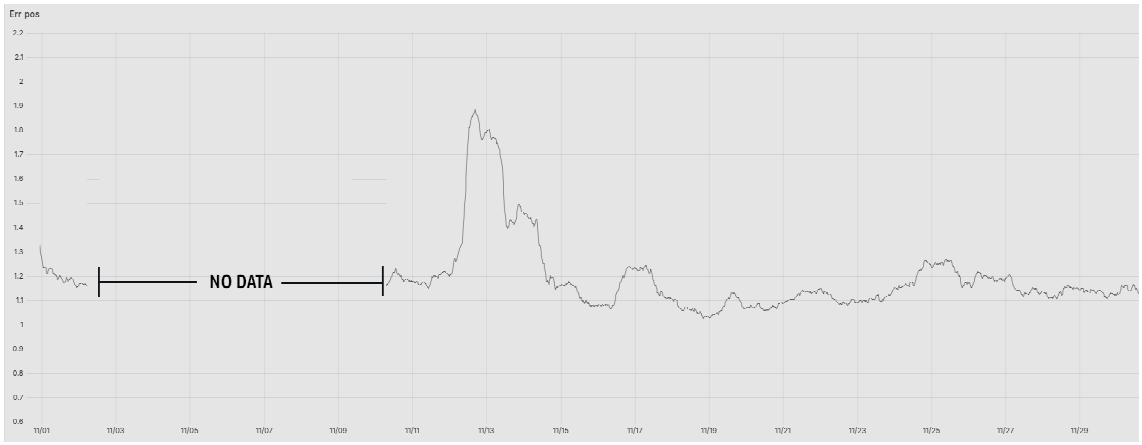


With a magnitude of 17..20nT it is quite a small change, but its timing is an exact match with the SID that we recorded. Unfortunately Callum Potter had a power cut shortly before the flare and so missed the SFE. Power had returned later, and so he did catch the magnetic storm that followed on the morning of the 12th.

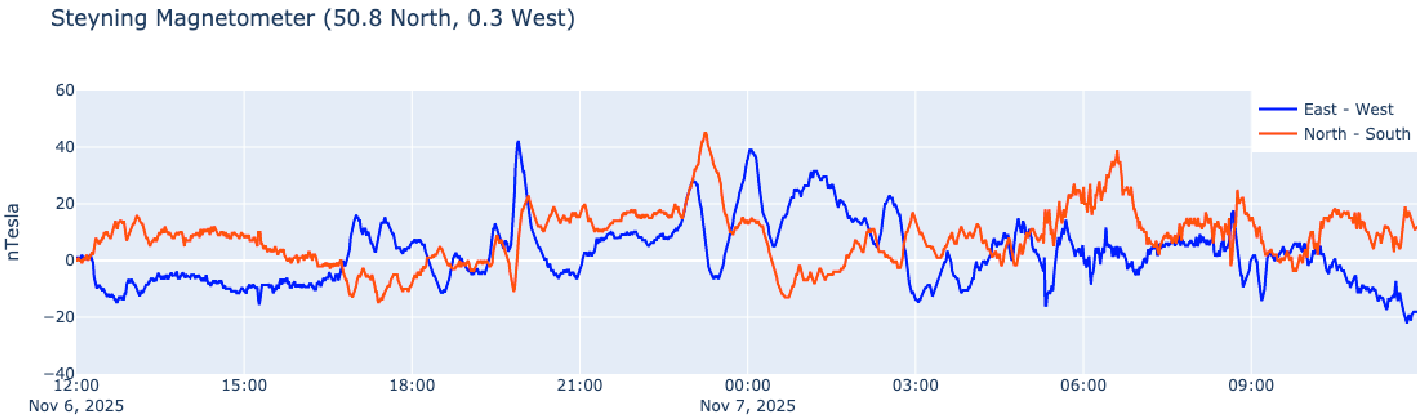
Wasbister Magnetometer (59.17N,3.06W)

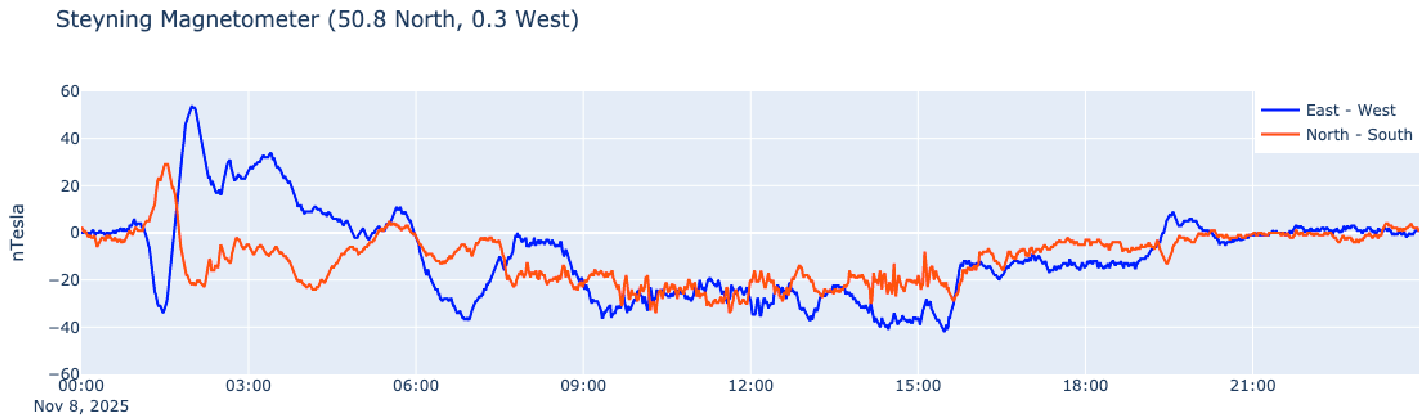
The storm continued into the 13th with some very rapid turbulence, although with a smaller amplitude.

Thomas Mazzi recorded a significant GPS error during this storm, shown in his monthly chart:



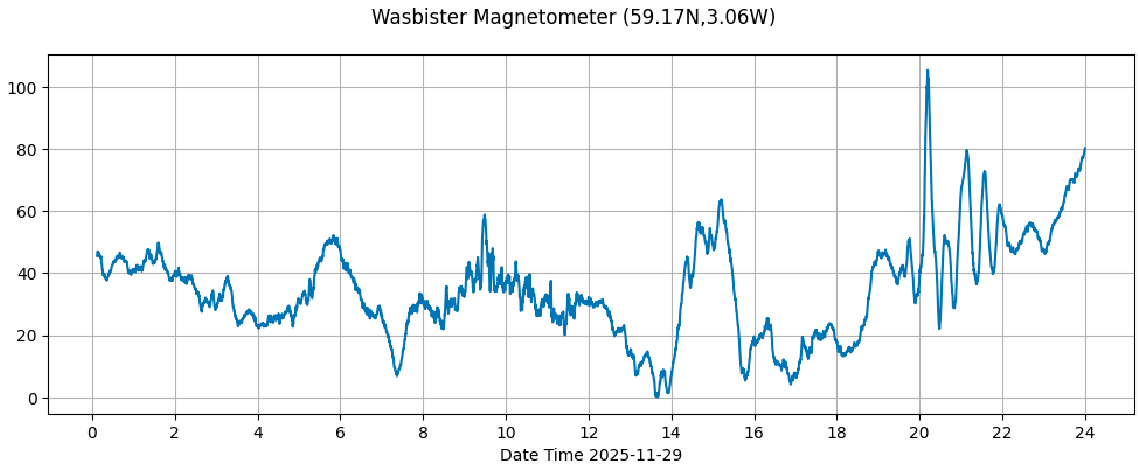
The peak error covers the 12th to 14th.



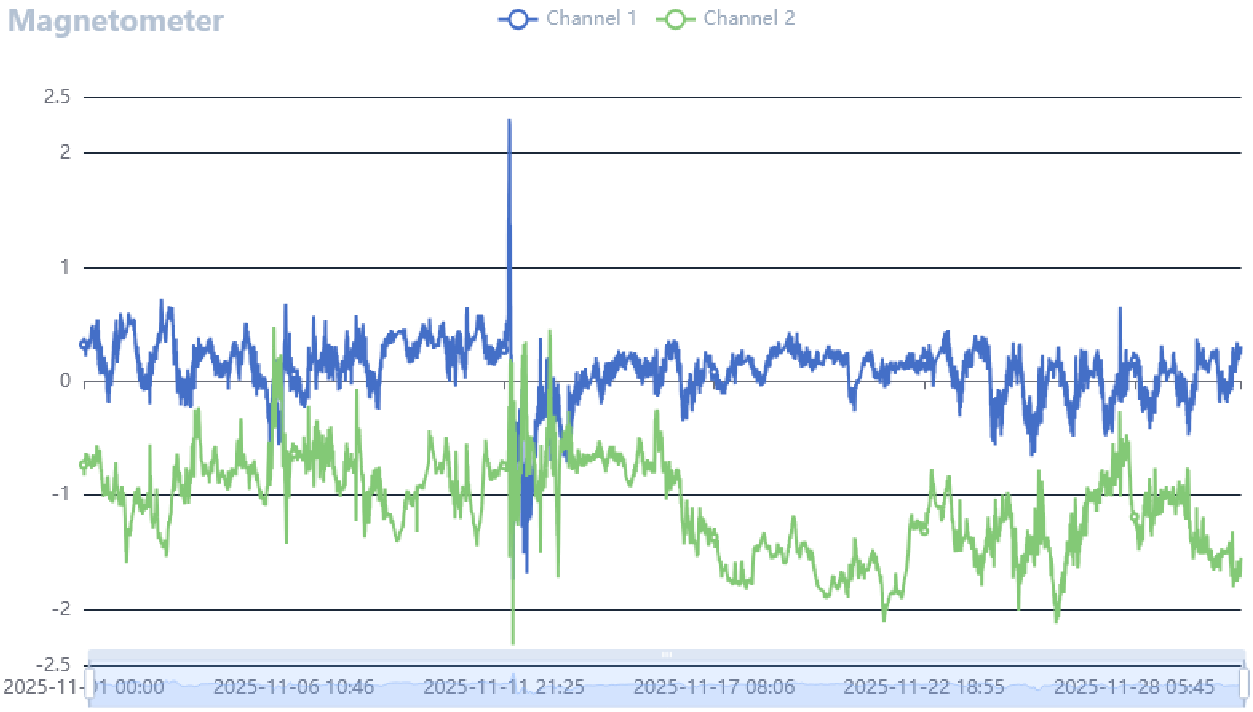


Multiple CMEs together with a strong solar wind produced activity at the start of November, with a very turbulent disturbance over the 6th to 8th, shown in Nick Quinn's recording. Most of the rapid turbulence is only about +/−30nT, with a short stronger peak around 02UT on the 8th. Roger Blackwell recorded stronger peaks, with around +/−100nT early on the 6th.

The solar wind was again responsible for the activity at the end of the month. Callum Potter's recording shows the strongest disturbance on the 29th:



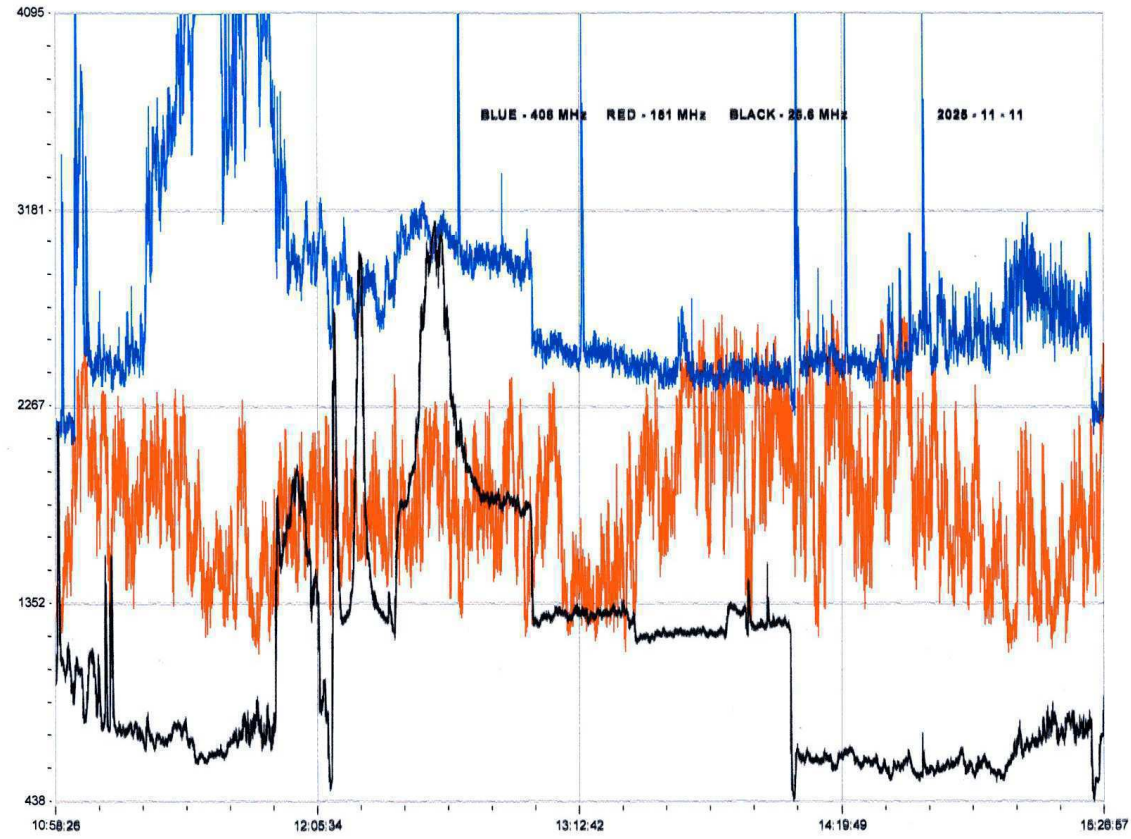
Andrew Thomas has also made a summary of the month's activity. This shows the diurnal variations in inclination (blue) and declination (Green) using the UKRAA 2-axis magnetometer. This gives a different pattern compared with the rate of change shown in Stuart Green's chart. The storm on the 11th-12th shows up well, while the rest of the activity shows a more defined diurnal curve.

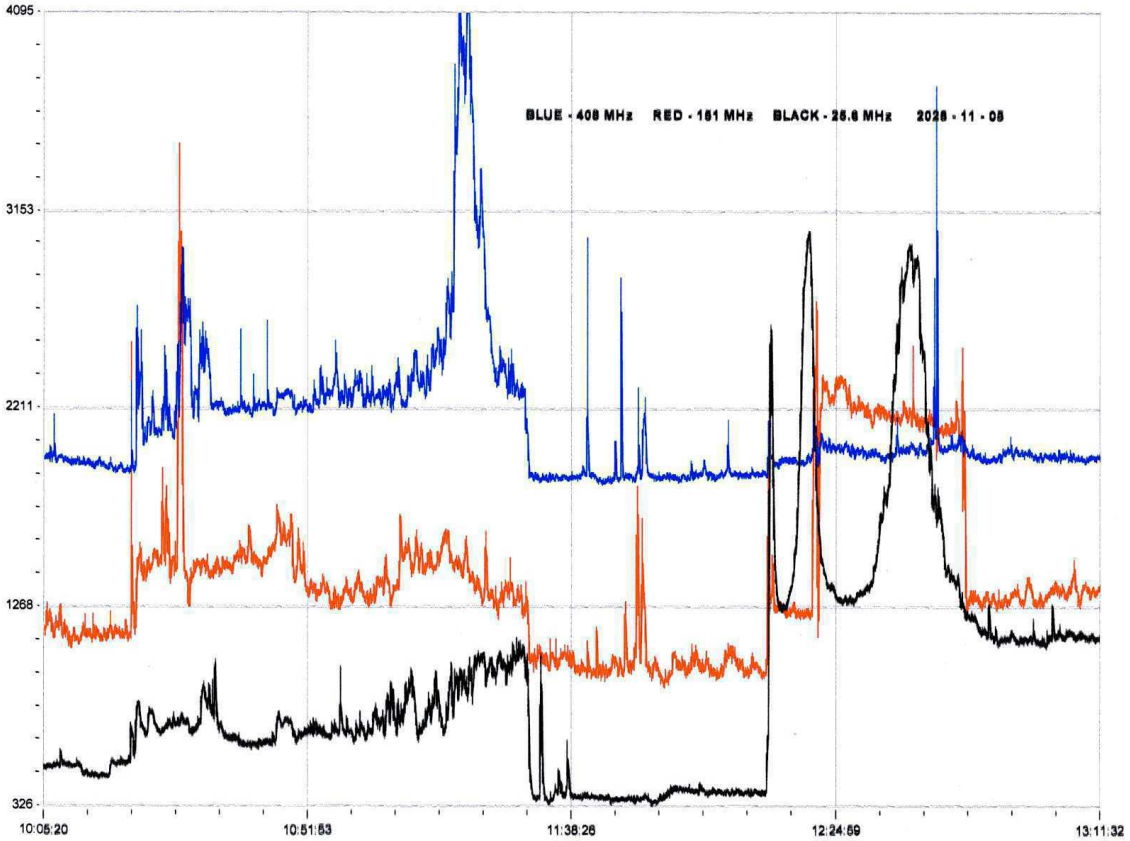


Magnetic observations received from Roger Blackwell, Stuart Green, Thomas Mazzi, Callum Potter, Nick Quinn, Andrew Thomas and John Cook.

SOLAR EMISSIONS

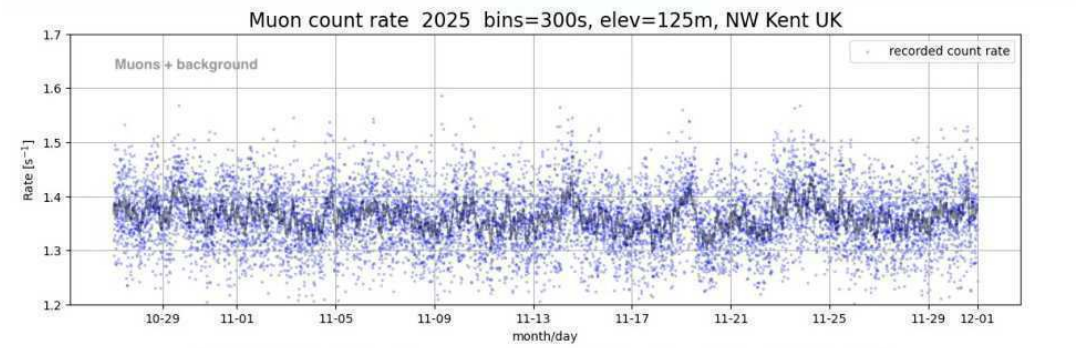
Colin Clememts recorded some very strong radio emissions from the X5.1 flare on the 11th. 408MHz (blue) shows a very strong peak in activity from the start of the recording, continuing at a lower amplitude until the end of the recording. 151MHz (red) shows a strong disturbance throughout the period, but with no significant peak. 25.6MHz (black) does have a peak after the 408MHz peak, but with much less activity.

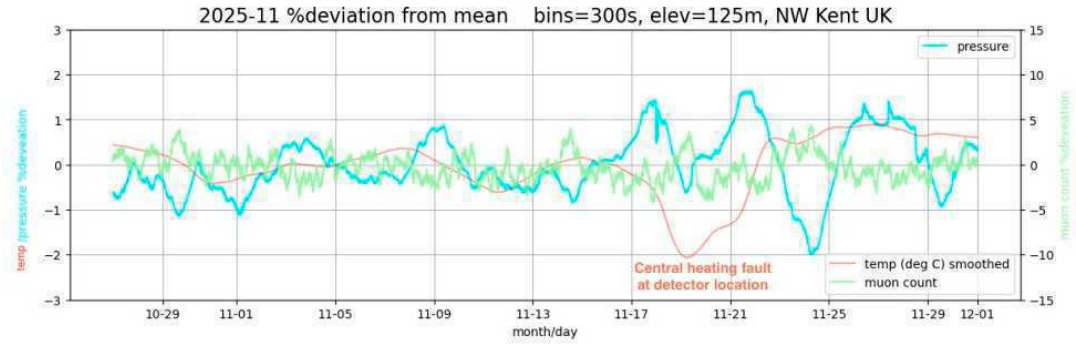


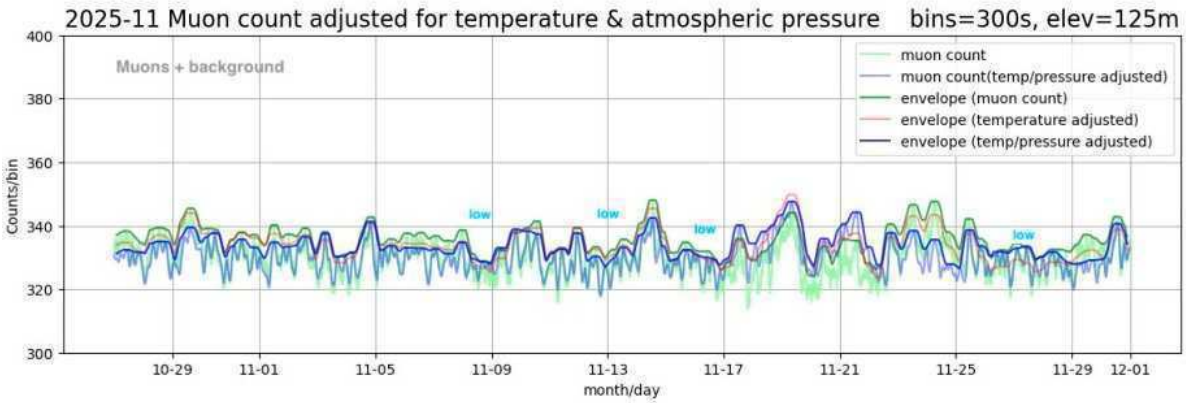


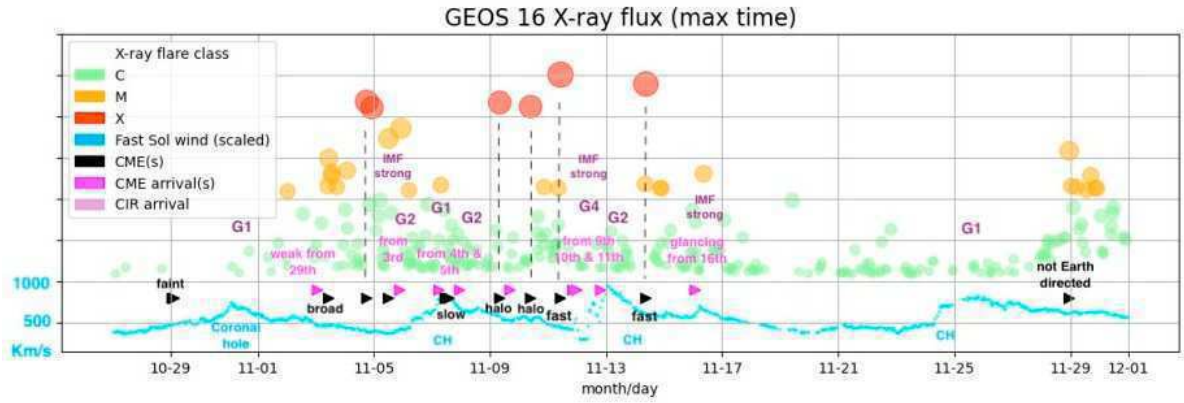
Colin also recorded emissions from the M7.4 on the 5th, with a strong 408MHz peak as well as a small increase for an hour before the peak. The 151MHz and 25.6Mha peaks are delayed by an hour, but are still quite strong. There was also activity of the 3rd, but much weaker.

MUONS





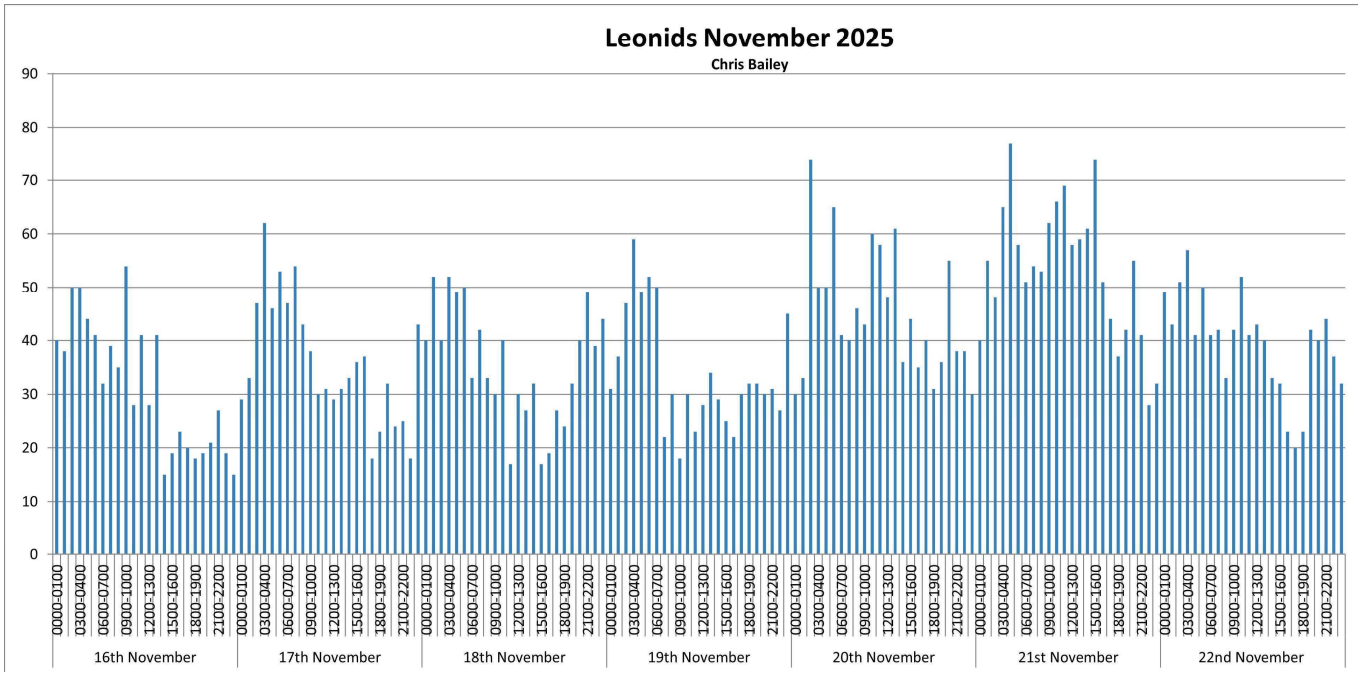


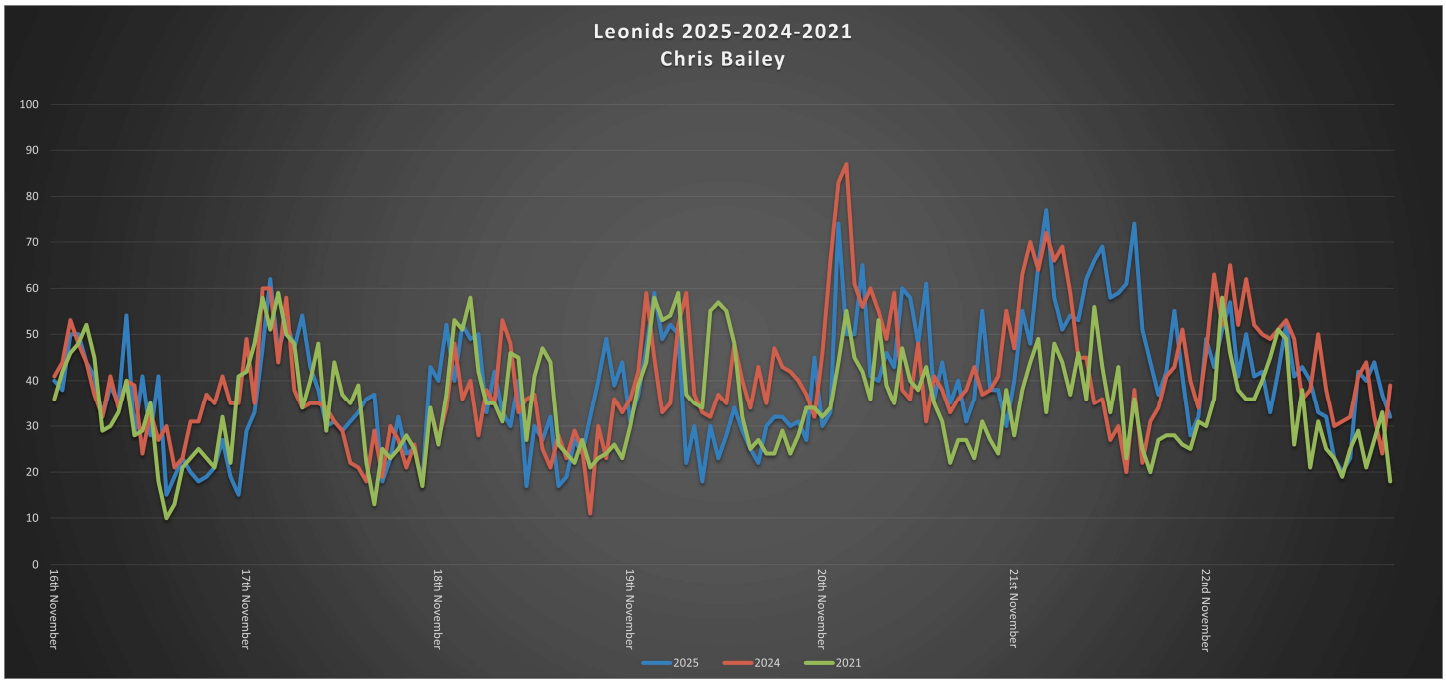


Mark Prescott's Muon chart for November is quite interesting, covering the series of X-flares around mid-month. The STCE weekly report (STCEnews20251210.pdf) has an in-depth report on the effects of these strong solar storms on the particles pushed into the Earth's atmosphere and their effect on air traffic. The X5.1 flare did cause a strong Ground Level Enhancement (GLE) during which the radiation levels experienced by aeroplane passengers was quite high. The report includes a map showing that the UK and Europe were not

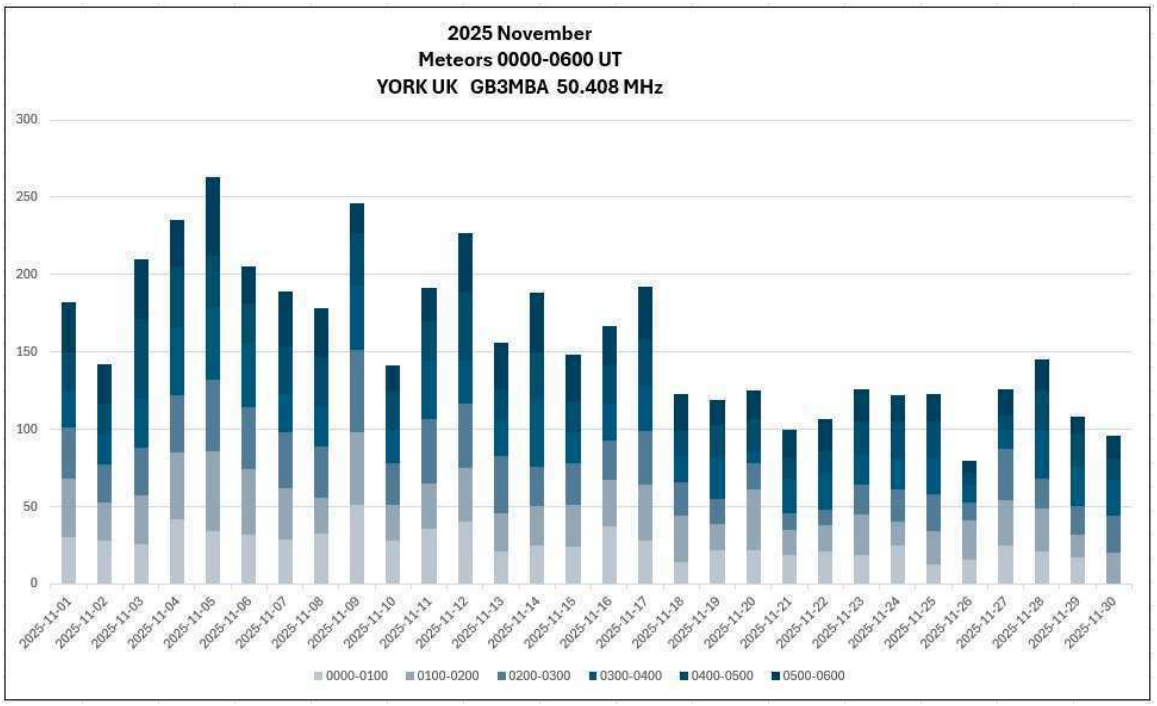
within the area covered by the GLE. Mark's chart shows plenty of peaks and lows during this period, but not the worst of the GLE. There were also some large swings in atmospheric pressure later in the month that have added to the variations in Muon flux.

LEONIDS

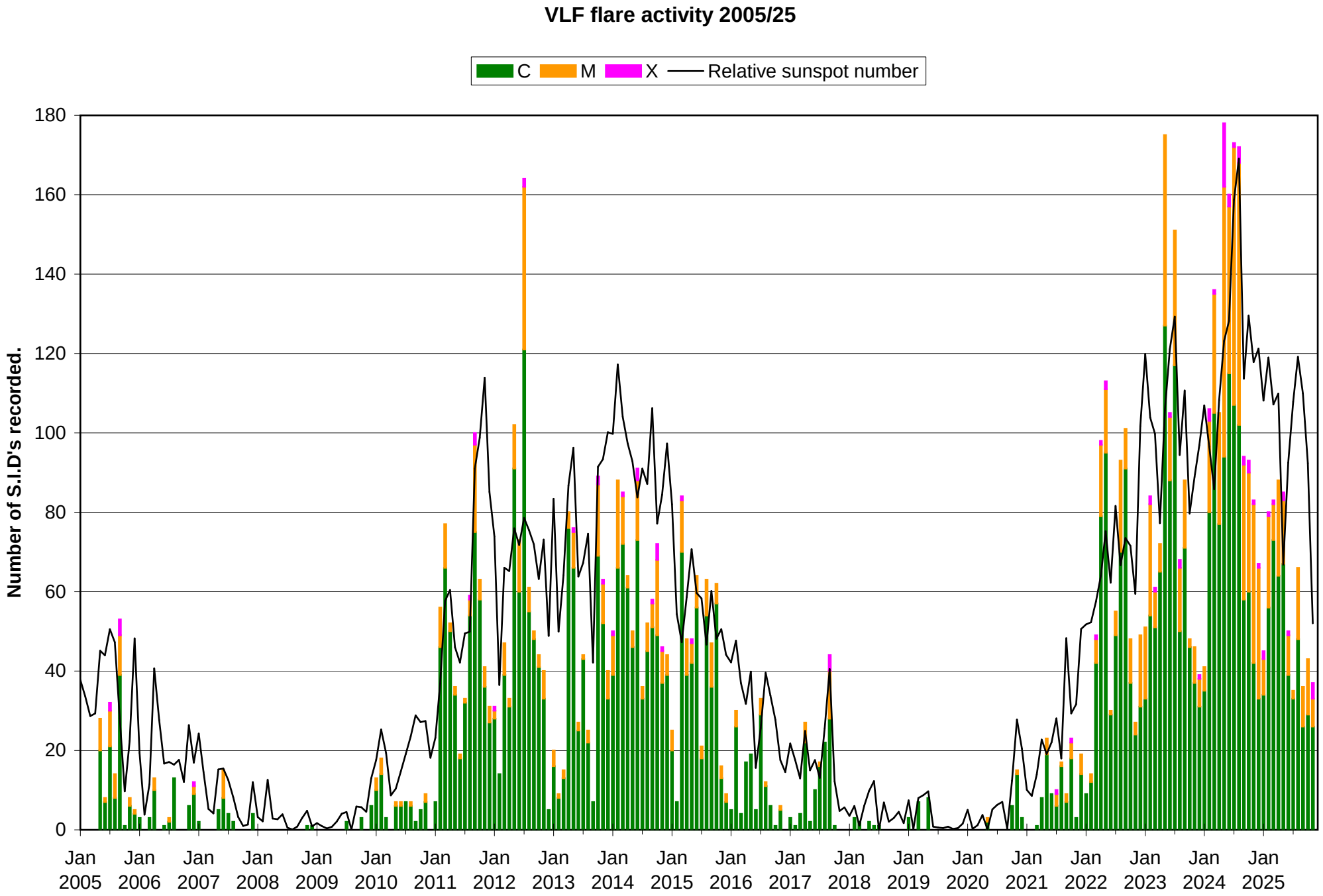




Chris Bailey monitored the Leonid meteor shower, recording activity during the early morning from the 16th to 22nd, with peaks on the 20th and 21st. The lower chart compares results from 2022 (green), 2024 (red) and 2025 (blue). The 2025 peak seems to be more evenly spread over the 21st–22nd compared with 2024, which had a more distinct peak on the 20th. The background levels leading up to the peak were very similar in each year.



Colin Briden also monitored meteors through the whole month, with the various daily periods shown with different shades of blue. Each segment covers a one hour period, running from 00h to 06h each day. This is the first report that we have received using the GB3MBA 50.408MHz beacon in Sherwood. The strongest activity seems to be from the 3rd to 17th, mostly in the 05 to 06h period. The geometry of the signal path will be very different compared with the more distant GRAVES signal, so it will be interesting to see how future meteor showers perform.


VLF flare activity 2005/25
C
M
X
Relative sunspot number
Number of S.I.D's recorded.
180
160
140
120
100
80
60
40
20
0
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
Jan 2023
Jan 2024
Jan 2025

BAA Radio Astronomy Section.

BARTELS DIAGRAM

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

ROTATION																											
2582						2022 December				2265																	
	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	22
F				C			C	M				C				C			MMMM	CMCM	MMMC		CC	CCC	M	C	C
2583	2023 January																										
	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	18
F	CC	C		CCC	CM		CM	CCCM	C							CC	MCCM	MM	MCMM	MC	MCMC	MC	CCC	CM	C		MC
2584										2267			2023 February														
	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	13	14
F	MMC	CC	CC	CMCM	C	CCC	MCM	CMCC		C		C	CC		C		C	C	C	CC	CM	MMMM	MCCM	MMXM	MMMM	CCCM	CCM
2585										2268					2023 March												
	15	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
F	CCCC	C	CX	C	CC	CMCC	MCCM	CCCM	CMCC	CCM	CCMM	CC	CC		CC	CCCC	MCCX	CMMC	CCMC	MCCC	C	MC	CCC	CCCC	C		
2586										2269									2023 April								
	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	C		C	CCCM	C	CCC	C	C			C		CC	CCC	CC	MC	M	CC					CCC	MC		CC	CCCC
2587												2270										2023 May					
	10	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
F	MCCC	MC	CCC	CCCC	CCMC	CCCC	C	CC	CCC	CCC	CCCC	M	CC		CC		C	M	CC	CCCC	CCM	CCMC	CCCC	MMMM	MCCC	CMM	CC
2588												2271													2023 June		
	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	2
F	C	CCCM	MCMM	MCCC	MCCM	CCCC	CCCC	C	C	CCCM	CCCC	MMMM	MCCM	MMMM	CCCM	CCMC	CCMC	MCCM	CCCC	CCC	MC	C	MMMC	CMCM	CCCC	CC	
2589												2272															
	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	29
F	CC	CCCC	C	CCCC	CMCC	CC	CM	C		CCCC	CCCC	CC	CC	MCMM	CC	M	MC	CCMX	CMMC	CMCC	C	CCMC	CCCC	CCMC	CMCC	MCC	CCCM
2590		2023 July										2273															
	30	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	CCCC	CCCC	CCCC	MCCC	MC	CCCM	CCM	MC	C	CCC	CCCC	MMMM	MMCC	CCCM	MCCC	MMMC	MCMM	CCC	MMMM	CMCM	C	C	CC	CC	C	CCCM	CMCM
2591						2023 August						2274															
	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	21	22
F	CMCC	CMCC	CCCM	MC	CMCC	MMMM	MMMM	CMCC	CC	MMCX	CM	CMMX	MC	C		CCCC	CCCC	C		C	CC	CCC		C	CC	CC	
2592										2023 September		2275															
	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	18
F	CCC	C	C	C				C			MC	MCC	CC	MCC	CCCC	CCM	CCC	C	C	CCCM	MCCC	C	CCM	C	CC	C	C
2593															2023 October												
	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	15
F	MCCC	CMCC	M	CCMM	CCCC	CCMC	C	CC		MCC	CCC	CCCM	CCCC	CCM	CCCC	C	C	CC	CC	CC	CCC	CMCC	CC			C	C
2594													2277			2023 November											
	16	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
F	CCC			C	C					CC	CC			CCCC		MCM	CCM			MCM	C		C	C	C	CCC	
2595													2278						2023 December								
	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	8	9
F	C	CCCC	C			CM	CC	MCCC	CCCC		CCMC	MC		C			C		CC				CCC	C			MCM
2596													2279											2024 January			
	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	CCC	CCCC	CC	C	MMX	MCCM	CC	C	C						MM						C	CCCC	M				
2597													2280														
	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	C		CC		CM	CCM	C		CC						C	CCC	C	CMMM	CCC	CCCC			CCC	CCC	C	C	CC
2598	2024 February													2281													
	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	CCCC	CCCC	MMMM	CC	CC	CCM	MMMM	CXM	C	C	CMCM	CC	MCCC	CCCM	XCC	C	C	CC	CC	CCCC	XCCM	CMMM	MMMM	CM	C	C	CC
2599		2024 March												2282													
	29	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			CCC		C	CC	C	CCCC	C		CMCC	CC	CCCC		MCC		CCMC	CCCC	CCCC	CCCC	MCCC	CC	CCCM	MMMM	MMMM	MCCC	MMMM
2600						2024 April								2283													
	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	21	22
F	MCCC	MMMX	CCCC	CCCC	CCCC					C					CCCC	CCCM	CCCC	MCCC	CCCC	MMMM	CCCM	CCCC	CMCC	MCCC	CCCC	MMM	MMMM
2601									2024 May					2284													
	23	24	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
F	MCCM	CCMC	CMCM	CC	MC	CC	CCC	CCMM	MC	CCCM	CMCC	MMCM	XMXM	MXMC	MMMM	XMMX	MXMX	XMMM	MXMM	MMMX	MMMM	XCXM	CMMX	M	CCC		MM
2602													2024 June		2285												
	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		CCCM	CM	CMMM	MCCC	C	CCCC	XCC	CCCC	MMXM	CM	CMCX	XCXM	CMCC	MMMM	MMCC	MMCC	CCMC	CMCM	MMMC	MMCM	MMXM	CC	CC	CCMC	CCCC	MCCC
2603															2286	2024 July											
	16	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
F	CCCC	MCMM	CMMC	MCCC	CMCC	CCCC	MMCC	MMMC	MMCM	MC	C	CC	CC	CC		MC		MCC	CCMM	CCCC	CCCC	CCMM	CMCC	CCCC	MMMM	CMCC	CCC
2604															2287					2024 August							
	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
F	MMMM	MCCM	MMCC	MCXM	MMMM	MMCC	CMCM	MCCM	MCCM	MCMC	CM	MCMC	CCM	MCC	MMMM	MMMM	MMMM	MMMM	MMMM	MMMM	MMMM	MMMM	MMMM	MMXX	CCCC	CCMM	MMMX
2605															2288										2024 September		
	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	4
F	MMMM	CCMM	MCCM	MC	CCCM	XMMC	CCCC	CMC	MM	MCM	MCCC	CCM	MCCC	CCMC	CCMM	CCMM	CCCC	CMC	MMCC	CCC	CMCC	MMCC	MCMM	CMCC	MCCM	CCMC	
2606															2289												
	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	1
F	MMMC	CCCC	MCCC	M	MMMM	CMC	MMMM	MXMM	MMMM	MCX	CC	C	C	C	C	C		C	M	C	C	C	CC	C	MMM	C	CCC
2607	2024 October															2290											
	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	CCMC	MXM	MC	MMCC	CMM	C	MCC	CCX	CMMC	CCMM	C		MC	MCCM	MCM	C	CCC	MCM	C		CCC	CCCC	MC	MCC	XMMM	CCCC	CCMM
2608		2024 November															2291										
	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	CM	CC	CMMM	MCMM	MM	MCMM	MMMM	MMMM	MMMM	MMMX	CCCC	CCCC	M	C	C	CC	CCC	M		CC	MMMM			CC	M	M	
2609							2024 December																	2292			
	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	MC	CC	CCCM			CC	CC	C		MC	MMC	MCC	CCM	XCCM	C	MCM	MCCM	CCM	MCM		CCCC				MCCM	CCM	
2610											2025 January							2293									
	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	CM	M	MCMC	C		M	MM	MMMM	MMMM		C	C	X	CCX	MM									CC			MMMC
2611															2025 February		2294										
	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	13
F	CCCC	CC	CC	M	MC	CC	CCC		CC	M	CC		CC	CCMC	CCCM	MMMM	MCCM	CMMC	CCCC	MCCC	MC	MCCC	C	CC	CC	C	CMCC
2612																2025 March			2295								
	14	15	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
F	MC	C	C	CCMC		CC	C	CMMC	C	MMMX	MCC	M	CCC	C	CCC	CCCC	C	CC	CCC	M			CC			MC	CCCC
2613																		2296		2025 April							
	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
F	CC	CCCC	CC	C	CCCC	C	CC	C	M	C	CCC	CC	CC	MCCC	CCC	CXMM	CCCC	CCMM	CMCC	MCCC	CCCC	CCC	CCC	C	C	CCCC	
2614																		2297					2025 May				
	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	4	5
F	CCC	CCC	CCCM	MMMM	MMMM	MMCC	CMCM	C	CCC		C	CMC	M	M	C	CC			C		MMMC	CMC			CCCC	CCCC	C
2615																			2298								
	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	CCCC	CCCC	CCCC	C	CC	CCCC	CC	CX	MXMM	CM				M	CCCC	C			CCCM	MCMM	CMM	C	CCCC	C	MCCM	MMCM	CC
2616	2025 June																		2299								
	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	MC	M		CC	CC	CC	C		C	CCCC	C	C	CCM	MMCM	CCMM	CX	CCCC	CCCC	CM			C					
2617		2025 July																	2300								
	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	24	25
F					C							CCCC	CC	MMCC		CCC			CC	C	C	CCCC		CC	C	CCC	
2618							2025 August												2301								
	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	21
F	C	C			CC		C	C	CMC	C	M	CCCM	CMC	CCC	CCMM	CM	CCMM	CCCC	C		CCC						
2619									2025 September										2302								
	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		C	CM	MCMM	CM	CC	CMM	C	CMM			C		M		C	CCCC			C						C	
2620														2025 October					2303								
	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	C				C	M	MC	C		MCC	MCCC	MMMC	CMM	CM	C	CCM				C		M			CC	CMCM	CCCM
2621																		2025 November		2304							
	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	MCCM	CCCM	CMMM	MCM	CC	C												C	C	MMM	C	CMC	CCC	CCC	C	X	CXCC
2622																				2305	2025 December						
	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	MCX		C	X		M			C	C	C	C						CC	CM	CC							

	Xray class	Observers	John Cook (23.4kHz/*22.1kHz*)				Roberto Battaiola 20.3kHz				Paul Hyde (22.1kHz/*24kHz*)				Mark Edwards			Colin Clements (23.4kHz/*21.75kHz*)			
			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	C3.0	1					08:19	08:30	08:46	1+											
2	C8.2	6	12:40	12:47	13:17	2					12:38	12:45	13:05	1+				12:43	12:51	14:19	3
3	**M1.6**	3	08:47	09:06	?	-	08:39	09:44	10:04	2+								*09:33*	*09:40*	*09:46*	*1-*
3	**M5.0**	6	09:40	10:11	12:03	3+					09:35	10:05	11:58	3+				09:58	10:17	10:56	2+
3	**M3.3**	7	12:23	12:35	?	-	12:20	12:25	12:40	1	12:20	12:30	13:42	2+				12:31	12:45	13:06	2
3	?	1					12:40	13:07	13:31	2+											
4	C4.6	2					10:06	10:12	10:19	1-	10:07	10:12	10:21	1-							
5	C3.2	2					09:24	09:30	09:42	1-	09:26	09:32	09:37	1-							
5	**M7.4**	8	10:47	11:14	?	-	10:38	11:10	11:53	2+	10:39	11:03	?	-				10:57	11:15	12:08	2+
5	?	3	12:21	12:27	12:56	2					12:06	12:26	12:59	2+							
5	C8.3	4	14:27	14:33	14:42	1-	14:23	14:30	14:48	1	14:25	14:31	14:42	1-							
6	C3.8	1					08:56	09:01	09:15	1											
6	C4.2	4	13:05	13:07	13:12	1-	13:02	13:06	13:09	1-	13:02	13:07	13:12	1-							
6	C4.5	3	13:14	13:17	13:24	1-	13:11	13:15	13:28	1-											
7	C8.7	4	09:23	09:27	09:33	1-	09:17	09:25	09:56	2											
7	C4.5	1					13:18	13:27	13:48	1+											
7	C2.6	1					14:55	15:00	15:08	1-											
8	C3.8	5	12:56	13:00	13:07	1-	12:55	12:58	13:16	1	12:54	12:58	13:05	1-							
9	**X1.7**	2	07:18	07:31	?	-	07:05	07:19	07:45	2											
10	C2.8	1					06:38	06:47	06:54	1-											
10	**X1.2**	7	09:03	09:38	11:38	3+	08:56	09:06	09:21	1	09:00	09:11	12:02	3+				*09:14*	*09:48*	*11:45*	*3+*
10	C6.0	3					14:07	14:17	14:40	2	14:08	14:16	14:33	1							
10	C3.8	1					14:52	14:56	15:02	1-											
11	**M1.4**	2	08:07	08:10	08:18	1-	08:02	08:09	08:24	1											
11	C6.8	1					08:34	08:40	08:56	1											
11	**X5.1**	7	09:58	10:08	12:00	3	09:48	10:04	11:25	3	09:54	10:04	12:03	3+				10:04	10:06	14:06	3+
13	C5.0	1					13:21	13:27	13:41	1											
14	**X4.0**	6	08:21	08:31	09:40	2+	08:20	08:30	09:23	2+	08:21	08:31	10:00	3				08:30	08:36	09:23	2+
16	**M3.1**	3	08:07	08:11	08:24	1-	07:57	08:10	09:21	2+								08:46	09:18	10:20	3
19	C9.9	3					09:29	09:57	10:59	3											
20	C2.3	1																			
21	C3.8	1					13:27	13:31	13:39	1-											
22	C4.8	4									11:42	11:44	11:59	1-				11:49	11:51	12:00	1-
28	C5.0	3	12:00	12:04	12:28	1+					12:01	12:04	12:33	1+							
28	C5.0	1									13:45	13:47	13:55	1-							
29	C3.6	1									12:26	12:30	12:42	1-							
29	**M1.1**	5	13:12	13:17	13:31	1					13:11	13:18	13:46	2				13:16	13:23	13:35	1
30	C8.3	2	10:19	10:23	10:29	1-															
30	C9.0	1	10:53	10:55	10:58	1-															

	Xray class		Steve Parkinson (Various)				Andrew Thomas (18.3kHz)				Phil Rourke (23.4kHz)				Mark Prescott (19.6kHz/*22.1kHz*)				John Elliott (18.3kHz)			
			Tuned radio frequency receiver, frame aerials.				Tuned radio frequency receiver, 0.6m frame aerial.				Spectrum Lab, 0.6m frame aerial.				SpectrumLab/Starbase, Active mini-whip aerial.				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)	
1	C3.0																					
2	C8.2		12:39	12:46	13:06	1+									12:45	12:49	13:10	1	12:40	12:48	13:10	1+
3	**M1.6**																					
3	**M5.0**		09:42	10:12	11:10	3									09:47	10:09	11:35	3	09:40	10:15	11:30	3
3	**M3.3**		12:23	12:35	13:36	2+									12:27	12:39	13:23	2+	12:24	12:45	13:30	2+
3	?																					
4	C4.6																					
5	C3.2																					
5	**M7.4**		10:46	11:13	?	-					10:45	12:04	13:48	3+	10:53	11:17	12:20	3	10:46	11:15	12:20	3
5	?		12:22	12:29	12:46	1																
5	C8.3										14:28	14:30	14:44	1-								
6	C3.8																					
6	C4.2										13:04	13:08	?	-								
6	C4.5										13:17	13:26	?	-								
7	C8.7		09:23	09:27	09:35	1-					09:18	09:27	09:41	1								
7	C4.5																					
7	C2.6																					
8	C3.8		12:57	13:00	13:08	1-					12:56	13:00	13:15	1								
9	**X1.7**																					
10	C2.8																					
10	**X1.2**		09:05	09:25	11:30	3+									09:12	09:43	11:48	3+	09:08	10:45	11:50	3+
10	C6.0														*14:17*	*14:23*	*14:32*	*1-*				
10	C3.8																					
11	**M1.4**																					
11	C6.8																					
11	**X5.1**		09:57	10:07	12:20	3+									10:01	10:10	12:05	3	08:55	10:02	14:00	3+
13	C5.0																					
14	**X4.0**														08:29	08:35	09:13	2	08:28	08:32	09:20	2+
16	**M3.1**																					
19	C9.9										09:38	09:55	10:29	2+	09:45	09:59	10:17	1+				
20	C2.3										10:04	10:05	10:10	1-								
21	C3.8																					
22	C4.8		11:45	11:47	11:54	1-					11:45	11:47	11:53	1-								
28	C5.0		12:00	12:04	12:23	1																
28	C5.0																					
29	C3.6																					
29	**M1.1**		13:12	13:17	13:35	1									*13:16*	*13:21*	*13:42*	*1+*				
30	C8.3		10:13	10:22	10:31	1-																
30	C9.0																					