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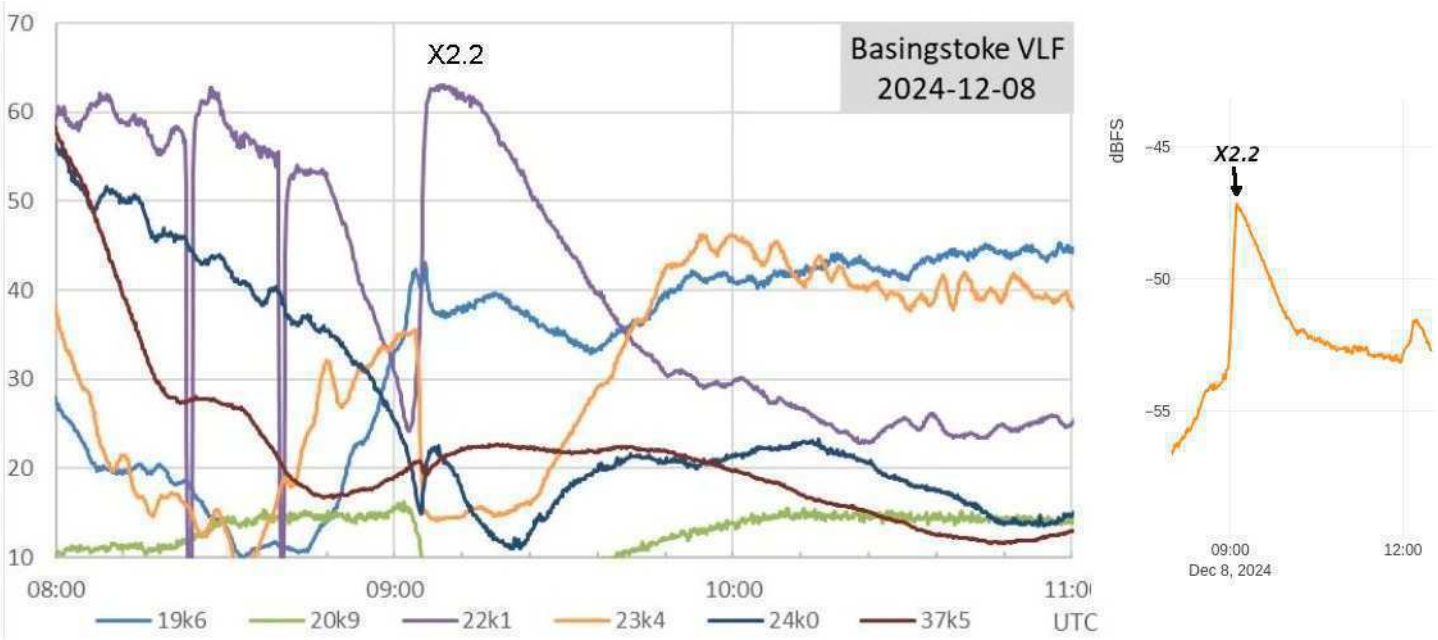
BAA Radio Astronomy Section. Director Paul Hearn.

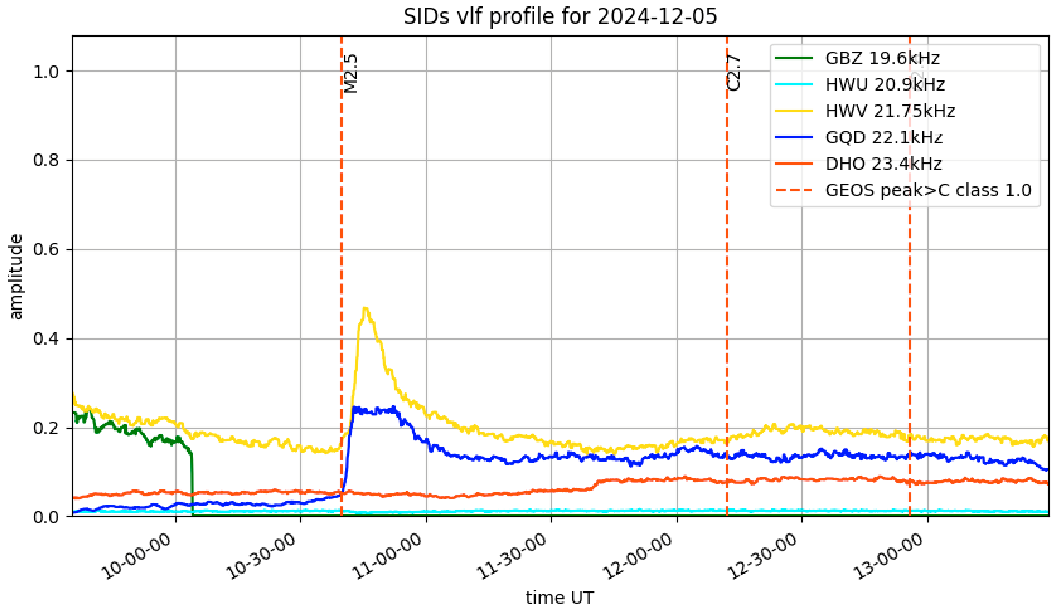
RADIO SKY NEWS 2024 DECEMBER.

VLF SID OBSERVATIONS.

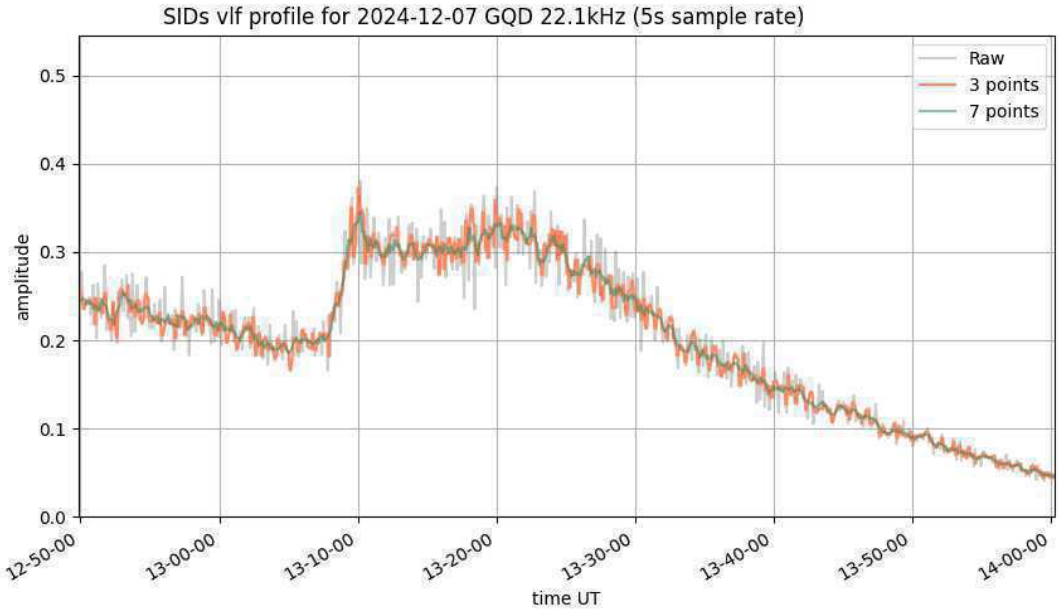
The number of SIDs recorded has been slowly decreasing since September, partly due to the shorter day lengths after the autumn equinox. The relative sunspot count, R, has also been slightly lower over this period. In December we recorded 33 M-class and 33 C-class flares, as well as a single X-flare. Signals have again been very noisy, hiding many C-class flares, and also making some SIDs from M-flares hard to see. 23.4kHz took its usual holiday break from December 23rd to the 31st.



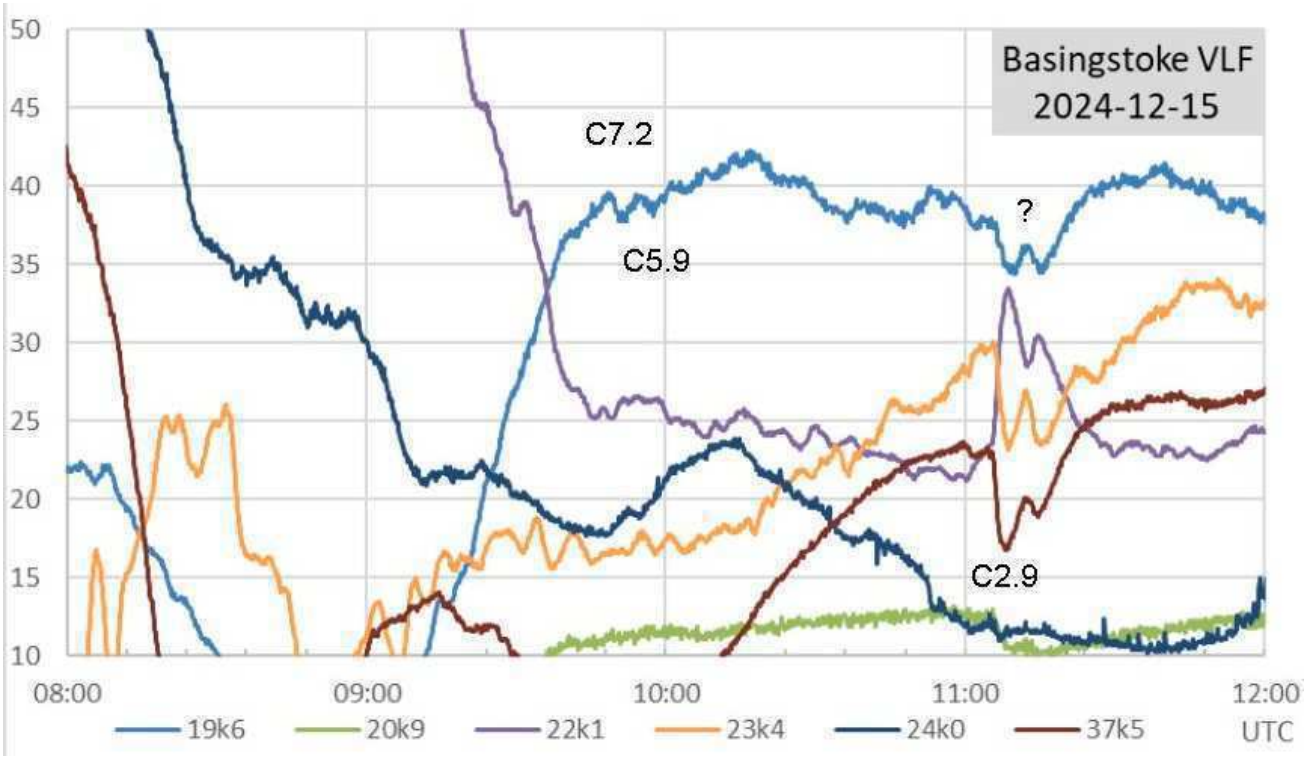
The X2.2 flare on the 8th was widely recorded, despite being very early in the morning. The left chart is by Paul Hyde, showing a very strong response on the 37.5kHz signal from Iceland. The American 24kHz also shows a clear spike-and-wave SID at the end of the sunrise dip. The right-hand chart is from Thomas Mazzi in Italy. The flare was produced by AR13912, which also produced much of the flaring in the previous week. It was very close to the solar limb at the time, rotating out of view over the next few days.

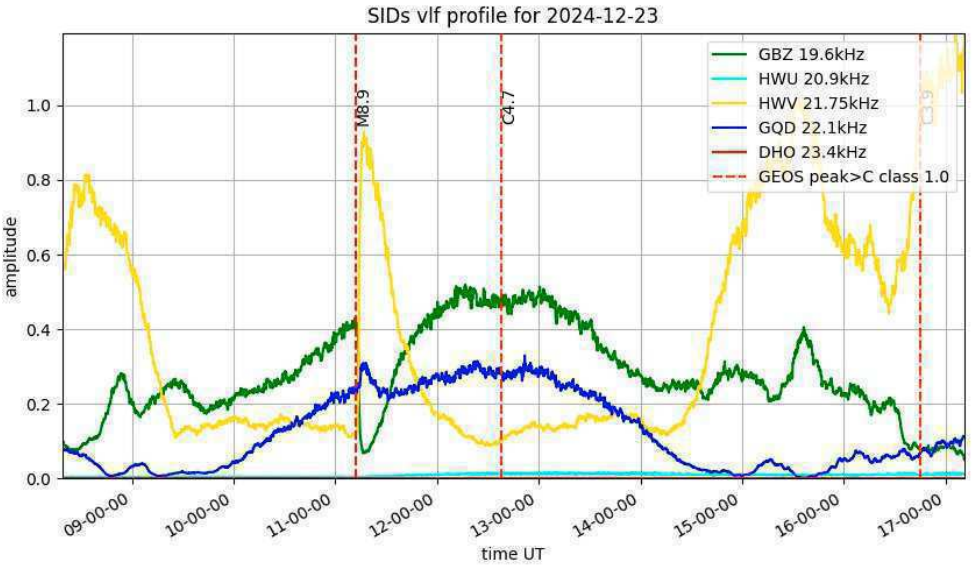


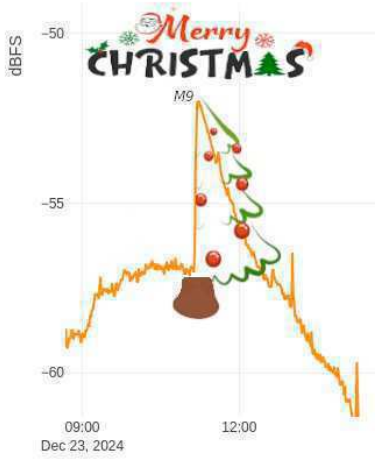
Mark Prescott noticed some very unusual looking SIDs at 22.1kHz, this one from the 5th apparently having a flat top. 21.75kHz shows a normal SID. This was from an M2.5 flare. 23.4kHz was active at the time, but shows no response. A similar effect was seen from the M2.3 flare on the 7th. Mark has produced a more detailed recording of this SID, showing that it has a very shallow spike-and-wave shape. The SID on the 5th is right on the borderline, where the sky wave / ground wave interference pattern has matched the change in X-ray flux very closely during the flare's peak.



The strong M-flaring continued through to the 13th, followed by a short period of very low activity. On the 15th we recorded six small C-flares, some of which are shown in Paul Hyde's recording on the next page. The C7.2 and C5.9 flares have been lost in the early morning noise on most of the signals, with just a hint of SIDs at 19.6kHz. The later C2.9 flare has produced a very clear SID, despite being much weaker. It appears with two peaks on most of the signals, although 20.9kHz and 24kHz show little effect.



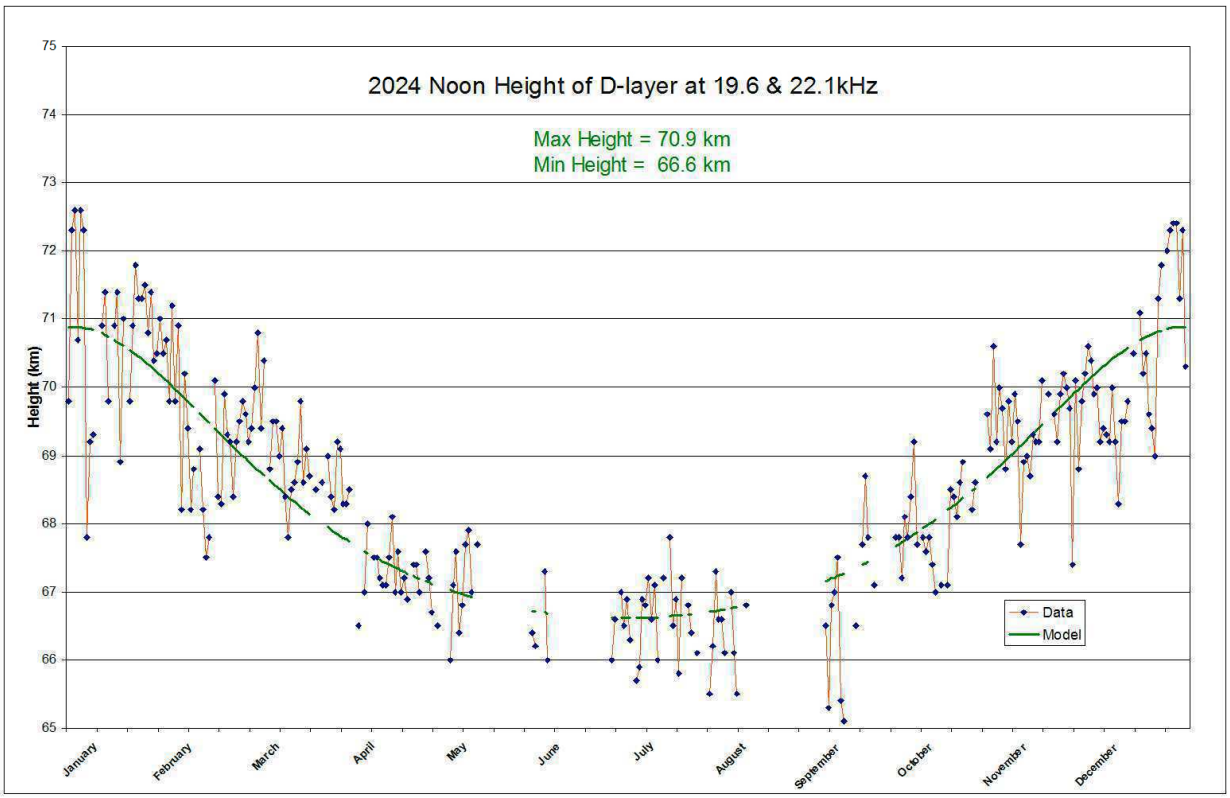


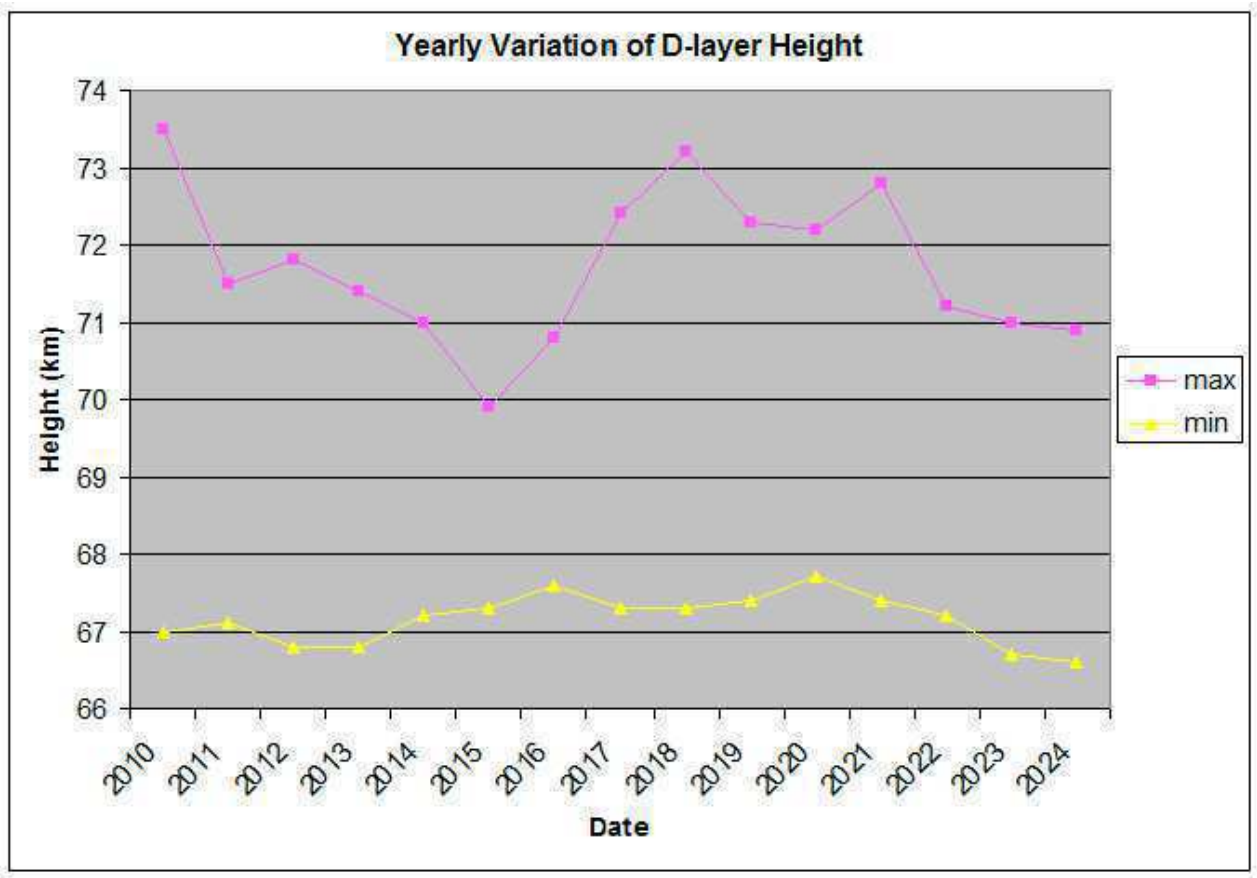


Flaring strength increased again after the 19th, with an M8.9 recorded on the 23rd. Mark Prescott's recording on the left shows clear SIDs on all of the active signals. The later C4.7 flare was not recorded. Thomas Mazzi has decorated his recording of the M8.9 SID to suit its seasonal appearance.

This strong activity continued to the end of the month, the satellite X-ray data including three more X-flares. These were during our night-time, so were not recorded. In 2024 we recorded a total of 2080 SIDs compared to 1294 in 2023.

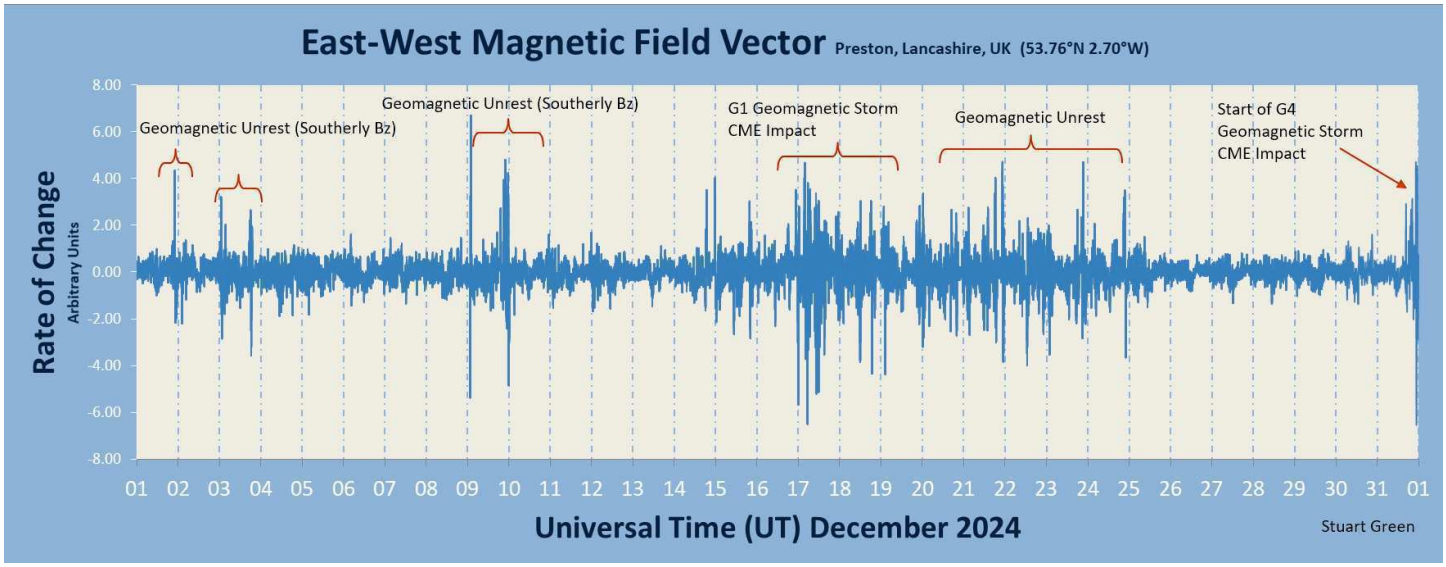
Mark Edwards has provided a chart of the D-region height during the year, analysed from his VLF recordings at 19.6 and 22.1kHz. There are some breaks during the summer when data was not available. The raw data (red trace) is quite variable during the winter months, but is more stable than in 2023.



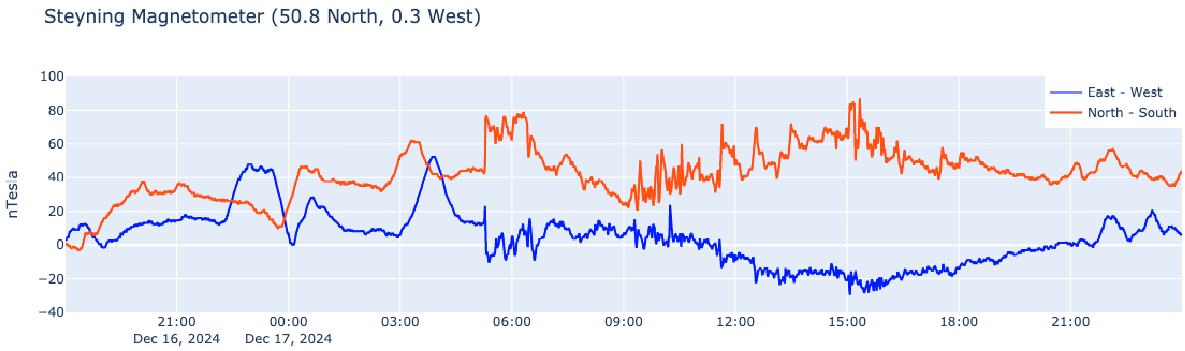


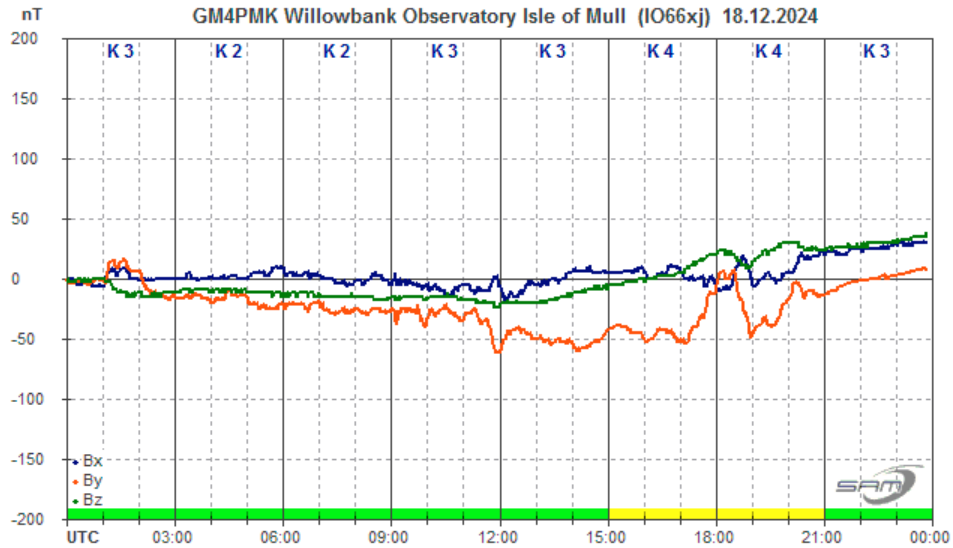
The lower chart shows how the heights have varied since 2010. 2012 to 2015 was the peak of cycle 24, and shows the lowest of the maximum heights. We are currently in the maximum period of cycle 25, again showing lower maximum heights due to the higher levels of X-ray flux. The minimum heights show much less variability.

MAGNETIC OBSERVATIONS.

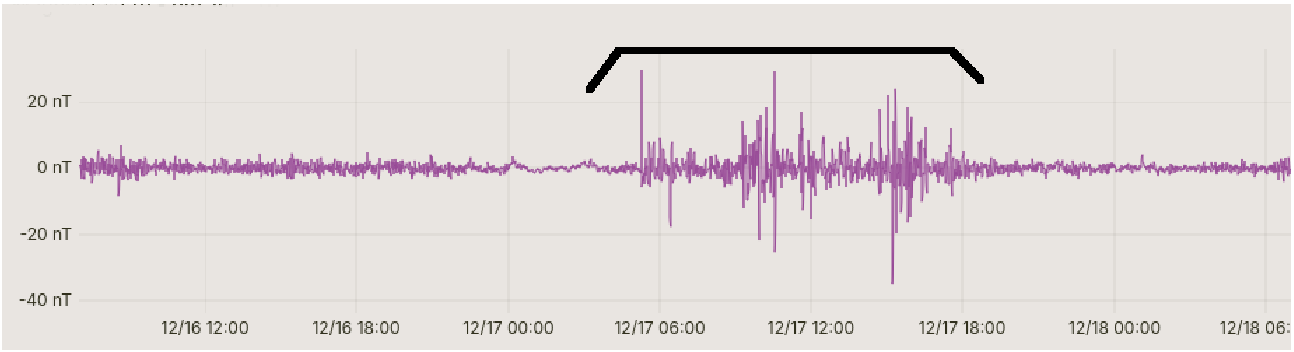


Stuart Green's summary of December's magnetic activity shows a long period of disturbance starting on the 15th, just as the solar flare activity was falling. On the 17th there was a very strong CME impact recorded at 05:15UT with a magnitude of about 40-50nT. It is very clear on Nick Quinn's recording:

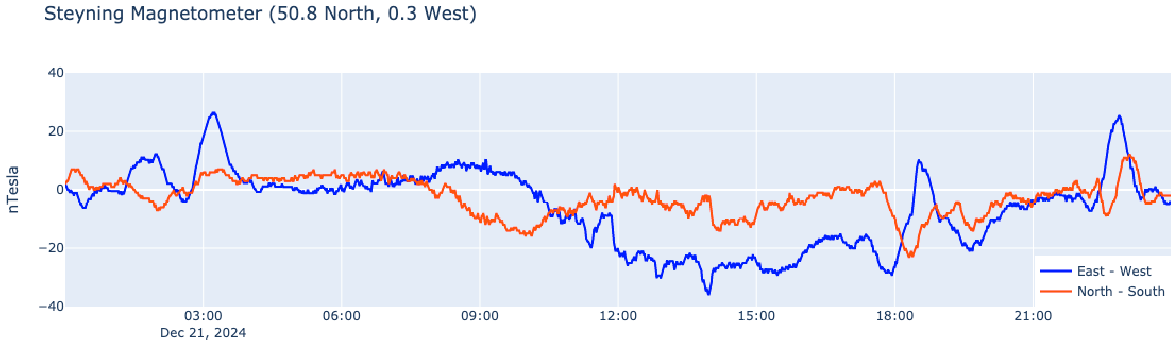


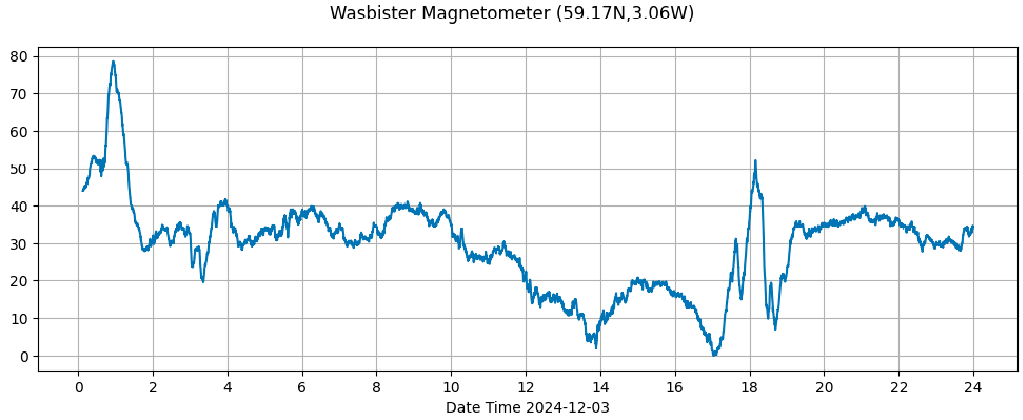


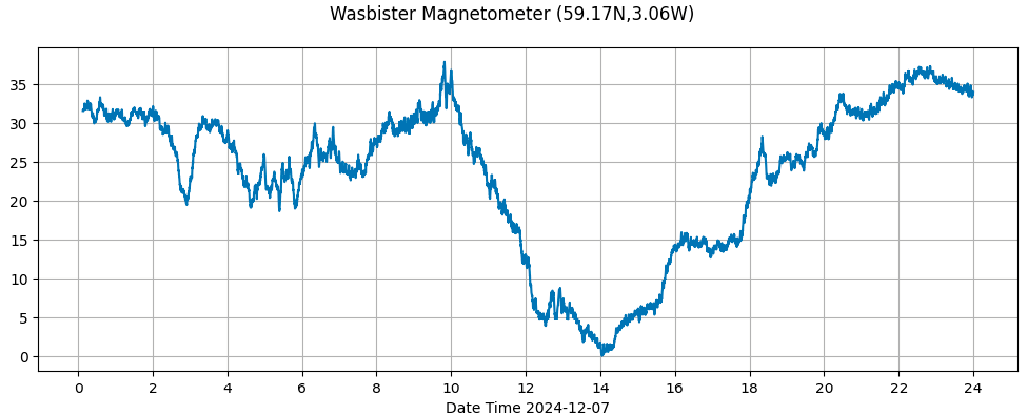
The disturbance faded out in the evening of the 17th, with just a mild disturbance on the 18th shown in Roger Blackwell's recording.



Thomas Mazzi also recorded the activity in Italy, again with a sharp impact around 05:30UT. Strong solar winds added to the disturbance, which then continued over several days. Nick Quinn's recording shows activity on the 21st:



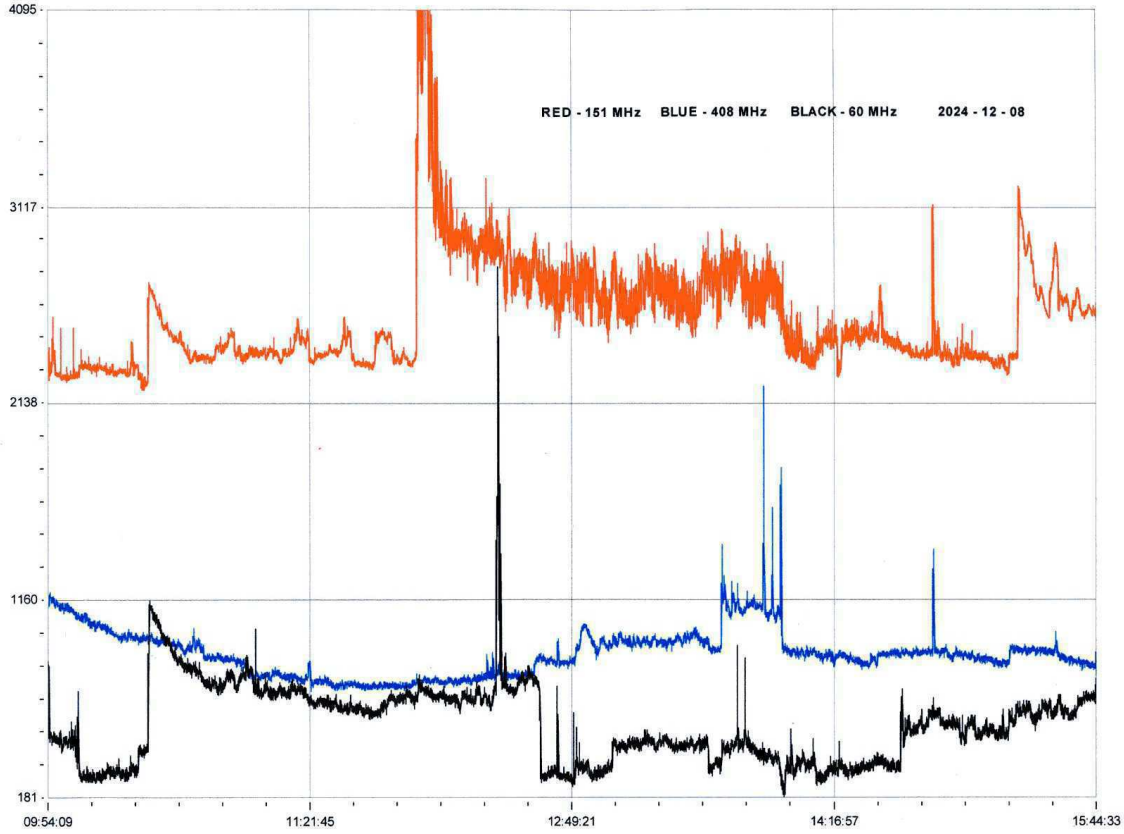




Callum Potter's recordings show activity on the 3rd and 7th, again from solar wind effects.

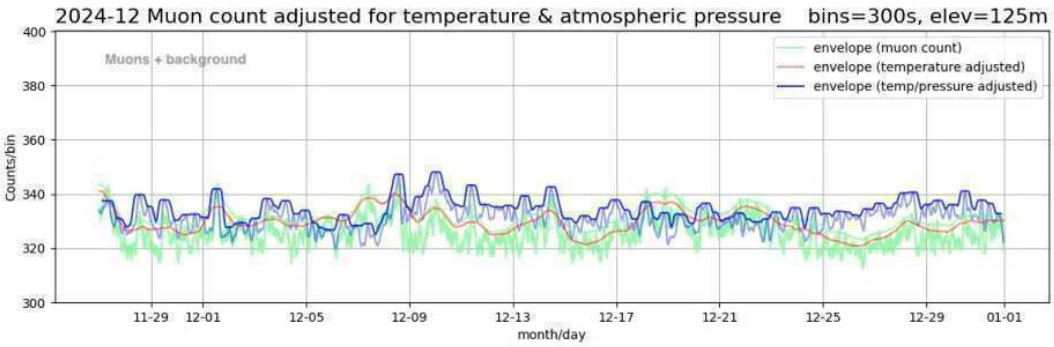
Magnetic observations received from Roger Blackwell, Stuart Green, Thomas Mazzi, Callum Potter, Nick Quinn and John Cook.

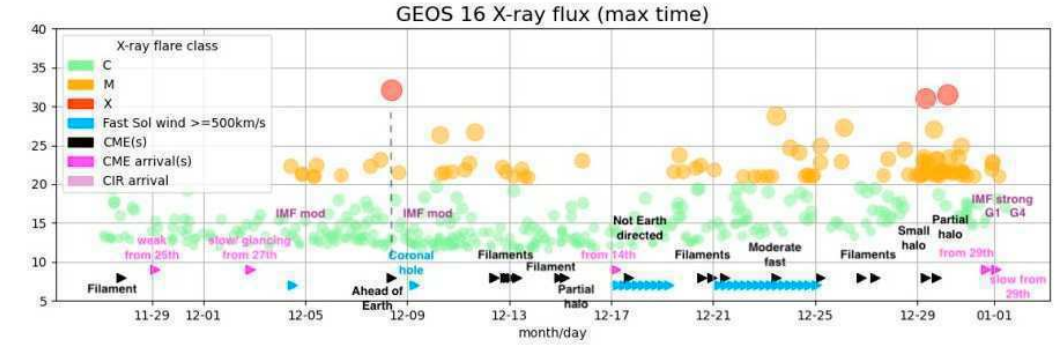
SOLAR EMISSIONS



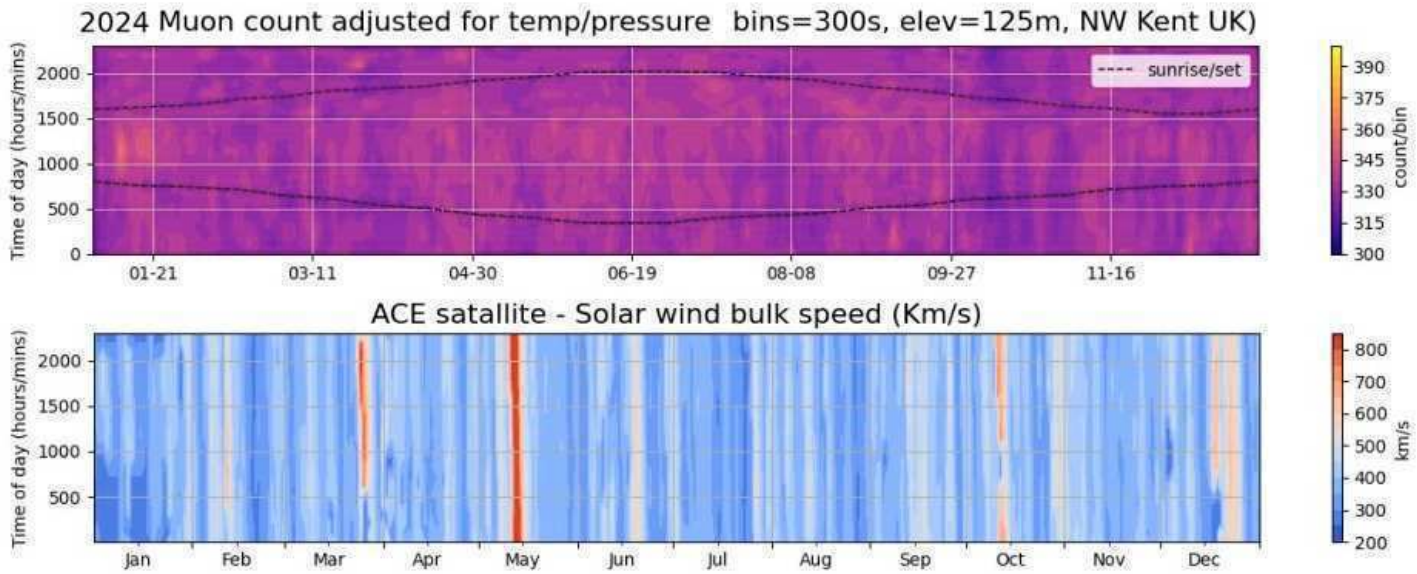
Colin Clements recorded this strong 151MHz noise burst starting at about 11:57UT. It sits between the X2.2 and C8.0 flares and so is rather a puzzle. It could be a delayed effect from the X flare, the lower frequency signal emitted as the flare's shock wave propagated through the varying density of the solar atmosphere.

MUONS



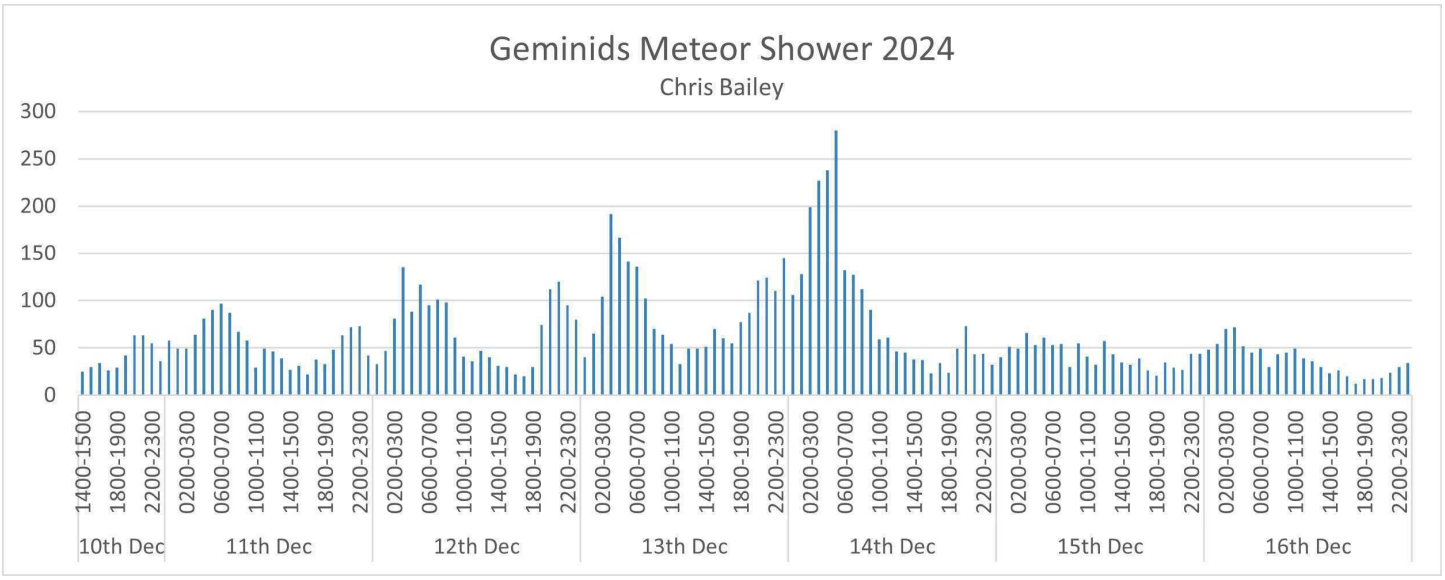


Mark Prescott's chart of Muon counts shows an increase from the 8th to the 15th, a period of lower solar wind speed. The strong CME impact that we recorded on the 17th is followed by a period of lower counts while the wind speed remained high. There was a small rise again in the last week, before a fall at the end of the month. Mark has also provided a chart of the activity through the year:

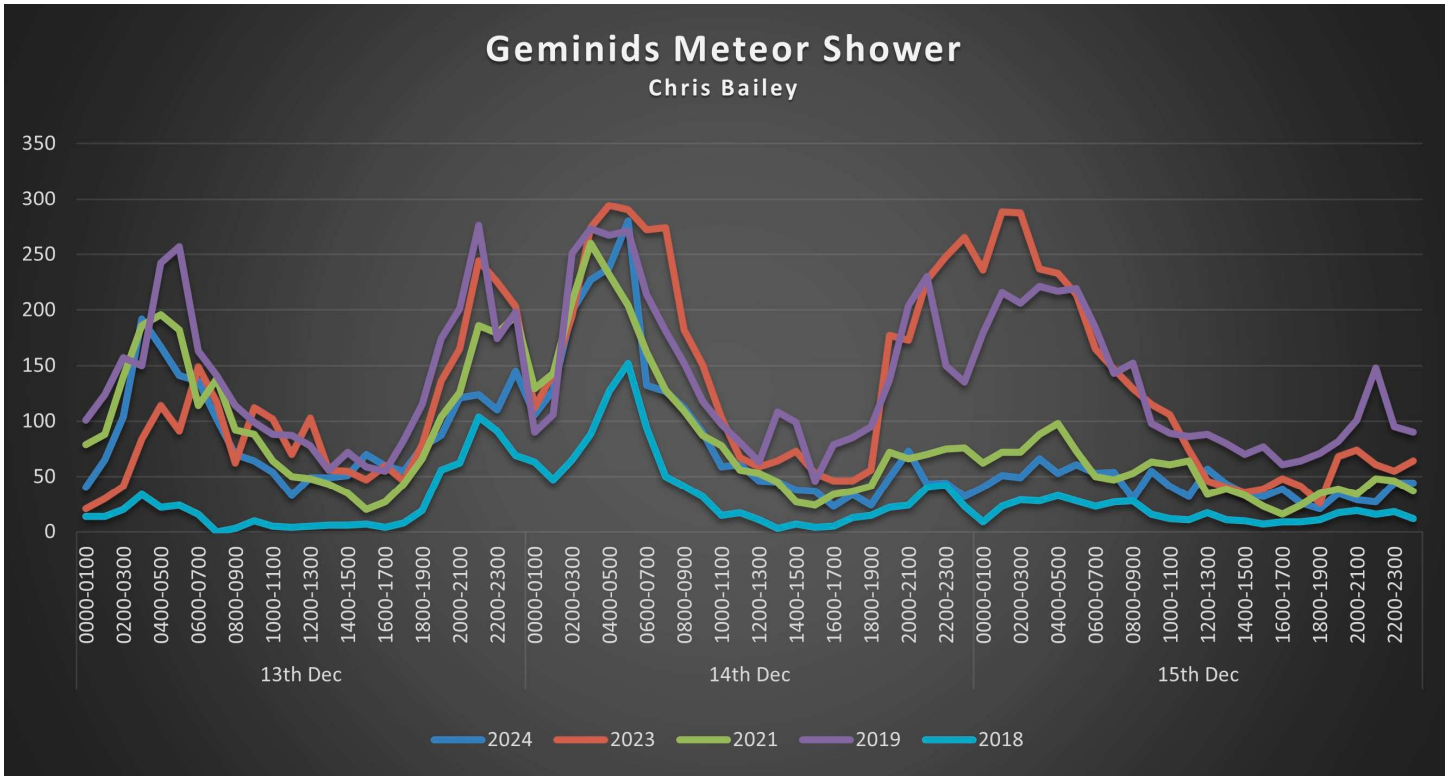


The very high wind speeds recorded in May are clear in the lower panel, and are followed by lower muon counts shown in the upper panel. The May copy of Radio Sky News shows this in more detail. May and August gave our highest flare counts of the year, lower muon counts also seen in the upper chart in August. Some of the highest counts were in January, a time when the sun had a very low altitude during the day and lower solar wind speeds were recorded.

GEMINIDS



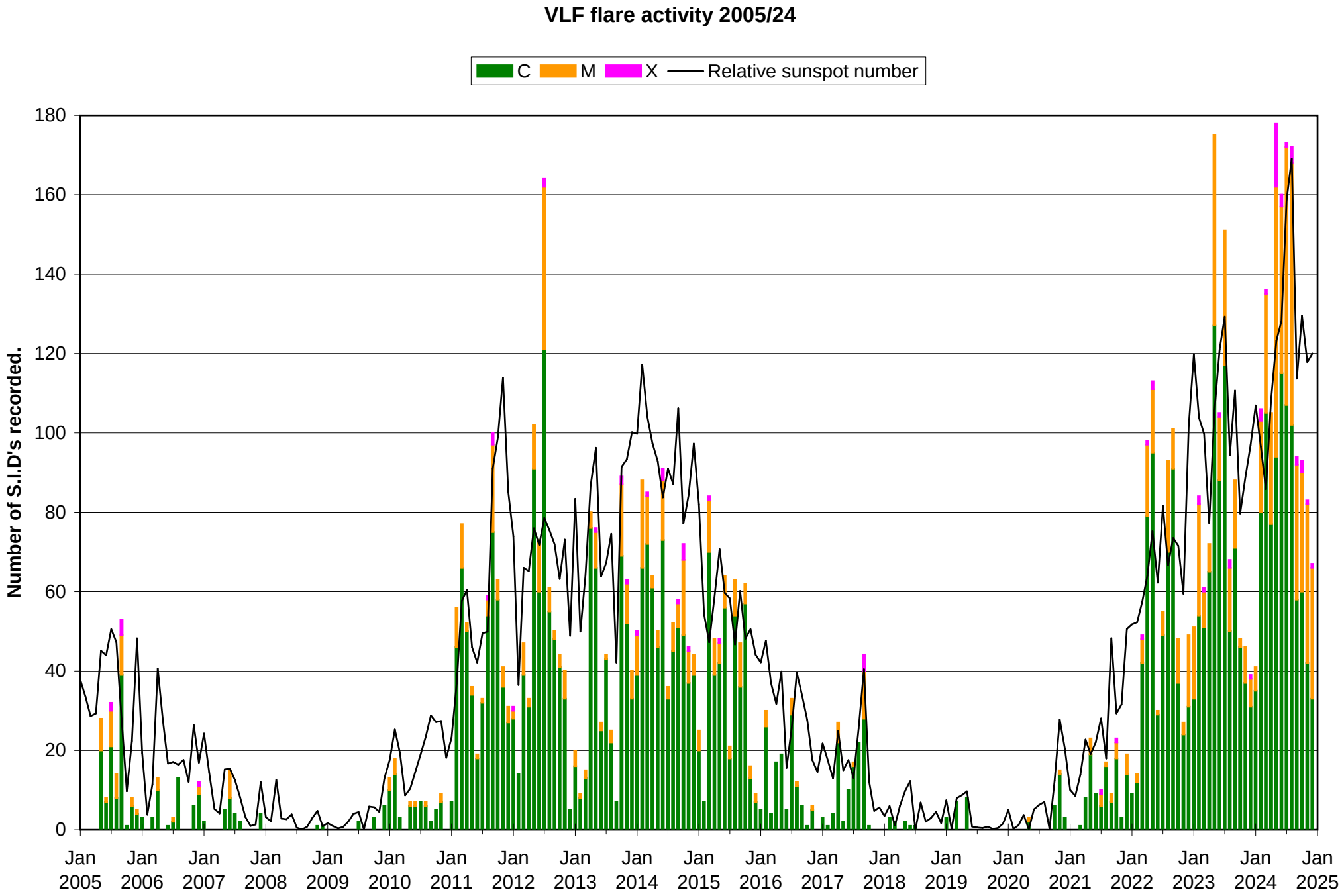
Chris Bailey monitored the December Geminid meteor shower, his chart showing a general rise in meteor counts from the 10th, with a strong peak in the morning of the 14th. This matches well with the predictions in the BAA Handbook. The fall-off in counts was very fast after the peak.



This chart compares the Geminid activity over recent years. In each year overnight activity from the 13th to 14th shows a short drop around midnight. 2019 and 2023 also shows overnight activity from the 14th into the 15th with much less of a midnight dip. General activity levels were also much lower in 2018, with very low activity in the morning of the 13th.

Many of our observers will be aware of the EUCARA meetings for Amateur Radio Astronomy. This year it is being held at the Harwell campus of RAL space, near Oxford, on the 5th to 7th of September. The main speaker will be Professor Jocelyn Bell Burnell. The meeting is still being organised, to find further details and register an interest, go to eucara.org.

Thank you for all of your reports and observations in 2024, I look forward to seeing how solar activity changes in 2025, the 20th year of data in the activity chart.


VLF flare activity 2005/24
C
M
X
Relative sunspot number
Number of S.I.D's recorded.
0
20
40
60
80
100
120
140
160
180
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																													
2570		6	7	8	9	10	11	2253 12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1
	F								C	C											C	CC		C	BCCC			C
2571	2022 February	2	3	4	5	6	7	2254 8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
	F	CC		CC					C			MCCC		CCM														C
2572	2022 March	1	2	3	4	5	6	2255 7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
	F	CM					C	C				CCCC	C		M	CCMC					CC		CC	CCCC	C		C	C
2573	2022 April	28	29	30	31	1	2	3 2256	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
	F	CMC	MCCC	CCCC	CCCX	CCCC	CCMM	CC	C		C		CC	C			CBCC			MMCC	CCCM	CCCM	MMCM	CCCC	CMCC	CC	CMC	C
2574	2022 May	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	20
	F		MCCC	CCCC	CCC	CC	MCCM	MMXM	CCCC		MCX	BMCM	CMMC	CC	CC	CCC	C	CCX	CCMM	CCCM	CCCC	CCCC	C	CMC	CCCC	CCCC	CMMM	CMM
2575		21	22	23	24	25	26	27	28 2258	29	30	31	2022 June 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	F	CCC	CC	CC	CC	CCM	CC	CC	CC												CC	CCMC	C		C	CCCC		C
2576		17	18	19	20	21	22	23	24 2259	25	26	27	28	29	30	2022 July 1	2	3	4	5	6	7	8	9	10	11	12	13
	F	CCCC	CCC	C	CC	C	CC	CC	C	C								BC	C	CC			M	CCCC	CCCC	CM	CCCC	CCC
2577		14	15	16	17	18	19	20	21 2260	22	23	24	25	26	27	28	29	30	31	2022 August 1	2	3	4	5	6	7	8	9
	F	CMCM	CCC	MCM	CCCC		C	CCCC			CCCC	C		C	C						CC	C			CC			
2578		10	11	12	13	14	15	16	17 2261	18	19	20	21	22	23	24	25	26	27	28	29	30	31	2022 September 1	2	3	4	5
	F		C	CC	CCCC	C	CMMM	MCC	CCMM	CMMM	MCCC		C	C			CCCM	CMMM	CMMM	CCMM	CMMM	CCCM	C	CC	CCCC	CCCC	CCCC	CCMC
2579		6	7	8	9	10	11	12	13 2262	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	2022 October 1	2
	F	CC				C	CCCC	CCCC	CCCC	MCCC		MM	M	CC	C	MCCC	M	CCCC	CCCM	CCCC		CCC	CCCC		CC	CCMM	CC	CMMC
2580	2022 October	3	4	5	6	7	8	9	10 2263	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
	F	CMMM	M	C		CM	C	CCCC	CM	MMCC	CC	C	M	C	C		C		CC		CB		CC	C	C			
2581	2022 November	30	31	1	2	3	4	5	6 2264	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
	F								C	C			C	MCCM	CC	C	C	CCC	CC	CC	CCC	M			CCC			
2582	2022 December	26	27	28	29	30	1	2	3	4 2265	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		19	20	21	22	23	24	25	26	27	28 2267	29	30	31	2023 February 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		15	16	17	18	19	20	21	22	23	24	25	26	27	28 2268	1	2023 March 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		14	15	16	17	18	19	20	21	22	23	24 2269	25	26	27	28	29	30	31	2023 April 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		10	11	12	13	14	15	16	17	18	19	20	21 2270	22	23	24	25	26	27	28	29	30	2023 May 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		7	8	9	10	11	12	13	14	15	16	17	18 2271	19	20	21	22	23	24	25	26	27	28	29	30	31	2023 June 1	2
	F	C		CCCM	MCMM	MCCC	MCCM	CCCC	CCCC	C		CCCM	CCCC	MMMM	MCCM	MMMM	CCCM	CCMC	CCMC	MCCM	CCMC	CCC	CCC	MC	C	MMMC	CMCM	CCCC	CC
2589		3	4	5	6	7	8	9	10	11	12	13	14 2272	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
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2590	2023 July	30	1	2	3	4	5	6	7	8	9	10	11 2273	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
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2591		27	28	29	30	31	2023 August 1	2	3	4	5	6	7	8	9 2274	10	11	12	13	14	15	16	17	18	19	20	21	22
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2593		19	20	21	22	23	24	25	26	27	28	29	30	2023 October 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		16	17	18	19	20	21	22	23	24	25	26	27	28 2277	29	30	2023 November 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		13	14	15	16	17	18	19	20	21	22	23	24	25 2278	26	27	28	29	30	2023 December 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		10	11	12	13	14	15	16	17	18	19	20	21	22 2279	23	24	25	26	27	28	29	30	31	2024 January 1	2	3	4	5
	F	CCC	CCCC	CC	C	MMX	MCCM	CC	C	C						MM						C	CCCC	M				
2597		6	7	8	9	10	11	12	13	14	15	16	17	18 2280	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	2	3	4	5	6	7	8	9	10	11	12	13	14	15 2281	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	29	1	2	3	4	5	6	7	8	9	10	11	12	13 2282	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		27	28	29	30	31	2024 April 1	2	3	4	5	6	7	8	9 2283	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		23	24	25	26	27	28	29	30 2024 May	1	2	3	4	5	6 2284	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		20	21	22	23	24	25	26	27	28	29	30	31	2024 June 1	2	2285 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		16	17	18	19	20	21	22	23	24	25	26	27	28	29	30 2286	2024 July 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		13	14	15	16	17	18	19	20	21	22	23	24	25	26	27 2287	28	29	30	31	2024 August 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		9	10	11	12	13	14	15	16	17	18	19	20	21	22	2288 23	24	25	26	27	28	29	30	31	2024 September 1	2	3	4
	F	MMMM	CCMM	MCCM	MC	CCCM	XMMC	CCCC	CMC	MM	MCM	MCCC	CCM	MCCC	CCMC	CCMM	CCMM	CCCC	CMC	CMCC	C	CCC	CMCC	MCMC	MCCM	CMCC	MCCM	CCMC
2606		5	6	7	8	9	10	11	12	13	14	15	16	17	18	2289 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	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	2290 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		29	30	31	2024 November 1	2	3	4	5	6	7	8	9	10	11	12	2291 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		25	26	27	28	29	30	2024 December 1	2	3	4	5	6	7	8	9	2292 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		22	23	24	25	26	27	28	29	30	31	2025 January 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																		

BAA Radio Astronomy Section. **2024 DECEMBER.**

			John Cook (23.4kHz/*22.1kHz*)				Roberto Battaiola (20.3kHz)				Paul Hyde (Various)				Mark Edwards (24.0/*23.4*/ **22.1kHz)**				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	Xray class	Observers	START	PEAK	END (UT)		START	PEAK	END (UT)		START	PEAK	END (UT)		START	PEAK	END (UT)		START	PEAK	END (UT)	
1	C2.1	1													15:07	15:09	15:14	1-				
1	C3.2	1													16:20	16:23	16:26	1-				
2	C4.1	2	11:28	11:33	11:42	1-									**11:29**	**11:32**	**11:43**	**1-**				
4	**M2.3**	7	09:58	10:03	10:15	1-	09:55	10:01	10:26	1+	09:58	10:03	10:30	1+								
4	C4.4	1	*14:50*	*14:55*	*15:06*	*1-*																
5	**M1.1**	1					08:15	08:20	08:41	1+												
5	**M2.5**	8	10:36	10:42	11:07	1+	10:32	10:40	11:01	1+	10:35	10:42	11:20	2	10:37	10:41	10:49	1-	10:38	10:42	11:27	2+
5	C3.6	1													13:38	13:50	14:04	1+				
6	?	1													*09:13*	*09:20*	*?*	-				
6	**M1.2**	3	09:14	09:20	09:27	1-									*09:24*	*09:27*	*09:43*	*1*				
6	?	1													*11:42*	*11:53*	*12:04*	*1*				
6	C5.9	1													14:57	15:01	15:23	1+				
6	C5.1	1													16:00	16:07	16:14	1-				
7	C7.8	2	*08:57*	*08:59*	*09:11*	*1-*									***08:56***	***08:59***	***09:17***	***1***				
7	C7.0	3									10:29	10:33	10:40	1-	*10:28*	*10:32*	*10:41*	*1-*				
7	**M2.3**	8	*13:04*	*13:07*	*13:32*	*1+*					13:03	13:10	13:58	2+	13:03	13:11	14:06	2+	13:05	13:10	14:08	2+
8	**X2.2**	7	08:59	09:05	10:05	2+					09:01	09:09	09:54	2+	*09:00*	*09:08*	*09:53*	*2+*	09:03	09:07	09:26	1
8	C8.0	3	12:08	12:10	12:16	1-									12:08	12:14	12:33	1				
8	C4.5	2	*15:32*	*15:37*	*15:43*	*1-*									15:36	15:38	15:49	1-				
8	**M1.5**	1													16:08	16:13	16:22	1-				
9	C6.3	5	12:22	12:27	12:38	1-	12:10	12:26	12:26	1-					*12:23*	*12:36*	*12:52*	*1+*	12:29	13:47	14:09	3
10	**M1.5**	7	*10:59*	*11:05*	*11:23*	*1*					10:58	11:06	11:30	1+	11:02	11:06	11:13	1-				
10	C2.6	1													***12:12***	***12:26***	***12:45***	***2***				
10	**M1.6**	1													17:56	18:00	18:11	1-				
11	**M2.7**	9	10:05	10:09	10:25	1	10:03	10:07	10:38	2	10:06	10:09	10:27	1	*10:05*	*10:14*	*10:34*	*1+*	10:09	10:23	11:30	2+
11	C3.8	3					11:16	11:21	11:25	1-	11:19	11:22	11:28	1-	*11:18*	*11:22*	*11:33*	*1-*				
11	C5.7	6	11:40	11:43	11:54	1-	11:37	11:42	11:53	1-	11:40	11:43	11:54	1-	*11:40*	*11:43*	*11:51*	*1-*				
11	C3.1	1													14:18	14:24	14:35	1-				
11	**M6.7**	2									15:40	15:47	16:28	2+	15:41	15:48	16:20	2				
12	C3.3	2									12:43	12:48	12:52	1-	*12:44*	*12:47*	*12:55*	*1-*				
12	C4.5	1													15:35	15:40	15:49	1-				
12	**M2.2**	1													17:40	17:46	18:06	1+				
13	**M2.0**	9	11:20	11:25	11:50	1+	11:15	11:24	12:35	2+	11:22	11:25	12:01	2	11:22	11:24	11:37	1-				
13	C4.2	5					13:01	13:08	13:18	1-	13:04	13:09	13:22	1-	13:05	13:10	13:18	1-				
13	**M1.0**	5	*14:23*	*14:26*	*14:34*	*1-*					14:23	14:28	14:58	2	14:23	14:28	14:43	1				
15	C7.2	2	09:35	09:39	10:04	1+									**09:38**	**09:41**	**09:47**	**1-**				
15	C5.9	1													***09:54***	***09:55***	***10:17***	***1***				
15	C2.9	7									11:05	11:09	?	-	*11:04*	*11:09*	*?*	-	11:05	11:10	11:24	1
15	?	2									11:13	11:15	11:30	1-	*11:13*	*11:15*	*11:31*	*1-*				
15	C3.1	1													***13:50***	***13:51***	***13:55***	***1-***				
15	C3.3	1													***14:13***	***14:15***	***14:18***	***1-***				
19	**M1.6**	8	10:29	10:37	10:53	1	10:24	10:38	11:21	2+	10:27	10:40	11:11	2	*10:28*	*10:34*	*10:55*	*1+*				
19	C7.1	5	13:51	13:55	14:05	1-					13:50	13:55	14:10	1	13:51	13:56	14:13	1				
19	C7.6	3					14:26	14:32	14:40	1-	14:27	14:35	14:45	1-	14:30	14:33	14:46	1-				
19	C5.9	2									15:06	15:08	15:18	1-	15:06	15:08	15:18	1-				
19	**M3.8**	3	*15:33*	*15:35*	*15:41*	*1-*					15:33	15:37	16:19	2+	15:31	15:36	16:06	2				
20	C9.4	3	08:59	09:03	09:11	1-	08:57	09:03	09:18	1					***09:00***	***09:04***	***09:14***	***1-***				
20	C9.4	5	10:10	10:12	10:22	1-	10:05	10:13	10:36	1+	10:10	10:12	10:27	1-	*10:10*	*10:13*	*10:27*	*1-*				
20	**M2.5**	9	11:17	11:20	11:32	1-	11:14	11:20	12:11	2+	11:17	11:19	11:42	1	11:18	11:20	11:34	1-				
22	C9.6	3	10:28	10:32	10:38	1-					10:27	10:33	10:56	1+	*10:29*	*10:33*	*?*	-				
22	?	1													*10:40*	*10:43*	*10:51*	*1-*				
22	**M1.0**	2	*14:09*	*14:15*	*14:28*	*1*									14:11	14:19	14:41	1+				
23	**M8.9**	8	*11:09*	*11:13*	*11:40*	*1+*	11:06	11:17	11:40	2	11:08	11:12	11:59	2+	11:09	11:13	11:26	1-				
24	**M4.1**	2					08:29	08:42	09:26	2+					**08:40**	**08:44**	**08:48**	**1-**				
24	C8.9	3	*09:38*	*09:41*	*09:53*	*1-*	09:31	09:41	10:11	2												
24	**M1.1**	3					14:03	14:09	14:13	1-					14:07	14:11	14:30	1				
24	C8.5	1													15:13	15:18	15:46	2				
25	C4.5	1													15:09	15:11	15:14	1-				
27	**M1.2**	2					15:34	15:39	15:52	1-					15:35	15:38	15:51	1-				
28	**M4.5**	6	*11:15*	*11:20*	*11:40*	*1*					11:14	11:22	11:58	2								
28	**M1.3**	2	*15:16*	*15:18*	*15:32*	*1-*					15:16	15:20	15:47	1+								
29	**M1.4**	1													***09:39***	***09:48***	***10:02***	***1***				
29	**M2.6**	5	*10:37*	*10:41*	*10:48*	*1-*					10:30	10:40	10:58	1+	**10:32**	**10:49**	**10:56**	**1**				
29	*	1													***11:21***	***11:24***	***11:41***	***1***				
29	**M1.6**	6	*12:23*	*12:25*	*12:42*	*1*					12:19	12:26	12:43	1	12:22	12:26	12:31	1-				
29	*	1									12:47	12:50	?	-								
29	**M1.3**	5	*12:53*	*12:57*	*13:08*	*1-*					12:51	12:57	13:15	1	12:53	12:57	13:03	1-				
29	*	1													14:11	11:24	14:49	2				
29	**M7.1**	4									15:06	15:12	?	-	15:06	15:12	15:52	2+				
29	**M3.3**	1													17:03	17:11	17:57	2+				
30	**M1.4**	1	*08:43*	*08:45*	*?*	-																
30	**M1.7**	1	*08:49*	*08:52*	*09:01*	*1-*																
30	**M1.7**	3	*10:08*	*10:10*	*10:17*	*1-*					10:06	10:12	10:23	1-	**10:07**	**10:12**	**10:17**	**1-**				
30	**M3.5**	4	*14:23*	*14:46*	*14:54*	*1+*					14:40	14:47	15:02	1	**14:43**	**14:54**	**15:08**	**1**				

BAA Radio Astronomy Section. **2024 DECEMBER.**

	Xray class		Steve Parkinson (Various)				Andrew Thomas (21.7/*19.6*/**22.1kHz**)				Phil Rourke (23.4kHz)				Mark Prescott (20.9kHz/*22.1kHz*)				John Elliott (19.6kHz)			
			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	C2.1																					
1	C3.2																					
2	C4.1																					
4	**M2.3**		09:58	10:02	10:20	1	09:58	10:03	10:06	1-	10:00	10:02	10:22	1	10:02	10:07	10:21	1				
4	C4.4																					
5	**M1.1**																					
5	**M2.5**		10:36	10:41	11:17	2	10:36	10:42	11:01	1					10:41	10:46	11:20	2				
5	C3.6																					
6	?																					
6	**M1.2**						09:14	09:20	09:52	2												
6	?																					
6	C5.9																					
6	C5.1																					
7	C7.8																					
7	C7.0						10:29	10:32	10:40	1-												
7	**M2.3**		13:04	13:10	13:45	2	13:03	13:09	13:34	1+	13:02	13:09	13:27	1	13:07	13:13	13:50	2				
8	**X2.2**										08:59	09:23	09:54	2+	09:06	09:12	09:49	2	09:05	09:08	09:20	1-
8	C8.0		12:07	12:12	12:25	1-																
8	C4.5																					
8	**M1.5**																					
9	C6.3		12:21	12:26	12:40	1																
10	**M1.5**		10:58	11:06	11:30	1+	10:57	11:06	11:13	1-					11:05	11:10	11:27	1	11:00	11:07	11:45	2
10	C2.6																					
10	**M1.6**																					
11	**M2.7**		10:05	10:08	10:25	1	*10:05*	*10:07*	*10:26*	*1*					*10:09*	*10:11*	*10:18*	*1-*	10:06	10:07	10:30	1
11	C3.8																					
11	C5.7		11:40	11:42	11:55	1-	*11:39*	*11:42*	*12:03*	*1*												
11	C3.1																					
11	**M6.7**																					
12	C3.3																					
12	C4.5																					
12	**M2.2**																					
13	**M2.0**		11:21	11:25	11:50	1+	11:21	11:24	11:40	1	11:20	11:23	12:03	2	11:25	11:28	11:46	1	11:22	11:24	11:36	1-
13	C4.2		13:05	13:09	13:20	1-	**13:03**	**13:09**	**13:20**	**1-**												
13	**M1.0**		14:23	14:26	14:40	1-	14:23	14:26	14:38	1-												
15	C7.2																					
15	C5.9																					
15	C2.9		11:05	11:08	11:18	1-	11:02	11:08	11:31	1+	11:04	11:08	11:30	1+	11:10	11:18	?	-				
15	?																					
15	C3.1																					
15	C3.3																					
19	**M1.6**		10:29	10:36	11:00	1+	10:28	10:42	10:56	1+	10:28	10:36	11:05	2	10:34	10:43	10:56	1				
19	C7.1						13:50	13:55	14:08	1-	13:51	13:54	14:07	1-								
19	C7.6																					
19	C5.9																					
19	**M3.8**																					
20	C9.4																					
20	C9.4						10:10	10:14	10:28	1-												
20	**M2.5**		11:17	11:19	11:40	1	11:19	11:20	11:37	1-	11:17	11:19	11:48	1+	11:22	11:23	11:52	1+	11:18	11:19	11:30	1-
22	C9.6																					
22	?																					
22	**M1.0**																					
23	**M8.9**		11:08	11:12	12:20	2+	11:08	11:14	11:58	2+					11:12	11:17	12:00	2+	11:08	11:14	12:20	2+
24	**M4.1**																					
24	C8.9						09:34	09:42	10:01	1+												
24	**M1.1**						14:03	14:11	14:26	1												
24	C8.5																					
25	C4.5																					
27	**M1.2**																					
28	**M4.5**		11:17	11:23	11:55	2	11:12	11:23	11:51	2					11:22	11:26	11:49	1+	11:15	11:23	12:10	2+
28	**M1.3**																					
29	**M1.4**																					
29	**M2.6**		10:32	10:40	10:58	1+									10:38	10:45	11:03	1				
29	*																					
29	**M1.6**		12:22	12:25	12:37	1-	12:22	12:24	12:37	1-					12:27	12:29	12:41	1-				
29	*																					
29	**M1.3**		12:54	12:56	13:06	1-	*12:53*	*12:56*	*13:08*	*1-*												
29	*																					
29	**M7.1**		15:06	15:11	15:27	1	15:05	15:11	15:41	2												
29	**M3.3**																					
30	**M1.4**																					
30	**M1.7**																					
30	**M1.7**																					
30	**M3.5**		14:40	14:46	15:10	1+																