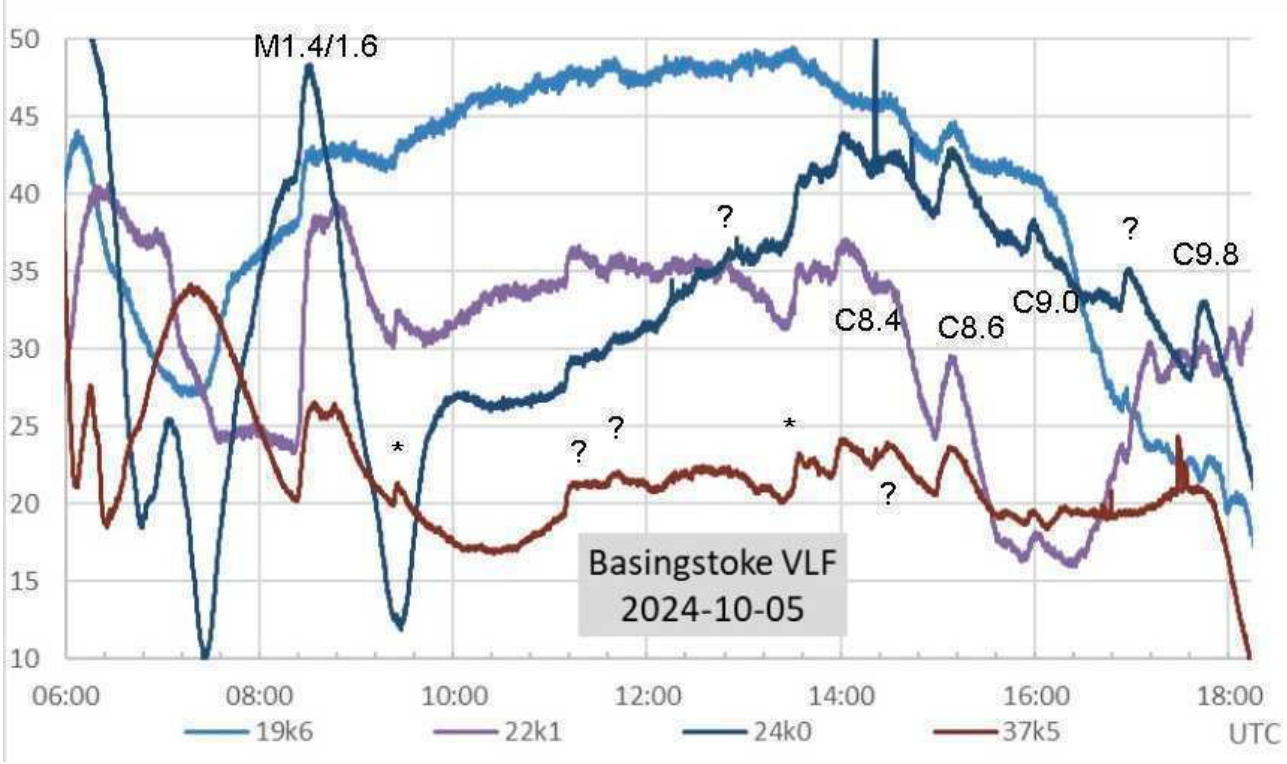
The British Astronomical Association
A company limited by guarantee
Registered Charity No. 210769
Founded in 1890
PO Box 702, Tonbridge, TN9-9TX 020-7734 4145
www.britastro.org

Please send all reports and observations to jacook@jacook.plus.com
BAA Radio Astronomy Section. Director Paul Hearn.

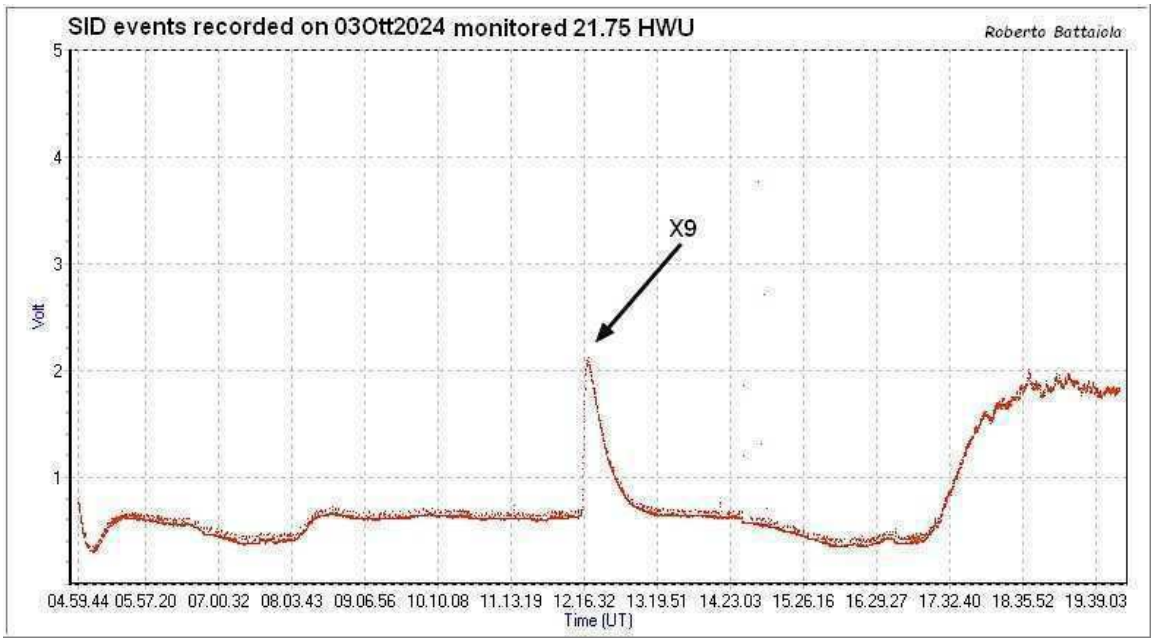
RADIO SKY NEWS 2024 OCTOBER.

VLF SID OBSERVATIONS.

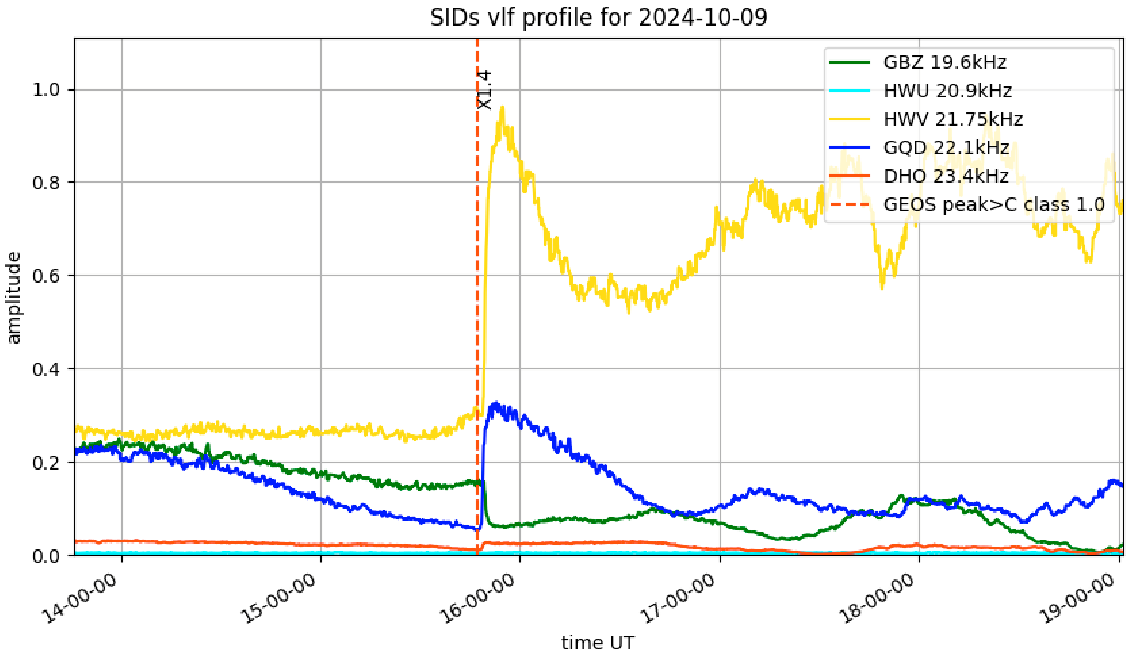
Solar flare activity in October was at a similar level to that in September, with another 3 X-class flares recorded as SIDs. Once again many of the flares had multiple peaks, and there were plenty of well-observed events that were not classified or not listed in the GOES satellite data.



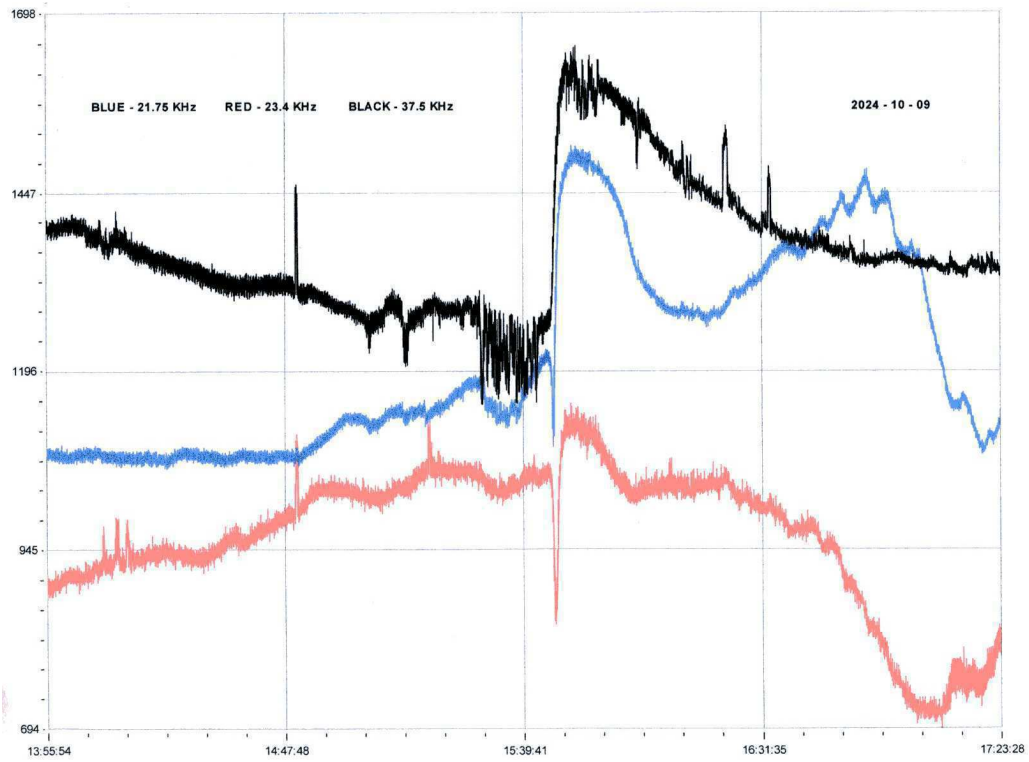
This recording from Paul Hyde shows plenty of activity on the 5th, much of it being unclassified. The M1.4 and M1.6 flares around 08:30UT were merged into a single SID in many recordings, occurring at the end of the local sunrise disturbance. This was followed by a series of small SIDs of unknown origin, before some strong C-class flares leading into the sunset. The last C9.8 flare was too late for the UK signals at 19.6kHz and 22.1kHz. During the autumn period, especially in October, the Earth-Sun alignment is perfect for minor magnetic disturbances to strongly influence the ionosphere, perhaps explaining some of the smaller SIDs shown in our recordings.



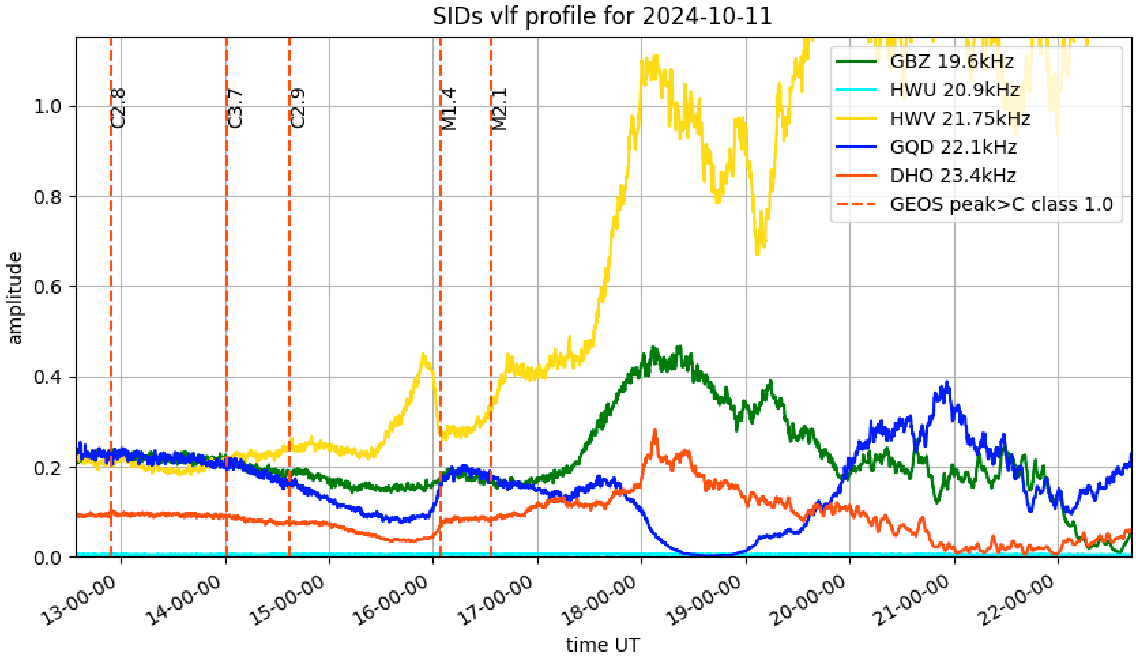
The strongest flare was the X9.0, well timed just after midday on the 3rd, shown here by Roberto Battaiola. There is also a small SID from the pair of M1.5 flares earlier in the morning. The GOES data gives peak times of 08:28 and 08:36 for these, producing a single, rather slow, SID. The later M1.5 flare at 17:20 has been lost in the sunset. The general background is much quieter compared to that shown on the 5th.



The X1.4 flare on the 9th was rather later in the afternoon, peaking just before 16:00UT. Mark Prescott's recording shows a pair of mirror SIDs at 19.6 and 22.1kHz, both with a clear decay phase. 21.75kHz shows a very strong rise to the peak, but then seems to hover at a much higher level than pre-flare. This path runs south into France, and so the sunset should be slightly later than with the northern UK paths. A rather strange behaviour. The flare was widely recorded, but I only have one other recording that shows this frequency, from Colin Clements:

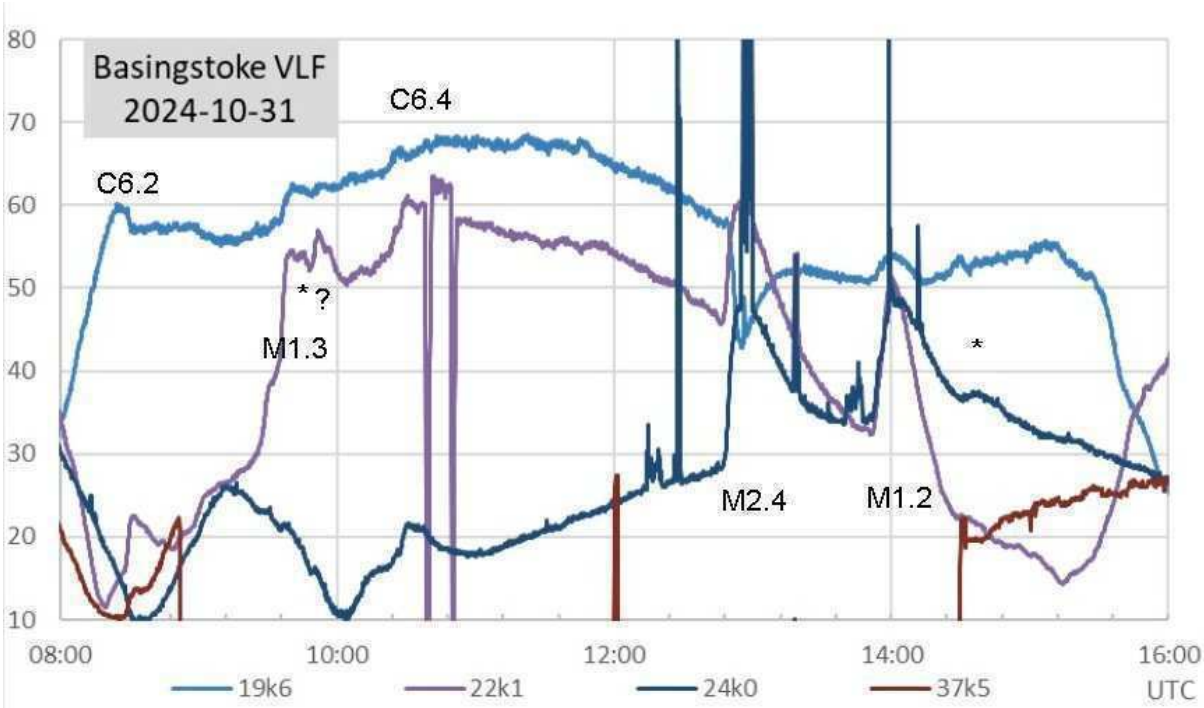


21.75kHz is shown in blue, with a spike-and-wave SID. It also shows the signal rising again after a short decay. 23.4kHz (red) has an eastern path, and shows an earlier sunset. 37.5kHz (black) is from Grindavik, Iceland, and so does not show any sunset effects.



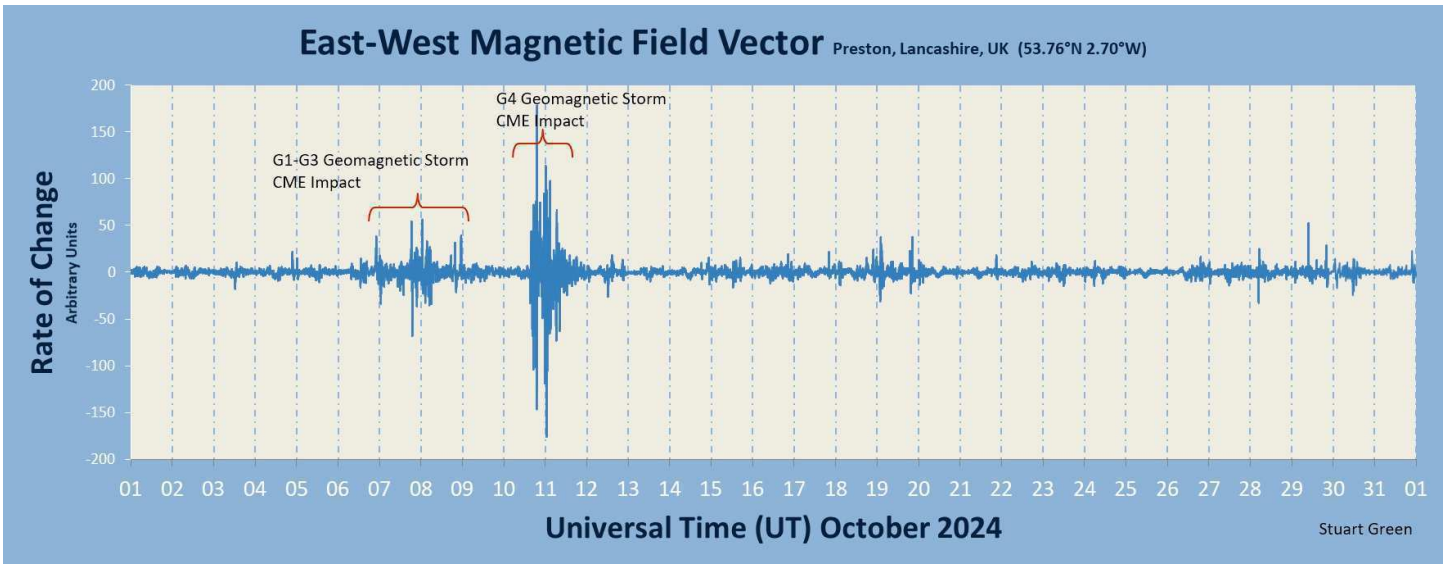
The M2.1 and M1.4 flares in the afternoon of the 11th merged to produce a single SID in all of our observations. The GOES data shows that they were both produced from the same active region, AR 13854. Mark Prescott's recording clearly shows a single SID at 19.6 and 22.1kHz, with a more complex SID at 21.75kHz. The GOES data lists peaks at 16:04 and 16:33, joining at 16:07UT. Our spread of peak timings from 16:02 to 16:21 reflects this complexity.

Activity through the middle of October was rather lower, increasing again at the end of the month.

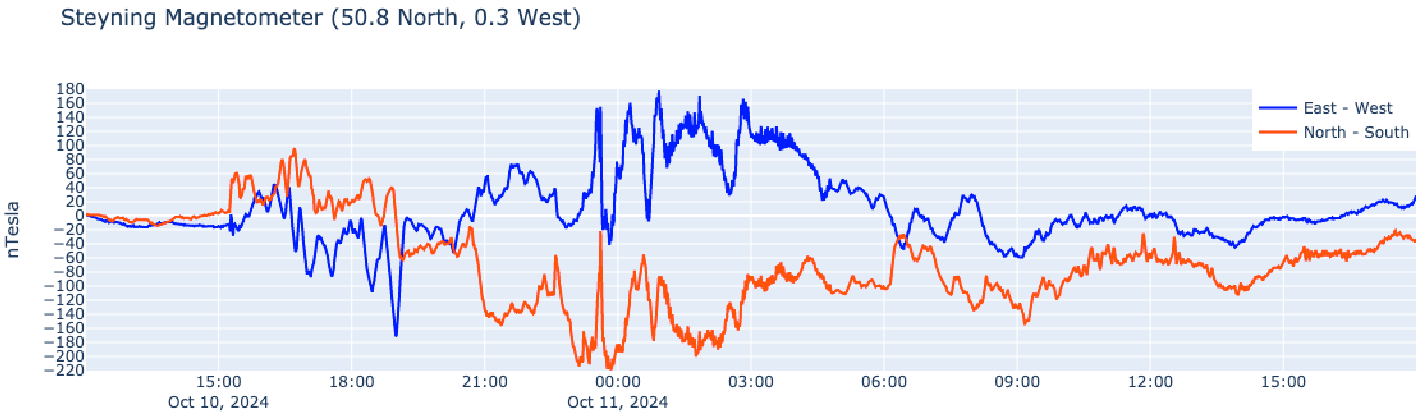


Paul Hyde's recording on the 31st shows the activity along with some significant interference. 22.1kHz shows the best SIDs, including the multiple peaks between 09:30 and 10:00UT.

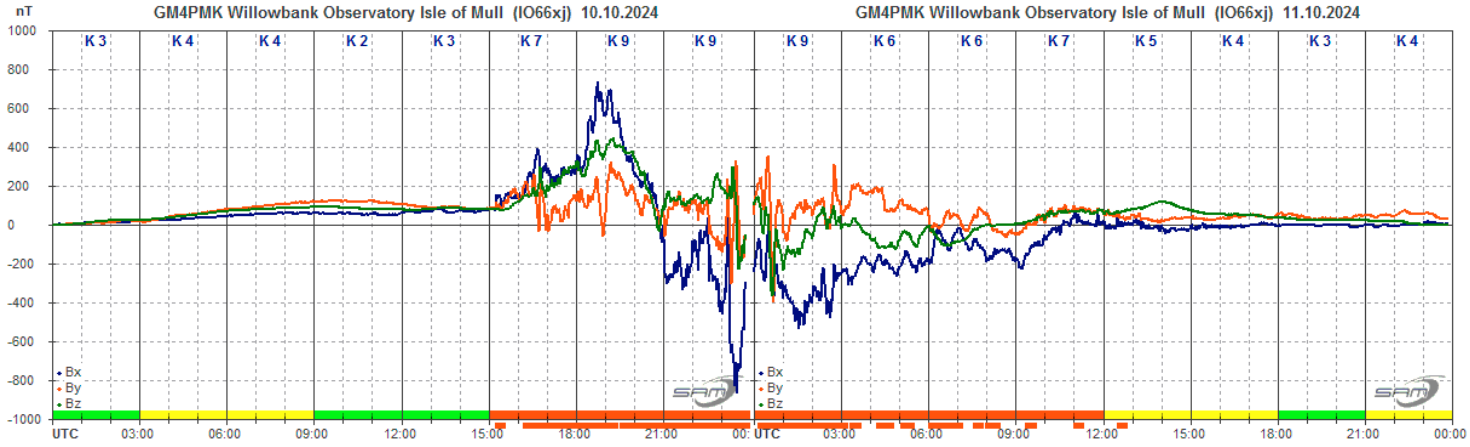
MAGNETIC OBSERVATIONS.



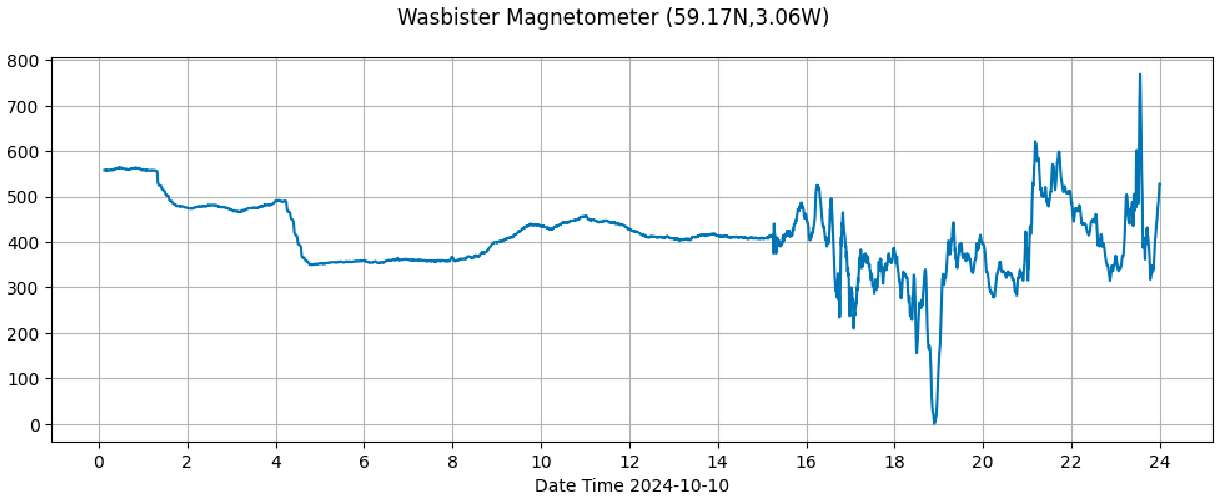
Stuart Green's summary of the month's magnetic activity shows just two periods of major disturbance, the storm on the 10th–11th of similar magnitude to that seen back in May. The STCE bulletin lists the source as a CME associated with an X1.8 flare on the 9th. This flare was at about 02:00UT, and so sadly not recorded as a SID. We do, however, have some excellent magnetic recordings showing its arrival impact at about 15:15 on the 10th, giving a transit time of 37 hours and 15 minutes. This makes it the third fastest CME that we have recorded, the first being on 2012 March 7th at 34h 41m.



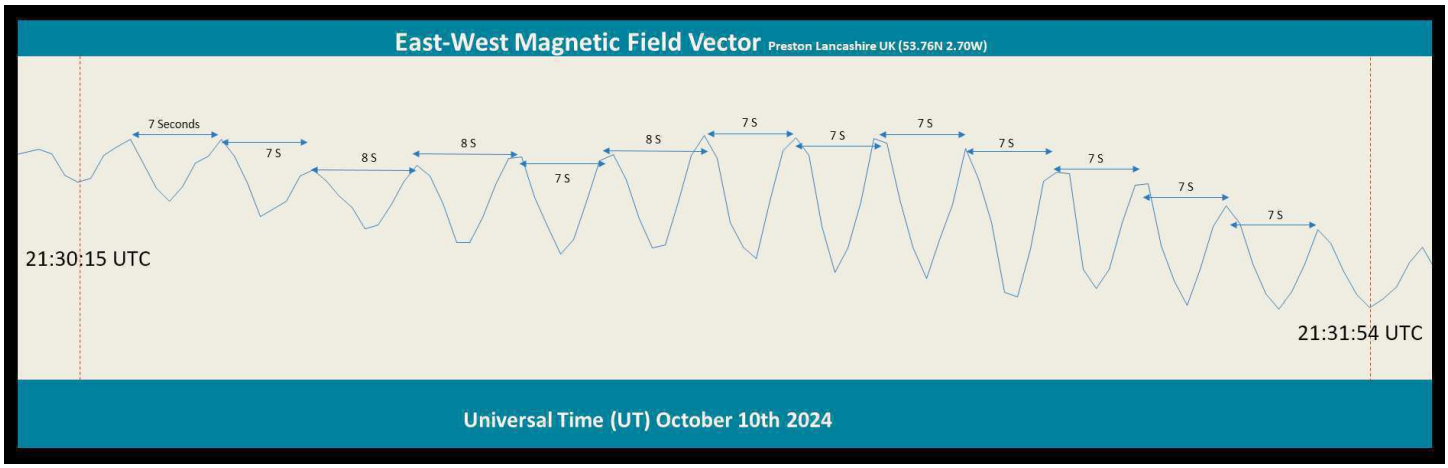
Nick Quinn's recording shows the CME impact followed by strong activity into the afternoon of the 11th, from the south coast. Roger Blackwell's recording from the Isle of Mull shows a stronger magnetic disturbance:



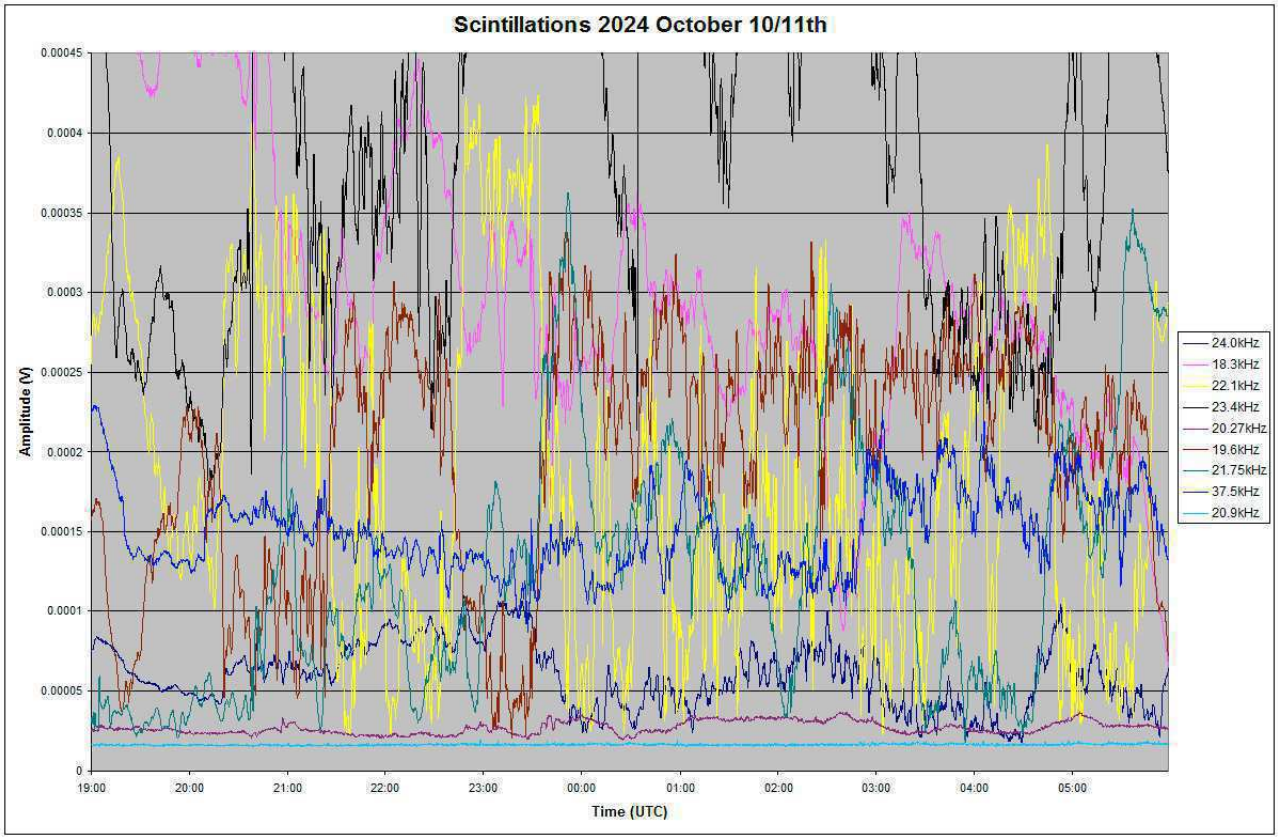
The CME impact is again clear, followed by a greater amplitude swing in the magnetic field.



A similar magnetic variation was recorded by Callum Potter, further north in Orkney. The single axis sensor records a vector sum of the three axes shown in Roger Blackwell's recording, and so appears slightly less when comparing the nT scales.



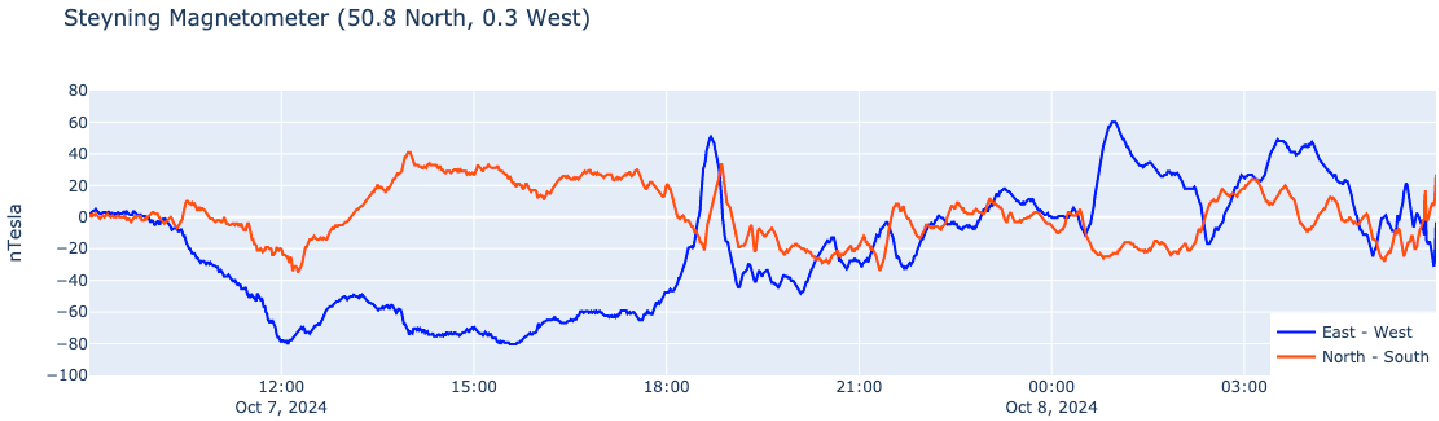
Stuart Green looked at his recordings in more detail, discovering this period of very stable oscillation during a very turbulent evening. They are a very rare example of PC2 waves, produced by Ultra Low Frequency magnetic waves travelling through the Earth's magnetosphere. The oscillation period is mostly 7.5 seconds, with some of the earlier ones at 8.5 seconds. These waves are classified according to the period, PC2 being in the range 5 to 10 seconds. PC1 are 0.2-5s, PC3 are 10-45s. Stuart received confirmation of this from Dr Tony Phillips at SpaceWeather.com (NASA). Stuart was also lucky to see another superb auroral display during this storm.

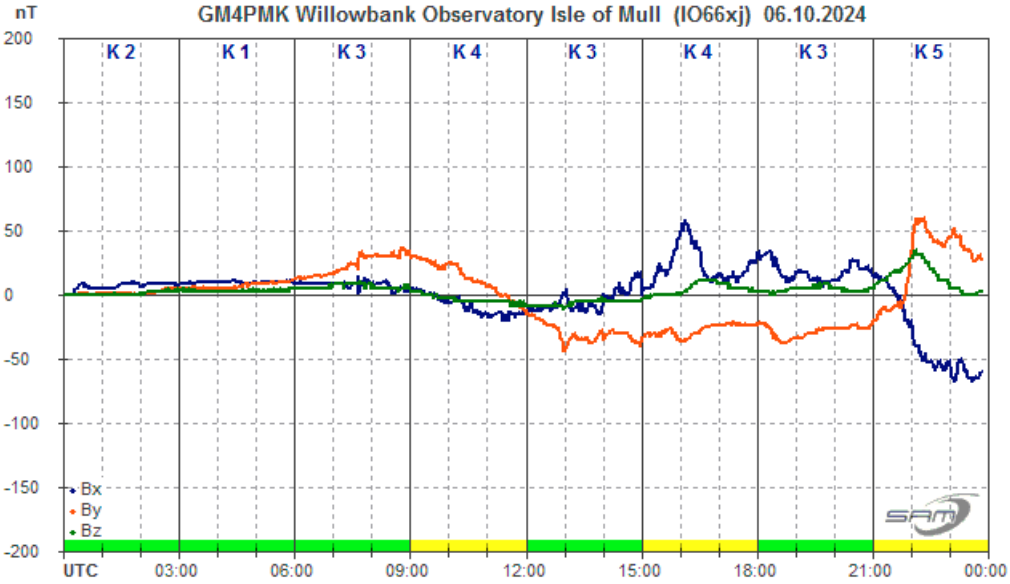


There were also some significant effects seen on the VLF signals during the storm, shown in this very chaotic chart from Mark Edwards. We often see magnetic induced VLF disturbances in the Trans-Atlantic signals, but the greatest effect here seems to have been on the European and UK signals. 24kHz shows a mild disturbance, while the Italian signal at 20.7kHz shows little disturbance. 20.9kHz appears to be off-air. Mark's recording from the following night still shows some scintillation, but with much smaller amplitude.

A recent STCE bulletin (STCEnews20241115.pdf) includes an item on Geomagnetic Induced Currents (GICs) produced within the Earth from these very strong magnetic storms. The huge storm of 1989 March showed how destructive they can be when the electricity distribution network in Quebec, Canada, was taken out due to the excess currents. The oil pipeline that runs from the north coast of Alaska to its south coast has regular insulating sections to prevent such currents from developing. This year's storms do not appear to have caused any such problems.

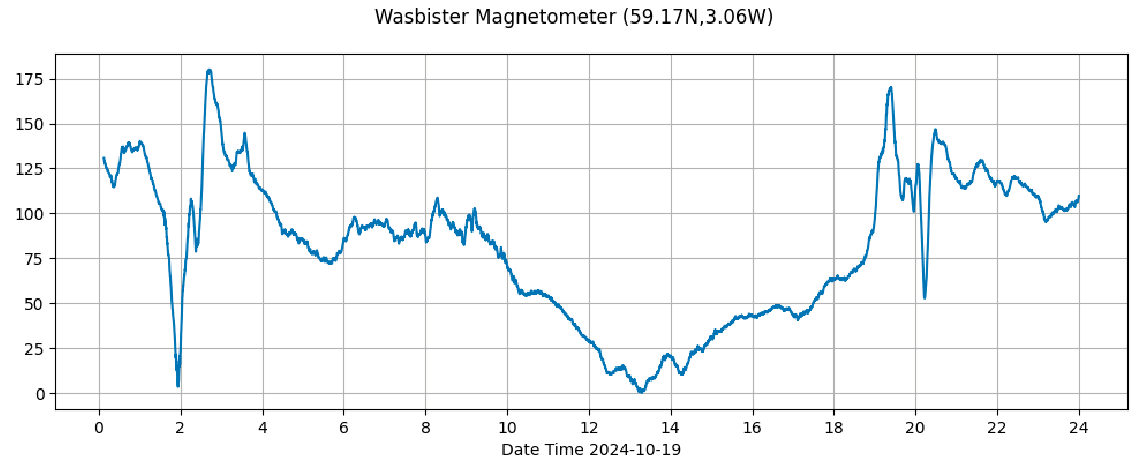
There was a much smaller magnetic storm from the 6th to 9th, the most active part shown in Nick Quinn's recording:





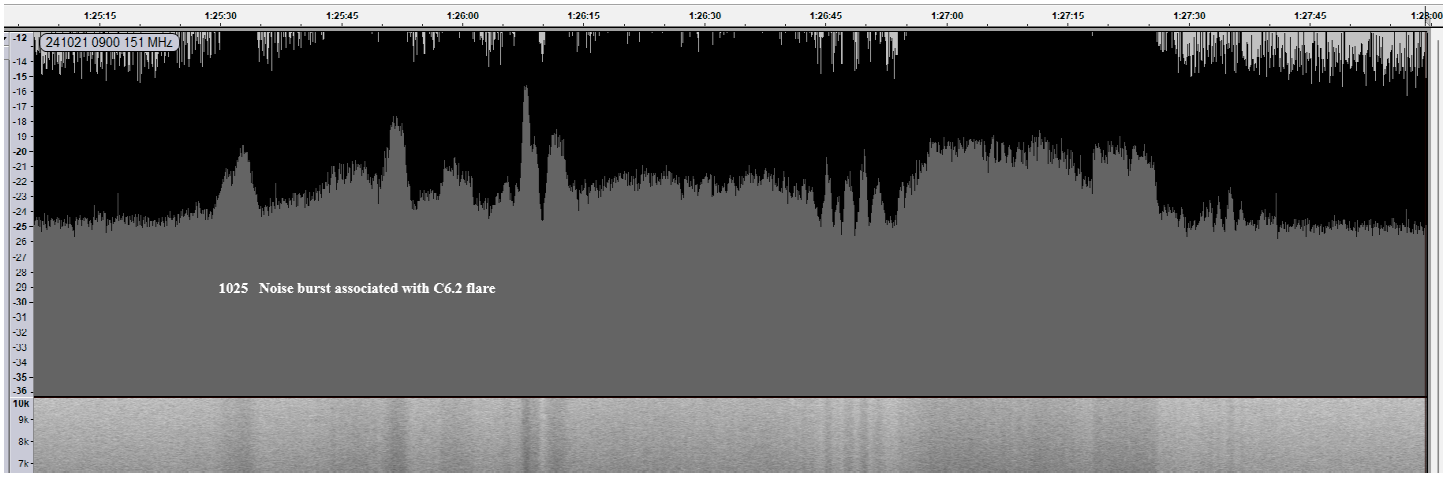
Roger Blackwell's recording shows the start of the disturbance on the 6th, with a very small CME impact visible at about 07:45UT. The STCE bulletin links this to CMEs from the 3rd. Activity continued into the 9th, but was very mild in comparison with the 10th/11th.

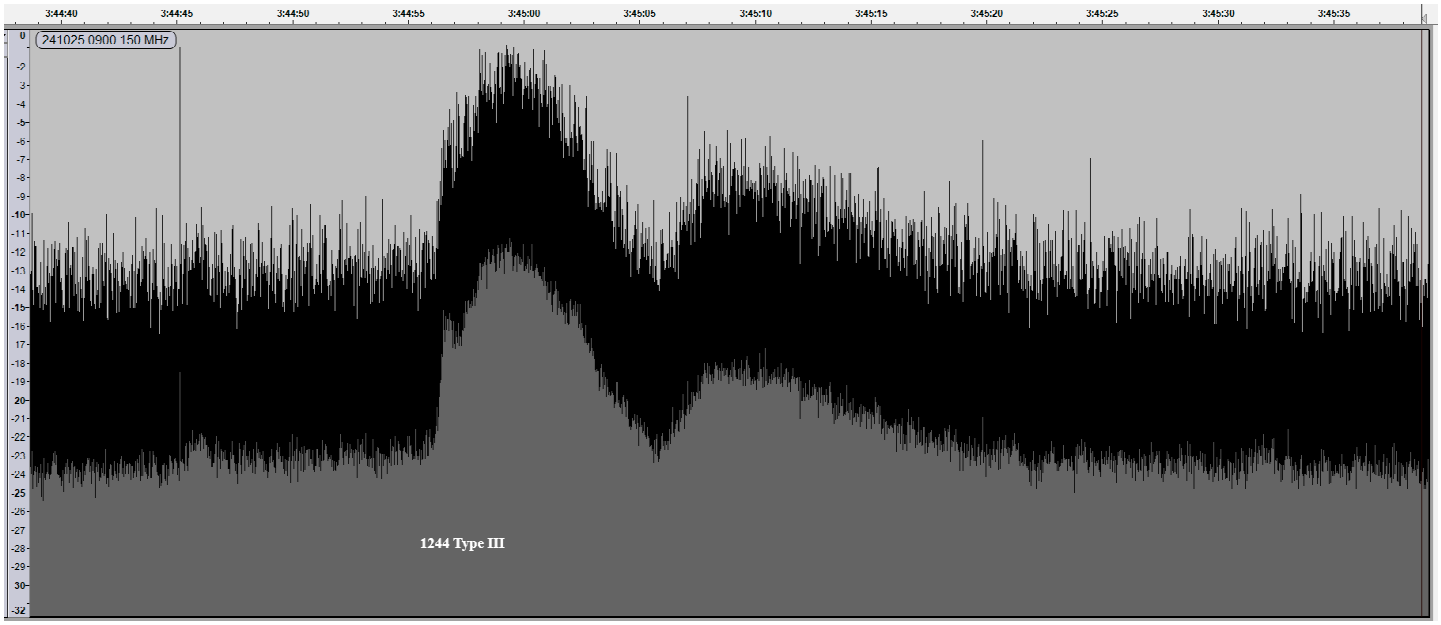
There were several periods of very mild magnetic activity later in the month, Callum Potter's chart on the next page showing activity on the 19th.



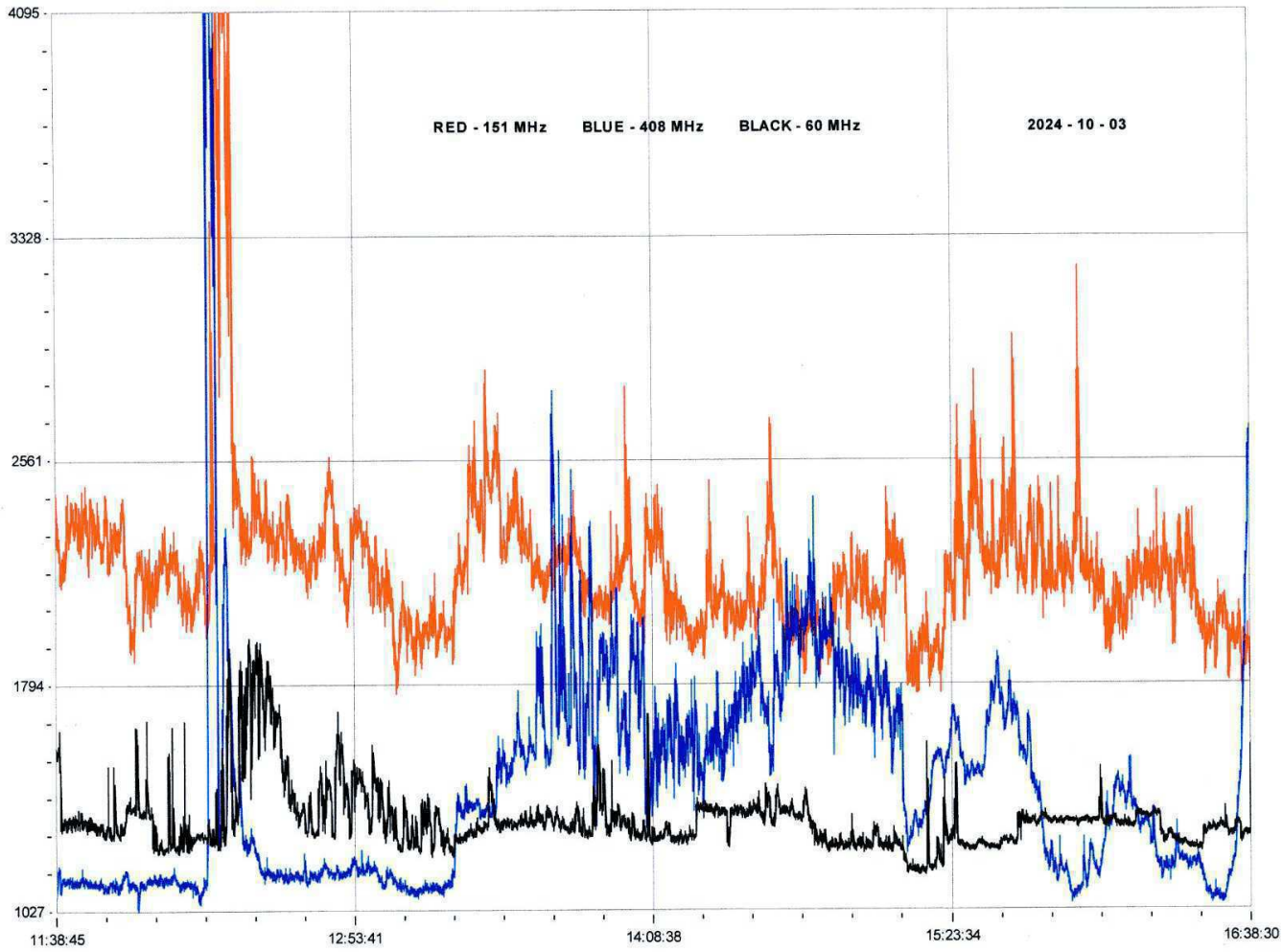
Magnetic observations received from Roger Blackwell, Thomas Mazzi, Callum Potter, Nick Quinn and John Cook.

SOLAR EMISSIONS



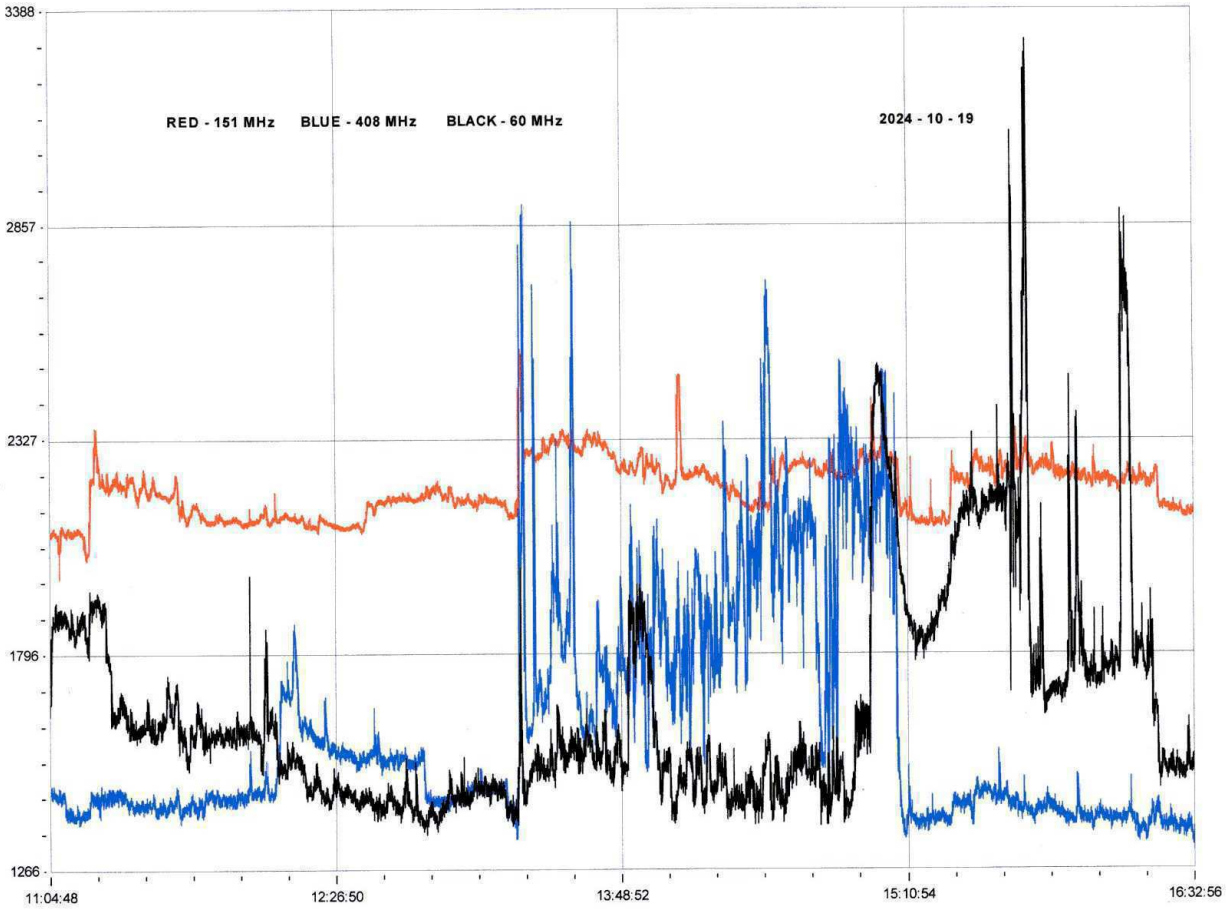


Colin Briden recorded two periods of solar emissions, shown above. The first (151MHz) was at 10:25 on the 21st, matching well with a C6.2 flare that we did not record as a SID. The active period in this chart is 2 minutes and 20 seconds, with about 21 individual peaks. The average amplitude is about 10dB. The second chart (150MHz) is a much more straight-forward type III emission at 12:44 on the 25th. It does not seem to match any individual flare, although there had been some earlier small C-flares. It has an amplitude of about 12dB.

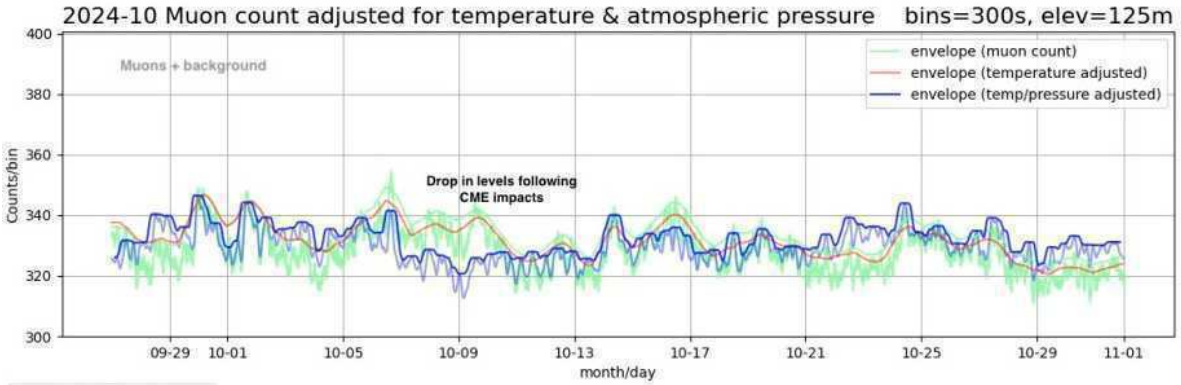


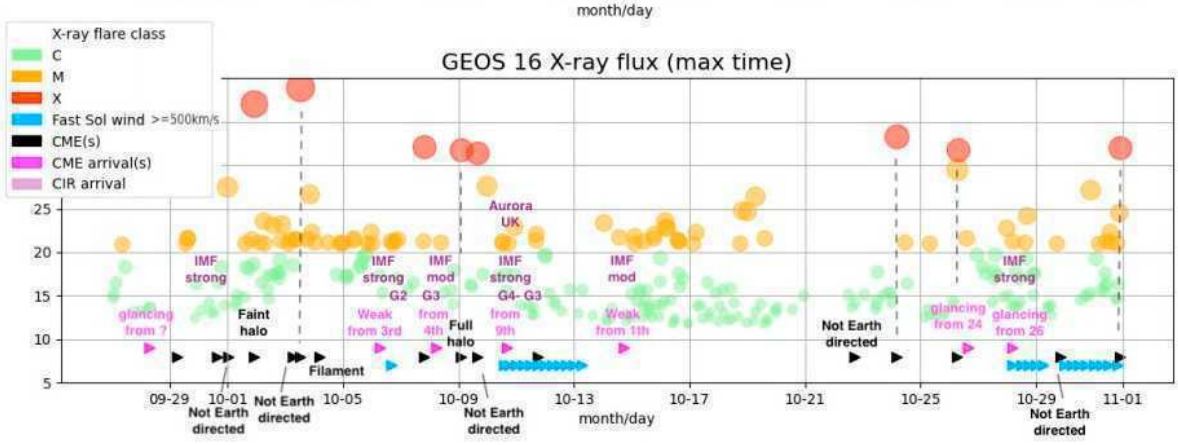
Colin Clements recorded a very strong noise burst starting at 12:00UT on the 3rd, matching the X9 flare that we recorded as a SID. All three of the monitored frequencies show the noise, although 60MHz (black) is much weaker than the others. 408MHZ (blue) also shows some prolonged emissions during the afternoon, although no further flaring was recorded until the M1.5 flare starting at 17:20.

Colin also recorded strong emissions on the 19th, shown on the next page. All three frequencies show the noise starting about 13:00UT, with 408MHz being the strongest. We did not record any SIDs at this time, although the SWPC satellite data does list a small C1.9 flare at 13:14. We did record the M1.7 flare at 14:35 covered by the emission which rises in strength before ending at 15:00. It also lists a C2.5 at 15:36 and a C2.1 at 16:27 that may be linked to the stronger 60MHz bursts in the chart. Colin also recorded emissions on the 4th, 16th and 24th.


RED - 151 MHz
BLUE - 408 MHz
BLACK - 60 MHz
2024 - 10 - 19
3388
2857
2327
1796
1266
11:04:48
12:26:50
13:48:52
15:10:54
16:32:56

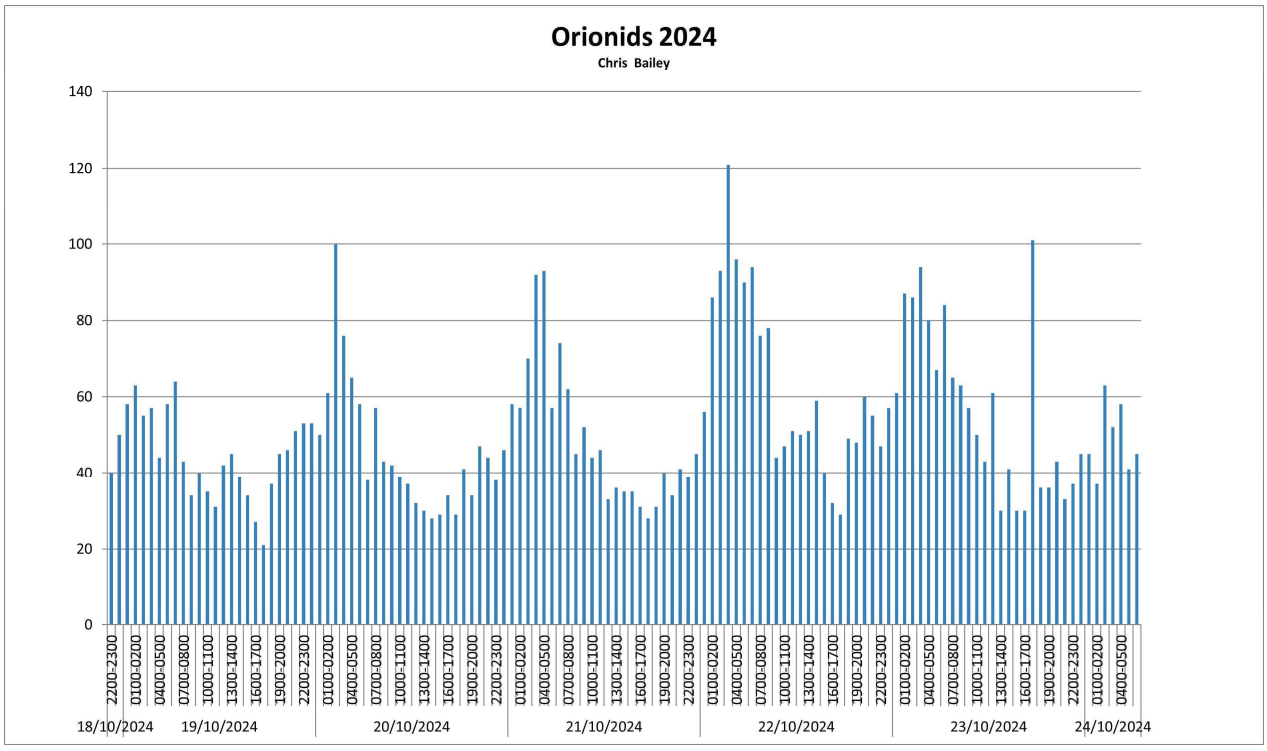
MUONS


2024-10 Muon count adjusted for temperature & atmospheric pressure bins=300s, elev=125m
Muons + background
envelope (muon count)
envelope (temperature adjusted)
envelope (temp/pressure adjusted)
Drop in levels following CME impacts
Counts/bin
400
380
360
340
320
300
09-29
10-01
10-05
10-09
10-13
10-17
10-21
10-25
10-29
11-01
month/day

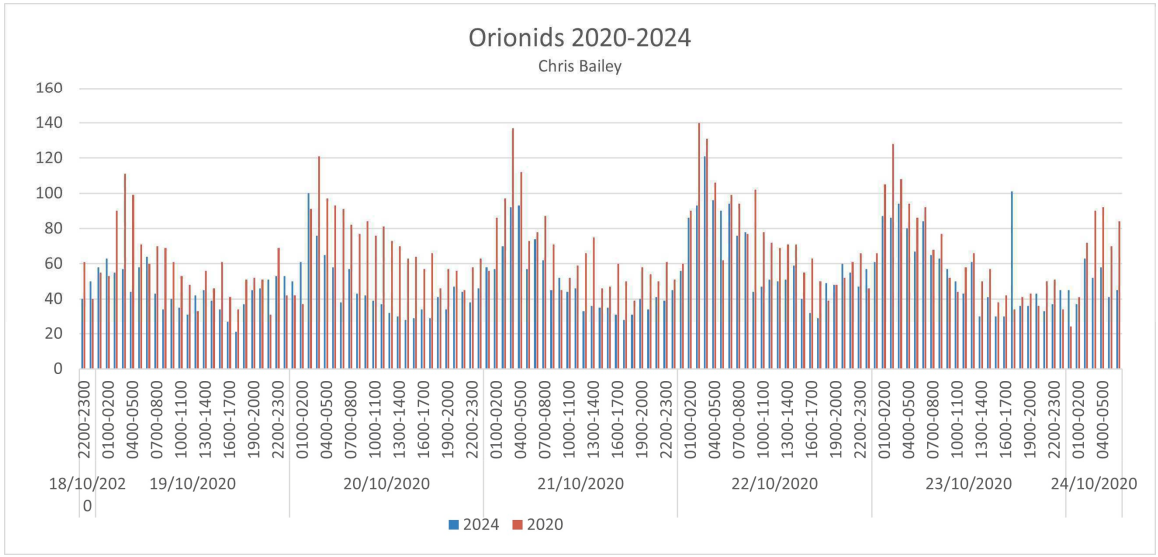

X-ray flare class
C
M
X
Fast Sol wind >=500km/s
CME(s)
CME arrival(s)
CIR arrival
GEOS 16 X-ray flux (max time)
Aurora UK
IMF strong
IMF strong G2
IMF mod G3
IMF strong G4- G3
IMF mod
IMF strong
glancing from 7
Faint halo
Weak from 3rd
from 4th
Full halo
from 9th
Weak from 11th
Not Earth directed
glancing from 24
glancing from 26
Filament
Not Earth directed
Not Earth directed
Not Earth directed
25
20
15
10
5
09-29
10-01
10-05
10-09
10-13
10-17
10-21
10-25
10-29
11-01
month/day

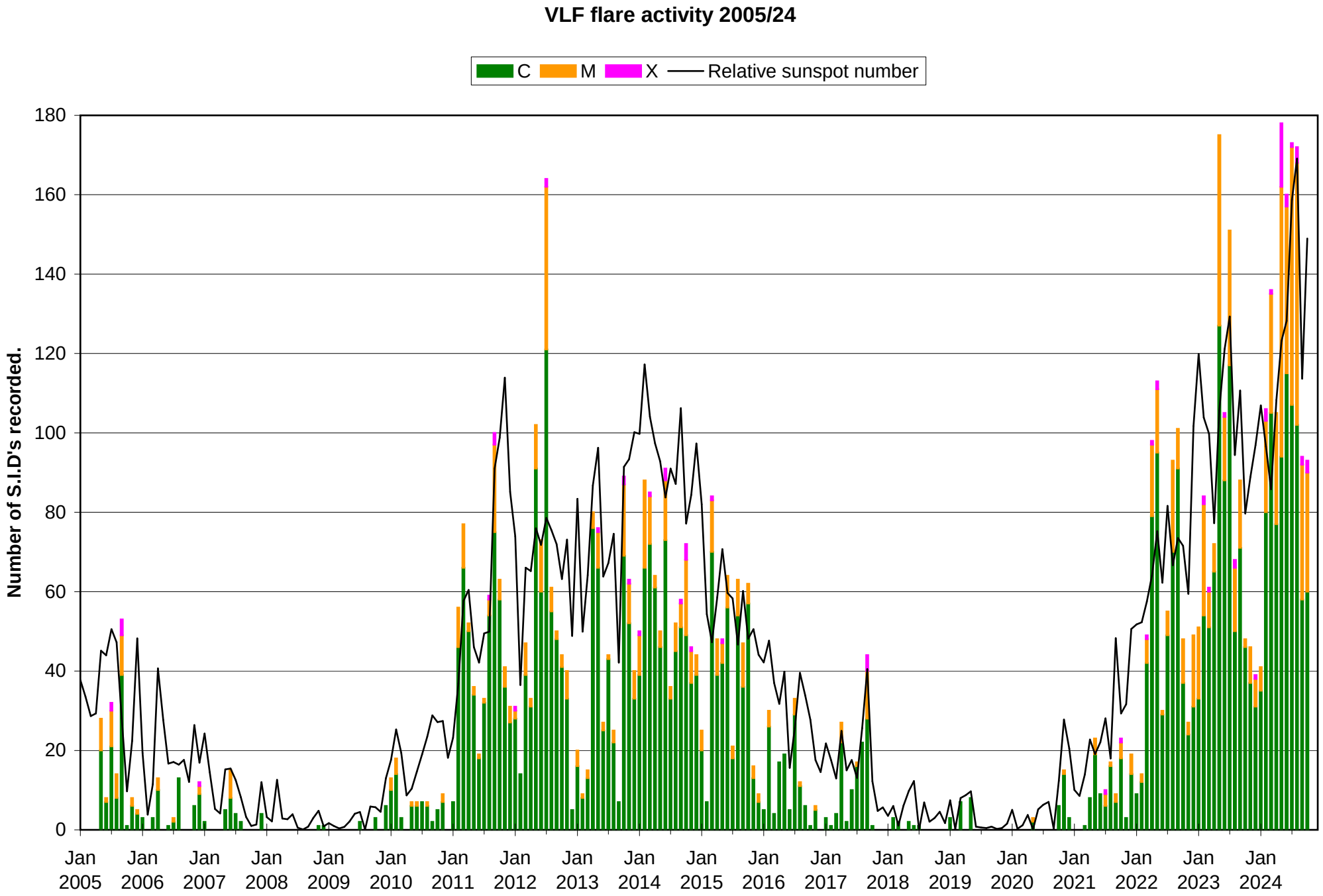
The strong flaring at the start of the month along with the subsequent magnetic storm had a very noticeable effect on the muon counts, shown in Mark Prescott's chart. The pressure/temperature adjusted trace shows a sharp drop on the 7th, while the raw count had previously had quite a distinct peak. The raw count remained fairly high through the 9th, and then dropped significantly with the strong solar wind through to the 13th. The adjusted trace also shows some slightly lower muon counts towards the end of October, with just a couple of smaller peaks on the 24th and 28th.

ORIONIDS



Chris Bailey made counts of the October Orionid meteor shower, his chart showing some strong activity peaks in the early morning from the 20th to 23rd. The strongest peak being around 03UT on the 22nd. Chris uses the GRAVES radar, counting by eye to remove the numerous starlink satellite trails. Chris has also made a comparison with 2020 counts, showing generally lower activity this year.




VLF flare activity 2005/24
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

BAA Radio Astronomy Section.

BARTELS DIAGRAM

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

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

28	29	30	31	2022 April 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

24	25	26	27	28	29	30	2022 May 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	2258 28	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	CCM	CC	CC	CC												CC	CCMC	C		C	CCCC		C

2576

17	18	19	20	21	22	23	2259 24	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

30	31	2022 November 1	2	3	4	5	6	7	2264 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

26	27	28	29	30	2022 December 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

23	24	25	26	27	28	29	30	31	2023 January 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	2268 25	26	27	28	2023 March 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

14	15	16	17	18	19	20	21	22	23	2269 24	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	2270 21	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	2271 18	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	C	CCCM	CCCC	MMMM	MCCM	MMMM	CCCM	CCMC	MCCM	CCMC	CCMC	CCC	MC	C	MMMC	CMCM	CCCC	CC

2589

3	4	5	6	7	8	9	10	11	12	13	2272 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

30	2023 July 1	2	3	4	5	6	7	8	9	10	2273 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

27	28	29	30	31	2023 August 1	2	3	4	5	6	2274 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

23	24	25	26	27	28	29	30	31	2023 September 1	2	2275 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

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	CCC	CMCC	CC			C	C

2594

16	17	18	19	20	21	22	23	24	25	26	27	2277 28	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	2278 25	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	2279 22	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	2280 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 2	3	4	5	6	7	8	9	10	11	12	13	14	2281 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

29	2024 March 1	2	3	4	5	6	7	8	9	10	11	12	2282 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

27	28	29	30	31	2024 April 1	2	3	4	5	6	7	8	2283 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

23	24	25	26	27	28	29	30	2024 May 1	2	3	4	5	2284 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	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	2286 30	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	2287 27	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	MMXM	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	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												C	CCC	CCMM	MCM	C			CCC	CCCC	MC	XMMM	CCCC	CCMM

BAA Radio Astronomy Section. **2024 OCTOBER.**

			John Cook (23.4kHz/*22.1kHz*)				Roberto Battaiola (21.75kHz)				Paul Hyde (Various)				Mark Edwards (24.0/*18.3*/**22.1kHz**)				Colin Clements (21.75/*23.4kHz*)			
	Xray class	Observers	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	C4.9	1													13:25	13:33	13:57	1+				
1	C8.4	5									14:48	14:55	15:56	2+	14:48	15:07	15:54	2+				
1	C8.1	1													17:50	17:55	18:08	1-				
2	C5.7	4	09:19	09:23	09:57	2	09:15	09:24	09:40	1	09:18	09:29	09:41	1	**09:19**	**09:25**	**09:47**	**1+**				
2	C7.4	8	10:10	10:14	11:02	2+	10:05	10:13	10:46	2	10:12	10:18	11:07	2+	10:11	10:16	10:40	1+	10:11	10:16	10:53	2
2	*	2									11:15	11:27	11:59	2	11:17	11:21	?	-				
2	*	1													13:01	13:04	?	-				
2	C7.4	6	13:10	13:13	?	-	13:04	13:12	13:20	1-	13:09	13:15	?	-	13:06	13:17	?	-	13:09	13:15	13:27	1-
2	**M3.2**	9	13:27	13:40	15:00	3	13:25	13:40	15:34	3+	13:27	13:39	15:33	3+	13:20	13:39	15:37	3+	13:27	13:40	15:25	3
2	C7.6	2									17:01	17:06	17:17	1-	17:01	17:06	17:15	1-				
2	C7.6	1													17:38	17:41	17:51	1-				
3	**M1.5**	3	08:18	08:33	09:19	2+	08:01	08:28	08:46	2									*07:27*	*08:04*	*08:41*	*2+*
3	?	1													11:44	11:50	11:53	1-				
3	?	1													12:02	12:05	?	-				
3	**X9.0**	8	12:14	12:20	14:40	3+	12:06	12:20	13:08	2+	12:14	12:21	13:10	2+	12:09	12:22	13:09	2+	*12:13*	*12:21*	*13:46*	*3*
3	**M1.5**	2									17:21	17:23	17:33	1-	17:20	17:24	17:40	1				
4	?	1													*09:41*	*10:00*	*10:11*	*1+*				
4	?	1													*10:27*	*10:29*	*10:44*	*1-*				
4	**M1.2**	9	11:01	11:07	12:10	2+	10:58	11:04	11:42	2	11:01	11:07	11:45	2	10:58	11:14	11:34	2	11:00	11:13	12:21	2+
4	?	1													12:17	13:07	?	-				
4	?	1													13:33	13:41	?	-				
4	?	1													13:49	13:53	?	-				
4	*	1													14:11	14:22	?	-				
4	?	3					14:37	14:44	16:13	3	14:51	14:55	15:07	1-	14:48	14:55	?	-				
4	?	1													15:38	15:39	16:36	2+				
4	*	1													17:18	17:22	17:28	1-				
4	C7.5	1													18:07	18:09	18:20	1-				
5	**M1.4**	2									08:22	08:36	?	-	*08:21*	*08:34*	*?*	-				
5	**M1.6**	5	08:23	08:31	09:51	3									*08:38*	*08:46*	*?*	-				
5	*	3									09:23	09:27	09:43	1	*09:21*	*09:25*	*09:42*	*1*				
5	?	2									11:09	11:13	11:30	1	11:09	11:13	11:31	1				
5	?	1													*11:17*	*11:22*	*?*	-				
5	?	1													*11:35*	*11:41*	*?*	-				
5	?	1													*11:52*	*11:57*	*12:00*	*1-*				
5	*	1													12:45	12:52	13:05	1				
5	?	1													13:09	13:11	13:24	1-				
5	*	2									13:29	13:35	?	-	13:24	13:34	?	-				
5	?	1													13:38	13:40	?	-				
5	C8.4	2									13:55	14:03	14:21	1+	13:52	14:00	?	-				
5	?	2	*14:24*	*14:35*	*?*	-									14:18	14:27	?	-				
5	C8.6	3	*14:57*	*15:05*	*15:21*	*1*					14:58	15:09	15:38	2	14:57	15:09	15:34	2				
5	C9.0	2									15:54	16:00	16:11	1-	15:55	15:57	16:08	1-				
5	?	1									16:53	16:59	?	-								
5	C9.8	2									17:36	17:44	?	-	17:37	17:42	18:01	1				
6	C5.4	1													*08:25*	*08:33*	*08:45*	*1*				
6	?	1													*09:27*	*09:38*	*09:55*	*1+*				
6	?	1													*10:29*	*10:37*	*10:41*	*1-*				
6	?	2									10:43	10:47	10:55	1-	10:44	10:46	11:09	1				
6	?	3									12:02	12:05	12:20	1-	*12:02*	*12:06*	*12:11*	*1-*				
6	?	1													*13:13*	*13:17*	*?*	-				
6	?	1													*13:27*	*13:31*	*?*	-				
6	?	1													*13:37*	*13:41*	*?*	-				
6	?	1													*13:44*	*13:53*	*14:00*	*1-*				
6	?	3									14:15	14:21	14:39	1	14:17	14:20	?	-				
6	?	1													14:38	14:44	?	-				
6	?	1													14:59	15:08	?	-				
6	**M1.3**	6	15:20	15:23	15:34	1-	15:15	15:19	15:31	1-	15:20	15:25	16:04	2	15:19	15:23	15:57	2				
6	**M1.0**	4	16:43	16:46	16:57	1-					16:43	16:50	17:17	2	16:43	16:49	17:17	2				
7	?	2													*08:46*	*09:22*	*10:01*	*2+*				
7	C6.6	7	10:24	10:29	10:46	1					10:23	10:31	?	-	10:25	10:29	10:37	1-	10:22	10:31	10:43	1
7	?	4									10:48	10:58	11:19	1+	10:50	10:54	11:09	1	**10:44**	**10:55**	**11:29**	**2**
7	?	2									11:54	12:14	13:10	2+	*12:00*	*12:16*	*12:40*	*2*				
7	?	1													*13:14*	*13:23*	*13:31*	*1-*				
7	?	3									14:12	14:26	15:06	2+	*14:12*	*14:26*	*14:45*	*2*				
8	*	2													*08:18*	*08:27*	*08:37*	*1*				
8	**M1.2**	5	*08:49*	*08:51*	*09:13*	*1*					08:49	08:55	09:33	2	08:48	08:52	09:06	1-				
8	*	2									11:05	11:09	11:17	1-	*10:59*	*11:07*	*11:33*	*2*				
8	C5.4	4									11:49	11:56	12:09	1	11:49	11:57	12:21	1+				
8	C5.8	1													17:50	17:53	17:59	1-				
9	C6.3	6	09:56	10:01	10:17	1					09:55	10:04	10:25	1+	09:55	10:00	10:11	1-	09:51	10:02	10:29	2
9	C6.1	6	10:56	11:01	11:29	2					10:56	11:00	11:22	1+	10:55	10:59	11:04	1-	10:56	11:03	11:25	1+
9	?	1													**13:57**	**14:01**	**14:15**	**1-**				
9	*	1													15:07	15:26	?	-				
9	**X1.4**	8	*15:45*	*15:47*	*?*	-	15:42	15:46	16:13	1+	15:45	15:51	16:33	2+	15:43	15:50	17:07	2+	15:45	15:50	16:19	2
10	C7.3	3	08:34	08:36	08:49	1-					08:32	08:37	08:47	1-	08:33	08:35	08:46	1-				
10	**M1.3**	9	11:52	12:00	?	-	11:43	12:01	13:45	3	11:49	12:01	12:55	2+	11:52	12:03	?	-	11:52	12:02	14:38	3+
10	**M1.1**	3	12:20	12:26	14:05	3									12:16	12:29	13:17	2+				
10	?	1													**13:21**	**13:25**	**13:51**	**1+**				
10	C7.5	6	14:38	14:42	15:56	2+	14:32	14:39	14:54	1	14:36	14:43	15:10	2	14:34	14:41	15:02	1+	14:38	14:42	14:52	1-
10	C5.6	1	*15:09*	*15:14*	*15:27*	*1-*																
11	C3.9	2	10:17	10:22	10:30	1-									*10:17*	*10:22*	*10:38*	*1*				
11	C3.7	3	13:55	14:01	14:24	1+									13:58	14:02	14:21	1				
11	C2.9	2	*14:30*	*14:39*	*15:10*	*2*									*14:37*	*14:38*	*14:49*	*1-*				
11	M2.1/M1.4	5	15:52	16:02	16:19	1+					15:54	16:21	16:59	2+	*15:55*	*16:20*	*16:44*	*2+*				
12	*	2									10:55	11:00	11:19	1	*10:56*	*11:03*	*11:16*	*1*				
12	C3.3	1													*13:14*	*13:16*	*13:28*	*1-*				
14	**M1.8**	8	13:26	13:37	14:30	2+					13:25	13:43	15:23	3	13:30	13:42	14:22	2+	13:28	13:43	14:51	2+
14	C2.9	2									18:00	18:08	18:19	1	18:01	18:04	18:18	1-				
15	**M1.3**	5	10:05	10:06	10:26	1	10:01	10:06	11:02	2+					***10:02***	***10:10***	***10:28***	***1+***				
15	C4.6	2	11:17	11:26	11:31	1-									*11:22*	*11:34*	*?*	-				
15	C5.7	2	11:50	11:54	?	-									*11:46*	*11:54*	*?*	-				
15	?	1													*12:04*	*12:09*	*12:46*	*2*				
15	C3.9	1													*13:01*	*13:07*	*13:19*	*1-*				
15	**M1.7**	1					18:03	18:10	18:15	1-												
16	*	1													*12:58*	*13:00*	*13:14*	*1-*				
16	**M1.5**	9	13:17	13:29	14:18	2+	13:12	13:28	13:33	1	13:19	13:30	14:08	2+	**13:20**	**13:31**	**14:00**	**2**	13:19	13:31	13:54	2
16	C7.6	1													*14:20*	*14:24*	*?*	-				
16	**M1.3**	3													*14:30*	*14:39*	*15:35*	*2+*	14:09	14:48	16:08	3
17	C6.6	1													14:27	14:30	14:36	1-				

BAA Radio Astronomy Section. **2024 OCTOBER.**

18	C2.3	1													*09:45*	*09:51*	*09:55*	*1-*				
18	C5.9	8	10:15	10:20	10:35	1	10:09	10:20	10:35	1+	10:15	10:23	10:43	1+	10:15	10:22	10:46	1+	10:07	10:22	10:35	1+
18	C4.2	8	12:28	12:31	12:49	1	12:25	12:31	12:44	1	12:29	12:32	12:44	1-	12:28	12:33	12:42	1-	12:27	12:33	13:02	2
19	**M6.5**	3	06:51	07:01	07:12	1	06:48	06:57	07:32	2					***06:55***	***07:01***	***07:17***	***1***				
19	C4.1	1													10:58	10:59	11:06	1-				
19	**M1.7**	9	14:32	14:36	14:48	1-	14:27	14:35	14:55	1+	14:33	14:38	15:08	2	14:32	14:36	14:56	1	14:34	14:36	14:51	1-
20	C3.5	1													13:19	13:23	13:28	1-				
22	C5.1	5	12:09	12:12	12:25	1-									*12:10*	*12:13*	*12:29*	*1*	12:10	12:14	12:33	1
22	C3.7	1													14:53	14:57	15:07	1-				
22	C4.2	1													16:58	17:02	17:18	1				
23	C3.5	2													*10:21*	*10:25*	*?*	-				
23	?	1													*10:33*	*10:38*	*?*	-				
23	C4.0	2													*10:43*	*10:49*	*?*	-				
23	C4.6	4													*11:15*	*11:22*	*?*	-				
23	C7.8	2													*11:41*	*12:15*	*12:57*	*2+*				
23	*	1													12:04	12:35	12:45	2				
24	**M1.2**	8	10:25	10:31	10:58	2					10:27	10:32	10:51	1	10:24	10:31	10:48	1	10:26	10:34	10:42	1-
24	?	1													11:57	11:59	12:03	1-				
24	C6.4	3	12:49	12:51	13:04	1-									12:48	12:53	13:02	1-				
25	**M1.1**	2	*07:31*	*07:35*	*07:38*	*1-*	07:26	07:32	07:46	1												
25	C3.5	1	10:33	10:36	10:40	1-																
25	C2.9	1	11:45	11:49	11:56	1-																
26	**X1.8**	2	*07:15*	*07:23*	*07:36*	*1*	06:30	06:47	08:00	3												
26	**M2.2**	6	11:36	11:52	?	-	11:44	11:50	11:55	1-	11:36	11:50	?	-	11:36	11:51	?	-	11:37	11:52	11:58	1
26	**M2.8**	9	11:58	12:02	?	-	11:55	12:06	12:26	1+	11:59	12:05	12:42	2	11:58	12:06	12:31	2	11:58	12:06	13:54	3
26	?	1													12:46	12:51	13:04	1-				
26	?	3	13:25	13:27	13:40	1-					13:26	13:29	13:43	1-	13:25	13:29	13:42	1-				
26	**M1.6**	7	14:07	14:16	?	-	14:05	14:09	14:35	1+	14:08	14:16	14:46	2	14:09	14:16	15:00	2+	14:12	14:17	14:27	1-
27	C7.9	6	12:38	12:42	12:52	1-					12:38	12:44	13:04	1+	12:39	12:44	?	-				
27	C7.1	2									13:09	13:16	?	-	13:03	13:17	?	-				
27	C9.8	6	13:25	13:28	13:37	1-					13:25	13:29	13:51	1+	13:23	13:28	13:51	1+				
27	C7.4	2									15:29	15:33	15:56	1+	15:29	15:32	15:45	1-				
28	C8.0	1					06:40	06:55	07:13	2												
28	C7.1	2	09:10	09:13	09:19	1-					09:07	09:14	09:30	1								
28	**M1.2**	2					14:41	14:43	14:55	1-					*14:43*	*14:46*	*15:02*	1				
28	**M4.2**	2	*16:23*	*16:28*	*16:35*	*1-*									16:24	16:27	16:43	1				
29	C4.0	1													*12:03*	*12:06*	*12:15*	*1-*				
29	**M1.1**	2	16:32	16:35	?	-									16:28	16:34	16:45	1-				
30	C7.1	1	10:11	10:17	10:32	1																
30	C4.6	1													*12:00*	*12:05*	*12:25*	*1*				
31	C6.2	3	08:22	08:30	08:36	1-					08:27	08:33	08:47	1	*08:28*	*08:31*	*08:39*	*1-*				
31	C5.5	2	08:39	08:42	08:49	1-									*08:43*	*08:45*	*08:49*	*1-*				
31	C7.6	1	08:58	09:02	09:10	1-																
31	**M1.3**	8	09:34	09:38	?	-	09:20	09:35	09:55	2	09:25	09:30	?	-	09:35	09:37	09:43	1-	09:34	09:39	09:47	1-
31	*****	1									09:33	09:39	?	-								
31	?	4	09:48	09:51	?	-					09:48	09:54	10:04	1-	*09:46*	*09:52*	*10:06*	*1*	09:47	09:52	10:04	1-
31	C6.4	7	10:27	10:29	10:55	1+	10:18	10:27	10:34	1-	10:27	10:31	10:46	1	10:27	10:30	10:46	1				
31	**M2.4**	8	12:47	12:54	13:40	2+	12:43	12:52	13:04	1	12:47	12:55	13:19	1+	12:46	12:55	13:28	2	12:46	12:54	13:38	2+
31	**M1.2**	7	13:52	13:59	14:13	1					13:52	14:00	14:29	2	13:51	14:02	?	-	13:53	13:59	14:12	1
31	*	2													14:31	14:37	14:46	1-	**14:27**	**14:29**	**16:43**	**3+**

BAA Radio Astronomy Section. **2024 OCTOBER.**

	Xray class		Steve Parkinson (Various)				Andrew Thomas (19.6/*18.3*/**21.7kHz**)				Phil Rourke (23.4kHz)				Mark Prescott (21.75/**23.4**/*20.9kHz*)				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, 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)	
1	C4.9																					
1	C8.4						14:48	14:58	15:39	2+					*14:53*	*15:11*	*16:02*	*2+*	14:48	15:10	15:40	2+
1	C8.1																					
2	C5.7																					
2	C7.4		10:10	10:15	10:33	1	10:10	10:16	10:42	1+					*10:14*	*10:22*	*10:50*	*2*				
2	*																					
2	*																					
2	C7.4														*13:12*	*13:19*	*?*	*-*				
2	**M3.2**		13:28	13:41	14:55	3	13:10	13:43	15:17	3+					*13:32*	*13:52*	*15:15*	*3*	13:10	13:42	15:40	3+
2	C7.6																					
2	C7.6																					
3	**M1.5**																					
3	?																					
3	?																					
3	**X9.0**		12:14	12:20	14:05	3	12:14	12:21	13:48	3					**12:18**	**12:23**	**?**	**-**				
3	**M1.5**																					
4	?																					
4	?																					
4	**M1.2**		11:00	11:07	11:40	2	11:01	11:11	11:54	2+					11:04	11:14	14:35	3+	11:00	11:13	12:10	2+
4	?																					
4	?																					
4	?																					
4	*																					
4	?																					
4	?																					
4	*																					
4	C7.5																					
5	**M1.4**																					
5	**M1.6**		08:23	08:35	09:20	2+	08:22	08:35	09:15	2+					08:28	08:51	09:26	2+				
5	*		09:22	09:25	09:35	1-																
5	?																					
5	?																					
5	?																					
5	?																					
5	*																					
5	?																					
5	*																					
5	?																					
5	C8.4																					
5	?																					
5	C8.6																					
5	C9.0																					
5	?																					
5	C9.8																					
6	C5.4																					
6	?																					
6	?																					
6	?																					
6	?		12:01	12:04	12:25	1																
6	?																					
6	?																					
6	?																					
6	?																					
6	?		14:16	14:19	14:25	1-																
6	?																					
6	?																					
6	**M1.3**		15:20	15:23	15:40	1	*15:20*	*15:22*	*15:35*	*1-*												
6	**M1.0**														16:48	16:52	17:02	1-				
7	?		09:03	09:17	09:40	2																
7	C6.6		10:24	10:30	?	-	10:24	10:29	11:36	2+					10:28	10:34	11:56	3				
7	?		10:47	10:57	11:20	2																
7	?																					
7	?																					
7	?		14:14	14:21	14:45	1+																
8	*		08:18	08:22	08:39	1																
8	**M1.2**		08:49	08:54	09:35	2+	*08:48*	*08:53*	*09:26*	*2*												
8	*																					
8	C5.4		11:48	11:54	12:20	1+									11:51	12:03	12:56	2+				
8	C5.8																					
9	C6.3		09:54	10:03	10:30	2													09:55	10:00	10:35	2
9	C6.1		10:55	10:58	11:10	1-													10:55	10:58	11:25	1+
9	?																					
9	*																					
9	**X1.4**		15:44	15:51	16:35	2+	15:44	15:50	16:52	2+					15:49	15:55	16:38	2+				
10	C7.3																					
10	**M1.3**		11:52	12:02	13:25	3	11:52	12:03	13:33	3					11:56	12:07	?	-	11:52	12:03	13:45	3
10	**M1.1**														12:26	12:29	13:45	2+				
10	?																					
10	C7.5		14:37	14:41	14:55	1-																
10	C5.6																					
11	C3.9																					
11	C3.7		13:52	13:56	14:02	1-																
11	C2.9																					
11	M2.1/M1.4						*15:57*	*16:07*	*16:39*	*2*					15:54	16:06	16:44	2+				
12	*																					
12	C3.3																					
14	**M1.8**		13:28	13:36	14:15	2+	13:28	13:42	14:41	2+					13:33	13:44	14:38	2+	13:28	13:42	14:50	2+
14	C2.9																					
15	**M1.3**						**10:03**	**10:08**	**11:09**	**2+**					10:07	10:12	11:12	2+				
15	C4.6																					
15	C5.7																					
15	?																					
15	C3.9																					
15	**M1.7**																					
16	*																					
16	**M1.5**		13:20	13:31	14:00	2	13:20	13:31	14:05	2					13:24	13:35	14:12	2+	13:18	13:33	14:05	2+
16	C7.6																					
16	**M1.3**														14:38	14:46	15:22	2				
17	C6.6																					
18	C2.3																					
18	C5.9		10:13	10:21	10:40	1+	10:12	10:21	10:51	2					10:19	10:25	11:06	2+				

18	C4.2		12:28	12:33	12:50	1	12:27	12:31	12:51	1		12:32	12:36	12:48	1-				
19	**M6.5**																		
19	C4.1																		
19	**M1.7**		14:33	14:36	14:55	1	14:32	14:37	14:59	1+		14:37	14:41	15:10	2	14:32	14:35	15:00	1+
20	C3.5																		
22	C5.1		12:09	12:13	12:35	1+	12:09	12:13	12:39	1+									
22	C3.7																		
22	C4.2																		
23	C3.5						10:19	10:23	10:36	1-									
23	?																		
23	C4.0						10:43	10:48	10:55	1-									
23	C4.6		11:18	11:22	11:35	1-	11:15	11:21	11:33	1-		11:20	11:26	11:46	1+				
23	C7.8						11:49	12:08	12:28	2									
23	*																		
24	**M1.2**		10:27	10:33	10:50	1	10:22	10:33	10:56	2		10:30	10:35	10:49	1	10:25	10:32	10:50	1
24	?																		
24	C6.4											12:51	12:54	13:12	1				
25	**M1.1**																		
25	C3.5																		
25	C2.9																		
26	**X1.8**																		
26	**M2.2**											11:41	11:56	?	-				
26	**M2.8**		11:36	12:09	13:00	2+	11:37	12:06	13:15	3		12:02	12:08	12:58	2+	11:35	12:05	13:15	3
26	?																		
26	?																		
26	**M1.6**		14:08	14:16	14:40	1+	14:08	14:15	14:28	1									
27	C7.9		12:38	12:44	13:00	1	12:37	12:45	12:57	1		12:42	12:48	13:02	1				
27	C7.1																		
27	C9.8		13:10	13:27	13:40	1+	13:08	13:16	13:24	1-		13:28	13:31	13:40	1-				
27	C7.4																		
28	C8.0																		
28	C7.1																		
28	**M1.2**																		
28	**M4.2**																		
29	C4.0																		
29	**M1.1**																		
30	C7.1																		
30	C4.6																		
31	C6.2																		
31	C5.5																		
31	C7.6																		
31	**M1.3**						09:26	09:37	10:02	2		09:38	09:43	10:05	1+	09:25	09:38	10:18	2+
31	*																		
31	?																		
31	C6.4						10:21	10:30	10:51	1+		10:30	10:34	10:45	1-	10:25	10:28	10:55	1+
31	**M2.4**		12:47	12:54	13:30	2	12:47	12:54	13:38	2+						12:47	12:55	13:50	2+
31	**M1.2**		13:52	14:00	14:20	1+	13:51	14:00	14:15	1						13:40	14:00	14:15	2
31	*																		