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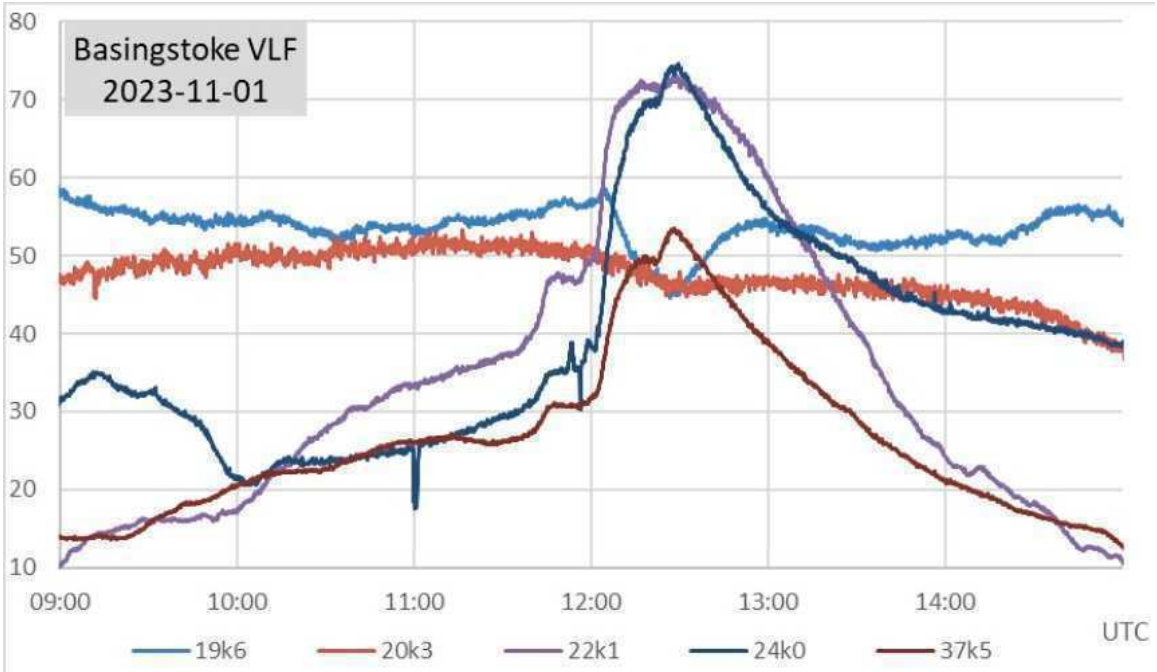
BAA Radio Astronomy Section. Director Paul Hearn.

RADIO SKY NEWS 2023 NOVEMBER.

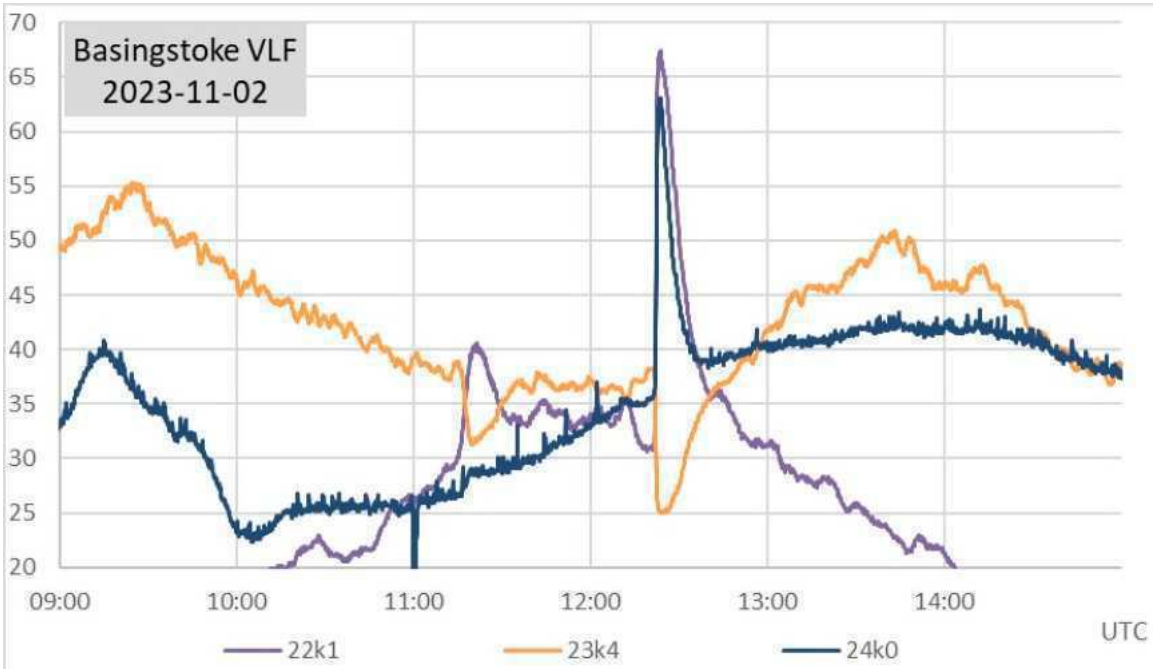
VLF SID OBSERVATIONS.

Activity in November remained at a similar level to that recorded in October, although with fewer C-class flares and more of M-class. The volcanic activity in the Grindavik area of Iceland has led to 37.5kHz being off-air, I imagine that the ground movements could severely upset the aerial system as well as disrupting power supplies. A major increase in the strength of the 22.1kHz signal was widely recorded at 13UT on the 24th, my own receiver then saturating as the sunset took over. This seems to be a transmitter effect as no other signals were affected.

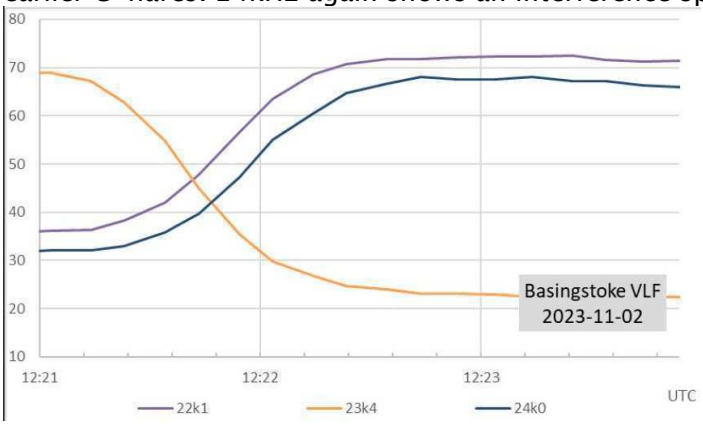
In the October summary I illustrated a small 'SID-like' feature in Paul Hyde's recording from October 24th. Detective work by Mark Edwards has shown that this was indeed a genuine SID from a flare of about C1 magnitude, but omitted from the SWPC list.



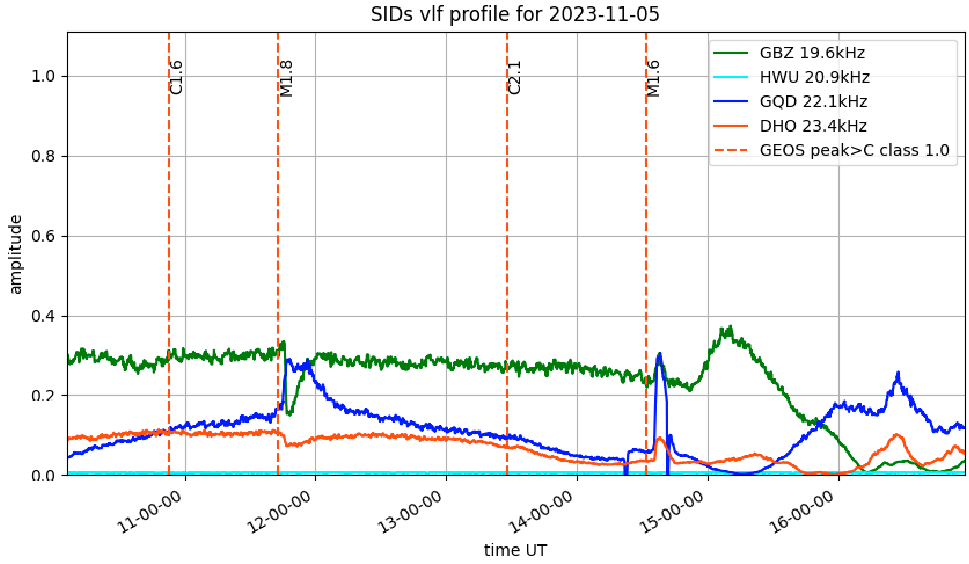
The M1.4 flare on November 1st produced a very complex array of SIDs. The GOES data shows a single event from 11:37 to 13:00UT, with a peak at 12:26. During this period we recorded five distinct SID peaks. This recording by Paul Hyde shows the complexity, with each signal showing slightly different responses. The 24kHz signal also shows a couple of interference spikes at 11:00 and just before 12:00.



In contrast, Paul's recording from the 2nd shows the very narrow M1.6 flare at 12:24, along with the earlier C-flares. 24kHz again shows an interference spike at 11:00.



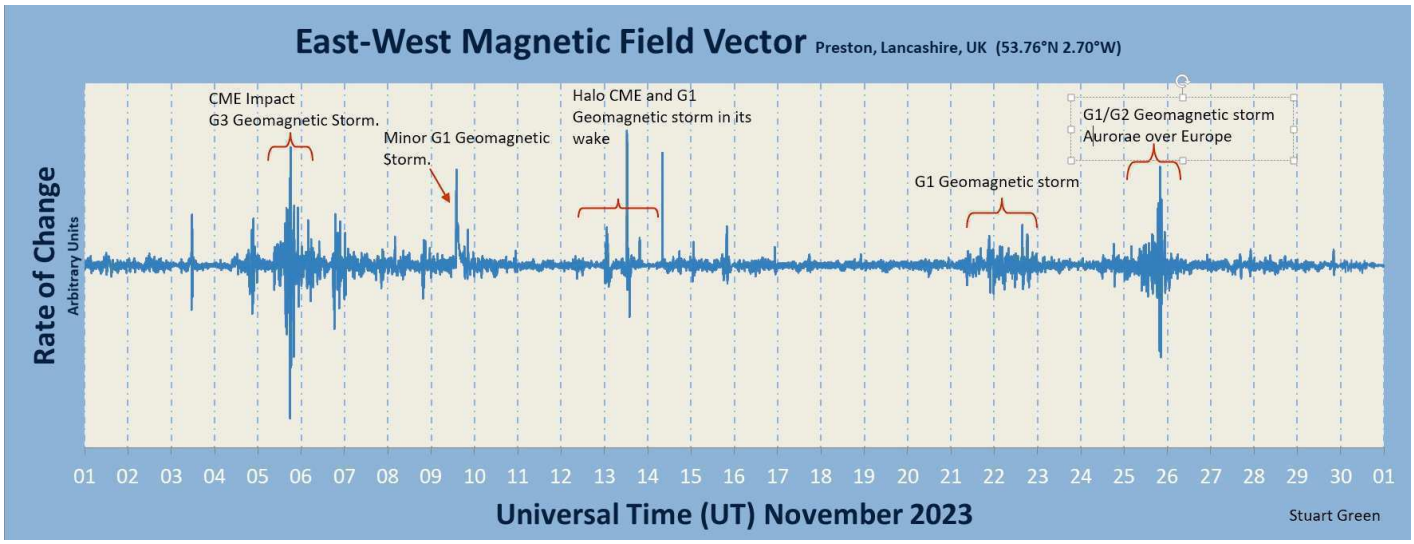
Paul re-scaled the rising stage of the M1.6 flare, showing that all three signals had a rise time of about 70 seconds, very rapid indeed. The GOES data gives timings of start: 12:18, peak: 12:22, end: 12:26, and an optical (H-alpha) class of "Brilliant".



The strongest flare of the month was the M1.8 at 11:43 on the 5th, shown here by Mark Prescott. It was followed by an M1.6 flare at 14:34, both producing strong SIDs at 22.1kHz. Mark has indicated the timings of the two weak C-class flares, but they have not produced a clear VLF response. The effects of the early sunsets in November can be seen after 15:00.

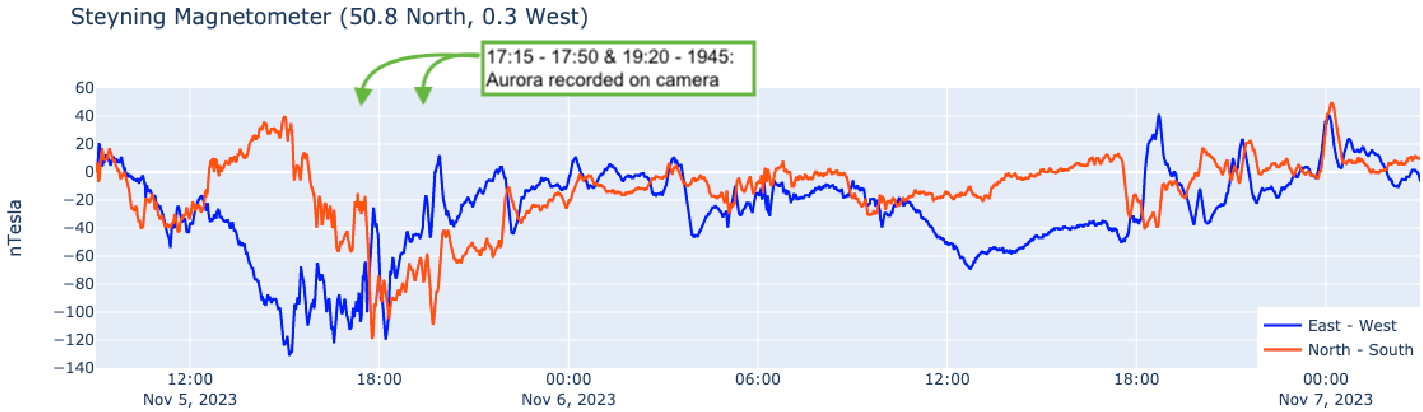
Some very noisy days were recorded, Colin Clements' recording from the 20th being a very noisy example. I have marked the M1.2 and C8.0 flares, both fairly distinct at 23.4kHz, but barely discernible from the background at 21.75kHz. 37.5kHz was off at the time, and shows just a few interference spikes.

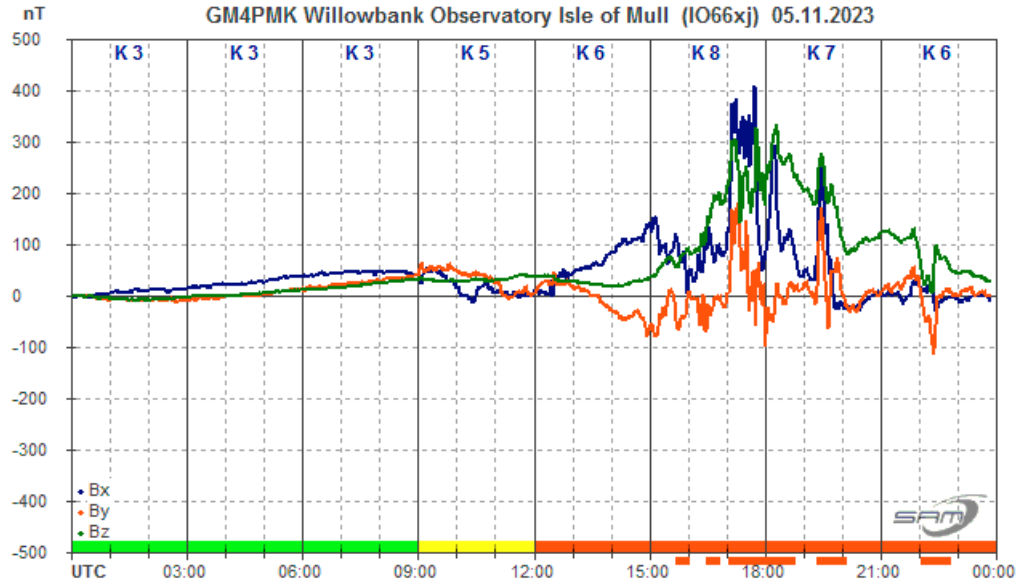
MAGNETIC OBSERVATIONS.



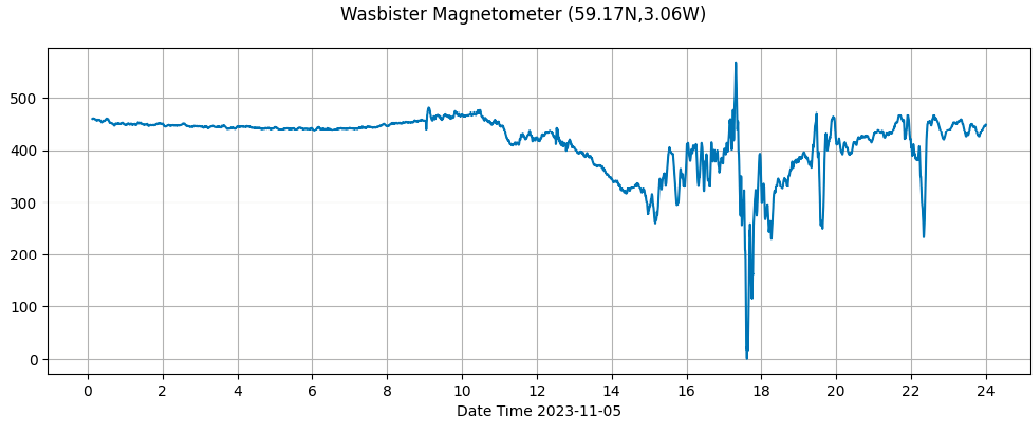
Stuart Green's monthly summary shows several periods of magnetic activity against a rather quiet background. The strong flaring at the start of the month produced a number of CMEs that combined to give a

very active period starting on November 5th. Auroral 'fireworks' were seen widely in the UK and Europe. Nick Quinn near the south coast caught these on his cameras, and recorded the magnetic disturbance:

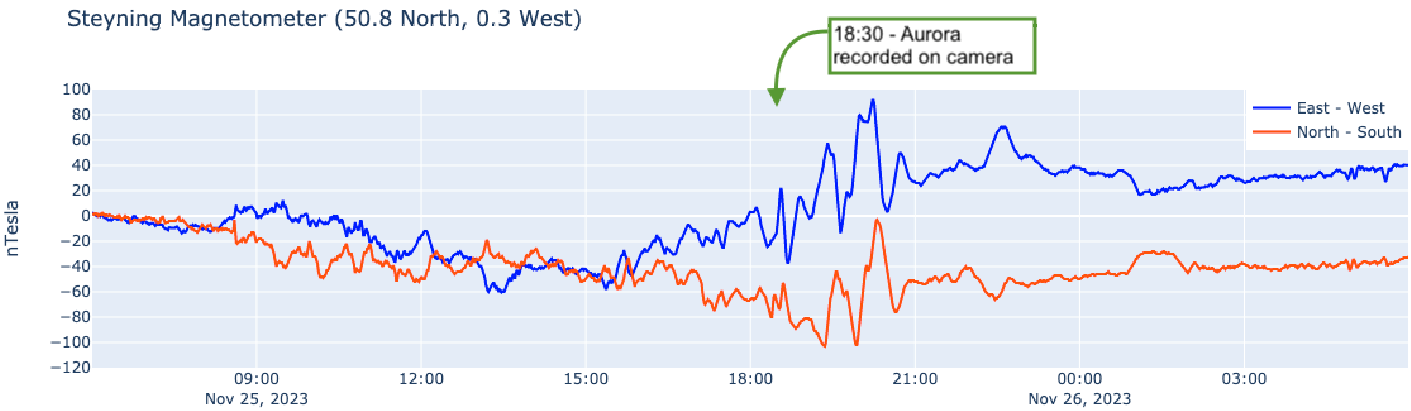




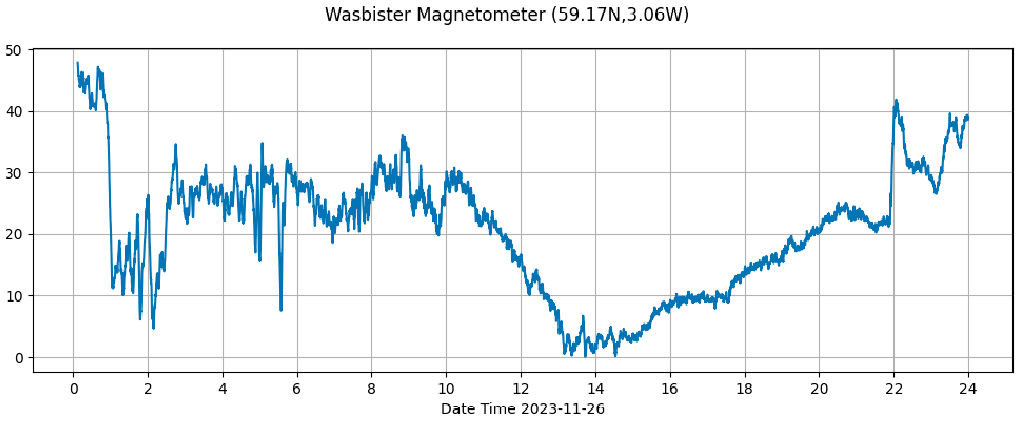
Roger Blackwell on the Isle of Mull recorded a stronger disturbance during the afternoon of the 5th, with a hint of CME impacts at 09:00 and 12:30 in the Bx (blue trace).

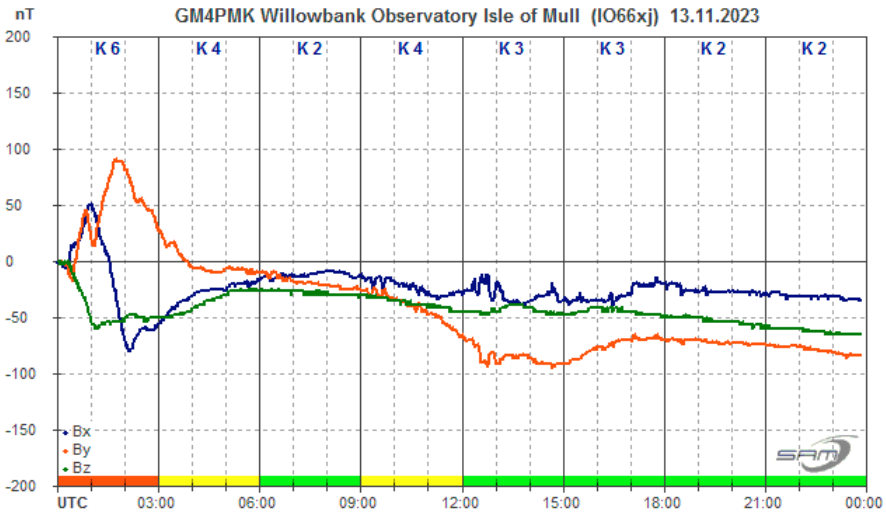


Callum Potter further north in Orkney recorded an even stronger disturbance around 17 to 18UT, and also the possible CME impacts.



Magnetic activity increased again towards the end of the month, with multiple CMEs and coronal hole winds contributing. Nick Quinn's recording from the 25th also shows that aurora were again recorded near the south coast. A possible CME impact is visible just before 09UT. The disturbance continued on the 26th, recorded by Callum Potter:

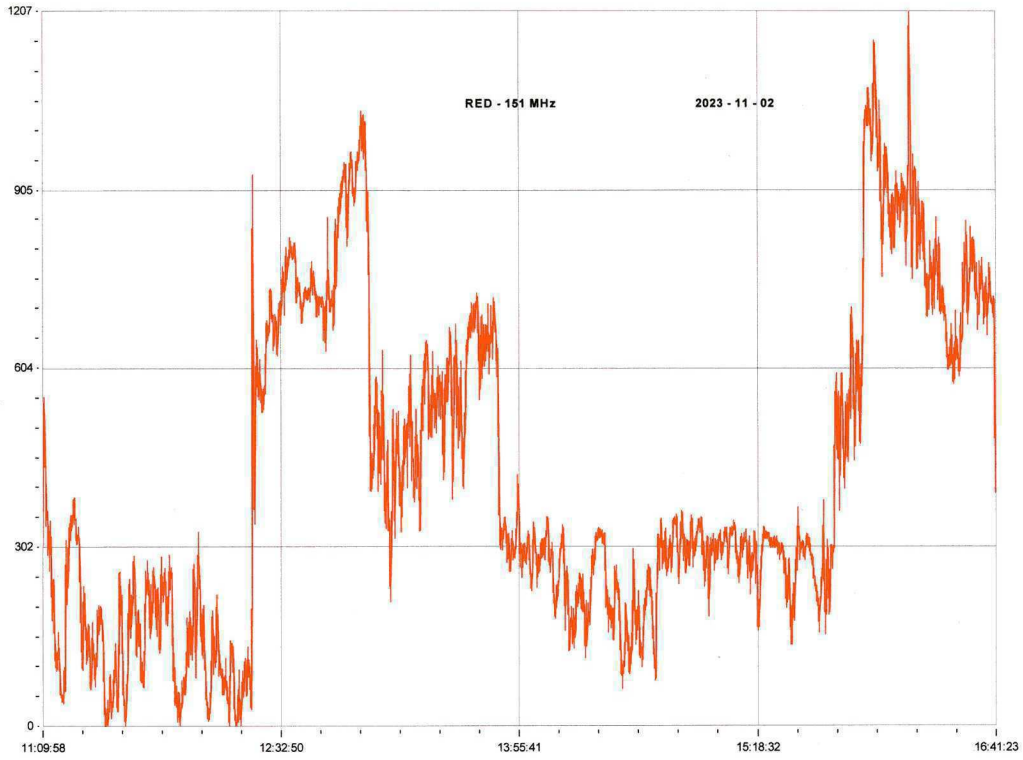


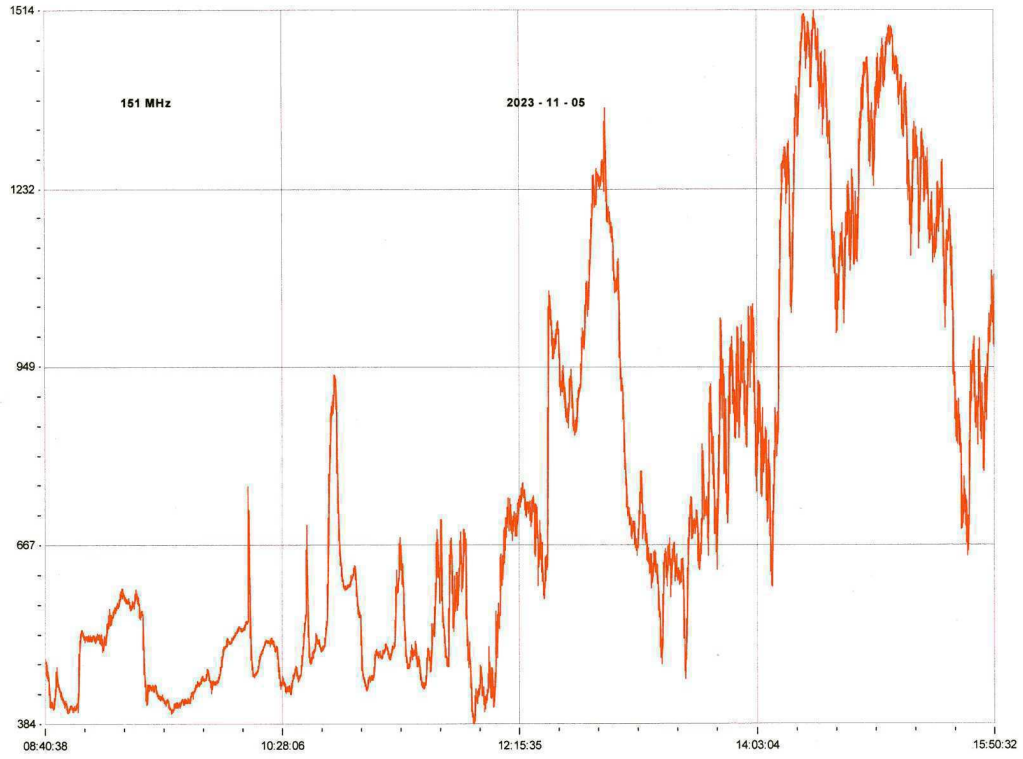


Activity on the 13th was much weaker and less turbulent, with no aurora reports. Roger Blackwell's recording shows an initial disturbance of about +/- 100nT compared with the 400..500nT seen earlier in the month.

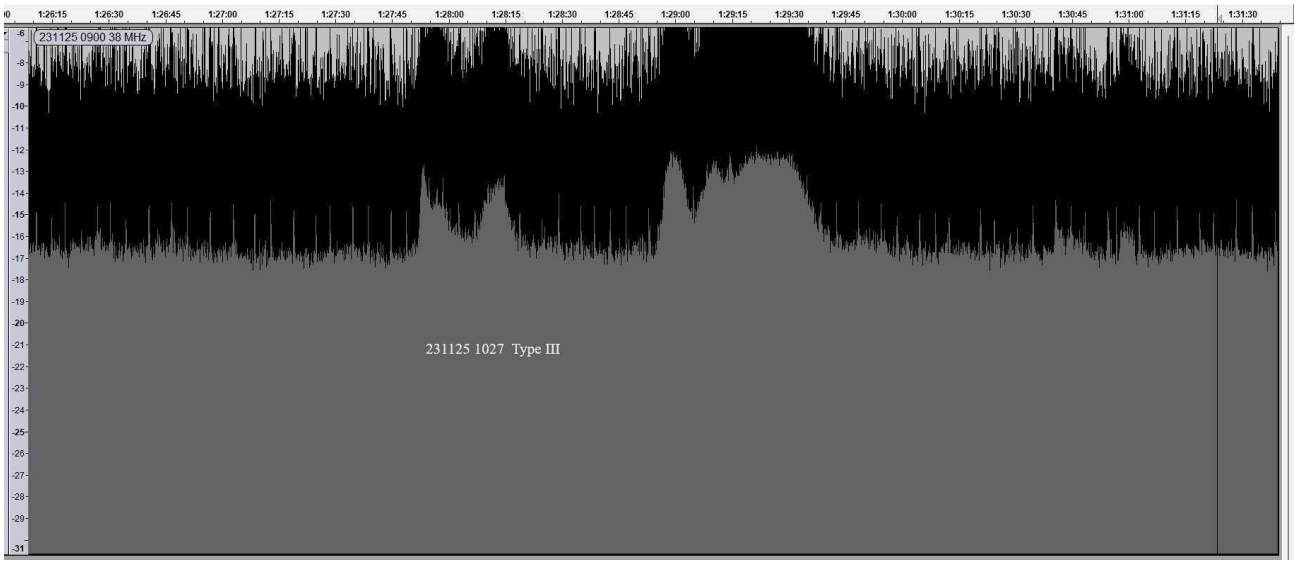
Magnetic observations received from Roger Blackwell, Stuart Green, Callum Potter, Nick Quinn and John Cook.

SOLAR EMISSIONS.



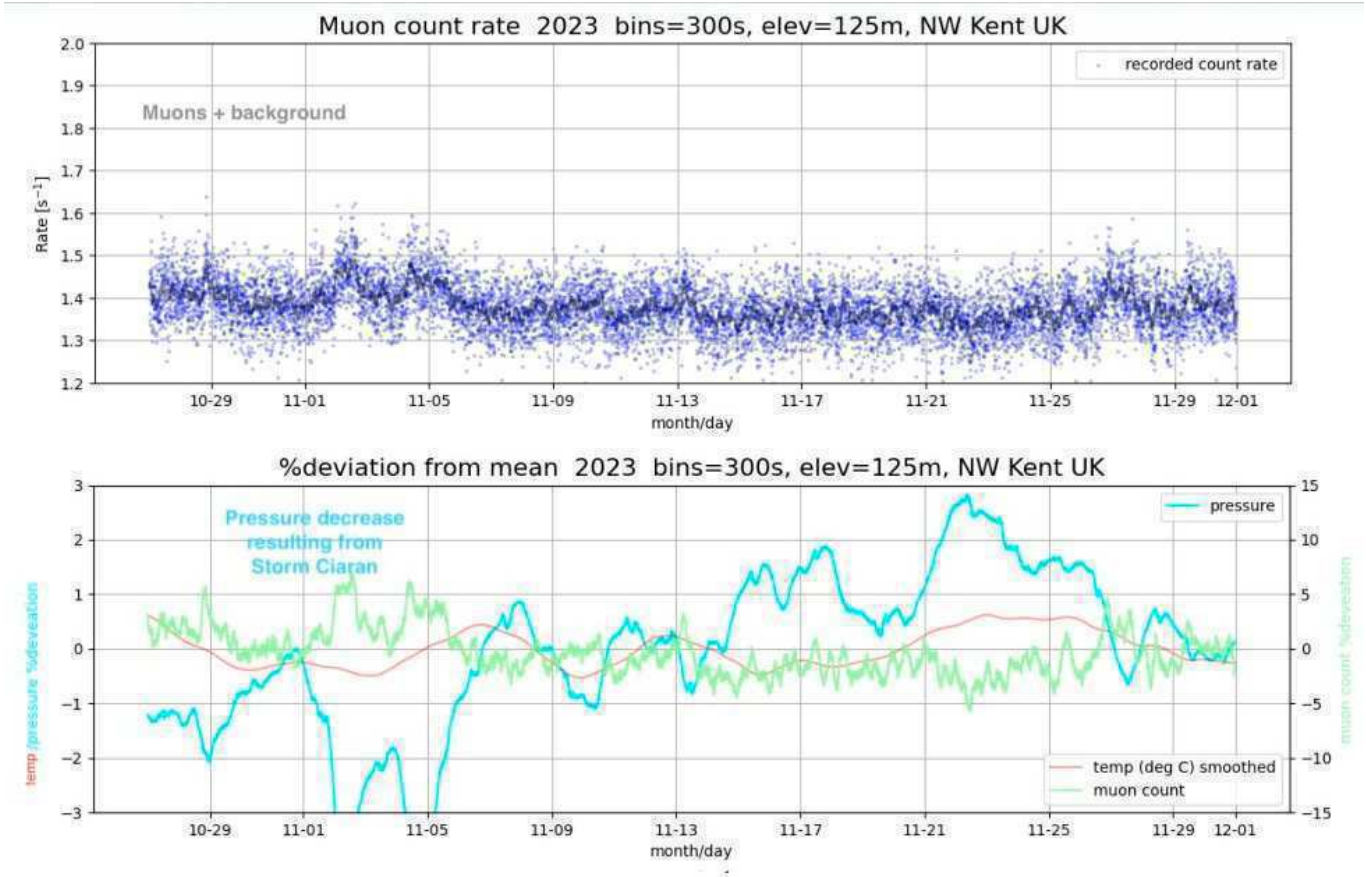


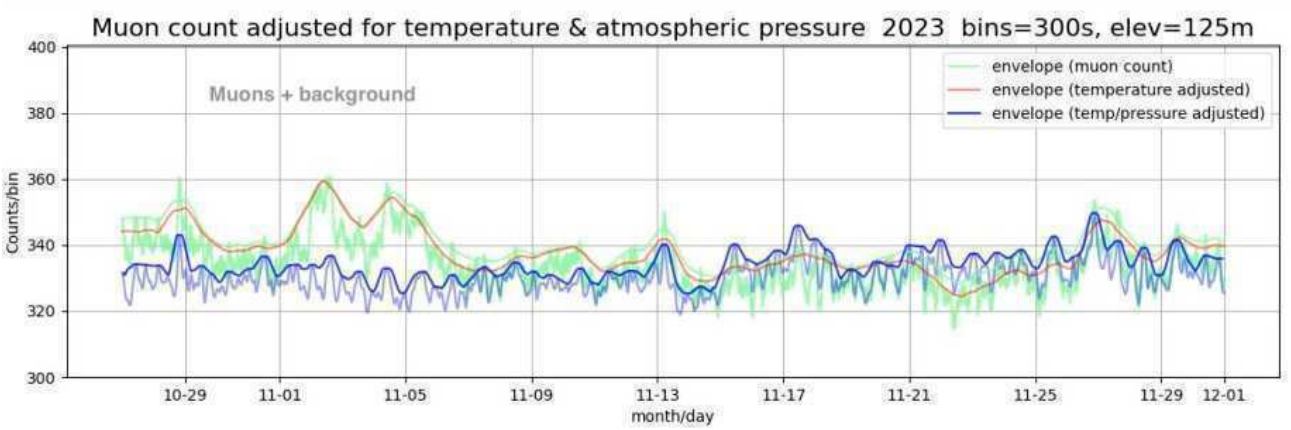
Colin Clements recorded some significant 151MHz solar noise during the strong flares on the 2nd and 5th. The aerial is now loft mounted and horizontally polarised, which seems to give a wider beam width for a fixed azimuth aerial. It is tricky to identify individual flares, as there were also plenty of smaller events that we did not record.

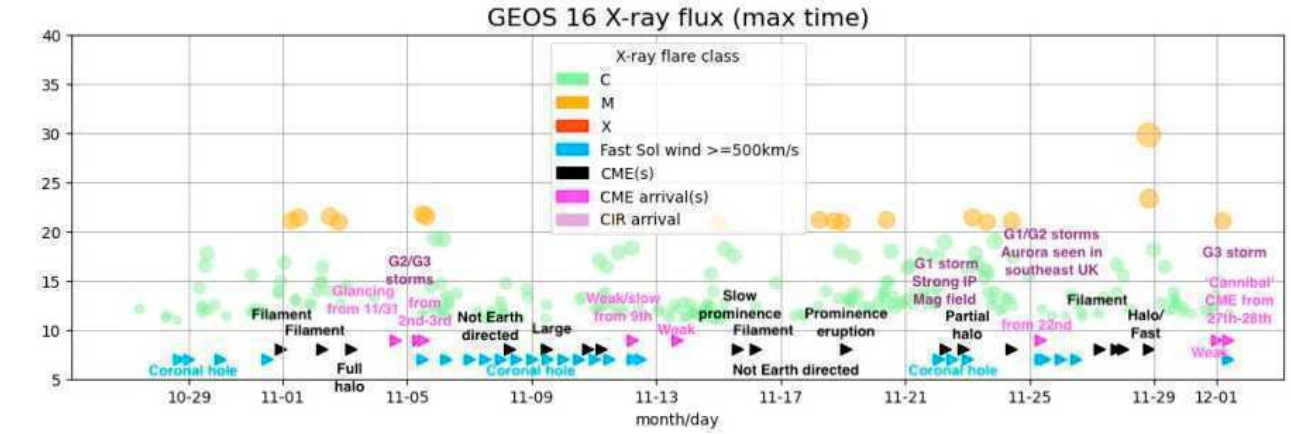


Colin Briden recorded a type III noise burst starting at 10:27 on the 25th. The SWPC does not list a flare at this time, but the recording is very distinct and does not appear to be interference. This was recorded at 38MHz, as the 28MHz band has become very noisy with other radio signals.

MUONS.

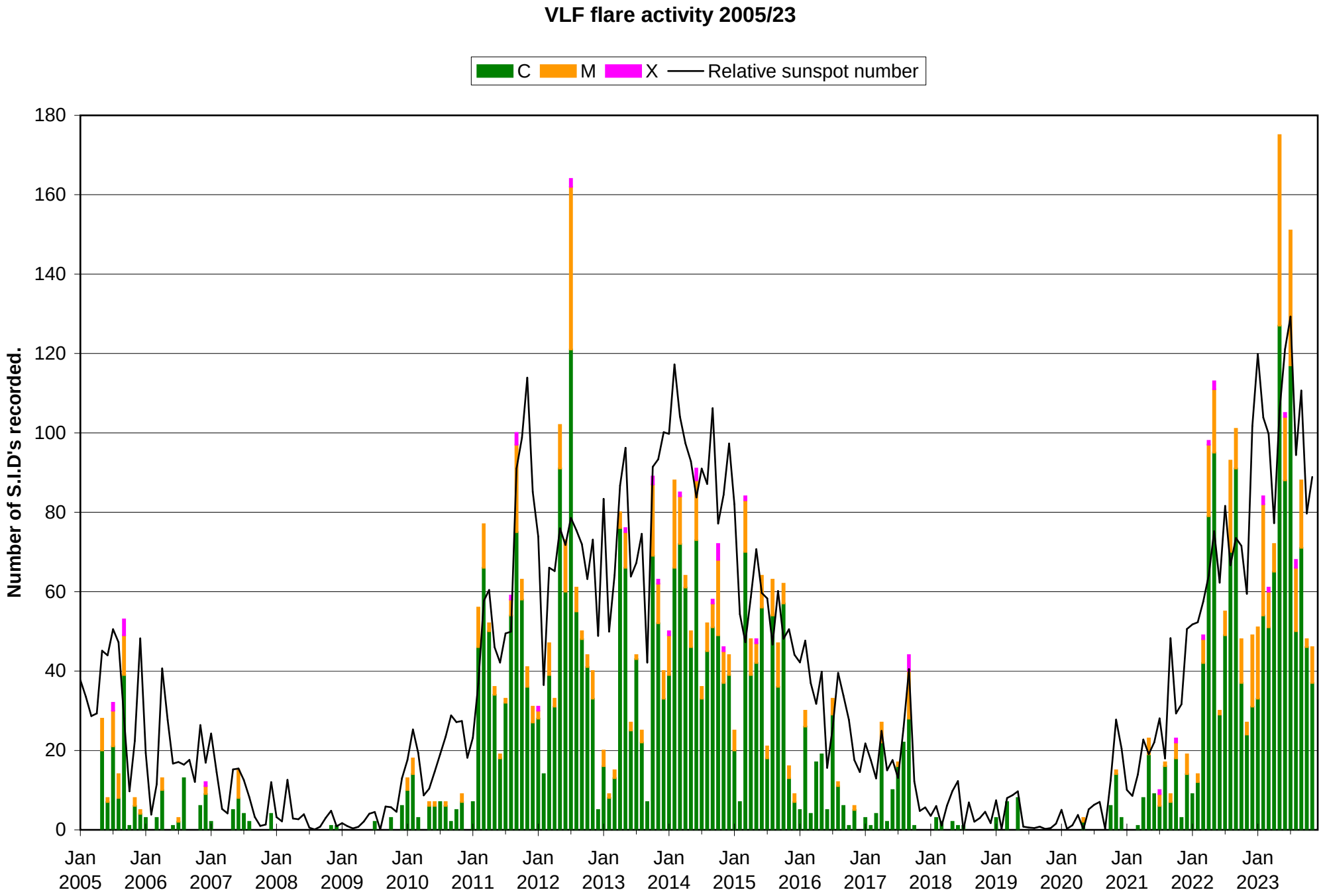






Mark Prescott has provided his muon counts for November. A very prominent feature is the very low atmospheric pressure recorded during storm Ciaran from the 1st to the 5th. My own barometer showed some of the lowest pressures that I have seen. Its effects on the muon count are clear in the top chart, the lower chart showing how effective the correction is. This was also the period of high solar activity, which may have been hidden by the storm. The CMEs towards the end of the month do seem to have increased the muon counts slightly.

Thank you for your continued support and contributions. Best wishes for a Happy Christmas.


VLF flare activity 2005/23
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

BAA Radio Astronomy Section.

BARTELS DIAGRAM

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

2556

F 24 25 | 2239 26 27 28 29 30 31 | 2021 January 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

2557

F 20 21 22 | 2240 23 24 25 26 27 28 29 30 31 | 2021 February 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

2558

F 16 17 18 | 2241 19 20 21 22 23 24 25 26 27 28 | 2021 March 1 2 3 4 5 6 7 8 9 10 11 12 13 14

C

2559

F 15 B 16 17 | 2242 18 19 20 21 22 23 24 25 26 27 28 29 30 31 | 2021 April 1 2 3 4 5 6 7 8 9 10

B

2560

F 11 12 13 | 2243 14 15 16 17 B 18 19 20 C 21 22 CCCC 23 24 25 26 27 28 29 30 | 2021 May 1 2 3 4 5 6 7 M

2561

F 8 CC 9 CC 10 | 2244 11 12 C 13 14 15 16 17 18 19 20 21 C 22 CCMM 23 CCBM 24 25 26 CCCC 27 C 28 29 30 31 | 2021 June 1 2 3

2562

F 4 5 6 7 | 2245 8 CCC 9 CCB 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 C 26 27 28 CBC 29 30 CC

2563

F 2021 July 1 2 3 MCXM 4 MC | 2246 5 6 7 8 9 CCB 10 11 12 13 14 15 16 C 17 18 C 19 20 21 22 23 24 25 26 27

2564

F 28 29 30 31 | 2021 August 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 CCC 21 22 C 23

2565

F 24 C 25 26 27 CCCC | 2248 28 MCCC 29 CC 30 C 31 | 2021 September 1 2 3 4 5 6 7 8 CC 9 C 10 11 12 13 14 15 16 17 18 19

2566

F 20 21 C 22 23 MM 24 | 2249 25 26 C 27 28 C 29 30 C | 2021 October 1 2 3 4 5 6 7 8 9 M 10 11 12 13 14 15 16

2567

F 17 18 19 20 21 | 2250 22 23 24 25 26 CCCM 27 CCCC 28 CMMX 29 CC 30 31 CCC | 2021 November 1 2 3 4 CC 5 6 7 8 9 10 11 12

2568

F 13 C 14 15 16 17 | 2251 18 19 20 21 22 23 24 25 26 27 28 29 30 | 2021 December 1 2 3 4 5 M 6 7 8 9

2569

F 10 11 12 13 14 | 2252 15 CCC 16 CC 17 C 18 19 20 CM 21 M 22 MCC 23 24 CC 25 CCCM 26 27 28 29 30 31 | 2022 January 1 2 3 4 5

2570

F 6 7 8 9 10 11 | 2253 12 13 C 14 C 15 16 17 18 19 20 21 22 23 24 25 C 26 CC 27 28 C 29 BCCC 30 31 1 C

2571

F 2022 February 2 CC 3 4 CC 5 6 7 | 2254 8 9 C 10 11 12 MCCC 13 14 CCM 15 16 17 18 19 20 21 22 23 24 25 26 27 28 C

2572

F 2022 March 1 CM 2 3 4 5 6 C | 2255 7 C 8 9 10 11 CCCC 12 C 13 14 M 15 CCMC 16 17 18 19 20 CC 21 22 CC 23 CCCC 24 C 25 26 C 27 C

2573

F 28 CMC 29 MCCC 30 CCCC 31 CCCX | 2022 April 1 CCCC 2 CCMM 3 CC | 2256 4 C 5 6 C 7 CC 8 C 9 C 10 11 CBCC 12 13 14 15 MMCC 16 CCCM 17 CCCM 18 MMCM 19 CCCC 20 CMCC 21 CC 22 CMC 23 C

2574

F 24 25 MCCC 26 CCCC 27 CCC | 2022 May 1 CCCC 28 CC 29 MCCM 30 MMXM 2 3 MCX 4 BMCM 5 CMMC 6 CC 7 CC 8 CCC 9 C 10 CCX 11 CCMM 12 CCCM 13 CCCC 14 CCCC 15 C 16 CMC 17 CCCC 18 CCCC 19 CMMM 20 CMM

2575

F 21 CCC 22 CC 23 CC 24 CC | 2258 25 CCM 26 CC 27 CC 28 CC 29 30 31 | 2022 June 1 2 3 4 5 6 7 8 9 CC 10 CCMC 11 C 12 13 C 14 CCCC 15 16 C

2576

F 17 CCCC 18 CCC 19 C 20 CC | 2259 21 C 22 CC 23 CC 24 C 25 C 26 27 28 29 30 | 2022 July 1 2 3 BC 4 C 5 CC 6 7 8 M 9 CCCC 10 CCCC 11 CM 12 CCCC 13 CCC

2577

F 14 CMCM 15 CCC 16 MCM 17 CCCC 18 | 2260 19 C 20 CCCC 21 22 CCCC 23 C 24 C 25 26 C 27 C 28 29 30 31 | 2022 August 1 CC 2 C 3 4 5 CC 6 7 8 9

2578

F 10 11 C 12 CC 13 CCCC 14 C 15 CMMM 16 MCC 17 CCMM | 2261 18 CMMM 19 MCCC 20 21 C 22 C 23 24 25 CCCM 26 CMMM 27 CMMM 28 CCMM 29 CMMM 30 CCCM 31 C | 2022 September 1 CC 2 CCCC 3 CCCC 4 CCCC 5 CCMC

2579

F 6 CC 7 8 9 10 C 11 CCCC 12 CCCC 13 CCCC | 2262 14 MCCC 15 16 MM 17 M 18 CC 19 C 20 MCCC 21 M 22 CCCC 23 CCCM 24 CCCC 25 26 CCC 27 CCCC 28 29 CC 30 CCMM | 2022 October 1 CC 2 CMMC

2580

F 2022 October 3 CMMM 4 M 5 C 6 7 CM 8 C 9 CCCC 10 CM | 2263 11 MMCC 12 CC 13 C 14 M 15 C 16 C 17 C 18 C 19 CC 20 21 22 CB 23 24 CC 25 C 26 C 27 28 29

2581

F 30 31 | 2022 November 1 2 3 4 5 6 C 7 C | 2264 8 9 10 C 11 MCCM 12 CC 13 C 14 C 15 CCC 16 CC 17 CCC 18 CCC 19 M 20 21 22 CCC 23 24 25

2582

F 26 27 28 29 30 C | 2022 December 1 C 2 C 3 M 4 | 2265 5 6 7 C 8 9 10 11 C 12 13 14 MMMM 15 CMCM 16 MMMC 17 18 CC 19 CCC 20 M 21 C 22 C

2583

F 23 CC 24 C 25 26 CCC 27 CM 28 CM 29 CCCM 30 CCM 31 C | 2023 January 1 2 3 4 5 6 7 CC 8 MCCM 9 MM 10 MCMM 11 MC 12 MCMC 13 MC 14 CCC 15 CM 16 C 17 MC 18

2584

F 19 MMC 20 CC 21 CC 22 CMCM 23 C 24 CCC 25 MCM 26 CMCC 27 28 C | 2267 29 C 30 C 31 CC | 2023 February 1 C 2 C 3 4 C 5 C 6 C 7 CC 8 CM 9 MMMM 10 MCCM 11 MMXM 12 MMMM 13 CCCM 14 CCM

2585

F 15 CCCC 16 C 17 CX 18 C 19 CC 20 CMCC 21 MCCM 22 CCCM 23 CMCC 24 CCM | 2268 25 CCMM 26 CC 27 CC 28 | 2023 March 1 CC 2 CCCC 3 MCCX 4 CMMC 5 CCMC 6 MCCC 7 C 8 MC 9 CCC 10 CCCC 11 C 12 13

2586

F 14 C 15 16 C 17 CCCM 18 C 19 CCC 20 C 21 C 22 23 | 2269 24 C 25 26 CC 27 CCC 28 CC 29 MC 30 M 31 CC | 2023 April 1 CCC 2 MC 3 4 5 6 7 CC 8 CCCC 9

2587

F 10 MCCC 11 MC 12 CCC 13 CCCC 14 CCMC 15 CCCC 16 C 17 CC 18 CCC 19 CCC 20 CCCC | 2270 21 M 22 CC 23 24 CC 25 26 C 27 M 28 CC 29 CCCC 30 CCM | 2023 May 1 CCMC 2 CCCC 3 MMMM 4 MCCC 5 CMM 6 CC

2588

F 7 C 8 CCCM 9 MCMM 10 MCCC 11 MCCM 12 CCCC 13 CCCC 14 C 15 C 16 CCCM 17 CCCC | 2271 18 MMMM 19 MCCM 20 MMMM 21 CCCM 22 CCMC 23 CCMC 24 MCCM 25 CCMC 26 CCC 27 CCC 28 MC 29 C 30 MMMC 31 CMCM | 2023 June 1 CCCC 2 CC

2589

F 3 CC 4 CCCC 5 C 6 CCCC 7 CMCC 8 CC 9 CM 10 C 11 12 CCCC 13 CCCC | 2272 14 CC 15 CC 16 MCMM 17 CC 18 M 19 MC 20 CCMX 21 CMMC 22 CMCC 23 C 24 CCMC 25 CCCC 26 CCMC 27 CMCC 28 MCC 29 CCCM

2590

F 2023 July 30 CCCC 1 CCCC 2 CCCC 3 MCCC 4 MC 5 CCCM 6 CCM 7 MC 8 C 9 CCC 10 CCCC | 2273 11 MMMM 12 MMCC 13 CCCM 14 MCCC 15 MMMC 16 MCMM 17 CCC 18 MMMM 19 CMCM 20 C 21 C 22 CC 23 CC 24 C 25 CCCM 26 CMCM

2591

F 27 CMCC 28 CMCC 29 CCCM 30 MC 31 CMCC | 2023 August 1 MMMM 2 MMMM 3 CMCC 4 CC 5 MMCX 6 CM | 2274 7 CMMX 8 MC 9 C 10 11 CCCC 12 CCCC 13 C 14 15 C 16 CC 17 CCC 18 19 C 20 CC 21 CC 22

2592

F 23 CCC 24 C 25 C 26 C 27 28 29 30 C 31 | 2023 September 1 2 MC | 2275 3 MCC 4 CC 5 MCC 6 CCCC 7 CCM 8 CCC 9 C 10 C 11 CCCM 12 MCCC 13 C 14 CCM 15 C 16 CC 17 C 18 C

2593

F 19 MCCC 20 CMCC 21 M 22 CCMM 23 CCCC 24 CCMC 25 C 26 CC 27 28 MCC 29 CCC 30 CCCM | 2023 October 1 CCCC 2 CCM 3 CCCC 4 C 5 C 6 CC 7 CC 8 CC 9 CCC 10 CMCC 11 CC 12 13 14 C 15 C

2594

F 16 CCC 17 18 19 C 20 C 21 22 23 24 25 CC 26 CC 27 | 2277 28 29 CCCC 30 | 2023 November 1 MCM 2 CCM 3 4 5 MCM 6 C 7 8 C 9 C 10 C 11 CCC 12

2595

F 13 C 14 CCCC 15 C 16 17 18 CM 19 CC 20 MCCC 21 CCCC 22 23 CCMC 24 MC 25 26 C | 2023 December 1 2 3 4 5 6 7 8 9 27 28 29 C 30

BAA Radio Astronomy Section. **2023 NOVEMBER.**

	Xray class	Observers	John Cook (23.4kHz/*22.1kHz*) Tuned radio frequency receiver, 0.58m frame aerial.				Roberto Battaiola 20.3kHz Modified AAVSO receiver.				Paul Hyde (22.1kHz/*24kHz*) Spectrum Lab / PC 1.5m frame aerial.				Mark Edwards (24.0/*18.3*/**19.6kHz**) Spectrum Lab / PC 2m loop aerial.				Colin Clements (23.4kHz/*21.75kHz*) 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	**M1.1**	1																				
1	C3.0	1	08:49	08:52	09:25	2																
1	?	3									11:38	11:46	?	-	*11:43*	*11:48*	*?*	-				
1	?	1									11:56	11:59	?	-								
1	?	3									12:01	12:17	?	-	12:00	12:20	?	-				
1	**M1.4**	12	12:01	12:22	13:38	3	11:37	12:24	14:32	3+	12:23	12:28	13:58	3	12:22	12:27	?	-	12:07	12:29	12:49	2
1	?	1													13:23	13:23	14:05	2				
2	C3.9	7	11:16	11:20	11:30	1-	11:14	11:18	11:34	1	11:16	11:21	11:32	1-	*11:17*	*11:22*	*11:26*	*1-*				
2	C2.2	2	12:10	12:13	12:20	1-									12:10	12:12	12:16	1-				
2	**M1.6**	10	12:22	12:23	12:45	1	12:19	12:23	12:29	1-	12:21	12:24	12:41	1	12:21	12:24	12:37	1-	12:21	12:25	12:36	1-
5	**M1.8**	12	11:41	11:43	12:14	2	11:32	11:43	12:14	2	11:42	11:45	12:14	1+	11:41	11:44	12:10	1+	*11:41*	*11:43*	*11:53*	*1-*
5	C2.1	2													13:27	13:32	13:45	1-				
5	**M1.6**	10	14:31	14:34	14:46	1-	14:29	14:33	14:42	1-	14:31	14:34	15:02	1+	14:31	14:34	15:04	2	14:31	14:33	14:50	1
6	C3.6	5	14:00	14:02	?	-					13:59	14:04	14:11	1-	**14:00**	**14:03**	**14:09**	**1-**				
8	C6.8	4	08:44	08:48	08:57	1-	08:43	08:48	09:00	1-					*08:43*	*08:48*	*09:01*	*1-*				
9	C2.6	1													11:12	11:19	11:25	1-				
10	C3.2	2	*12:05*	*12:11*	*12:36*	*1+*	12:03	12:20	12:40	2												
11	C3.8	4	08:29	08:34	08:39	1-	08:26	08:34	08:41	1-					*08:30*	*08:34*	*08:39*	*1-*				
11	C6.5	9	09:14	09:17	09:20	1-	09:11	09:16	09:29	1-	09:12	09:16	09:25	1-	09:14	09:17	09:31	1-				
11	C2.8	2													12:38	12:39	12:51	1-				
11	?	1													13:13	13:16	13:26	1-				
11	?	2													13:42	13:47	13:53	1-				
13	C2.6	1													13:22	13:34	13:50	1+				
14	C1.5	1	08:53	08:54	08:59	1-																
14	C2.1	4					11:41	11:48	11:53	1-												
14	C2.2	1													14:43	14:45	?	-				
14	C2.5	1													14:48	14:51	14:58	1-				
14	C2.7	1													15:28	15:31	15:39	1-				
15	C7.6	9	12:09	12:13	12:22	1-	12:09	12:13	12:36	1+	12:09	12:14	12:33	1	12:11	12:15	12:30	1				
15	?	2													12:59	13:03	13:14	1-				
18	C4.0	2																				
18	**M1.1**	3									16:38	16:43	17:04	1+	16:39	16:45	17:02	1				
19	C7.5	5	08:33	08:37	08:48	1-	08:29	08:38	09:02	2												
19	C3.6	1																				
20	C2.1	1																				
20	**M1.2**	8									09:01	09:07	09:18	1-	*08:56*	*09:06*	*09:16*	*1*	09:01	09:05	09:21	1
20	C4.8	2																				
20	C5.0	4									10:14	10:18	10:33	1	10:13	10:18	10:23	1-				
20	C8.0	10	12:30	12:33	12:48	1-	12:28	12:33	12:55	1+	12:28	12:34	12:56	1+	12:29	12:33	12:54	1	12:29	12:33	12:45	1-
20	C2.7	2													13:05	13:08	13:13	1-				
20	C3.5	1													14:02	14:08	14:21	1				
21	C3.2	1																				
21	C3.5	4									13:34	13:36	13:41	1-	13:35	13:36	13:43	1-				
21	C7.7	6					13:50	13:56	14:07	1-	13:50	13:55	14:19	1+	13:52	13:54	14:10	1-				
21	C3.9	2													14:33	14:37	14:41	1-				
23	C5.3	5	12:41	12:45	?	-	12:38	12:46	12:55	1-	12:41	12:45	12:58	1-	12:42	12:47	?	-				
23	C6.2	2	12:59	13:11	13:30	1+									12:55	13:14	13:51	2+				
23	**M1.0**	7	14:32	14:36	14:44	1-	14:33	14:38	14:49	1-	14:33	14:38	14:57	1	14:32	14:38	14:59	1+				
23	C5.9	1													15:34	15:40	15:47	1-				
24	**M1.1**	6					09:19	09:34	10:14	2+					*09:20*	*09:33*	*09:49*	*1+*				
24	C7.5	10	10:40	10:43	10:51	1-	10:34	10:43	11:01	1+	10:38	10:44	10:55	1-	*10:39*	*10:44*	*10:57*	*1-*				
26	C2.7	3									12:55	13:00	13:12	1-	12:53	12:59	13:02	1-				
29	C3.8	1													14:32	14:37	15:01	1+				

BAA Radio Astronomy Section. **2023 NOVEMBER.**

	Xray class		Steve Parkinson (Various)				Andrew Thomas (18.3kHz/*19.6kHz*)				Phil Rourke (23.4kHz)				Mark Prescott (22.1kHz/*19.6kHz*)				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	**M1.1**																					
1	C3.0																					
1	?		11:42	11:48	?	-																
1	?																					
1	?																					
1	**M1.4**		12:01	12:10	13:38	3	*12:01*	*12:24*	*13:42*	*3*	11:41	12:42	13:39	3	*12:06*	*12:31*	*13:22*	*2+*	12:00	12:20	13:50	3
1	?																					
2	C3.9		11:16	11:21	11:40	1					11:15	11:20	11:32	1-	11:19	11:26	11:40	1				
2	C2.2																					
2	**M1.6**		12:21	12:24	12:43	1	12:22	12:24	12:45	1	12:20	12:23	12:50	1+	12:25	12:27	12:42	1-				
5	**M1.8**		11:41	11:44	12:20	2	11:41	11:44	12:20	2	11:39	11:43	12:34	2+	11:44	11:48	12:25	2	11:40	11:43	12:00	1
5	C2.1																					
5	**M1.6**		14:31	14:34	14:50	1					14:31	14:34	14:52	1	14:35	14:38	14:46	1-				
6	C3.6						13:54	14:04	14:16	1					14:04	14:07	?	-				
8	C6.8										08:43	08:48	09:10	1+								
9	C2.6																					
10	C3.2																					
11	C3.8																					
11	C6.5		09:15	09:16	09:21	1-	09:14	09:16	09:25	1-	09:12	09:16	09:22	1-								
11	C2.8																					
11	?																					
11	?																					
13	C2.6																					
14	C1.5																					
14	C2.1						*11:42*	*11:44*	*11:54*	*1-*	11:43	11:46	11:59	1-								
14	C2.2																					
14	C2.5																					
14	C2.7																					
15	C7.6		12:10	12:14	12:30	1	*12:09*	*12:14*	*12:29*	*1*	12:10	12:13	12:38	1+	*12:14*	*12:17*	*12:24*	*1-*				
15	?																					
18	C4.0										10:40	10:44	10:56	1-								
18	**M1.1**																					
19	C7.5						08:31	08:37	08:51	1												
19	C3.6																					
20	C2.1																					
20	**M1.2**		09:01	09:05	09:15	1-	08:59	09:06	09:21	1	09:00	09:05	?	-								
20	C4.8										?	09:21	10:02	-								
20	C5.0		10:12	10:15	10:20	1-																
20	C8.0		12:29	12:33	12:53	1	12:29	12:33	13:00	1+	12:29	12:33	12:54	1								
20	C2.7																					
20	C3.5																					
21	C3.2																					
21	C3.5						13:34	13:36	13:40	1-												
21	C7.7						13:49	13:55	14:15	1+												
21	C3.9																					
23	C5.3						12:42	12:46	12:56	1-												
23	C6.2																					
23	**M1.0**						14:31	14:37	14:50	1	14:28	14:33	14:36	1-								
23	C5.9																					
24	**M1.1**						09:22	09:35	09:52	1+	09:21	09:30	09:54	2	09:32	09:35	09:59	1+				
24	C7.5		10:40	10:43	11:00	1	10:39	10:43	10:54	1-	10:40	10:43	10:56	1-	10:44	10:48	11:01	1-				
26	C2.7														12:59	13:03	13:12	1-				
29	C3.8																					

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	Xray class		Chris Bailey			Colin Briden 45.9kHz				Richard Coffey (19.6kHz/*24kHz*)							
			Spectrum Lab.							Spectrum Lab, 0.55m Frame Aerial.							
DAY			START	PEAK	END (UT)	START	PEAK	END (UT)		START	PEAK	END (UT)		START	PEAK	END (UT)	
1	**M1.1**									06:27	06:39	06:51	1				
1	C3.0																
1	?																
1	?																
1	?					12:10	12:12	12:16	1-								
1	**M1.4**					12:22	12:24	12:49	1+	12:04	12:27	13:06	2+				
1	?																
2	C3.9																
2	C2.2																
2	**M1.6**									*12:22*	*12:25*	*12:36*	*1-*				
5	**M1.8**					11:41	11:44	12:00	1	11:43	11:45	11:49	1-				
5	C2.1					13:26	13:28	13:31	1-								
5	**M1.6**					14:31	14:32	14:41	1-	14:27	14:34	14:50	1				
6	C3.6																
8	C6.8																
9	C2.6																
10	C3.2																
11	C3.8					08:29	08:33	08:38	1-								
11	C6.5					09:14	09:16	09:21	1-	09:12	09:18	09:28	1-				
11	C2.8					12:28	12:33	12:36	1-								
11	?																
11	?					13:42	13:43	13:47	1-								
13	C2.6																
14	C1.5																
14	C2.1					11:43	11:45	11:57	1-								
14	C2.2																
14	C2.5																
14	C2.7																
15	C7.6					12:10	12:14	12:27	1-								
15	?					13:02	13:04	13:05	1-								
18	C4.0					10:41	10:44	10:49	1-								
18	**M1.1**									16:40	16:43	16:53	1-				
19	C7.5					08:31	08:34	08:55	1	08:21	08:58	09:34	2+				
19	C3.6					11:09	11:13	11:18	1-								
20	C2.1					08:31	08:34	08:38	1-								
20	**M1.2**					08:59	09:04	09:14	1-	09:01	09:08	09:21	1				
20	C4.8					09:22	09:25	09:28	1-								
20	C5.0					10:12	10:15	10:22	1-								
20	C8.0					12:29	12:32	12:44	1-	12:28	12:34	12:41	1-				
20	C2.7					13:04	13:10	13:17	1-								
20	C3.5																
21	C3.2					11:10	11:11	11:14	1-								
21	C3.5					13:34	13:36	13:44	1-								
21	C7.7					13:51	13:54	14:00	1-	13:52	13:55	14:04	1-				
21	C3.9					14:33	14:35	14:37	1-								
23	C5.3																
23	C6.2																
23	**M1.0**									14:35	14:39	15:00	1				
23	C5.9																
24	**M1.1**					09:22	09:27	09:31	1-								
24	C7.5					10:39	10:42	11:00	1	10:42	10:44	10:51	1-				
26	C2.7																
29	C3.8																