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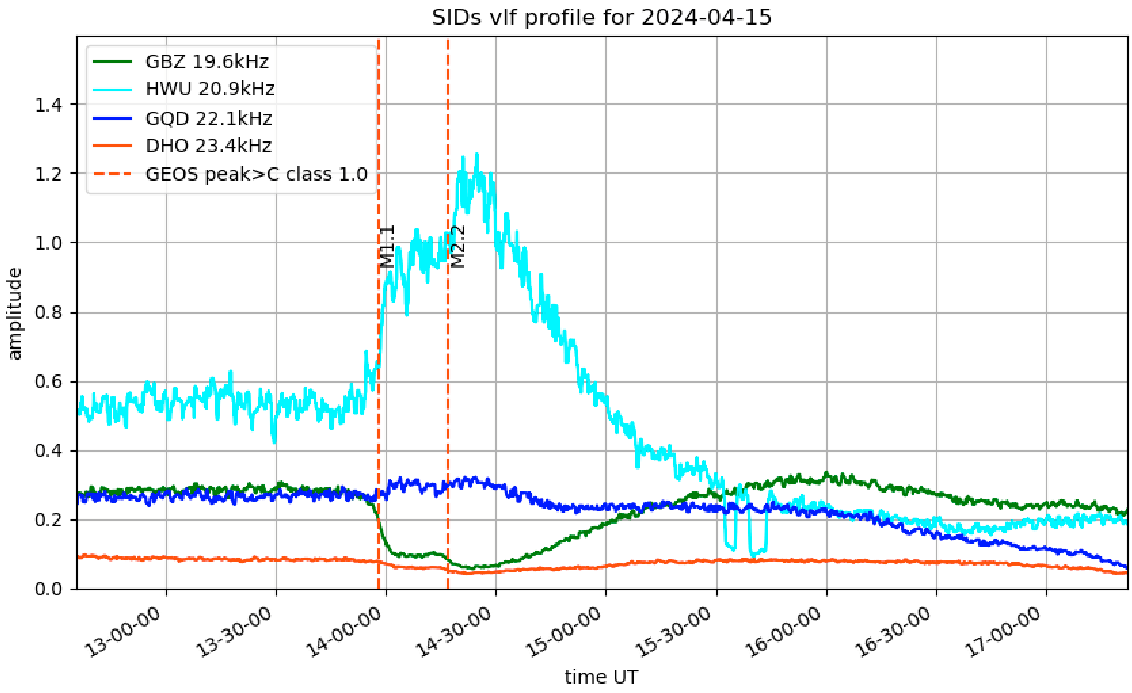
BAA Radio Astronomy Section. Director Paul Hearn.

RADIO SKY NEWS 2024 APRIL.

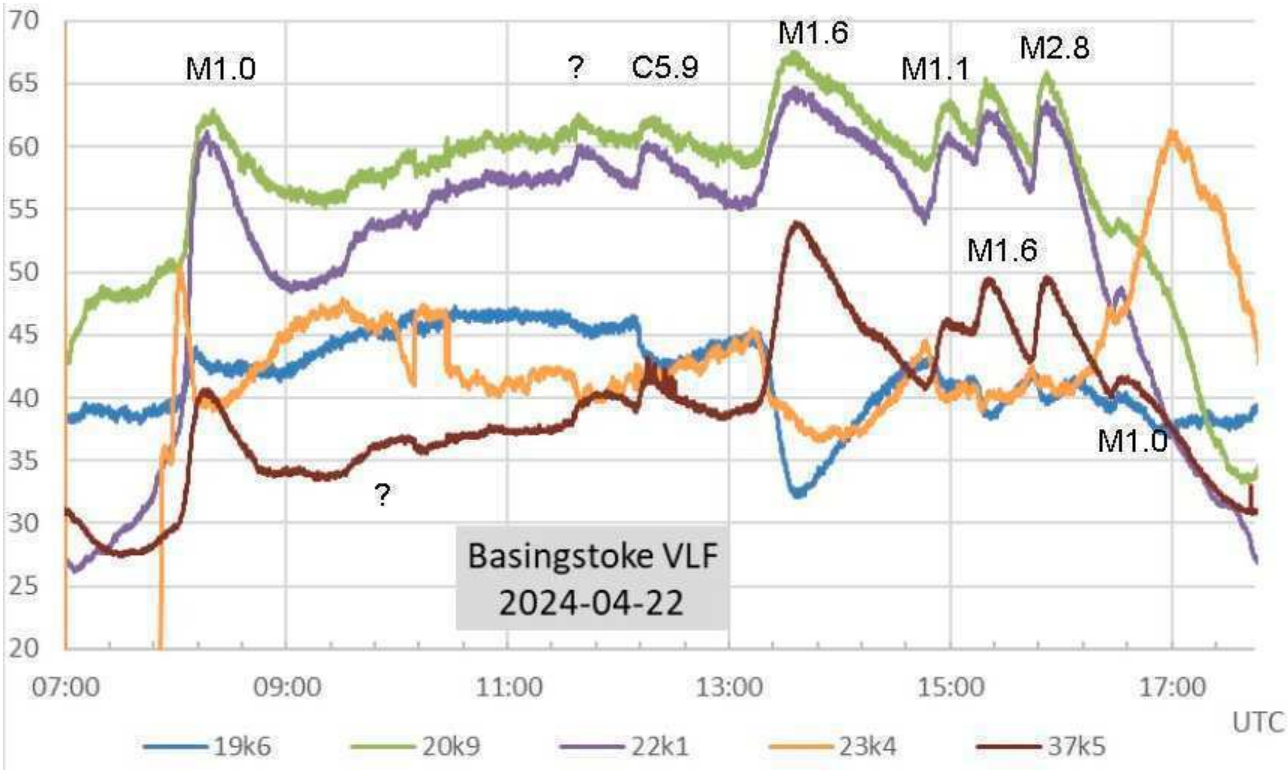
VLF SID OBSERVATIONS.

Flare activity in April was slightly lower than in March, but there were still plenty of strong M-class flares with a generally high background X-ray flux. The month started very quietly, with just a single SID recorded between the 1st and 9th. Activity increased in the second half of the month, with plenty of M-class flares hiding the smaller C-class flares. Multiple peaks were a problem again, with a very difficult triple on the 15th:

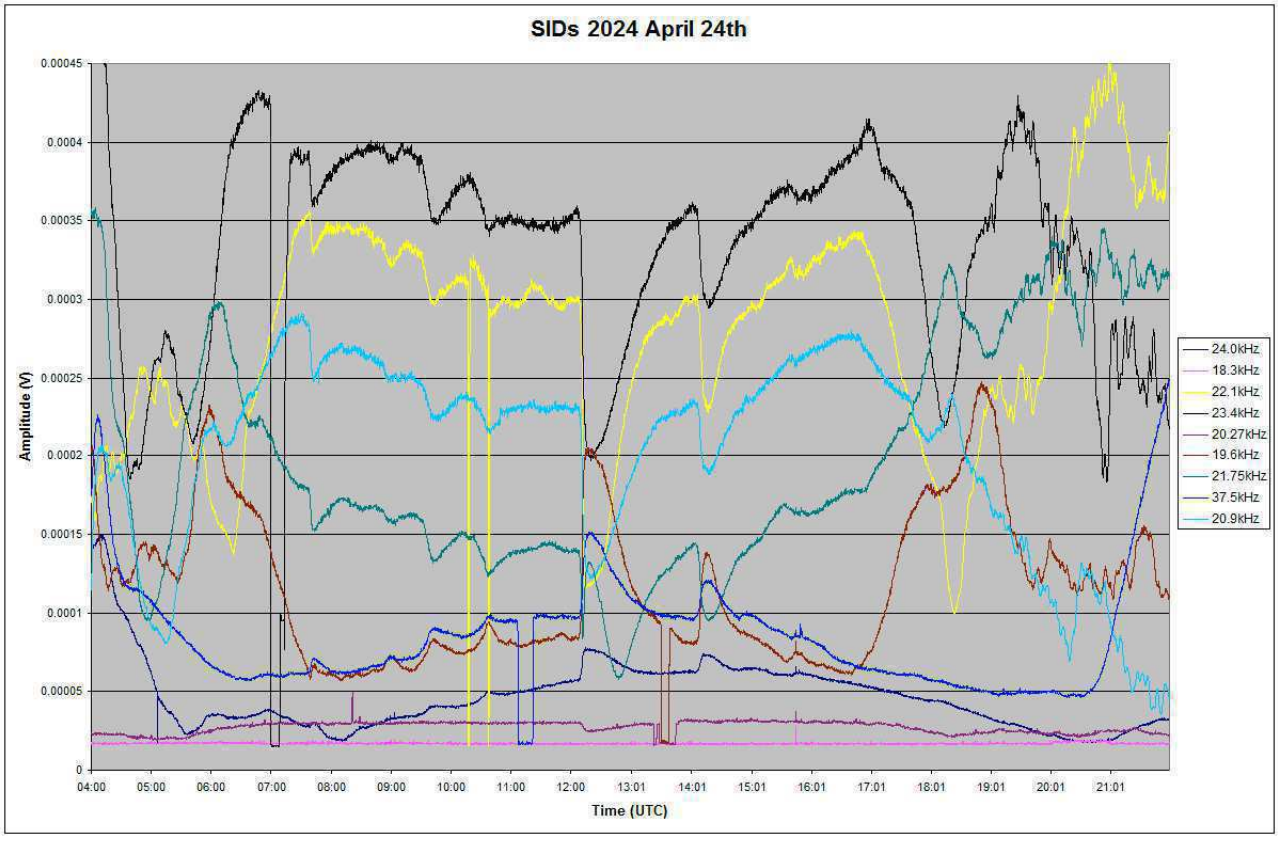


Mark Prescott's chart shows SIDs from two of these, the way that all of our observers recorded them. Satellite X-ray data lists an M1.1 flare peaking at 13:58UT, followed by an M1.4 peaking at 14:04. The M2.2 is listed at 14:17. Two active regions were involved; AR13639 for the M1.1 and M2.2, AR13634 for the M1.4.

Activity further increased after this, with a rapid sequence of M-flares on the 22nd. The recording from Paul Hyde shows these on several signals:

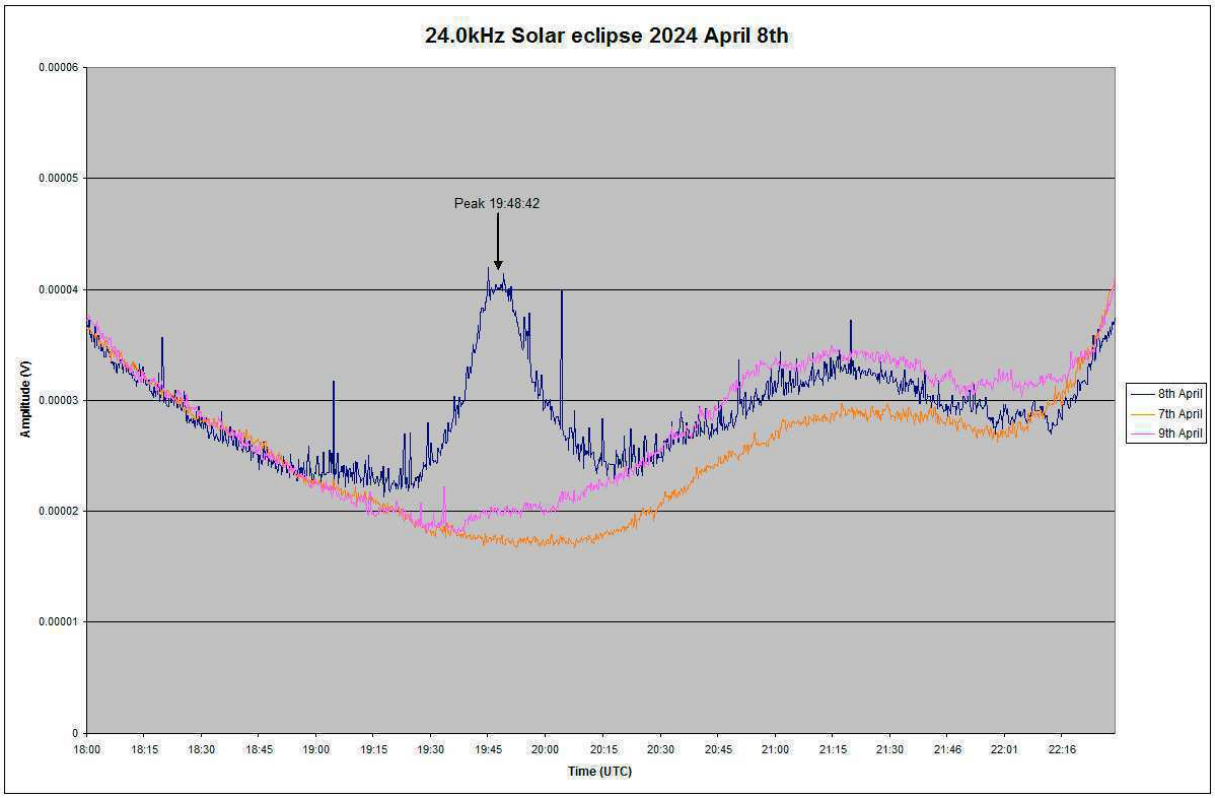


23.4kHz and 19.6kHz have not produced clear SIDs from all of these events, while 20.9kHz and 22.1kHz are very clear. The afternoon sequence of SIDs are all overlapping, with three active regions flaring. The 24th also produced many overlapping SIDs, shown here by Mark Edwards:

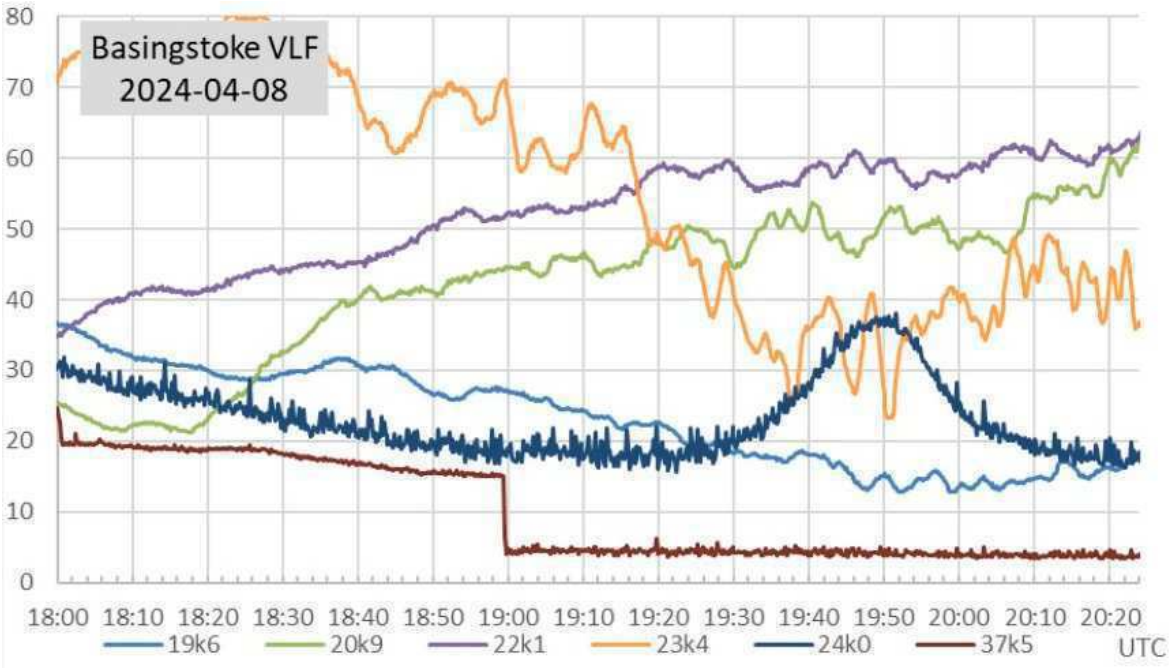


Most of these are C-class, with an M1.4 prominent at 12:15UT.

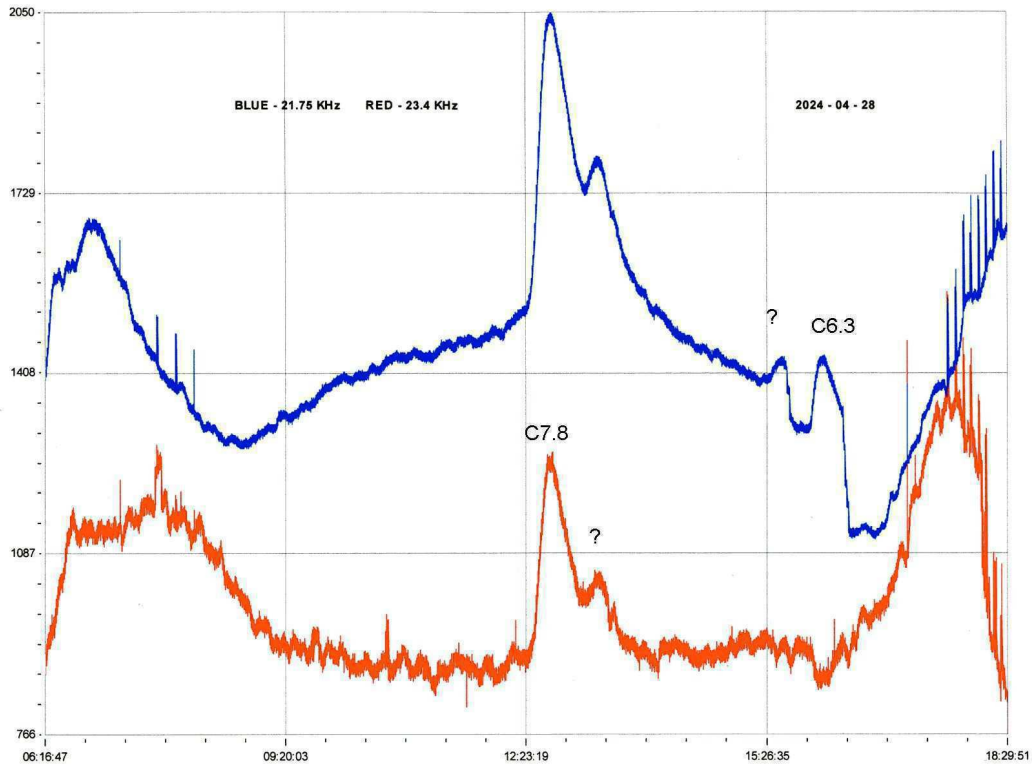
There was a solar eclipse on April 8th, visible mostly from the USA. The most westerly parts of the UK were able to catch a glimpse at sunset, but the trans-Atlantic signal paths were also included.



Mark Edwards' 24kHz recording shows a significant symmetrical rise in the 24kHz signal peaking at 19:48UT, blue trace. Pink and orange show the 9th and 7th, with more normal quiet curves. Mark notes that the symmetry of the curve was rather unexpected, given the long path length. There would presumably have been several reflection points on the ionosphere.

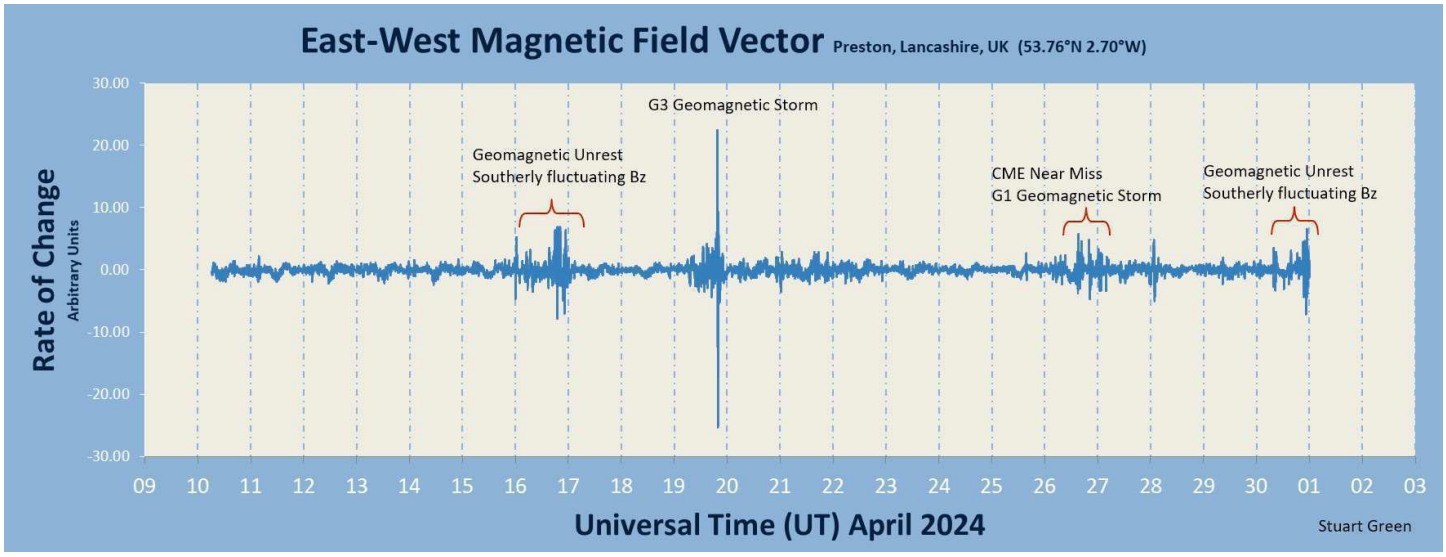


Paul Hyde's recording shows a very similar response at 24kHz, the other local signals well past sunset.

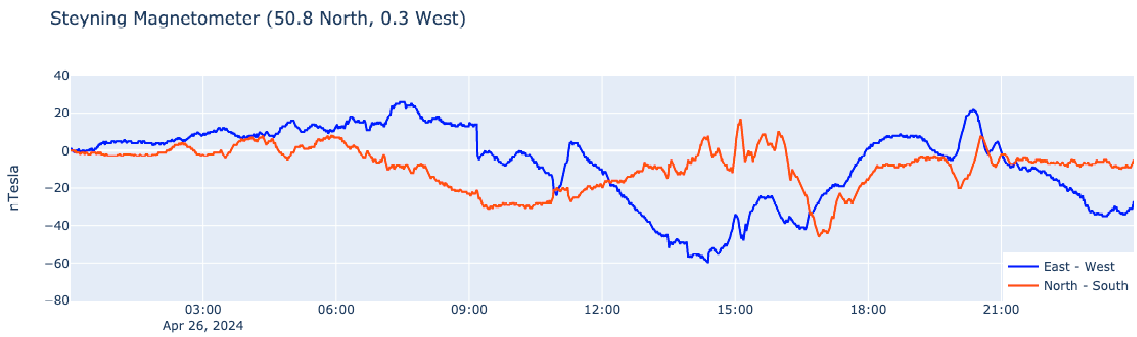


Colin Clements recorded the C7.8 and C6.3 flares on the 28th. There were also two unclassified events that show clearly. The second pair were rather close to the sunset, and are less clear at 23.4kHz.

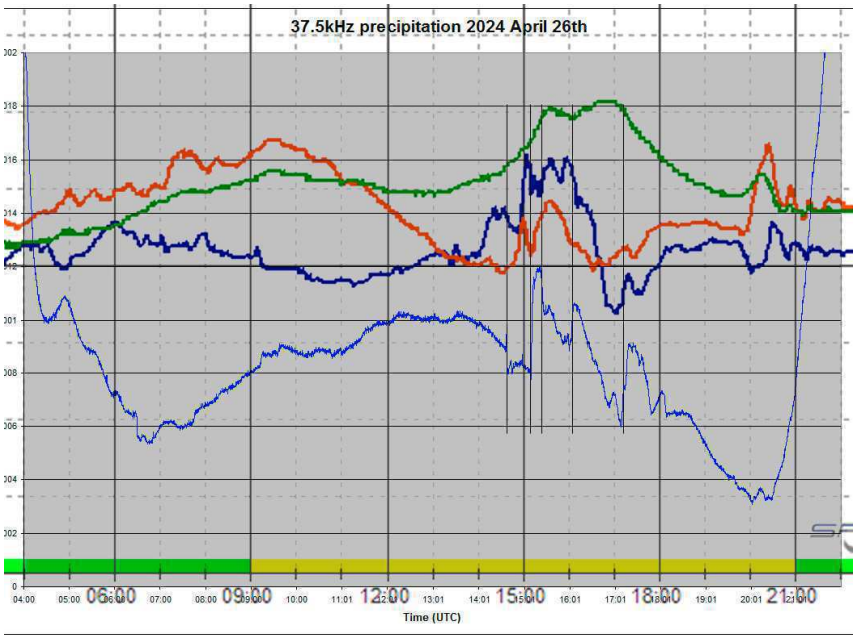
MAGNETIC OBSERVATIONS.



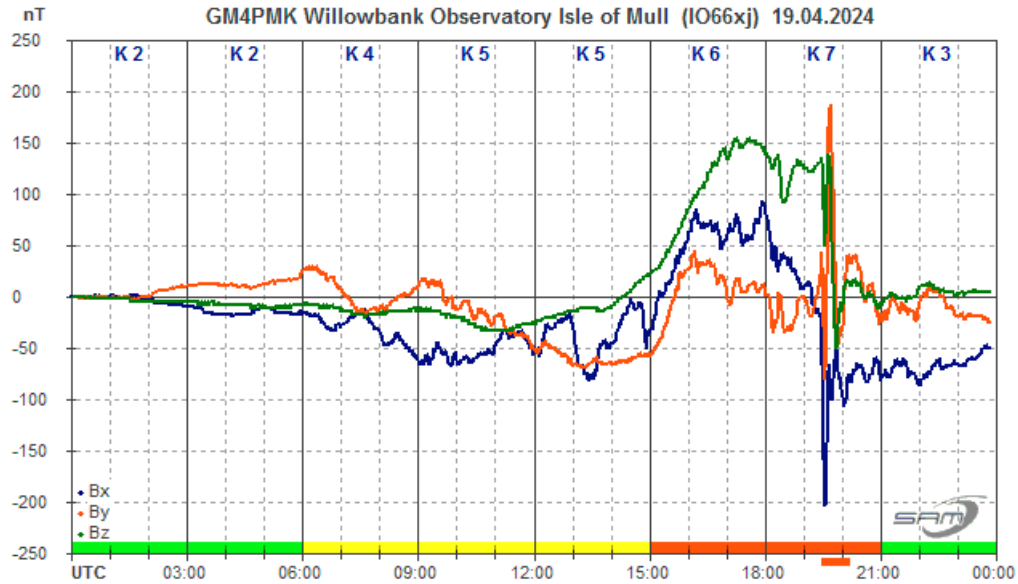
Stuart Green's summary starts on the 10th, and is deceptively quiet. The first few days are missing while the sensor was being relocated. There were plenty of CMEs associated with the stronger flares, but they were mostly directed away from Earth and were fairly weak. There were also a number of coronal holes present, with stronger winds responsible for some of the magnetic disturbance. A CME glancing blow seems to have been responsible for a storm on the 26th:



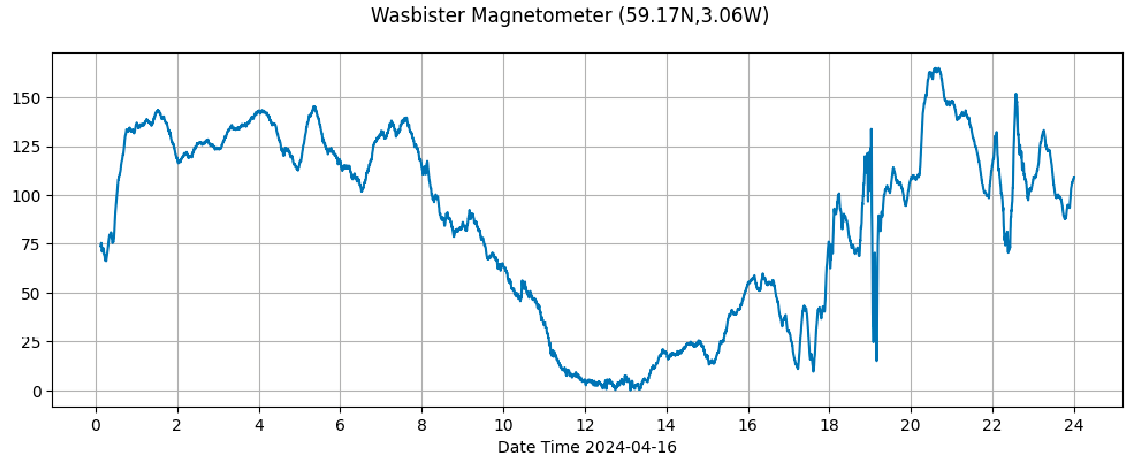
Nick Quinn's recording shows the disturbance lasting through most of the day, fading out after about 21UT. Mark Edwards also recorded a strong response on the 37.5kHz Grindavik signal, matching well with the magnetic recordings. He has overlaid Roger Blackwell's magnetic data on his VLF chart:



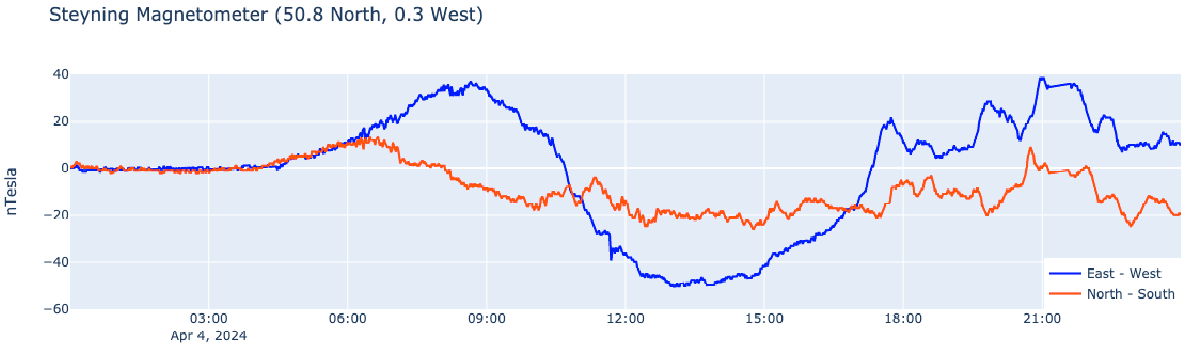
The vertical black lines help to show the alignment between the magnetic and VLF effects. The light blue trace is the 37.5kHz signal.



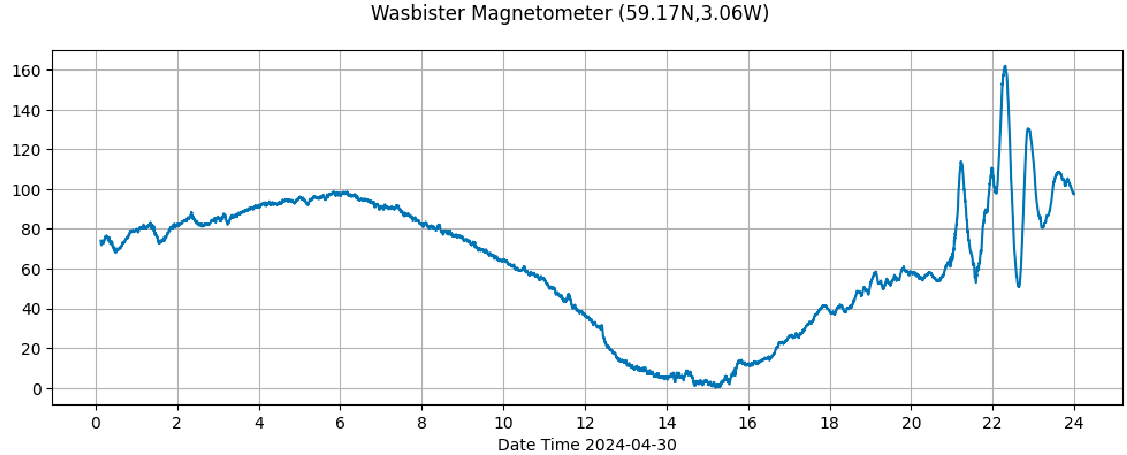
Roger Balckwell's recording from the 19th shows the strongest magnetic disturbance in April. The very sharp spike at 19:30 is about +/-200nT, and may be an impact feature although it is not clear from the data to hand. The STCE bulletin lists a CME from the 15th as being the source. It also lists a CME arrival on the 15th from a flare on the 12th. Callum Potter's recording from the 16th shows the resulting disturbance, again showing a sharp spike shortly after 19UT. This was a slightly weaker storm of about 150nT.



Nick Quinn recorded the much weaker magnetic disturbance on the 4th from a coronal hole solar wind:

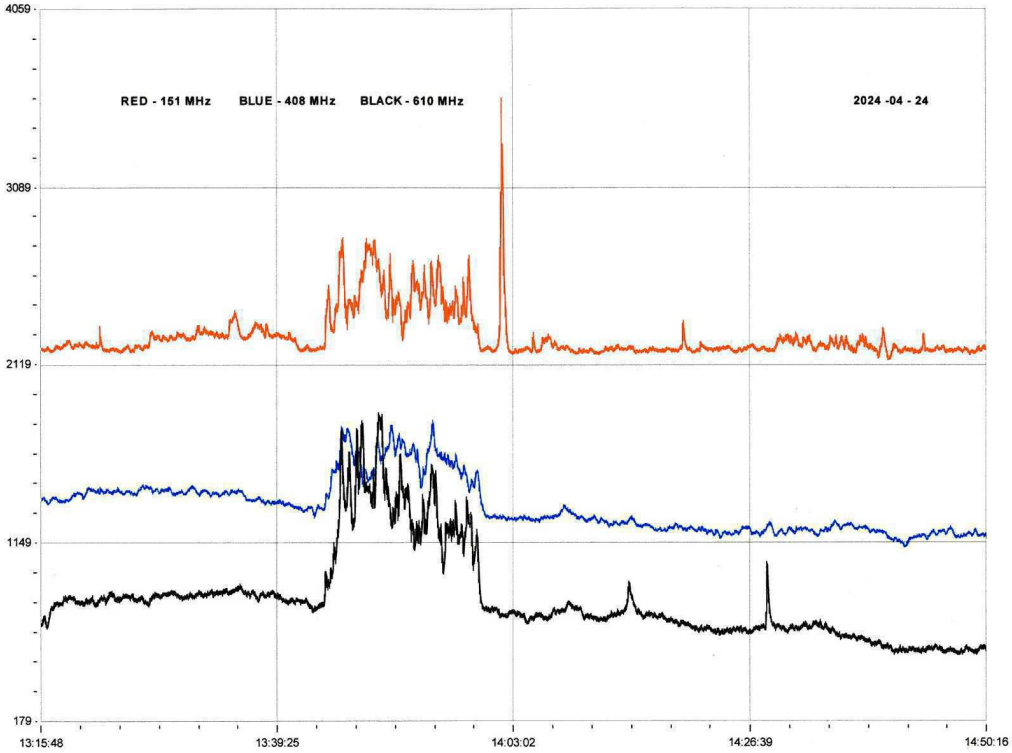


April ended with further solar wind disturbances, continuing into the start of May. Callum Potter's recording shows the disturbance starting about 21UT on the 30th.

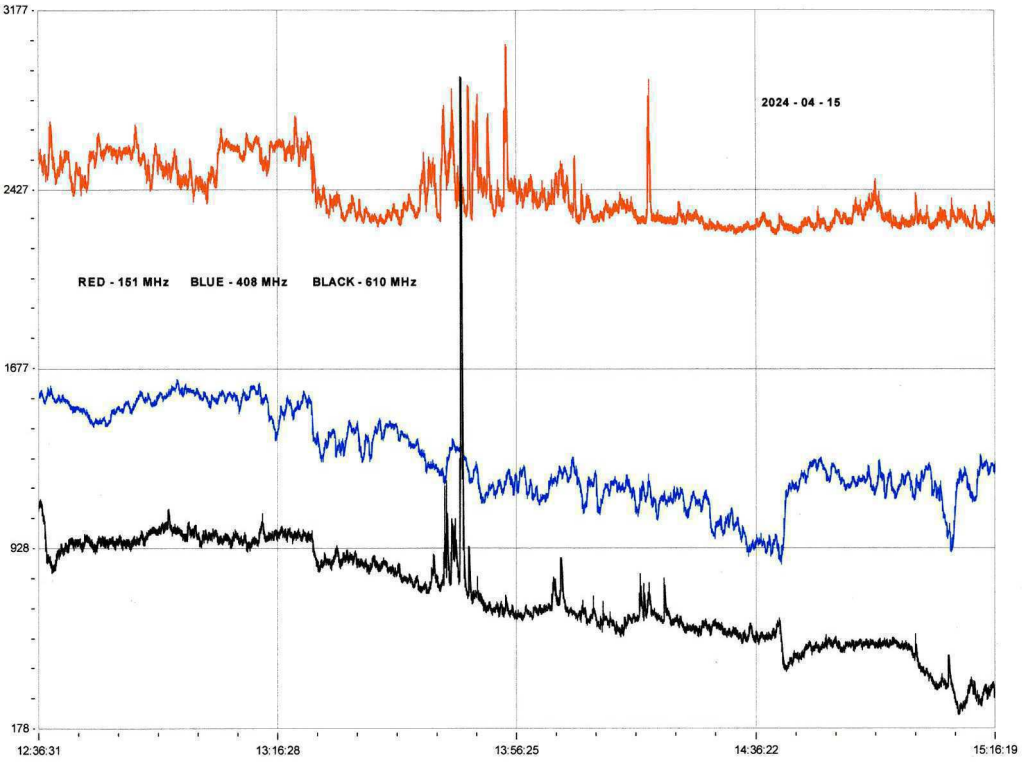


Magnetic observations received from Roger Blackwell, Stuart Green, Callum Potter, Nick Quinn and John Cook.

SOLAR EMISSIONS

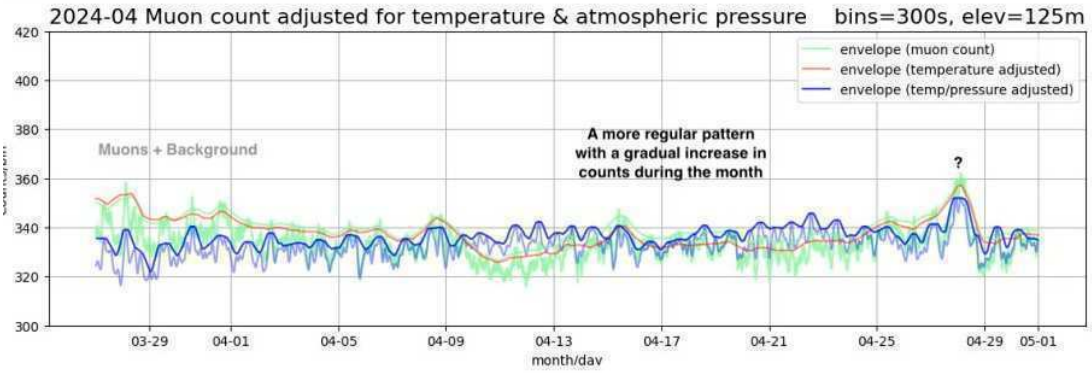


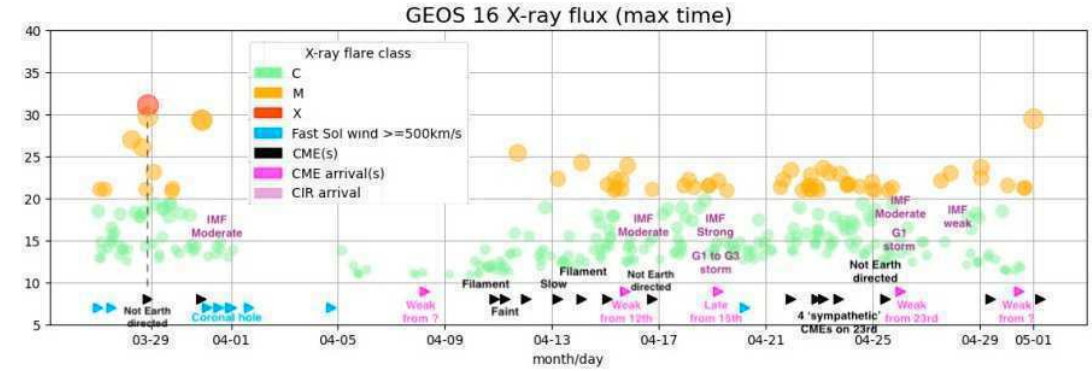
Colin Clements VHF recording from the 24th shows a strong emission at all three frequencies between 13:40 and 14:00UT. This sits between the M1.4 and C9.8 flares that we recorded, matching an unclassified flare in the SWPC satellite data.

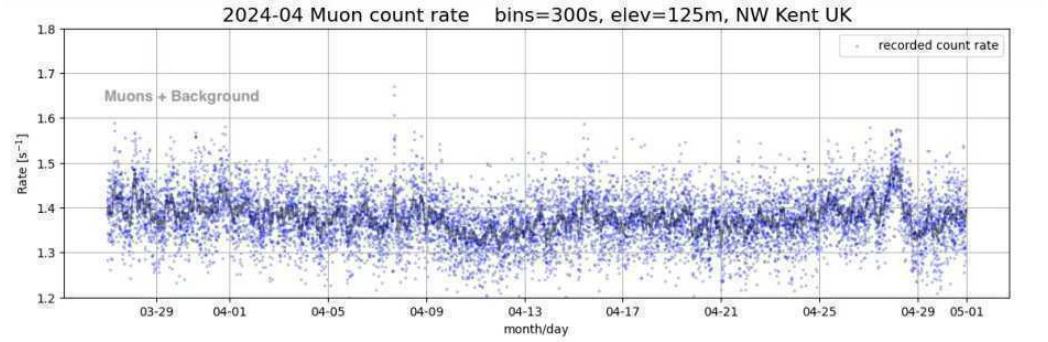


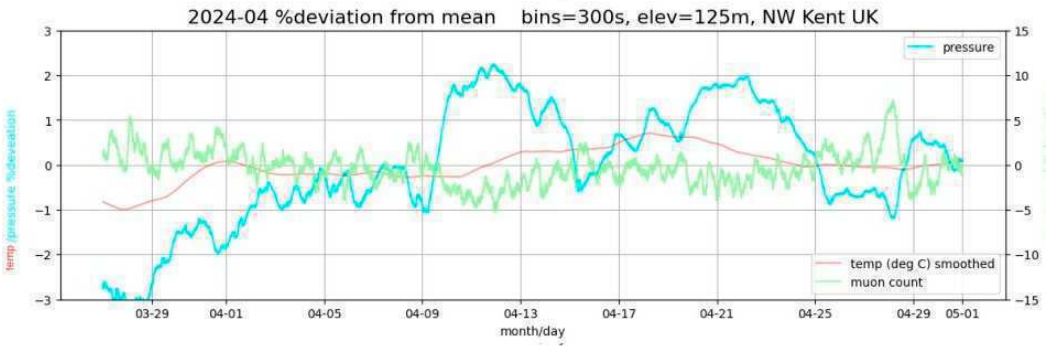
Colin's recording from the 15th possibly shows 610MHz and 151MHz emissions related to the M1.1/M1.4/M2.2 flares illustrated earlier in this report. The peak of these emissions occurs roughly at the start time of the first flare of the triple.

MUONS

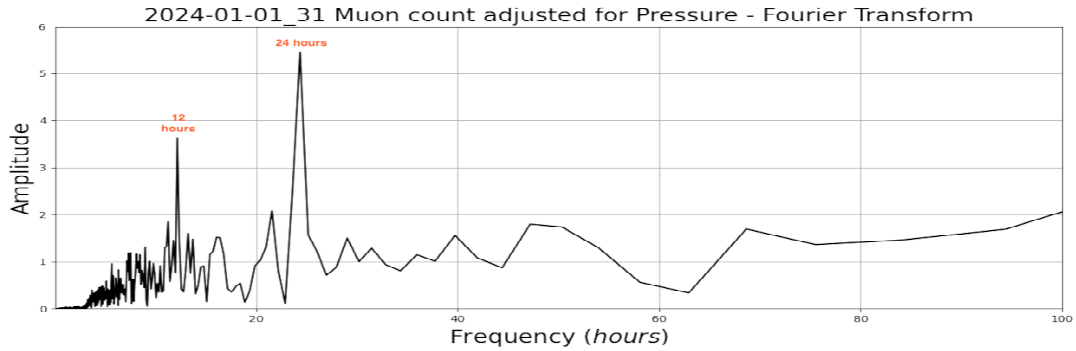


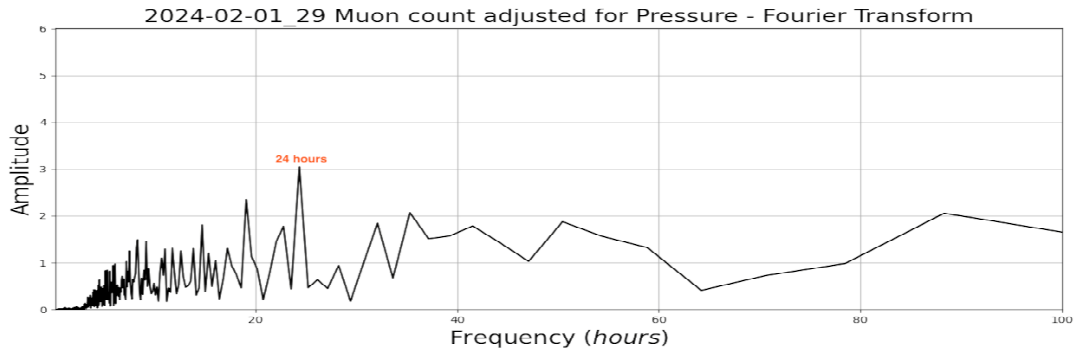


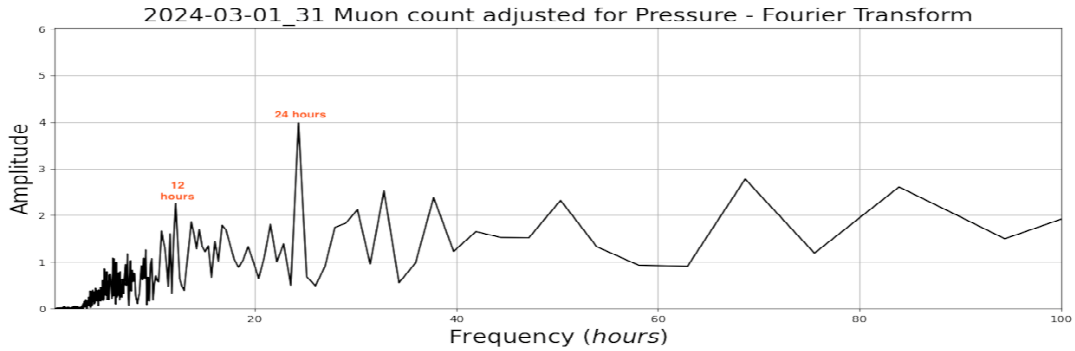


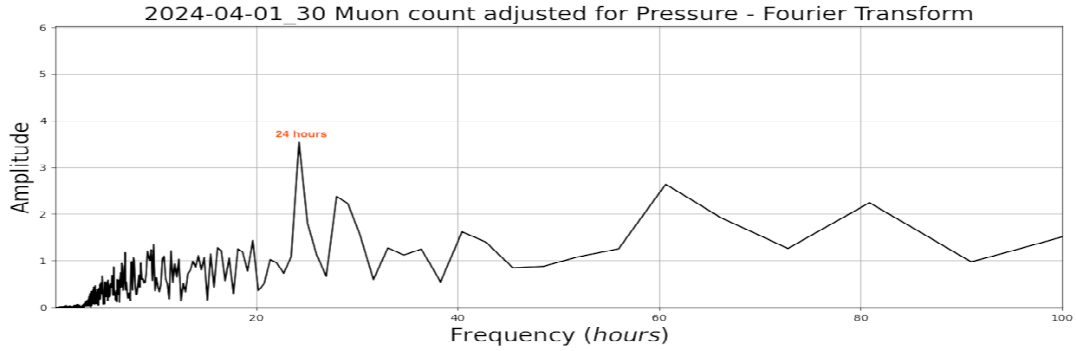


The Muon charts from Mark Prescott show a very stable start to April, reflecting the low flare activity. The counts increase and become more variable as the flare activity increased after the 9th, with a distinct peak on the 28th. This appears to follow a general weakening in the interplanetary magnetic field following a weak CME.



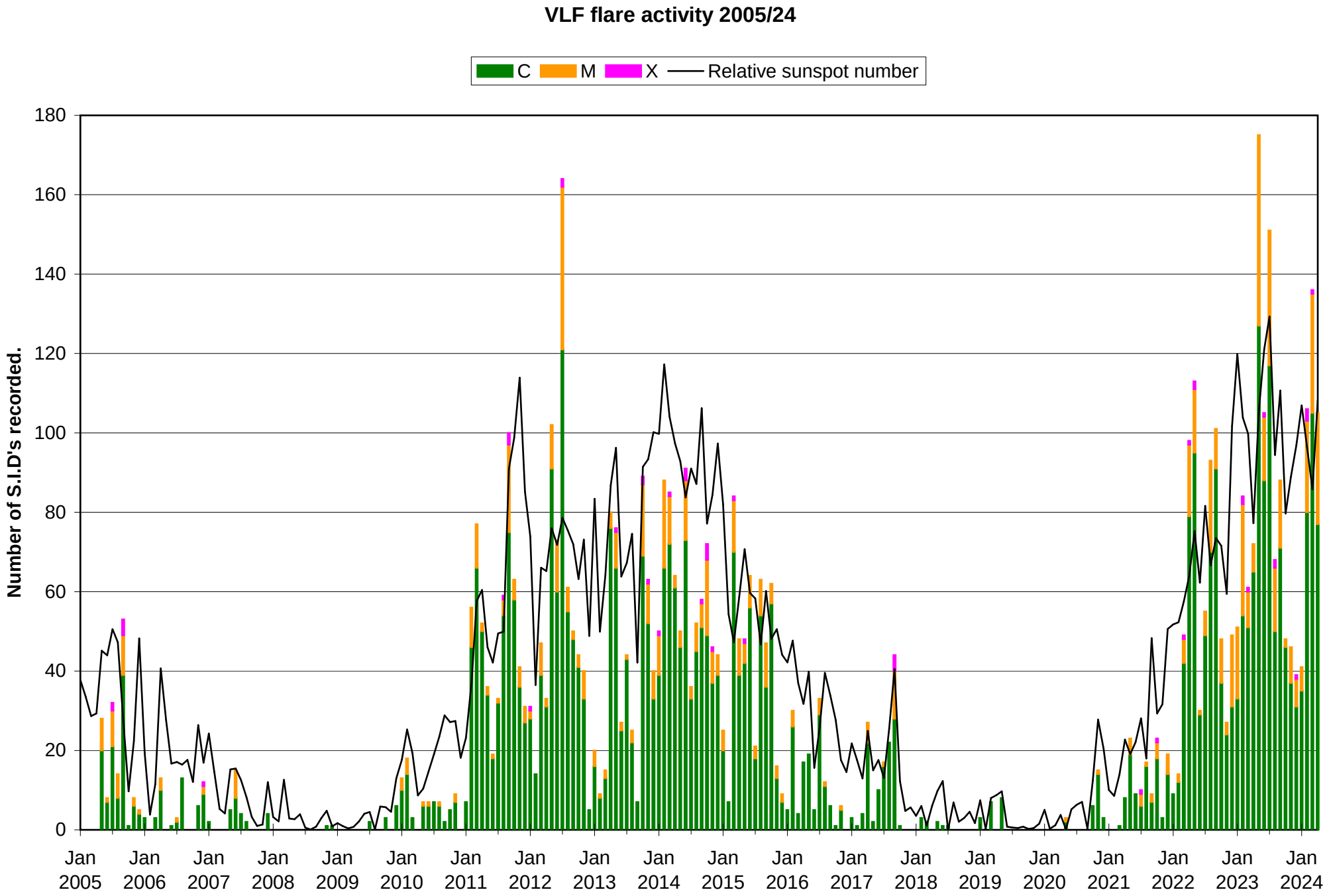






Mark has also created Fourier transforms of the muon counts each month so far this year. The 24 hour diurnal period stands out well in April, with little evidence of the 12 hour period.

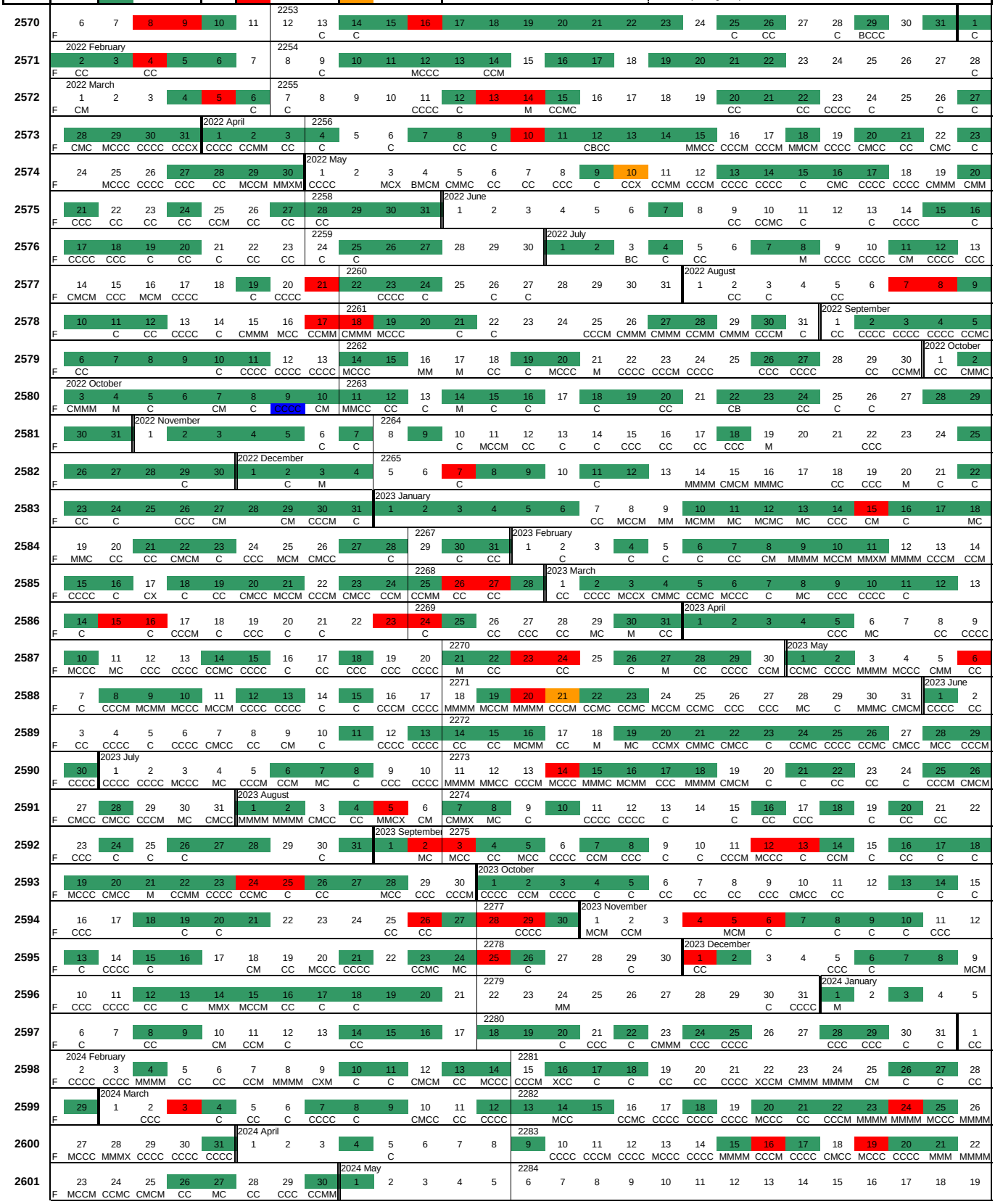
Andrew Thomas has been experimenting with muon detection, and has written a short paper on his results so far. Running into difficulties with the analysis and statistics, he would appreciate any assistance that others can offer. The file 'Muon Events.pdf' is included with this report.


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

BAA Radio Astronomy Section.

BARTELS DIAGRAM

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



BAA Radio Astronomy Section. **2024 APRIL.**

	Xray class	Observers	John Cook (23.4kHz/*22.1kHz*) Tuned radio frequency receiver, 0.58m frame aerial.				Roberto Battaiola (21.75kHz) Modified AAVSO receiver.				Paul Hyde (22.1kHz/*24kHz*) Spectrum Lab / PC 1.5m frame aerial.				Mark Edwards (24.0/*19.6*/**22.1kHz**) Spectrum Lab / PC 2m loop aerial.				Colin Clements (21.75kHz/*23.4kHz*) 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)	
5	C2.0	4									13:01	13:06	13:21	1	13:05	13:10	13:33	1+				
10	C4.0	7	11:47	11:52	12:17	1+					11:43	11:50	12:08	1	11:46	11:52	12:10	1	11:48	11:57	12:15	1+
10	C2.0	6	12:46	12:50	13:00	1-					12:44	12:48	12:57	1-	12:46	12:49	13:17	1+	12:46	12:53	12:59	1-
10	C1.9	4	13:32	13:34	13:38	1-									13:31	13:34	13:55	1				
10	?	1													14:16	14:18	14:30	1-				
10	C1.7	2									14:29	14:34	14:46	1-	14:32	14:38	14:56	1				
10	C2.0	1													17:34	17:37	17:45	1-				
11	C3.4	7	09:53	09:59	10:48	2+					09:51	09:58	10:20	1+	09:54	09:59	10:09	1-	09:56	10:03	10:55	2+
11	C3.5	7	11:01	11:04	11:30	1+	09:52	10:01	10:10	1-	10:57	11:04	11:23	1+	11:01	11:12	11:20	1	10:55	11:14	11:37	2
11	?	1													11:23	11:31	11:58	2				
11	C5.9	7	14:02	14:12	15:12	2+	13:51	13:56	14:10	1	13:59	14:09	14:44	2	14:00	14:13	14:40	2	14:04	14:18	16:03	3
11	?	1													15:39	15:43	15:53	1-				
11	C3.6	2									16:16	16:19	16:32	1-	16:17	16:21	16:35	1-				
11	**M5.4**	8	*17:01*	*17:07*	*17:35*	*2*	16:59	17:02	17:07	1-	16:58	17:05	17:43	2	17:00	17:08	17:51	2+	17:05	17:11	17:36	1+
12	?	1													**09:48**	**09:57**	**10:07**	**1**				
12	C3.1	3	11:14	11:23	11:28	1-									11:18	11:29	11:35	1-	10:56	11:32	12:09	2+
12	C1.9	1													***13:29***	***13:33***	***13:39***	***1-***				
12	C3.6	5	13:43	13:48	14:09	1+					13:39	13:47	14:07	1+	13:44	13:51	14:21	2	13:44	13:54	14:26	2
12	?	1													14:49	14:52	15:01	1-				
12	C4.0	3	15:50	15:53	16:05	1-					15:47	15:52	16:12	1	15:51	15:54	16:10	1				
12	C8.9	2									17:50	17:55	18:18	1+	17:53	17:57	18:22	1+				
13	**M2.4**	1					04:59	05:02	05:16	1-												
13	C2.3	1					07:15	07:15	07:34	1												
13	C2.7	1					09:33	09:47	09:58	1												
13	?	1													12:25	12:29	12:31	1-				
13	C2.4	3	12:41	12:44	13:04	1									12:43	12:47	13:02	1				
13	C2.0	1													13:22	13:23	13:34	1-				
13	C3.3	6	13:58	14:07	?	-					13:53	14:03	14:20	1+	13:59	14:05	14:22	1	13:57	14:10	14:35	2
13	C5.5	6	14:54	15:01	15:19	1					14:52	15:00	15:21	1+	14:54	15:00	15:23	1+	14:54	15:06	16:05	2+
14	C5.0	5	10:48	11:03	11:31	2					10:45	11:00	11:22	2	10:50	11:08	11:26	2	10:45	11:08	11:37	2+
14	?	1													**11:31**	**11:38**	**?**	**-**				
14	?	1													**11:46**	**11:50**	**12:16**	**1+**				
14	?	1													12:16	12:22	12:29	1-				
14	?	1													*12:45*	*12:49*	*12:56*	*1-*				
14	C4.0	4	13:13	13:18	13:33	1					13:12	13:16	13:27	1-	13:12	13:18	?	-	13:19	13:21	13:43	1
14	?	1													13:33	13:46	14:19	2+				
14	C5.3	6	15:06	15:12	15:40	2					15:04	15:10	15:33	1+	15:06	15:16	15:34	1+	15:08	15:15	16:10	2+
14	C8.0	6	16:25	16:31	16:45	1					16:22	16:29	16:52	1+	16:24	16:31	17:09	2	16:29	16:35	16:51	1
14	C4.1	2									18:24	18:30	18:47	1	18:21	18:23	?	-				
14	C7.1	1													18:28	18:33	18:56	1+				
15	**M1.0**	1													*07:27*	*07:34*	*07:45*	*1-*				
15	?	1													**08:29**	**08:32**	**08:39**	**1-**				
15	**M2.3**	5	08:39	08:45	?	-	08:39	08:43	09:04	1	08:38	08:44	09:17	2	08:41	08:46	09:11	1+	08:44	08:49	09:31	2+
15	**M1.2**	5	09:27	09:34	10:30	2+	09:25	09:32	09:59	2	09:23	09:33	10:27	2+	09:28	09:34	10:00	1+	09:31	09:38	10:27	2+
15	**M1.1/1.4**	5	13:52	?	15:20	3					13:47	13:58	?	-	*13:51*	*14:05*	*?*	-	13:40	14:09	14:12	1+
15	**M2.2**	6					14:11	14:18	14:45	2	14:07	14:19	15:03	2+	*14:09*	*14:19*	*15:29*	*2+*	14:12	14:23	16:16	3
15	**M4.0**	2									19:27	19:34	20:07	2	19:29	19:35	20:19	2+				
16	C3.9	4	10:11	10:17	10:22	1-					10:08	10:18	10:34	1+	10:10	10:18	10:32	1				
16	C4.8	3	15:33	15:34	15:52	1					15:31	15:36	15:52	1	15:35	15:39	16:10	2				
16	C5.3	4	17:25	17:29	17:37	1-	17:23	17:29	17:39	1-	17:23	17:27	17:47	1	17:24	17:34	?	-				
16	**M1.1**	2									17:49	17:59	18:24	2	17:52	18:03	18:33	2				
17	C8.8	2									07:26	07:30	07:45	1	07:29	07:32	07:46	1-				
17	?	1													*08:50*	*08:56*	*09:15*	*1*				
17	C3.5	2													13:45	13:49	13:55	1-	13:48	13:56	14:04	1-
17	C3.7	1													***13:59***	***14:06***	***14:37***	***2***				
17	C6.6	4									15:44	15:49	16:08	1	15:47	15:52	16:02	1-	15:50	15:54	16:41	2+
17	C5.2	4					16:44	16:48	16:57	1-	16:43	16:48	17:08	1	16:46	16:50	17:09	1				
17	C3.3	1													18:06	18:07	?	-				
17	C4.6	2									18:14	18:18	18:32	1-	18:17	18:24	18:32	1-				
17	C9.0	1													20:08	20:11	20:15	1-				
18	C7.3	1	06:04	06:09	06:30	1+																
18	**M1.3**	4	*07:27*	*07:36*	*08:10*	*2*	07:17	07:33	07:42	1					07:26	07:34	08:00	2				
18	?	2									10:58	11:02	11:08	1-	*11:01*	*11:04*	*?*	-				
18	?	1													*11:17*	*11:40*	*?*	-				
18	C8.9	7	11:49	11:52	12:15	1+	11:48	11:52	12:13	1	11:47	11:52	12:11	1	*11:49*	*11:54*	*12:20*	*1+*	11:52	11:57	12:18	1+
18	?	3									16:23	16:34	?	-	16:26	16:36	?	-	*16:22*	*16:39*	*17:20*	*2+*
18	C9.8	5	16:26	16:47	17:05	2					16:40	16:47	17:24	2	16:42	16:51	17:31	2+	16:29	16:56	17:13	2
18	?	1													19:40	19:50	20:09	1+				
19	C4.9	6	11:19	11:22	11:41	1					11:13	11:21	11:37	1	11:19	11:24	11:34	1-	11:15	11:25	11:47	1+
19	**M1.0**	6	13:00	13:17	13:56	2+					12:57	13:06	13:48	2+	13:00	13:09	?	-				
19	?	1													13:14	13:18	13:52	2				
19	?	2													***13:18***	***13:27***	***14:53***	***3***	13:02	13:21	14:02	2+
19	?	1													14:03	14:06	14:27	1				
19	C4.4	5									14:59	15:05	?	-	15:02	15:06	15:26	1	15:06	15:10	15:34	1+
19	C3.5	3									15:28	15:35	15:48	1	15:32	15:36	15:49	1-				
19	C4.7	1													17:40	17:44	18:02	1				
19	?	1													18:57	19:02	?	-				
19	C3.8	1													19:21	19:25	?	-				
19	?	1													19:33	19:44	19:55	1				
20	C3.7	1													***06:23***	***06:29***	***06:40***	***1-***				
20	C3.7	2													*11:51*	*11:55*	*12:11*	*1*	11:39	11:58	12:18	2
20	?	1													*12:43*	*12:52*	*13:02*	*1*				
20	C2.8	1													*13:06*	*13:07*	*13:28*	*1*				
20	?	1													*14:45*	*14:52*	*15:12*	*1+*				
20	?	1													15:08	15:28	15:35	1+				
20	?	1													*15:41*	*15:47*	*15:53*	*1-*				
20	?	1													*16:04*	*16:05*	*16:19*	*1-*				
20	C4.9	3													16:39	16:41	?	-	16:41	16:46	16:55	1-
20	C7.5	3													16:59	17:09	17:34	2	17:02	17:11	17:32	1+
21	?	1													*12:04*	*12:07*	*?*	-				
21	?	1													*12:13*	*12:18*	*12:30*	*1-*				
21	**M1.0**	7	12:42	12:59	14:05	2+	12:47	12:58	13:41	2+	12:40	12:59	14:11	3	12:44	13:00	13:50	2+	12:43	13:05	15:12	3+
21	**M2.2**	8	15:10	15:16	16:21	2+	15:07	15:15	15:37	1+	15:08	15:17	15:41	2	15:11	15:16	15:42	1+	15:12	15:20	17:12	3
21	?	2									17:14	17:28	18:07	2+	17:18	17:30	17:46	1+				
21	**M3.4**	1													21:50	21:53	22:03	1-				
22	**M1.0**	6	08:02	08:13	08:58	2+	08:00	08:09	08:16	1-	08:01	08:14	09:00	2+	08:03	08:17	08:57	2+	08:04	08:22	09:11	2+
22	?	2									09:30	09:39	10:11	2	**09:32**	**09:39**	**09:53**	**1**				
22	?	1													*09:33*	*09:45*	*10:09*	*2*				
22	?	3									11:35	11:41	12:05	1+	*11:35*	*11:40*	*?*	-				

22	C5.9	6	12:10	12:14	?	-					12:09	12:15	13:00	2+	*12:08*	*12:18*	*13:01*	*2+*	12:13	12:22	13:09	2+
22	**M1.6**	7	13:15	13:37	14:42	3	13:11	13:32	14:14	2+	13:13	13:34	14:46	3	*13:14*	*13:38*	*14:48*	*3*	13:09	13:42	14:48	3
22	**M1.1**	6	14:47	14:56	?	-					14:50	15:00	?	-	*14:51*	*14:59*	*?*	-	14:48	15:04	15:16	1+
22	**M1.6**	6	15:13	15:21	?	-					15:13	15:19	?	-	*15:12*	*15:21*	*?*	-	15:16	15:25	15:47	1+
22	**M2.8**	6	15:44	15:51	16:00	1-					15:44	15:53	?	-	*15:44*	*15:51*	*?*	-	15:47	15:56	16:309	3+
22	**M1.0**	2									16:28	16:32	16:48	1	*16:28*	*16:31*	*16:53*	*1*				
23	C3.5	1	*06:59*	*07:01*	*07:08*	*1-*																
23	C5.4	3	*07:37*	*07:42*	*07:54*	*1-*					07:34	07:42	08:03	1+	07:37	07:42	07:54	1-				
23	**M3.0**	7	08:12	08:21	09:30	2+	08:11	08:21	08:46	2	08:11	08:23	09:08	2+	08:13	08:30	09:16	2+	08:16	08:27	09:31	2+
23	C4.6	2									09:46	09:52	10:01	1-	09:51	09:55	10:04	1-				
23	?	1									10:52	10:58	11:05	1-								
23	C5.0	4	12:41	12:45	12:54	1-					12:41	12:47	13:01	1	12:44	12:52	13:00	1-	12:44	12:51	13:18	2
23	C7.8	6	13:41	13:48	14:33	2+					13:39	13:44	14:44	2+	13:41	13:49	14:38	2+	13:44	13:54	14:38	2+
23	?	4									15:28	15:39	16:25	2+	15:29	15:38	16:20	2+				
23	?	2									16:40	16:53	17:24	2	16:41	16:52	17:24	2				
23	**M2.9**	5					17:35	17:44	18:01	1+	17:35	17:42	18:35	2+	17:36	17:43	18:28	2+				
23	?	1													18:38	18:39	18:55	1-				
24	C4.2	1					06:32	06:39	06:47	1-												
24	C6.9	5	07:38	07:42	08:03	1					07:37	07:43	08:06	1+	07:39	07:42	07:51	1-				
24	?	3	08:54	08:57	09:09	1-					08:55	09:00	09:18	1	*08:53*	*09:00*	*09:15*	*1*				
24	C5.0	6	09:32	09:42	10:04	1+					09:24	09:42	10:00	2	09:32	09:45	10:07	2	09:29	09:48	10:13	2
24	?	3									10:33	10:38	10:50	1-	10:27	10:39	10:56	1+				
24	**M1.4**	8	12:10	12:16	13:41	3	12:04	12:19	12:51	2+	12:09	12:17	13:04	2+	12:11	12:15	13:28	2+	12:11	12:23	14:09	3
24	C9.4	7	14:07	14:15	15:10	2+	14:03	14:10	14:28	1	14:06	14:16	14:48	2	14:07	14:13	14:46	2	14:09	14:21	14:50	2
24	?	1													*14:52*	*14:53*	*15:16*	*1*				
24	C3.5	3									15:40	15:44	15:58	1-	15:43	15:49	16:04	1				
25	?	1													09:36	09:38	09:42	1-				
25	C2.6	4	12:01	12:03	12:17	1-					12:00	12:04	12:11	1-	12:01	12:05	12:23	1				
25	C4.2	4	12:32	12:37	12:55	1					12:32	12:38	12:47	1-	12:33	12:42	?	-				
25	?	4	13:06	13:09	?	-					13:05	13:09	?	-	13:05	13:13	?	-				
25	**M1.0**	7	13:15	13:22	14:07	2+					13:16	13:24	14:17	2+	13:14	13:22	13:56	2	13:09	13:28	14:32	2+
25	C3.7	6	14:30	14:32	14:50	1					14:29	14:33	14:50	1	14:31	14:32	14:48	1-	14:32	14:37	15:04	1+
25	?	1													16:02	16:03	16:08	1-				
25	C3.2	2									16:31	16:36	16:45	1-	16:36	16:37	16:46	1-				
25	**M1.3**	6	*17:11*	*17:!4*	*17:34*	*1*	17:10	17:12	17:25	1-	17:11	17:15	?	-	17:11	17:16	17:50	2				
25	C9.4	4					18:03	18:05	18:07	1-	18:03	18:10	19:05	2+	18:06	18:10	18:38	1+				
26	C6.6	2	06:33	06:36	06:50	1-									*06:35*	*06:39*	*06:45*	*1-*				
26	C4.9	1													19:33	19:39	19:52	1				
27	**M2.1**	8	12:27	12:35	13:56	3	12:23	12:35	13:12	2+	12:26	12:35	13:38	2+	12:27	12:36	13:25	2+	12:29	12:40	13:30	2+
27	?	1													15:08	15:13	15:26	1-				
27	?	1													16:06	16:18	?	-				
27	C4.9	3	*16:15*	*16:18*	*16:52*	*2*					16:23	16:27	16:48	1	16:22	16:30	16:40	1-				
28	?	1													12:02	12:08	?	-				
28	C7.8	7	12:20	12:37	?	-					12:21	12:33	?	-	12:10	12:37	?	-	12:23	12:42	15:18	3+
28	?	4	13:05	13:12	13:43	2					13:03	13:14	13:39	2	13:00	13:11	13:54	2+				
28	?	3									15:22	15:31	15:46	1	15:23	15:30	15:39	1-				
28	C6.3	7	15:55	16:02	16:26	1+					15:54	16:03	?	-	15:57	16:05	16:33	2	15:57	16:10	16:29	1+
28	?	2									16:36	16:42	16:59	1	16:38	16:41	16:53	1-				
29	C3.4	2									07:30	07:37	08:08	2	***07:31***	***07:36***	***07:45***	***1-***				
29	?	1													*11:31*	*11:33*	*11:40*	*1-*				
29	?	1													*12:04*	*12:07*	*12:19*	*1-*				
29	C2.8	7	13:24	13:27	13:36	1-					13:23	13:28	13:48	1	*13:24*	*13:28*	*13:49*	*1*	13:28	13:33	14:07	2
29	C8.5	2									19:22	19:28	19:57	2	19:21	19:28	19:52	1+				
30	C2.0	1													10:04	10:05	10:16	1-				
30	C1.8	2									12:40	12:50	13:17	2	12:42	13:00	13:06	1				
30	**M1.2**	8	14:57	15:11	16:15	2+	14:51	15:10	15:39	2+	14:57	15:12	16:01	2+	14:58	15:11	16:12	2+	*15:06*	*15:16*	*15:44*	*2*
30	**M1.3**	7	16:20	16:35	17:48	3	16:14	16:32	17:04	2+	16:17	16:29	17:23	2+	16:19	16:29	17:26	2+				

BAA Radio Astronomy Section. **2024 APRIL.**

	Xray class		Steve Parkinson (Various) Tuned radio frequency receiver, frame aerials.				Andrew Thomas (19.6kHz/*21.7kHz*) Tuned radio frequency receiver, 0.6m frame aerial.				Phil Rourke (23.4kHz) Spectrum Lab, 0.6m frame aerial.			Mark Prescott (20.9/*19.6*/**22.1kHz**) SpectrumLab/Starbase, mini-whip aerial. Active				John Elliott (19.6kHz) 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)	
5	C2.0						13:03	13:09	13:25	1				13:07	13:12	13:39	1+				
10	C4.0		11:46	11:51	12:07	1	11:46	11:51	12:21	2				*11:49*	*11:54*	*12:16*	*1+*				
10	C2.0		12:46	12:49	12:58	1-	12:47	12:51	13:06	1											
10	C1.9		13:31	13:34	13:40	1-	13:31	13:33	13:47	1-											
10	?																				
10	C1.7																				
10	C2.0																				
11	C3.4		09:53	09:59	10:39	2+	*09:53*	*09:59*	*10:48*	*2+*				09:57	10:03	?	-				
11	C3.5		10:59	11:06	11:59	2+								11:03	11:13	12:20	2+				
11	?																				
11	C5.9		14:02	14:12	14:45	2								14:07	14:15	15:22	2+				
11	?																				
11	C3.6																				
11	**M5.4**		17:00	17:08	17:44	2	17:01	17:07	17:30	1+				17:07	17:11	17:41	2				
12	?																				
12	C3.1																				
12	C1.9																				
12	C3.6													13:45	13:51	14:42	2+				
12	?																				
12	C4.0																				
12	C8.9																				
13	**M2.4**																				
13	C2.3																				
13	C2.7																				
13	?																				
13	C2.4		12:41	12:45	13:00	1															
13	C2.0																				
13	C3.3		13:57	14:06	14:30	2								14:01	14:11	14:43	2				
13	C5.5		14:55	15:02	15:22	1+								14:59	15:07	15:39	2				
14	C5.0		10:47	11:04	11:40	2+															
14	?																				
14	?																				
14	?																				
14	?																				
14	C4.0																				
14	?																				
14	C5.3		15:07	15:12	15:35	1+								15:12	15:17	15:41	1+				
14	C8.0		16:26	16:31	17:00	2								16:31	16:34	17:09	2				
14	C4.1																				
14	C7.1																				
15	**M1.0**																				
15	?																				
15	**M2.3**																				
15	**M1.2**																				
15	**M1.1/1.4**													13:58	14:08	?	-				
15	**M2.2**		13:51	14:20	15:55	3								14:19	14:22	15:49	3				
15	**M4.0**																				
16	C3.9		10:13	10:18	10:30	1-															
16	C4.8																				
16	C5.3																				
16	**M1.1**																				
17	C8.8																				
17	?																				
17	C3.5																				
17	C3.7																				
17	C6.6		15:47	15:50	16:10	1															
17	C5.2		16:46	16:49	17:05	1															
17	C3.3																				
17	C4.6																				
17	C9.0																				
18	C7.3																				
18	**M1.3**													07:33	07:47	08:47	2+				
18	?																				
18	?																				
18	C8.9		11:49	11:53	12:18	1+								11:15	11:59	13:38	3+				
18	?																				
18	C9.8													16:30	16:51	17:46	2+				
18	?																				
19	C4.9		11:19	11:24	11:34	1-								11:23	11:30	?	-				
19	**M1.0**		12:59	13:15	14:00	2+								13:05	13:25	?	-	13:00	13:08	13:45	2
19	?																				
19	?																				
19	?																				
19	C4.4		15:01	15:05	15:30	1+								15:04	15:10	?	-				
19	C3.5		15:31	15:34	15:45	1-															
19	C4.7																				
19	?																				
19	C3.8																				
19	?																				
20	C3.7																				
20	C3.7																				
20	?																				
20	C2.8																				
20	?																				
20	?																				
20	?																				
20	?																				
20	C4.9		16:38	16:41	?	-															
20	C7.5		16:59	17:07	17:34	2															
21	?																				
21	?																				
21	**M1.0**		12:44	13:04	14:10	3								12:54	13:07	14:10	2+				
21	**M2.2**		15:10	15:18	16:20	2+								15:14	15:19	16:38	2+	15:10	15:15	15:30	1
21	?																				
21	**M3.4**																				
22	**M1.0**													08:10	08:21	09:19	2+				
22	?																				
22	?																				
22	?		11:35	11:40	11:60	1															
22	C5.9		12:10	12:14	12:50	2								12:13	12:24	?	-				
22	**M1.6**		13:15	13:37	14:30	2+								13:23	13:39	?	-				

22	**M1.1**		14:48	14:57	?	-			14:54	15:04	?	-				
22	**M1.6**		15:15	15:21	?	-			15:18	15:25	?	-				
22	**M2.8**		15:45	15:52	16:10	1			15:50	15:56	16:26	2				
22	**M1.0**															
23	C3.5															
23	C5.4															
23	**M3.0**		08:12	08:23	09:55	3			08:19	08:26	09:24	2+				
23	C4.6															
23	?															
23	C5.0															
23	C7.8		13:40	13:56	?	-			13:43	13:51	?	-				
23	?		15:29	15:40	?	-			?	15:42	?	-				
23	?															
23	**M2.9**		17:38	17:48	?	-			**17:40**	**17:52**	**18:26**	**2+**				
23	?															
24	C4.2															
24	C6.9		07:39	07:43	08:08	1+			07:42	07:47	08:14	1+				
24	?															
24	C5.0		09:34	09:43	10:05	1+			09:38	09:46	10:17	2				
24	?								?	10:41	?	-				
24	**M1.4**		12:09	12:19	13:20	2+			12:15	12:20	13:28	2+	12:10	12:22	13:40	3
24	C9.4		14:07	14:15	14:47	2			14:10	14:18	15:29	2+				
24	?															
24	C3.5		15:42	15:45	16:05	1										
25	?															
25	C2.6		11:59	12:05	12:20	1										
25	C4.2		12:33	12:38	?	-										
25	?								13:08	13:12	?	-				
25	**M1.0**		13:05	13:24	14:10	2+			13:20	13:28	?	-	13:15	13:27	14:20	2+
25	C3.7		14:29	14:34	14:50	1			14:32	14:36	15:17	2				
25	?															
25	C3.2															
25	**M1.3**		17:11	17:14	?	-			17:14	17:18	?	-				
25	C9.4		18:06	18:10	18:30	1										
26	C6.6															
26	C4.9															
27	**M2.1**		12:27	12:38	14:30	3			12:31	12:42	14:07	3	12:25	12:37	12:50	1
27	?															
27	?															
27	C4.9															
28	?															
28	C7.8		12:20	12:38	13:55	3			12:25	12:39	14:22	3	12:18	12:38	14:10	3
28	?								?	13:14	?	-				
28	?		15:22	15:30	15:48	1+										
28	C6.3		15:56	16:04	16:35	2			16:01	16:12	16:43	2	15:54	16:04	16:35	2
28	?															
29	C3.4															
29	?															
29	?															
29	C2.8		13:24	13:30	13:50	1+			13:29	13:32	13:51	1	13:24	13:30	13:55	1+
29	C8.5															
30	C2.0															
30	C1.8															
30	**M1.2**		14:58	15:12	15:55	2+			15:03	15:16	16:17	2+	14:57	15:16	16:07	2+
30	**M1.3**		16:20	16:35	17:20	2+			16:28	16:41	17:32	2+	16:20	16:35	17:10	2+