BAA Radio Astronomy Group. **2015 MARCH**

			John Cook (23.4kHz/*22.1kHz*)				Roberto Battaiola (20.3kHz)				Paul Hyde (22.1/*23.4kHz*)				Bob Middlefell (22.1kHz)				Mark Edwards (**20.9**/24.0/*18.3kHz*)			
	Xray class	Observers	Tuned radio frequency receiver, 0.58m frame aerial.				Modified AAVSO receiver.				Tuned radio frequency receiver, 0.96m frame aerial.				Tuned radio frequency receiver, 0.5m frame aerial.				Spectrum Lab / PC 2m loop aerial.			
DAY			START	PEAK	END (UT)		START	PEAK	END (UT)		START	PEAK	END (UT)		START	PEAK	END (UT)		START	PEAK	END (UT)	
1	C6.8	5	15:55	16:02	16:30	2					15:56	16:06	16:17	1					15:55	16:09	16:36	2
2	?	2					07:42	07:47	07:57	1-									*07:45*	*07:49*	*07:58*	*1-*
2	?	3					08:35	08:42	08:49	1-	*08:40*	*08:43*	*08:50*	*1-*					*08:39*	*08:44*	*08:52*	*1-*
2	C3.2	3	09:14	09:17	09:22	1-					09:13	09:17	09:26	1-					*09:14*	*09:16*	*09:23*	*1-*
2	**M1.1**	7	09:37	09:49	10:24	2+	09:38	09:48	10:24	2+	09:39	09:49	?	-					09:45	09:48	09:54	1-
2	C5.5	4	10:29	10:35	11:08	2					10:28	10:35	?	-					10:30	10:37	?	-
2	?	1																	10:41	10:47	11:06	1
2	?	4	11:24	11:29	11:38	1-					11:24	11:30	?	-					11:25	11:28	11:33	1-
2	?	3	11:57	12:01	12:12	1-					11:57	12:01	12:12	1-					*11:57*	*12:02*	*12:10*	*1-*
2	C3.4	5	13:00	13:09	13:30	1+					13:01	13:09	13:28	1+					*13:00*	*13:10*	*13:21*	*1*
2	C2.1	4	14:09	14:13	14:33	1					14:09	14:13	14:28	1					*14:11*	*14:13*	*14:19*	*1-*
2	**M3.7**	6	15:10	15:27	16:22	2+					15:07	15:29	16:12	2+					*15:12*	*15:30*	*16:00*	*2+*
3	C1.1	4					08:48	08:53	09:00	1-	08:51	08:55	09:04	1-					*08:50*	*08:55*	*09:07*	*1-*
3	C4.0	7	13:24	13:36	14:09	2					13:24	13:36	14:33	2+					13:23	13:37	14:21	2+
4	?	1																	*10:14*	*10:21*	*?*	-
4	C2.8	1																	*10:26*	*10:40*	*10:56*	*1+*
4	C1.1	1																	13:39	13:46	13:57	1-
5	C3.5	5	09:36	09:47	10:09	2					09:31	09:48	10:10	2					**09:36**	**09:47**	**10:05**	**1+**
5	**M1.2**	1																	18:03	18:10	18:29	1+
6	**M1.5**	1	*08:14*	*08:18*	*08:35*	*1*																
6	C2.5	2									15:06	15:09	15:24	1-					15:06	15:10	15:15	1-
6	?	1																	***15:27***	***15:28***	***15:31***	***1-***
6	C2.6	2									15:50	15:53	16:15	1					15:50	15:53	15:59	1-
6	C2.7	1																	16:02	16:06	16:14	1-
6	?	1																	16:20	16:22	16:25	1-
7	?	2																	14:08	14:28	?	-
7	?	1																	14:44	14:50	15:16	1+
8	C2.5	1																				
9	C4.0	5	10:05	10:10	10:42	2					10:06	10:09	10:40	2					10:06	10:14	10:27	1
9	C1.1	2	11:16	11:18	11:28	1-					11:17	11:19	11:27	1-								
9	**M4.5**	8	14:25	14:35	16:20	3	14:24	14:32	15:15	2+	14:25	14:32	15:24	2+					*14:26*	*14:35*	*15:26*	*2+*
9	C9.1	2																	*17:40*	*17:44*	*17:51*	*1-*
10	C2.7	2					07:22	07:26	07:32	1-									*07:24*	*07:28*	*07:32*	*1-*
10	C1.5	2									08:50	08:52	09:03	1-					*08:51*	*08:52*	*08:59*	*1-*
10	C1.0	1																	13:09	13:11	13:20	1-
10	B9.7	1																	13:52	13:53	13:58	1-
10	?	1																	14:50	14:53	14:57	1-
10	?	1																	14:59	15:02	15:09	1-
10	?	1																	*15:16*	*15:18*	*15:23*	*1-*
10	C1.2	1																	*15:30*	*15:31*	*15:36*	*1-*
10	?	1																	16:36	16:38	16:41	1-
10	C1.1	1																	17:18	17:21	17:22	1-
10	?	1																	17:30	17:35	17:40	1-
11	**M1.8**	2									07:13	07:18	?	-					*07:16*	*07:19*	*?*	-
11	?	1																	*07:26*	*07:30*	*07:38*	*1-*
11	**M2.6**	5	*07:49*	*07:58*	*08:20*	*1+*	07:52	07:57	08:09	1-	?	07:58	08:30	-					*07:44*	*07:58*	*08:27*	*2*
11	C1.8	4	09:23	09:26	09:35	1-					09:23	09:27	09:44	1					*09:23*	*09:26*	*09:34*	*1-*
11	C5.8	7	11:22	11:32	12:37	2+					11:21	11:32	12:58	3					11:23	11:35	?	-
11	?	1																	11:38	11:42	?	-
11	?	1																	11:58	11:59	?	-
11	?	1																	12:06	12:10	12:19	1-
11	?	1																	*12:25*	*12:27*	*12:29*	*1-*
11	C2.3	6	13:12	13:15	13:34	1					13:07	13:18	13:33	1+					13:10	13:19	13:34	1
11	?	1																	**12:54**	**13:57**	**14:01**	**2+**
11	C2.0	5	14:36	14:40	14:48	1-					14:35	14:41	15:02	1+					14:34	14:41	?	-
11	?	1																	14:49	14:49	14:57	1-
11	C1.7	2									15:17	15:25	15:41	1					15:17	15:23	15:39	1
11	**X2.1**	5	16:15	16:23	17:20	2+					16:14	16:18	?	-					16:15	16:20	17:34	2+
11	**M1.0**	1																	18:49	18:53	19:07	1-
12	C4.3	2	08:08	08:11	08:28	1					08:07	08:16	08:46	2								
12	C8.4	6	09:05	09:14	10:08	2+					09:00	09:15	10:33	3					*09:07*	*09:16*	*?*	-
12	?	1																	*09:31*	*09:37*	*10:21*	*2+*
12	**M1.6**	7	11:41	11:52	13:06	2+	11:35	11:49	12:08	2	11:40	11:51	12:53	2+					11:40	11:50	?	-
12	**M1.4**	2																	12:11	12:16	13:01	2+
12	**M4.2**	8	14:02	14:10	15:16	2+	13:48	14:08	14:32	2	13:45	14:06	15:22	3					13:53	14:09	14:47	2+
13	C6.9	5	*07:34*	*07:39*	*07:52*	*1-*	07:31	07:38	07:52	1	07:32	07:36	?	-					*07:35*	*07:39*	*07:52*	*1-*
13	?	1																	*10:54*	*10:58*	*11:07*	*1-*
13	?	1																	**11:16**	**11:34**	**12:14**	**2+**
14	C1.3	2									07:56	08:03	08:25	1+					*07:59*	*08:03*	*08:06*	*1-*
14	C2.1	2	08:12	08:21	08:30	1-													*08:12*	*08:25*	*08:33*	*1*
14	C2.6	6	11:50	11:55	12:02	1-					11:46	11:57	12:36	2+					11:52	11:57	12:06	1-
14	?	2																	12:15	12:20	12:29	1-
14	C1.7	6	13:24	13:26	13:35	1-					13:24	13:27	13:46	1					13:24	13:28	13:41	1-
14	B7.3	1																	15:21	15:23	15:26	1-
14	C5.3	1																	18:43	18:47	18:53	1-
15	**M1.0**	8	09:36	09:41	11:04	3	09:36	09:41	09:51	1-	09:37	09:42	?	-					09:37	09:48	10:07	1+
15	C1.3	4									10:18	10:24	10:33	1-					10:19	10:22	10:32	1-
15	?	1																	11:34	11:51	?	-
15	C6.8	8	11:43	12:01	13:58	3+	11:37	12:03	12:21	2	11:33	12:04	12:50	2+					11:53	12:02	12:40	2+
15	C2.4	3									13:05	13:08	13:13	1-					*13:06*	*13:09*	*13:14*	*1-*
15	C1.2	2									14:04	14:07	14:15	1-					14:05	14:06	14:14	1-
15	B8.7	1																	*08:19*	*08:25*	*08:31*	*1-*
16	C1.8	3									09:41	09:46	10:12	1+					*09:42*	*09:47*	*?*	-
16	C1.9	2	09:44	09:46	?	-													*09:49*	*09:55*	*10:10*	*1*
16	**M1.6**	8	10:41	11:02	12:07	3	10:38	11:01	11:40	2+	10:41	10:57	11:58	2+					*10:41*	*11:02*	*11:52*	*2+*
16	C1.1	4	12:57	12:59	13:07	1-					12:58	13:00	13:06	1-					**12:58**	**13:00**	**13:03**	**1-**
16	C2.8	7	13:52	13:56	14:20	1+	13:50	13:56	14:10	1	13:52	13:56	14:23	1+					**13:52**	**13:56**	**14:11**	**1**
18	C9.3	3					07:42	07:53	08:23	2	07:44	07:56	08:09	1					**07:42**	**07:55**	**08:01**	**1**
18	?	1																	***09:34***	***09:40***	***09:45***	***1-***
18	C2.8	4	09:46	09:52	10:01	1-					09:45	09:53	10:03	1-					09:45	09:53	10:03	1-
18	C5.5	6	10:20	10:29	11:00	2	10:19	10:24	10:32	1-	10:20	10:29	10:56	2					10:22	10:32	10:50	1+
18	C1.1	1																	**11:19**	**11:25**	**11:42**	**1**
18	C1.0	3	12:25	12:28	12:34	1-					12:23	12:29	12:34	1-					**12:24**	**12:28**	**12:38**	**1-**
18	?	1																	***12:49***	***12:52***	***?***	**-**
18	?	3									12:54	12:56	13:08	1-					***12:54***	***12:58***	***?***	**-**
18	C3.8	4	13:10	13:15	13:29	1													***13:11***	***13:16***	***13:44***	***2***
18	C1.3	4	14:22	14:25	14:29	1-					14:23	14:25	14:46	1					**14:23**	**14:25**	**?**	**-**

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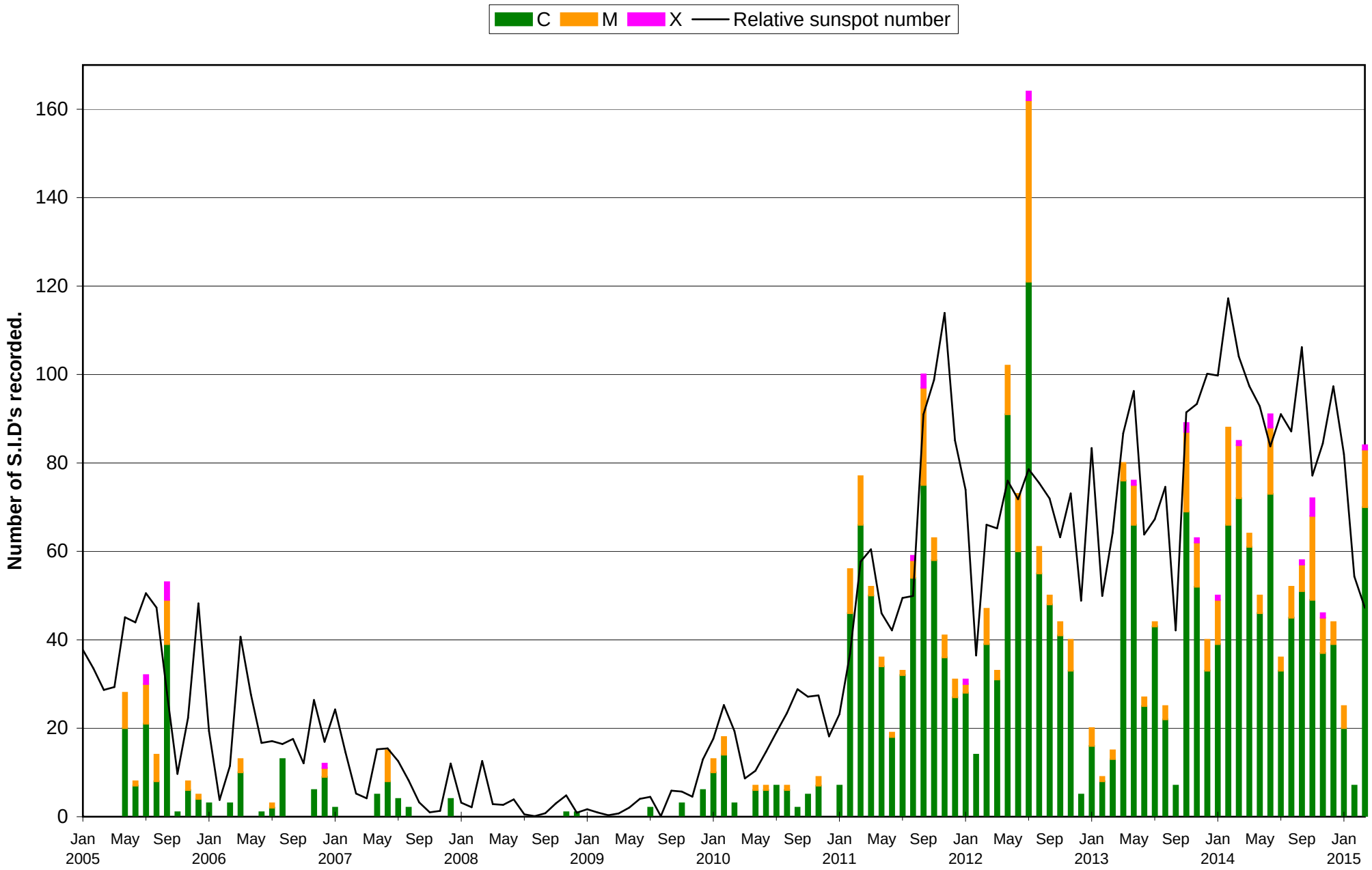
18	C1.4	1													**14:31**	**14:34**	**14:41**	**1-**
18	C3.5	3					16:07	16:11	16:19	1-	16:08	16:11	?	-	***16:10***	***16:10***	***16:18***	***1-***
18	C7.6	3					16:20	16:29	16:51	1+	16:18	16:28	16:56	2	***16:22***	***16:28***	***16:40***	***1-***
19	?	2									08:07	08:20	08:43	2	***08:16***	***08:26***	***08:39***	***1***
19	C1.2	2									12:11	12:27	13:45	3				
23	C3.6	4	09:05	09:11	09:24	1					09:04	09:13	09:40	2	**09:05**	**09:11**	**09:27**	**1**
25	C3.2	5	08:27	08:31	08:37	1-					08:26	08:31	08:42	1-	**08:27**	**08:31**	**08:37**	**1-**
25	C3.3	1													16:34	16:45	16:59	1
26	C1.1	1													15:19	15:23	15:25	1-
26	B9.3	1													16:09	16:14	16:19	1-
26	C1.4	1													19:14	19:21	19:37	1
27	C1.6	4	12:39	12:42	12:56	1-									12:41	12:44	12:57	1-
27	C1.1	1													**14:35**	**14:36**	**14:41**	**1-**
27	C1.8	3									15:08	15:12	15:18	1-	**15:09**	**15:11**	**15:17**	**1-**
28	?	1													14:00	14:02	?	-
28	C1.2	1													14:07	14:12	14:14	1-
28	C2.4	2									16:06	16:09	16:21	1-	16:07	16:09	?	-
28	?	1													16:11	16:13	16:20	1-
28	?	1													17:14	17:20	17:27	1-
29	C2.3	5	10:39	10:42	11:00	1	10:40	10:43	10:54	1-	*10:39*	*10:43*	*11:05*	*1+*	**10:41**	**10:44**	**10:52**	**1-**
29	C2.7	5	13:20	13:23	13:38	1-	13:20	13:24	13:36	1-	13:20	13:30	13:36	1-	13:22	13:24	13:32	1-
29	C3.2	4									15:26	15:31	15:47	1	15:28	15:32	15:49	1
29	C1.4	1													17:43	17:46	17:51	1-
29	?	1													17:59	18:01	18:06	1-
30	C2.4	5	12:53	13:00	13:20	1+					12:52	13:00	13:45	2+	*12:52*	*12:59*	*13:15*	*1*
30	?	1													***15:38***	***15:40***	***?***	***-***
30	C1.5	2													***15:44***	***15:45***	***15:53***	***1-***

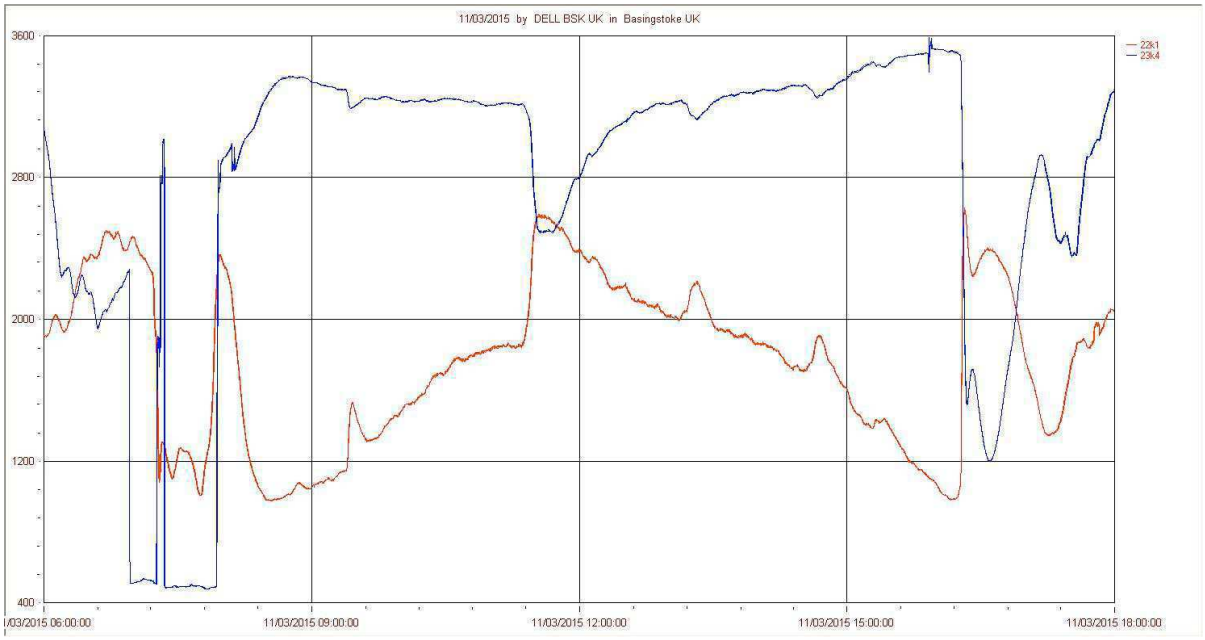
			Colin Clements (23.4kHz/*22.1kHz*)				Steve Parkinson (Various)				John Elliott (18.3kHz)				John Wardle (19.6/23.4kHz)				Richard Kaye (Various)		
			AAVSO receiver, 0.76m screened loop aerial.				Tuned radio frequency receiver, frame aerials.				Tuned radio frequency receiver, 0.5m frame aerial.				PC soundcard, 0.7m frame aerial.				Pre-amplifier + PC software receiver.		
DAY			START	PEAK	END (UT)		START	PEAK	END (UT)		START	PEAK	END (UT)		START	PEAK	END (UT)		START	PEAK	END (UT)
1	C6.8						15:58	16:05	16:25	1+					15:57	16:08	16:30	2			
2	?																				
2	?																				
2	C3.2																				
2	**M1.1**		09:38	09:48	10:23	2	09:39	09:50	?	-					09:39	09:51	10:26	2+			
2	C5.5						10:28	10:35	10:58	1+											
2	?																				
2	?						11:25	11:31	12:14	2+											
2	?																				
2	C3.4						12:49	13:08	13:25	2					12:57	13:10	13:32	2			
2	C2.1						14:09	14:13	14:26	1-											
2	**M3.7**		15:12	15:27	15:50	2	15:11	15:29	16:10	2+					15:13	15:31	16:03	2+			
3	C1.1		08:48	08:52	09:06	1-															
3	C4.0		13:23	13:33	14:03	2	13:25	13:34	14:09	2	13:30	13:36	14:15	2	13:25	13:38	14:27	2+			
4	?																				
4	C2.8																				
4	C1.1																				
5	C3.5						09:40	09:47	10:10	1+					09:39	09:50	10:11	1+			
5	**M1.2**																				
6	**M1.5**																				
6	C2.5																				
6	?																				
6	C2.6																				
6	C2.7																				
6	?																				
7	?		14:09	14:24	15:01	2+															
7	?																				
8	C2.5						09:13	09:25	09:37	1											
9	C4.0		10:02	10:12	10:39	2									10:04	10:09	10:40	2			
9	C1.1																				
9	**M4.5**		14:20	14:32	15:20	2+	14:26	14:35	15:40	2+	14:30	14:34	15:15	2	14:25	14:36	15:23	2+			
9	C9.1														17:40	17:46	17:57	1-			
10	C2.7																				
10	C1.5																				
10	C1.0																				
10	B9.7																				
10	?																				
10	?																				
10	?																				
10	C1.2																				
10	?																				
10	C1.1																				
10	?																				
11	**M1.8**																				
11	?																				
11	**M2.6**														07:47	08:00	08:25	2			
11	C1.8														09:24	09:29	09:38	1-			
11	C5.8		11:05	11:31	12:59	3	11:24	11:33	12:20	2+	11:20	11:40	13:00	3	11:23	11:34	12:48	2+			
11	?																				
11	?																				
11	?																				
11	?																				
11	C2.3		13:06	13:17	13:36	1+	13:08	13:18	13:35	1+					13:08	13:19	13:30	1			
11	?																				
11	C2.0						14:33	14:40	14:52	1					14:32	14:42	14:54	1			
11	?																				
11	C1.7																				
11	**X2.1**						16:15	16:25	?	-					16:14	16:24	17:12	2+			
11	**M1.0**																				
12	C4.3																				
12	C8.4		09:06	09:12	09:27	1	09:03	09:14	10:10	2+					09:06	09:17	10:19	2+			
12	?																				
12	**M1.6**		11:37	11:50	13:17	3	11:41	11:52	13:15	3					11:40	11:54	12:26	2+			
12	**M1.4**														12:09	12:17	12:57	2+			
12	**M4.2**		13:43	14:08	15:07	2+	13:52	14:10	15:00	2+	13:50	14:05	15:00	2+	13:51	14:12	14:57	2+			
13	C6.9														07:30	07:39	07:50	1			
13	?																				
13	?																				
14	C1.3																				

14	C2.1																	
14	C2.6		11:45	11:54	12:09	1	11:50	11:57	12:39	2+					11:50	11:57	12:14	1
14	?		12:09	12:17	12:32	1												
14	C1.7		13:30	13:31	13:38	1-	13:24	13:26	13:33	1-					13:23	13:29	13:46	1
14	B7.3																	
14	C5.3																	
15	**M1.0**		09:35	09:39	10:15	2	09:37	09:41	?	-	09:40	09:50	10:15	2	09:35	09:43	10:37	2+
15	C1.3		10:15	10:22	10:35	1	10:19	10:23	10:30	1-								
15	?																	
15	C6.8		11:29	12:02	13:00	3	11:34	12:02	13:00	3	11:45	11:55	12:30	2	11:33	12:06	13:00	3
15	C2.4		13:00	13:05	13:11	1-												
15	C1.2																	
15	B8.7																	
16	C1.8														09:41	09:53	10:21	2
16	C1.9																	
16	**M1.6**		10:37	11:00	12:04	3	10:42	11:03	12:05	2+	10:45	10:50	11:00	1-	10:40	11:05	12:21	3
16	C1.1						12:57	13:00	13:04	1-								
16	C2.8		13:51	13:53	14:07	1-	13:52	13:55	14:15	1					13:52	13:56	14:20	1+
18	C9.3																	
18	?																	
18	C2.8						09:45	09:52	10:01	1-								
18	C5.5		10:16	10:27	10:47	1+	10:21	10:30	10:55	2								
18	C1.1																	
18	C1.0																	
18	?																	
18	?		12:52	12:53	13:00	1-												
18	C3.8		13:04	13:12	13:50	2+	13:10	13:14	13:25	1-								
18	C1.3						14:23	14:25	14:40	1-								
18	C1.4																	
18	C3.5																	
18	C7.6																	
19	?																	
19	C1.2						12:22	12:41	13:10	2+								
23	C3.6														09:06	09:13	09:26	1
25	C3.2						08:27	08:30	08:38	1-	08:25	08:35	08:45	1				
25	C3.3																	
26	C1.1																	
26	B9.3																	
26	C1.4																	
27	C1.6						12:40	12:44	13:00	1					12:38	12:48	12:58	1
27	C1.1																	
27	C1.8						15:09	15:12	15:20	1-								
28	?																	
28	C1.2																	
28	C2.4																	
28	?																	
28	?																	
29	C2.3														10:37	10:45	10:55	1-
29	C2.7														13:18	13:25	13:50	1+
29	C3.2						15:26	15:31	15:48	1					15:26	15:35	15:45	1
29	C1.4																	
29	?																	
30	C2.4						12:52	13:00	13:18	1+					12:50	13:02	13:28	2
30	?																	
30	C1.5						15:36	15:41	15:50	1-								

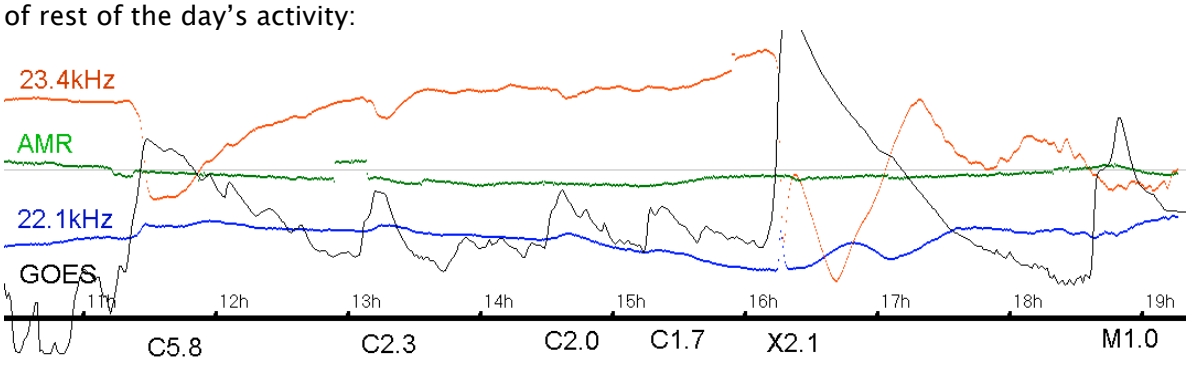

VLF flare activity 2005/15.
C
M
X
Relative sunspot number
Number of S.I.D's recorded.
0
20
40
60
80
100
120
140
160
Jan 2005
May
Sep
Jan 2006
May
Sep
Jan 2007
May
Sep
Jan 2008
May
Sep
Jan 2009
May
Sep
Jan 2010
May
Sep
Jan 2011
May
Sep
Jan 2012
May
Sep
Jan 2013
May
Sep
Jan 2014
May
Sep
Jan 2015

BAA Radio Astronomy Group. **2015 MARCH.**

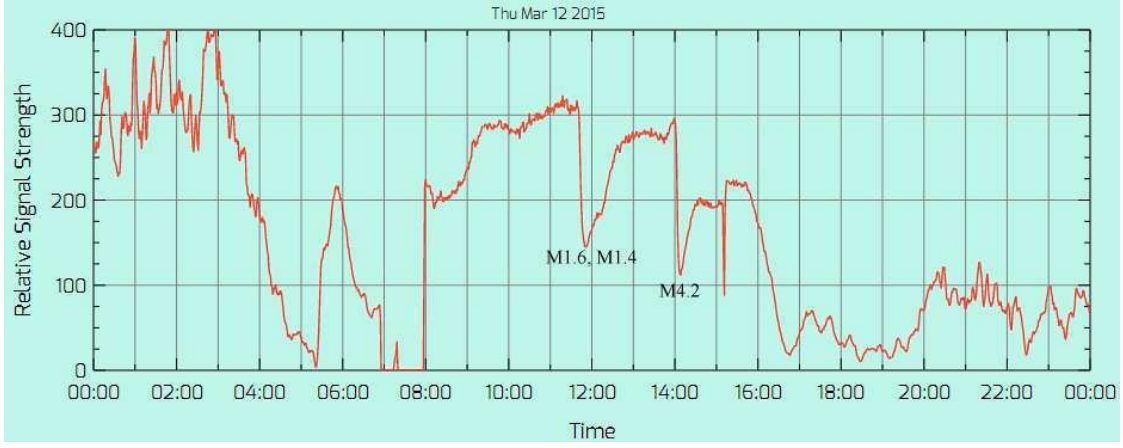
After two months of low solar activity to start the year, March saw a dramatic increase in flares as well as possibly the most active magnetic storm of the current solar cycle. There is a single X-class flare in the SWPC record, on March 11th, and luckily it was suitably timed for us to record as a SID.



This chart by Paul Hyde shows 22.1kHz in red and 23.4kHz in blue. The X2.1 flare can be clearly seen starting at 16:15UT with a very sharp edge to the SID. Recovery lasts well into the local sunset. The earlier C5.8 flare can also be seen, peaking at 11:32UT. My own recording, below, includes the GOES X-ray data to show some of rest of the day's activity:

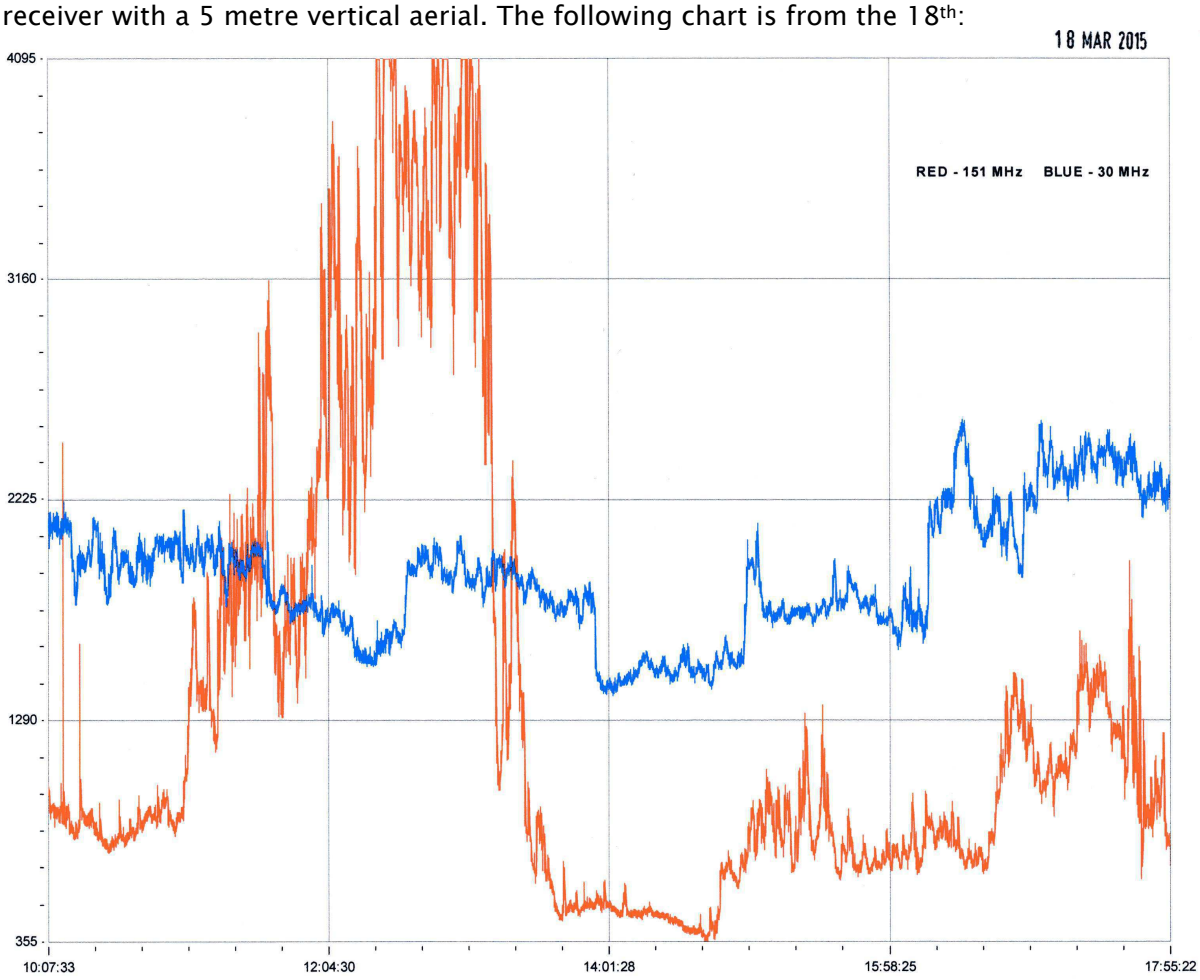


The C5.8 flare had a very slow decay, including a number of small secondary peaks. All of this activity was from a single active region, AR12297, the only major group visible at the time.



The chart at the bottom of the last page is from Peter Meadows, and shows more activity from AR12297 on the 12th. This was dominated by three M-class flares, the first two merging into a single SID for most observers. Optical timings suggest that there were indeed three separate flares, although the X-ray flux from the first (M1.6) was still decaying when the second (M1.4) occurred.

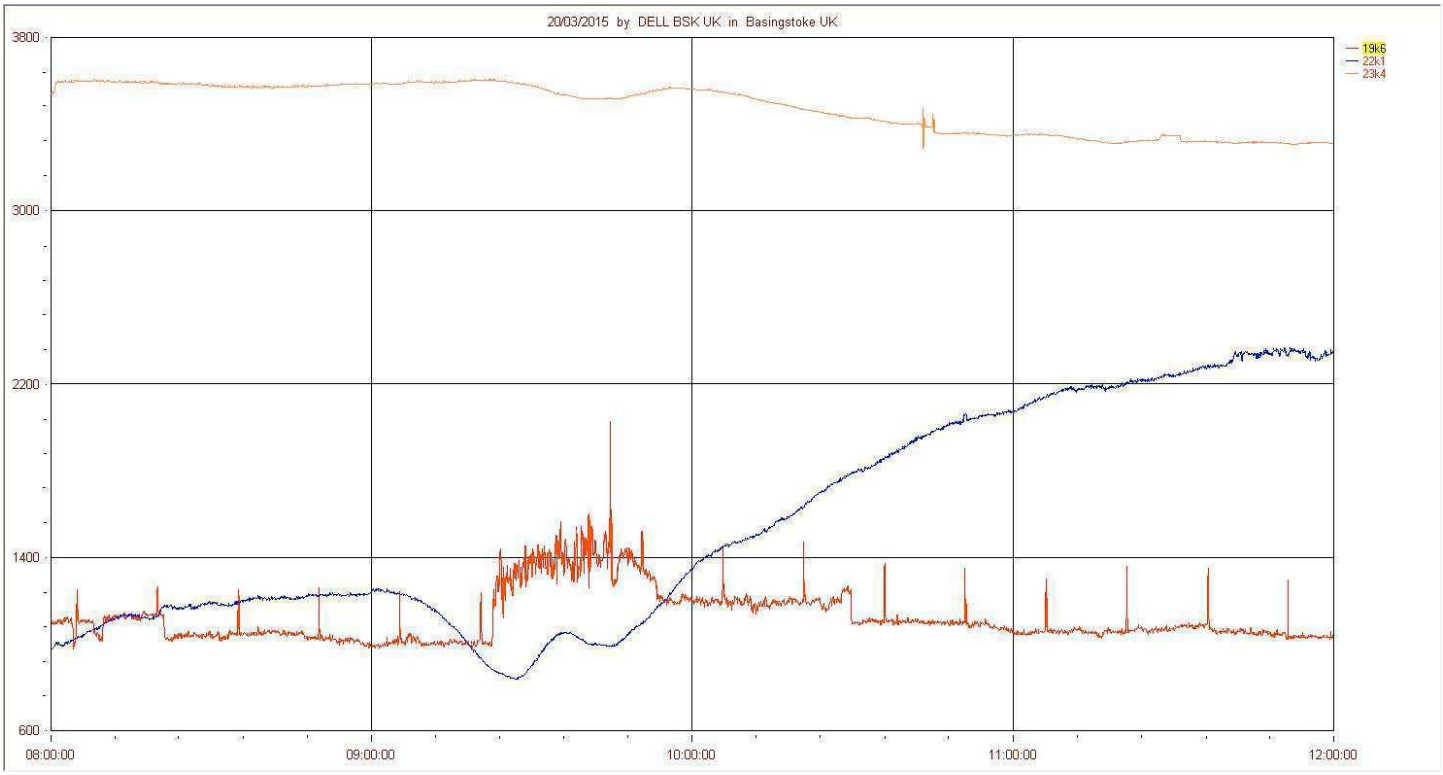
Colin Clements has continued to improve his 151MHz radiometer, and has now added a 30MHz receiver with a 5 metre vertical aerial. The following chart is from the 18th:



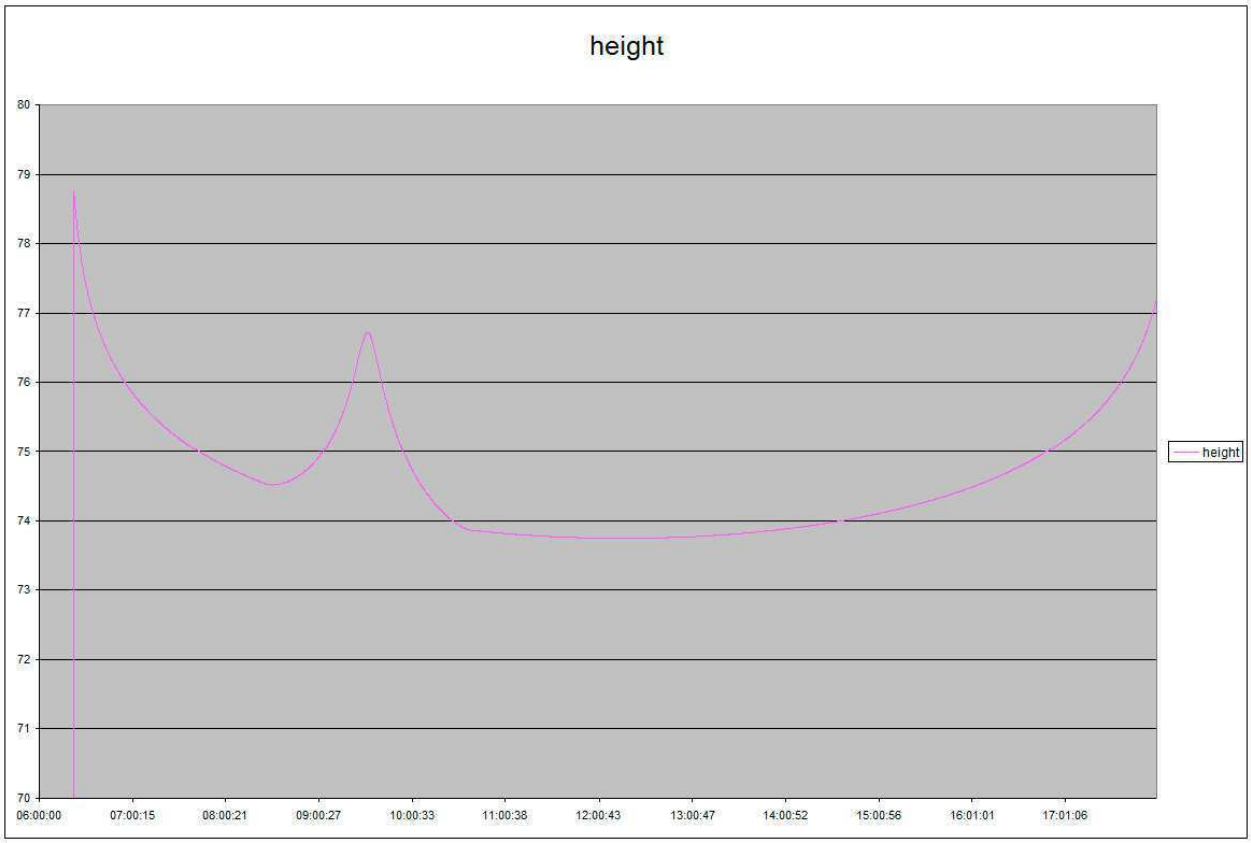
Most of the flares on the 18th were of modest magnitude, although there is a strong increase at 151MHz from about 11:00 to 13:00 (red trace). The 30MHz trace (blue) does not show the same effect. The C3.5 and C7.6 flares after 16:00 show a much smaller 151MHz signal, but there may also be a weak correlation with the 30MHz signal. The radio output from flares is not directly related to the X-ray magnitude, and this is shown in Colin's other recordings through the month. In particular the M1.6 flare on the 16th produced very minor 151Mhz signals, whilst the minor flares on the 19th produced a major 151MHz disturbance.

The highlight for March was of course the solar eclipse on the 20th. The weather was not very co-operative in many parts of the UK, but here in the midlands it was very favourable. Changes in temperature and light quality were very noticeable during the maximum phase. Many radio observations have been received, and work is in progress to produce a full report for the journal, as well as our ragazine.

Solar activity was much lower by the 20th, with just a single active region visible. This resulted in recordings undisturbed by SIDs. The chart on the next page is by Paul Hyde, and shows 19.6kHz in red, 22.1kHz in blue and 23.4kHz in yellow:

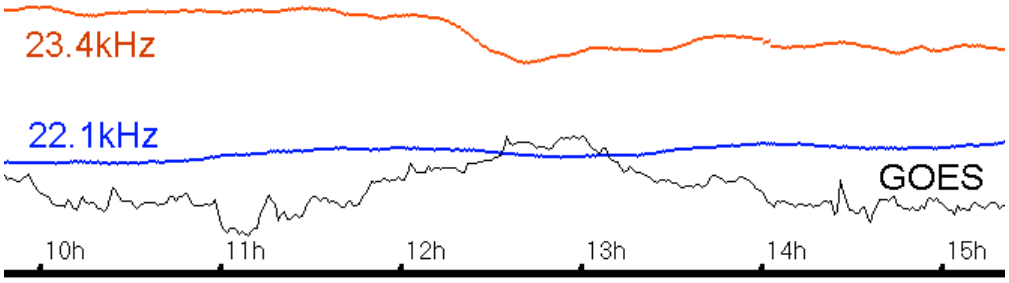


All of these paths were entirely within the partial eclipse area, but they still show a clear effect. The double dip at 22.1kHz was reported by several observers, and is very noticeable in Paul's recording. The 23.4kHz path is much further to the east, and so the dip is delayed in time relative to the others.



This graph is the D-region reflection height at 22.1kHz, modelled by Mark Edwards. A 2-3km rise in altitude is seen during the eclipse, based on the received signal amplitude. This reflection point is of course well south of the path of totality.

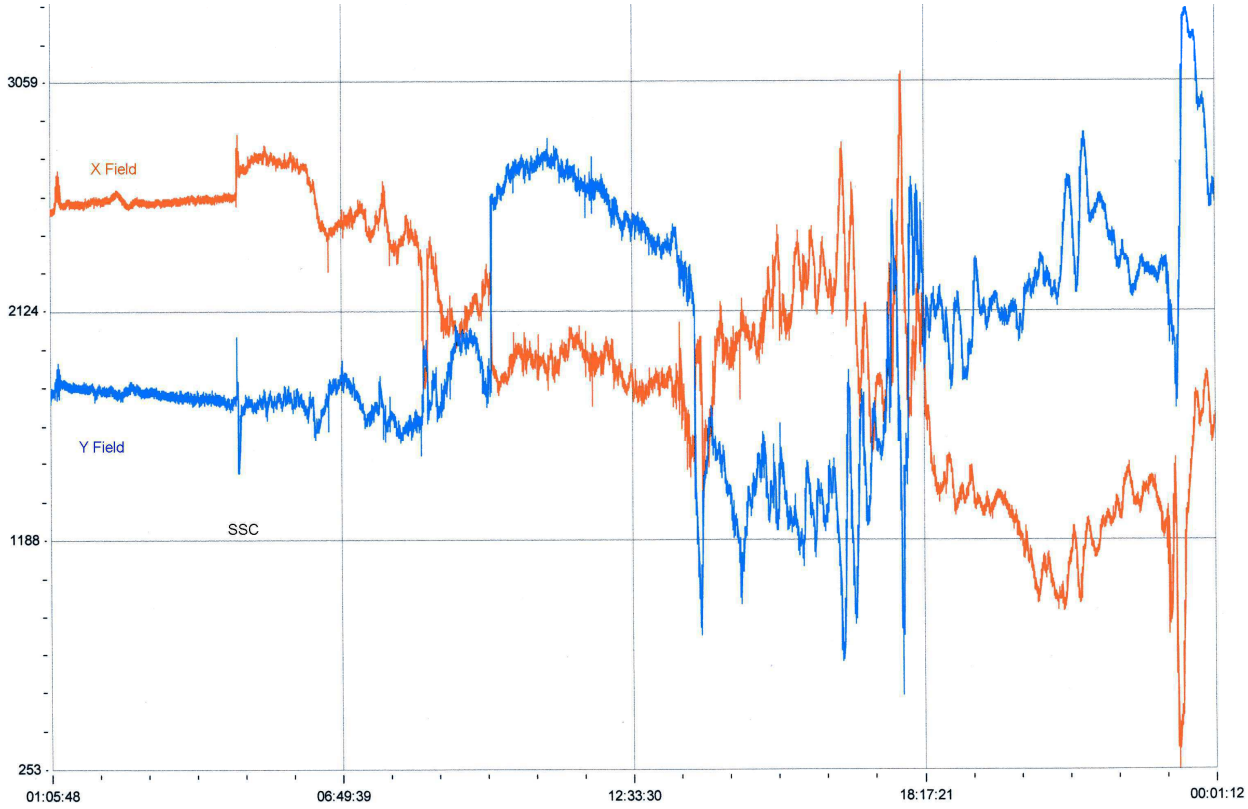
The C2.1 flare at 12:27 on the 19th was a very slow event, as can be seen in the GOES X-ray flux:



A very slow rise begins shortly after 11UT, flattening off for nearly 30 minutes from 12:30. The decay lasts until 14UT. The 23.4kHz SID is simply a slow dip, more like the eclipse response. The same active region was responsible for this flare as well as the X2.1 and various M-class flares already illustrated. The earlier flare on the 19th is not listed by SWPC as GOES15 was in eclipse at the time.

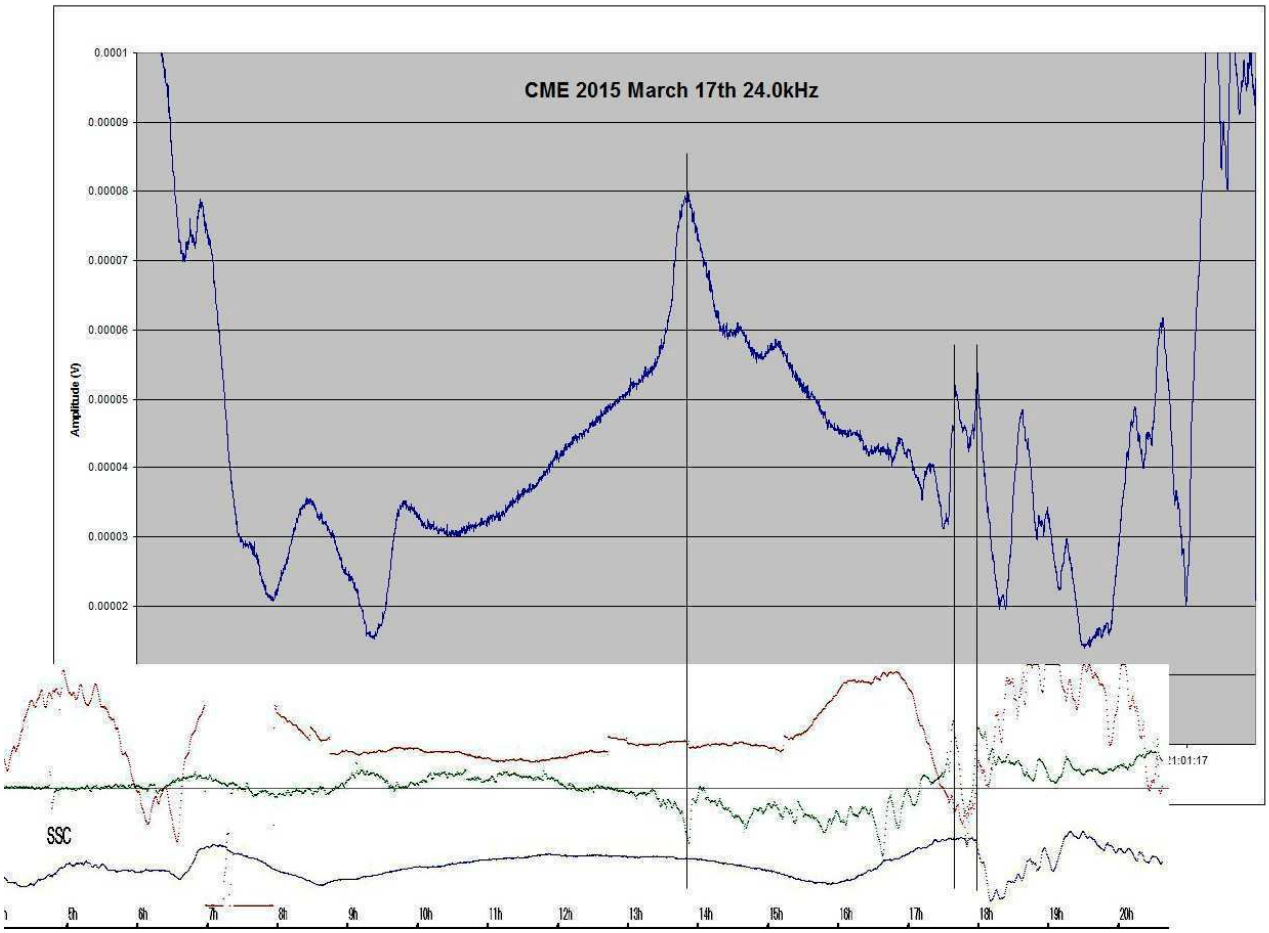
MAGNETIC OBSERVATIONS.

The X2.1 flare on the 11th produced a small SFE shown in my chart at the start of this summary. There was also a CME detected in satellite images although it was not aimed towards the Earth and had little magnetic effect. A much larger storm was produced by a combination of filament eruption and C-class flares early in the morning of the 15th. This caused a very well defined SSC at 04:45UT on the 17th followed by some very active storm conditions lasting into the early hours of the 18th, as illustrated in this recording by Colin Clements:



There is some local interference at 09:47 but the scale of this storm is clear, particularly around 17-19UT and again close to midnight. Aurora were reported from several European countries as well as large parts of North America.

Mark Edwards reported an unusual VLF response during this storm:



Aligned above my own recording is Mark's NAA 24kHz signal showing a very distinct rise at 13:52, coincident with the first sharp dip in the magnetometer (green trace). The same magnetic feature is also present on Colin's chart on the previous page. Two further peaks are indicated at 17:40 and 18:00UT, which have matching magnetic and VLF features. The sunset dip expected around 19:00 is also very disturbed when compared to recordings on quiet days. A report by the Solar-Terrestrial Centre of Excellence (STCE) in Belgium indicates that a substantial increase in the atmospheric vertical total electron count occurred in mid and northern European latitudes at the time of this CME impact. Although the measurement was at 4 degrees east, a long way from the 24kHz reflection point in mid-Atlantic, it may well be related to this recording.

Another SFE was recorded at 14:35 on the 9th from the M4.5 flare. No CME seems to have been generated, and the magnetosphere remained mostly quiet over the next few days with only minor disturbances. Most of the remaining activity shown in the Bartels diagram was from coronal hole effects.

Magnetic observations received from Roger Blackwell, Colin Clements, Gonzalo Vargas and John Cook.

Observations to jacook@jacook.plus.com

BAA Radio Astronomy Group

BARTELS DIAGRAM

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

2440					2012 June																						2125		
	F	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
		BB		C	CCCC	C		C	M	CC	CCM	CCCC	CCMCMCMCMC		M	CCCC	CCCC	CMCC	CCCM	CC	C	CC		CC	CC				
2441									2012 July																		2126		
	F	24	25	26	27	28	29	30	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
				C	CCCC	CMC	CCMC	CCMCM	CCCM	CMCM	CCCC	MMMM	MMMM	MMMX	MMMC	MMMM	CCCC	MMCC	CCCC	CX	CCCC	MCCC	C	CCC	M	C	M		
2442													2012 August														2127		
	F	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
				CB	CCCC		C	CCCM	CCM	MCC	CCCM	CCCC	CCCC	C	CCC	C		CCCC	CCCC	CCCC	CCC	CC	MC		CCC	C		C
2443																	2012 September											2128	
	F	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12
		CMCM	MCCM											C	CCM	CCCC	CCC	CCC	CCC	C	CCC	MCCC	C	M	CC	CCC	CB	CC
2444																					2012 October							2129	
	F	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	1	2	3	4	5	6	7	8	9
		CCC				CCC	CC	CC					C	CC		C		CCCC	CCC	CCCC	C						CCMC	CCCC
2445																								2012 November				2130	
	F	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5
		CMBC	CCC	CB	B			C	CCCC			CM	CCC	C	CCC	CCCC		CC					C					B
2446																											2012 December		
	F	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	1	2
						C		CC	CMMC	CMC	CCCC	C		CC		CCMC	MCM		C	C		CCC	CCCM	C	CC	C	CC	
2447		2131																										
	F	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
											C		C											C				
2448		2132		2013 January																								
	F	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
								MC	CC	C		CC	CC	MM	MCCC		C	C			CC		C					
2449		2133						2013 February																				
	F	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
												C												CM		C	CC	B
2450		2134							2013 March																			
	F	22	23	24	25	26	27	28	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
		C	C	C						C			M		C					CC	C		MC		C	C	CC	
2451		2135													2013 April													
	F	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
		C	CBC											B	CBC	C	M	CCC	CC	C	CCCC	CCC	MCCC	CM	C		C	CC
2452		2136														2013 May												
	F	17	18	19	20	21	22	23	24	25	26	27	28	29	30	1	2	3	4	5	6	7	8	9	10	11	12	13
			C	C	CC	CCCC	M	CCCC	CCCC	CCCC	CCCC	CCCC	CCCC	CC	CCC	CCCC	MC	CCMM	CCCC	CCCM		CBC		CCC	CMCC	CCCC	CCC	CCMX
2453		2137																		2013 June								
	F	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9
		C		CC	M	C	CCCC	CCCM			CCCC		C	C					M			C		M		CC	C	
2454		2138																							2013 July			
	F	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	1	2	3	4	5	6
		BC									CC	CCC	CC	C	M	CCCC	B	C	CBC	C		CCCC	CC	CC	MCCC	CCCC	CCCC	
2455		2139																									2013 August	
	F	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2
		CB		C	C	CC	C	C	C	CC	C	C	CC			CC						C	CCCC	C				
2456		2140																										
	F	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
										CCC	M	CCCC	CCC	CC	CC	CMM	C	C	C	CC	C							
2457				2013 September																								
	F	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
			C	C		BC	C																CCCC					
2458				2142			2013 October																					
	F	26	27	28	29	30	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
												C	C		C	CCCC	MCCC	CCC	C	C	CMCC	CCC	CCM	CCCC	CCC	CC		CCCM
2459				2143													2013 November											
	F	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
		CCCC	CMMC	XMXM	MMMM	CCMC	MMMM	CCCC	C	MCC	C	CCC	C	CCC	MCCM	CCCM	CCMC	M	CC	CCC	CMC	CC	CCCM	CCC	C	MCC	CCC	CCC
2460				2144											2013 December													
	F	19	20	21	22	23	24	25	26	27	28	29	30	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		X	CC	M	C	CCM	CC							C	C			C	C		C	CCC		CC	C		CC	CC
2461					2145													2014 January										
	F	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11
		C			C	CMCC	C	MMMM	M		C		CC	CC	MCCC	C	C	C	C	CCMC	CCMC	C	C	CMCX	CCCC			CCC
2462					2146																	2014 February						
	F	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7
			CC	C		C	CCCC	CC								C	C	MMMM	CCC	MCC	CM	CCCC	MMMM	CCCC	MCCM	CCCM	CCC	CCMC
2463						2147																			2014 March			
	F	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	1	2	3	4	5	6
		CCC	M	CC	CM	CM	MCCM	CMMM		MCC	CCC	CC	C	M	CC	C	CC	MMC	C	CCM	CCCC	CCC	MC	CCC	CCCM	CCCC	C	
2464						2148																					2014 April	
	F	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2
				CCMM	CCCM	CMCC	CMC	CCM	C	CCC	CC	CCC	C	CCCC	CC	C	MCC	CC	CC		CC		CM	CCCX	M	MC		CCM
2465						2149																						
	F	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
		CC	CCC	CCC		CC			C	CCC	C	C	CCCC	CCCC	CCCM	CC	CM	CCCC	CCCC	C	CCCC	CCCC	C	CC	C		BC	B
2466			2014 May				2150																					
	F	30	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
		B		CCC	CCCC	CCCC	C	MCC	CMC	M	CCCC	CCC	CCCC		C	CCC	C	CCC				B	C	C		M	C	CCC
2467							2014 June																					
	F	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
		C				B	C	M	CCM				CC	CC	CCC	CCXX	MMXC	MMMM	MCCC	CCM	CMCC	CCCC	CBCC	CC	C	CC	C	B
2468							2152			2014 July																		
	F	23	24	25	26	27	28	29	30	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
			BBB				CCCC	CCCC	CC	CCCM	C		C		CC	CC	CM	C	CC		CCC	CCCC						
2469							2153							2014 August														
	F	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
			B				C	CCCB	CC		CC	CC	CMCC	CMM	CC	C		CCC			CCCC	C						CC
2470								2154											2014 September									
	F	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11
		C		C		CCCC	CMCC	MCCC	CCCC	CMC	MM	C		CB	C	CCB	CCCC	CC	CC	CCM	CCCC	CC	CCMC	CCC	C	C	CCX	CCM
2471								2155														2014 October						
	F	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	1	2	3	4	5	6	7	8
		CCCC	CC			CC		CMC	C	CC	CCC			CC	C	CCC	M	CCMM	C			MM	CCC					C
2472								2156																			2014 November	
	F	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4
		MCCC							CCM	CC	MCCC	CCCC	MCMM	CCCM	CCXM	MCC	MCC	CCCX	XCCM	CCMX	CCM	MMMM	CCCC		CCCC		M	MM
2473								2157																				
	F	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	1
		MC	C	MCCX		CCM	CC	C	C	C	CC	M	CCCM	C					C	C	C			CCC	C	CCCC	CC	
2474		2014 December							2158																			
	F	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
		CCC	CCCC	MCM	CCM	C			CCCC		C	C	CCC	CC		CCC	CC	CCC	MC	C	M	C			C	C		C
2475					2015 January				2159																			
	F	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
		C		C			M	M	C	C	CC	C	C	C		CC	C	CM	CC						CCC		CC	
2476									2015 February																			
	F	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
				CC	C	MC	M		C		CC	C																C
2477										2015 March																		
	F	21	22	23	24	25	26	27	28	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
									CC	C	CMCCM	CC	CC	CM	MCCC		C	CCMC	CCCC	MMCX	CMMM	C	CCCC	MCCC	CCMC		CCCC	C
2478											2162			2015 April														
	F	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
					C		CC	CC	CCC	CC	CCCC	CC																