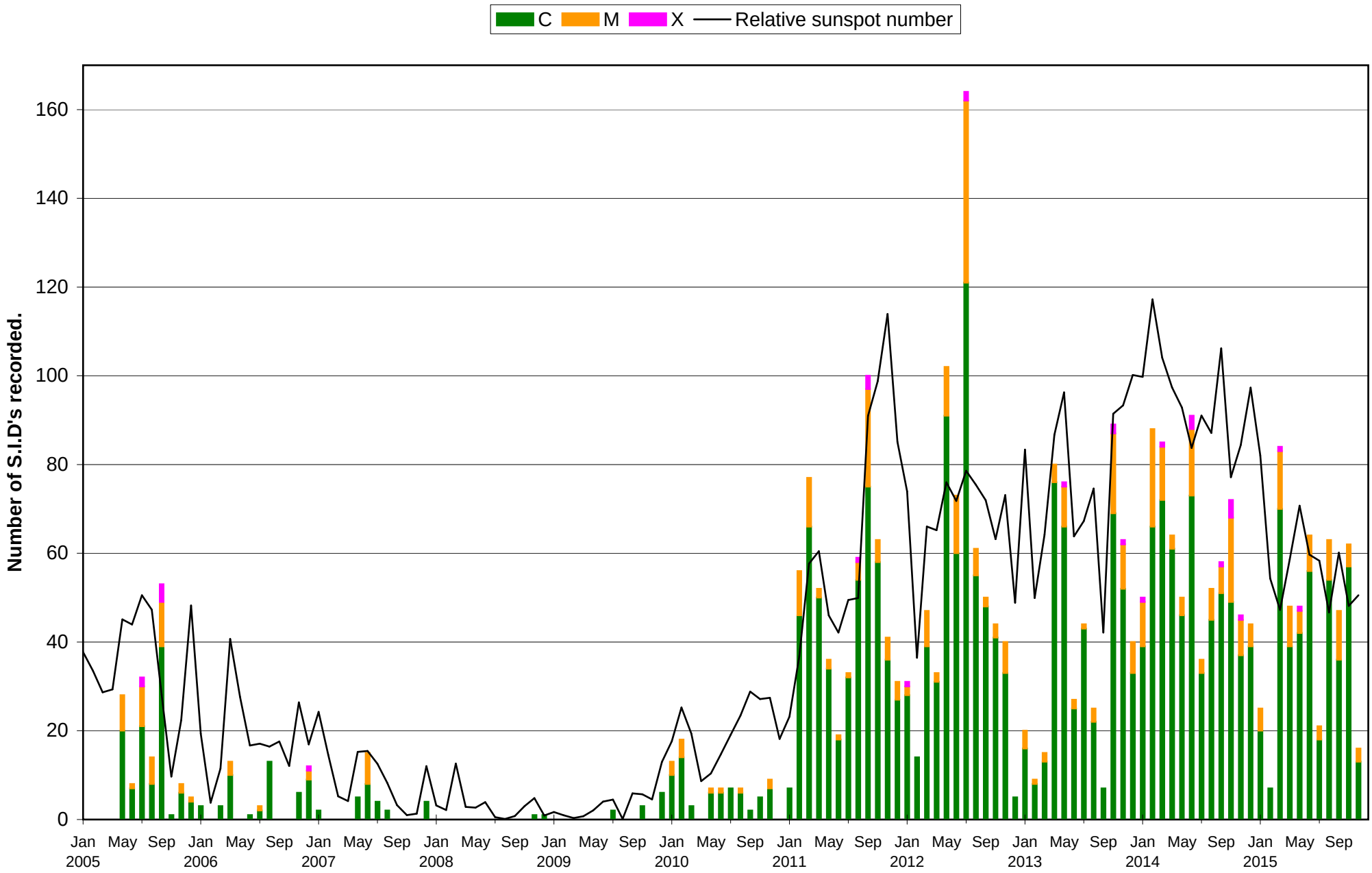
BAA Radio Astronomy Group. **2015 NOVEMBER**

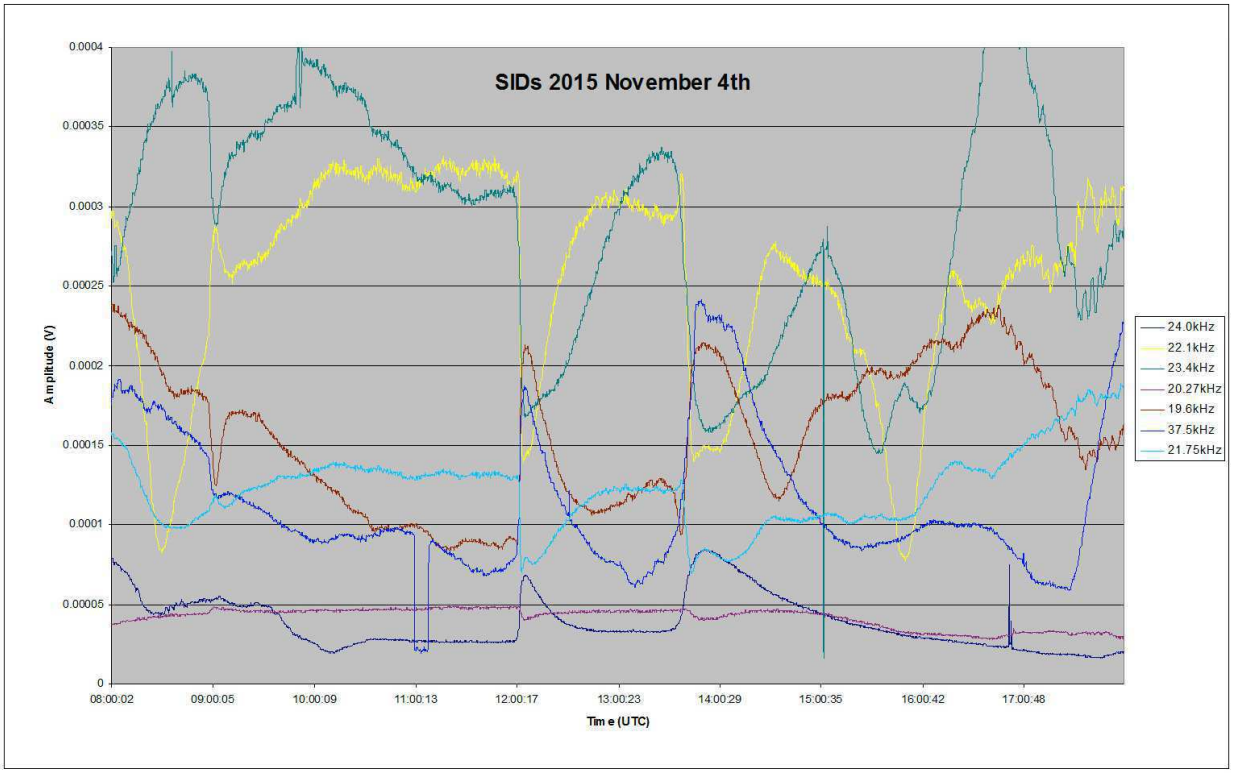
	Xray class	Observers	John Cook (23.4kHz/*22.1kHz*)				Roberto Battaiola (21.75kHz)				Paul Hyde (22.1/23.4kHz)				Mark Edwards (**37.5**/24.0/*19.6kHz*)				Colin Clements (23.4kHz/*22.1kHz*)			
			Tuned radio frequency receiver, 0.58m frame aerial.				Modified AAVSO receiver.				Tuned radio frequency receiver, 0.96m frame aerial.				Spectrum Lab / PC 2m loop aerial.				AAVSO receiver, 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	C1.1	1																				
1	C1.3	2													12:07	12:09	12:20	1-				
1	C1.0	1																				
1	C5.0	1													16:37	16:44	16:59	1				
2	C7.2	7	09:55	10:01	10:22	1+					09:52	10:00	10:31	2	*09:52*	*10:00*	*10:23*	*1+*	09:56	10:02	10:17	1
2	C1.3	2													**10:59**	**11:00**	**11:03**	**1-**				
2	C1.8	2													*13:14*	*13:20*	*13:32*	*1-*				
2	?	1													*13:36*	*13:40*	*?*	-				
2	*	1													*13:43*	*13:47*	*13:53*	*1-*				
2	*	1													*14:37*	*14:46*	*14:56*	*1*				
2	C5.0	3									14:57	15:00	15:17	1	*14:58*	*15:01*	*15:07*	*1-*				
2	C2.0	1																				
4	C4.6	6	08:56	09:02	09:45	2+					08:48	09:00	09:18	1+	*08:56*	*09:01*	*09:10*	*1-*				
4	**M2.5**	7	12:00	12:05	13:10	2+					12:00	12:03	12:37	2	11:59	12:05	12:48	2+	12:00	12:04	12:46	2+
4	**M3.7**	7	13:37	13:50	15:22	3					13:36	13:42	14:40	2+	13:33	13:51	15:48	3+	13:36	13:52	14:38	2+
9	?	2													*12:53*	*12:58*	*?*	-				
9	**M3.9**	8	13:00	13:12	13:46	2+	13:01	13:13	14:18	2+	12:53	13:05	13:47	2+	*13:01*	*13:14*	*13:49*	`	13:00	13:13	13:46	2+
10	C3.7	3									14:03	14:08	14:26	1	14:04	14:11	14:33	1+				
10	C2.7	1																				
21	C3.3	2													13:45	13:51	14:11	1+				

			Steve Parkinson (Various)				John Wardle (19.6/23.4kHz)				Phil Rourke (23.4kHz)				Jim Barber				John Elliott (18.3kHz)			
			Tuned radio frequency receiver, frame aerials.				PC soundcard, 0.7m frame aerial.				TRF receiver, 0.6m frame aerial.				Spectrum Lab, 0.6m frame 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	C1.1						09:19	09:23	09:30	1-												
1	C1.3						12:04	12:08	12:14	1-												
1	C1.0						12:57	13:00	13:07	1-												
1	C5.0																					
2	C7.2		09:53	10:03	10:30	2	09:53	10:04	10:30	2	09:52	10:00	10:28	2								
2	C1.3						10:58	11:00	11:06	1-												
2	C1.8						13:21	13:23	13:29	1-												
2	?																					
2	*																					
2	*																					
2	C5.0						14:55	15:00	15:08	1-												
2	C2.0						17:33	17:35	17:40	1-												
4	C4.6		08:58	09:01	09:12	1-	08:52	09:01	09:08	1-	08:56	09:00	09:12	1-								
4	**M2.5**		12:00	12:04	13:00	2+	11:58	12:05	13:11	2+	11:58	12:04	12:54	2+								
4	**M3.7**		13:35	13:52	14:50	2+	13:36	13:41	14:12	2	13:33	13:51	14:49	2+								
9	?										12:53	12:58	?	-								
9	**M3.9**		12:54	13:14	13:54	2+	12:52	13:13	13:47	2+	13:12	13:24	14:02	2+								
10	C3.7						14:04	14:09	14:30	1+												
10	C2.7						16:48	16:59	17:07	1												
21	C3.3						13:14	13:27	13:31	1-												

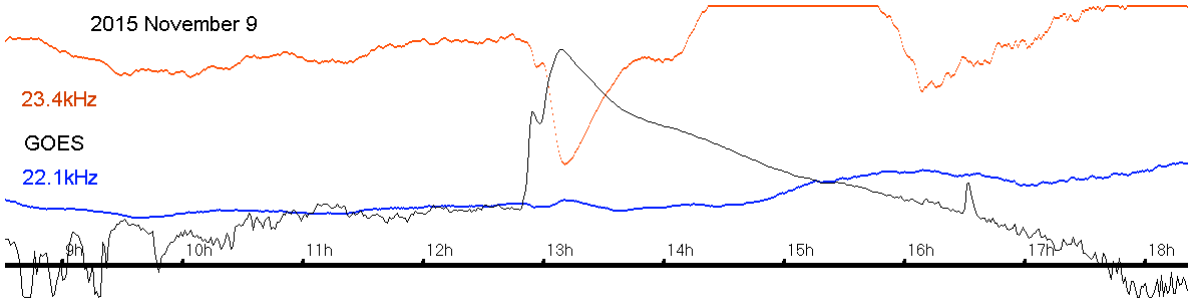

VLF flare activity 2005/15.
C
M
X
Relative sunspot number
Number of S.I.D's recorded.
0
20
40
60
80
100
120
140
160
Jan 2005
May
Sep
Jan 2006
May
Sep
Jan 2007
May
Sep
Jan 2008
May
Sep
Jan 2009
May
Sep
Jan 2010
May
Sep
Jan 2011
May
Sep
Jan 2012
May
Sep
Jan 2013
May
Sep
Jan 2014
May
Sep
Jan 2015
May
Sep

BAA Radio Astronomy Group. **2015 NOVEMBER.**

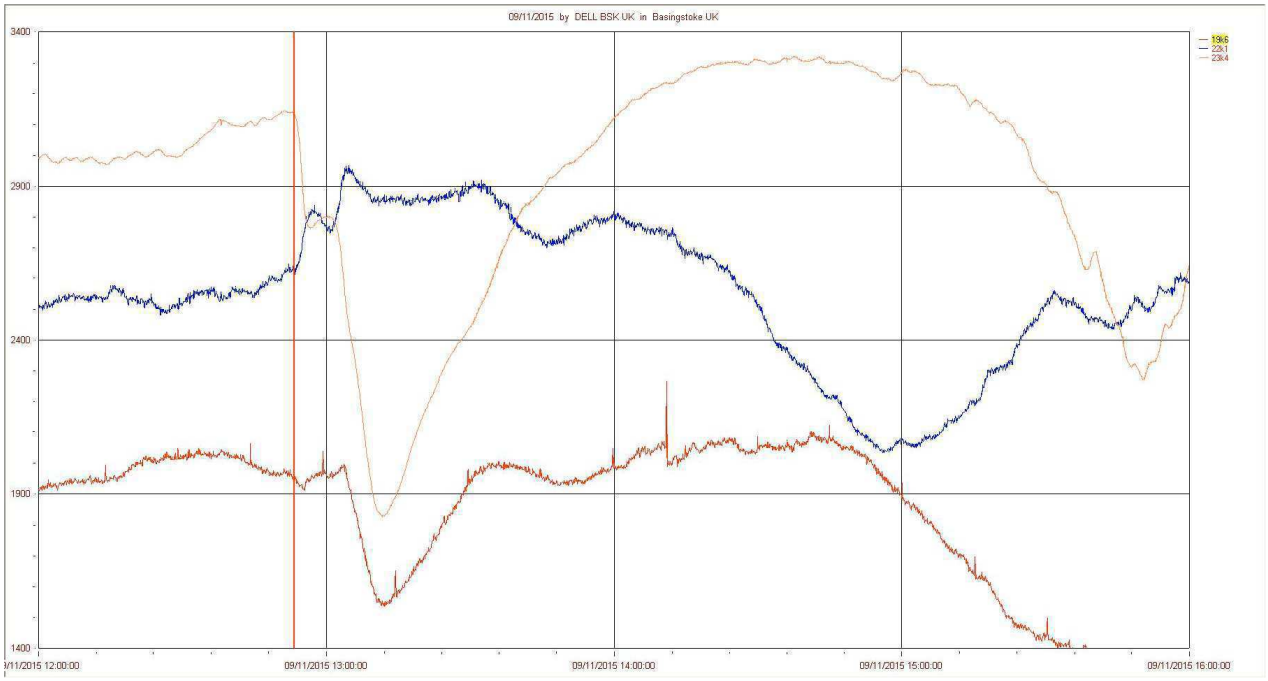
The November SID count is significantly lower than in the previous three months, with just 16 individual flares recorded. This is still higher than the 2015 February count, when just seven C-class flare were recorded. This month we also had the benefit of three strong M-class flares.



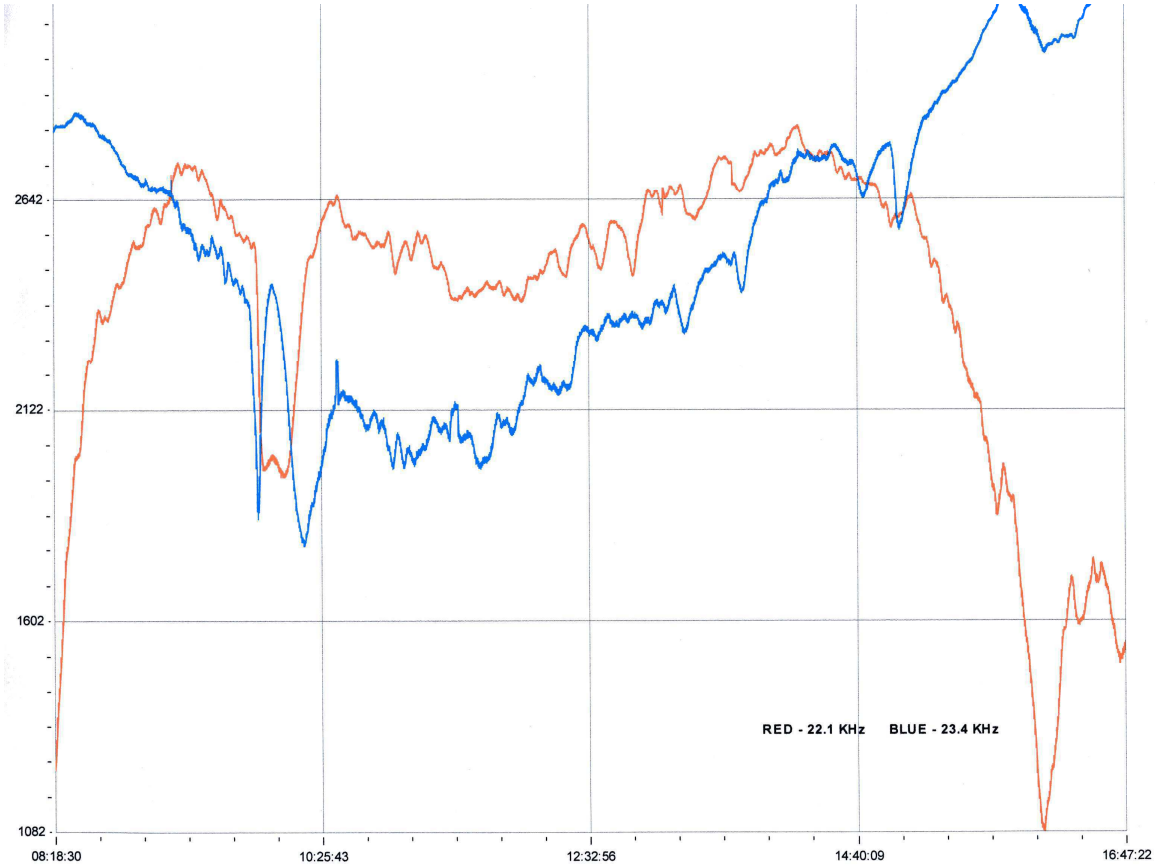
Two of the M-class flares occurred on the 4th, and show clearly in this recording by Mark Edwards. The earlier C4.6 flare is also clear, especially at 19.6kHz (brown trace), where the SID is inverted relative to the afternoon SIDs. At 23.4kHz (green) all three SIDs have the same polarity. On this path to the east over the North Sea, sunrise is a little earlier, and so this area of the ionosphere has already settled into daytime conditions compared to the more northerly path at 19.6kHz.



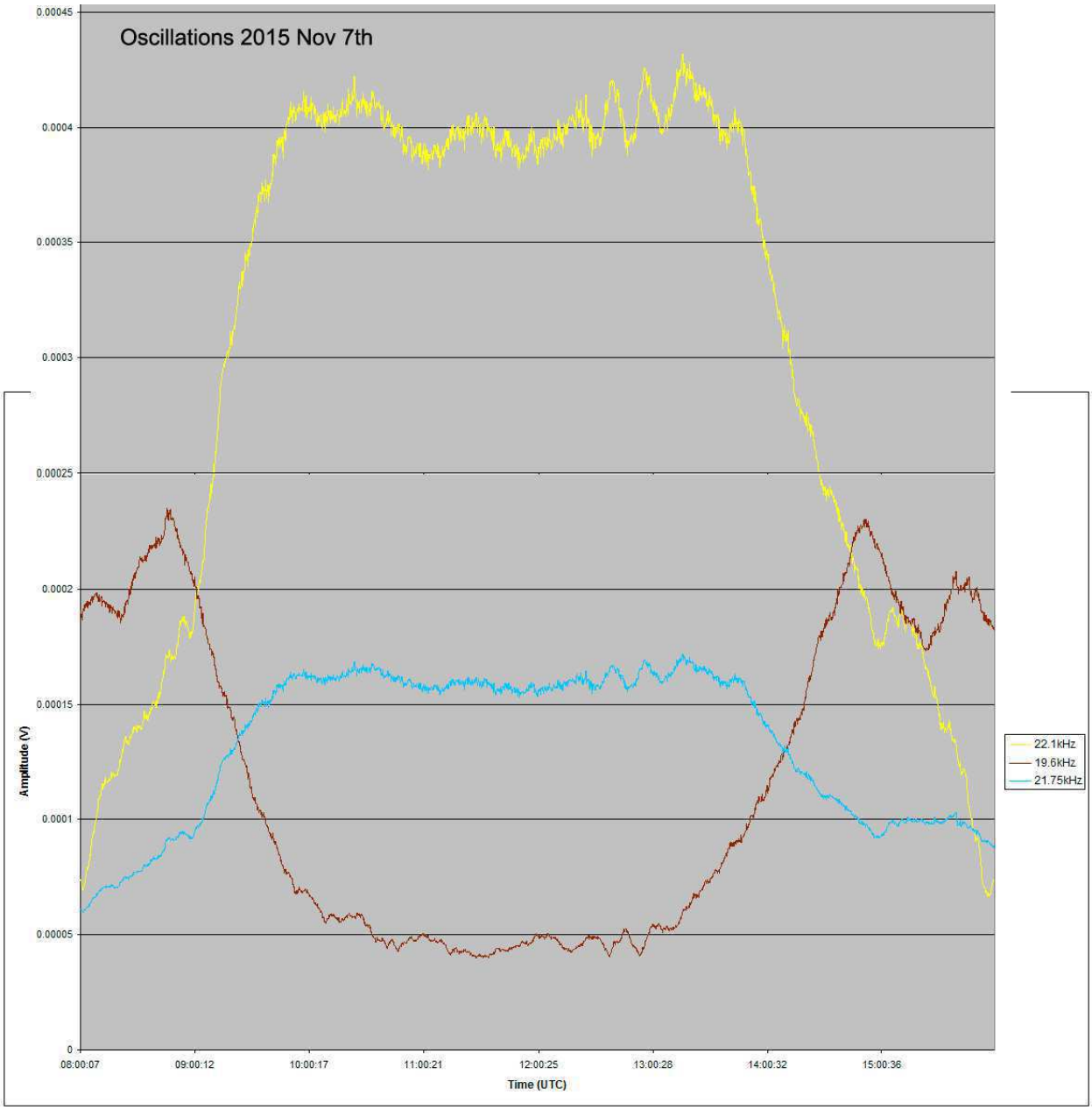
The M3.9 flare on the 9th was well timed for recording as a SID. I have added the GOES15 X-ray flux data to my own recording (above). This flare had a fairly short rise-time that included a small sub-peak about 15 minutes before the main peak. The decay lasted for the rest of the afternoon. I found the 23.4kHz signal level to be very high all day, saturating the receiver by 14:20UT. Signal strength at 22.1kHz seemed to be lower than usual, with a very minor SID recorded. Paul Hyde noticed a similar weak response at 22.1kHz, shown in his chart on the next page. 22.1kHz is blue, 19.6kHz red and 23.4kHz yellow. The effect is to give a three-peaked SID. The 23.4kHz SID is also very similar to mine, although without saturating the receiver.



Paul Hyde.



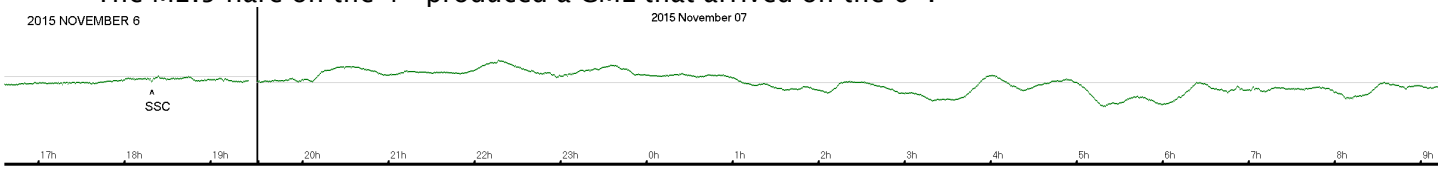
The C7.2 flare on the 2nd produced strong SIDs at both 23.4kHz and 22.1kHz for Colin Clements (above). Although the tables show this to be the busiest day of the month with 8 events recorded, Colin found both signals to be very noisy, with some large oscillations in the afternoon that have largely masked the other SIDs. Colin also noted a sharp spike in 151MHz noise associated with the C7.2 flare, followed by some erratic VHF activity through the rest of the day. There was no noticeable VHF noise from the M3.9 flare on the 9th, but flare-quiet periods on the 6th, 8th, 10th, 11th, 12th and 25th did show some excess noise.



This chart shows more ionospheric waves recorded by Mark Edwards on the 7th. They are particularly strong at 22.1kHz (yellow) through the day, and also in the afternoon at 19.6kHz (brown) and 21.75kHz (blue). While 22.1 and 19.6 are northerly paths, 21.75 is to the south from Rosnay, France.

MAGNETIC OBSERVATIONS.

The M2.5 flare on the 4th produced a CME that arrived on the 6th.



The SSC is indicated in my own recording (above) at 18:19UT, and measures about 10nT in my horizontally mounted magnetometer. The subsequent disturbance of +/- 70nT lasted until 06:30 on the 7th, and was followed by another 8 hours of very low level rapid fluctuations.

SIDs from the flare were timed at 12:03 to 12:05UT, giving a CME transit time of 54hours 5 minutes, making it the tenth-fastest recorded by the group.

This CME occurred against a background of coronal hole activity, some of it quite strong, that had been present for several days. A high speed solar wind on the 3rd. caused the ionospheric total electron count (ie, ionisation level) to increase by about 40% (as measured by the Royal Observatory of Belgium) causing a strong magnetic disturbance. This can be seen in Colin Clement's recording:

Smaller, more rapid fluctuations had begun around 08:00 on the 3rd, with further activity lasting until mid-afternoon on the 4th. Some interesting notes on the measurement of total electron count can be found at http://gnss.be/ionosphere_tutorial.php. Several coronal holes were present through the first two weeks of November, producing a generally disturbed background.

The magnetosphere was much quieter from the 16th to the 18th, when CMEs from a pair of filament eruptions arrived. The first of these was from a very long looped filament near the solar meridian in the southern hemisphere. As it split into two parts on the 15th, some of the material was ejected as a CME. On the 16th a much smaller filament in the south-west quadrant erupted with a stronger CME. These 'Hyder' flares do not produce SIDs, but cause magnetic disturbances when they arrive at the Earth. In this case a small disturbance from about 19:30UT on the 18th to 01:00 on the 19th resulted from their combined effects.

A final coronal hole produced a solar wind speed increase in the last three days of the month, with some very minor magnetic disturbances.

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

BAA Radio Astronomy Group

BARTELS DIAGRAM

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

ROTATION																													
2454		2138																							2013 July					
	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		
F	BC									CC	CCC	CC	C	M	CCCC	B	C	CBC	C		CCCC	CC	CC	MCCC	CCCC	CCCC			
2455		2139																									2013 August		
	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		
F	CB		C	C	CC	C	C	C	CC	C	C	CC			CC						C	CCCC	C						
2456		2140																											
	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		
F									CCC	M	CCCC	CCC	CC	CC	CMM	C	C	C	CC	C									
2457			2013 September																										
	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		
F		C	C		BC	C																CCCC							
2458		2142			2013 October																								
	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		
F											C	C		C	CCCC	MCCC	CCC	C	C	CMCC	CCC	CCM	CCCC	CCC	CC		CCCM		
2459		2143								2013 November																			
	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18		
F	CCCC	CMMC	XMXM	MMMM	CCMC	MMMM	CCCC	C	MCC	C	CCC	C	CCC	MCCM	CCCM	CMMC	M	CC	CCC	CMC	CC	CCCM	CCC	C	MCC	CCC	CCC		
2460		2144											2013 December																
	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		
F	X	CC	M	C	CCM	CC							C	C			C	C		C	CCC		CC	C		CC	CC		
2461			2145															2014 January											
	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		
F	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							
	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		
F		CC	C		C	CCCC	CC								C	C	MMMM	CCC	MCC	CM	CCCC	MMMM	CCCC	MCCM	CCCM	CCC	CCMC		
2463				2147																					2014 March				
	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		
F	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			
	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		
F			CCMM	CCCM	CMCC	CMC	CCM	C	CCC	CC	CCC	C	CCCC	CC	C	MCC	CC	CC		CC		CM	CCCX	M	MC		CCM		
2465					2149																								
	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		
F	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																							
	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		
F	B		CCC	CCCC	CCCC	C	MCC	CMC	M	CCCC	CCC	CCCC		C	CCC	C	CCC				B	C	C		M	C	CCC		
2467						2014 June																							
	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		
F	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																					
	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		
F		BBB				CCCC	CCCC	CC	CCCM	C		C		CC	CC	CM	C	CC		CCC	CCCC								
2469					2153									2014 August															
	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		
F		B				C	CCCB	CC		CC	CC	CMCC	CMM	CC	C		CCC			CCCC	C							CC		
2470						2154																	2014 September						
	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		
F	C		C		CCCC	CMCC	MCCC	CCCC	CMC	MM	C		CB	C	CCB	CCCC	CC	CC	CCM	CCCC	CC	CC	C	C	CCX	CCM			
2471							2155																2014 October						
	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		
F	CCCC	CC			CC		CMC	C	CC	CCC			CC	C	CCC	M	CCMM	C			MM	CCC					C		
2472							2156																			2014 November			
	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		
F	MCCC							CCM	CC	MCCC	CCCC	MCMM	CCCM	CCXM	MCC	MCC	CCCX	XCCM	CCMX	CCM	MMMM	CCCC		CCCC		M	MM		
2473							2157																						
	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		
F	MC	C	MCCX		CCM	CC	C	C	C	CC	M	CCCM	C					C	C	C			CCC	C	CCCC	CC			
2474	2014 December							2158																					
	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		
F	CCC	CCCC	MCM	CCM	C			CCCC		C	C	CCC	CC		CCC	CC	CCC	MC	C	M	C			C	C		C		
2475			2015 January					2159																					
	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		
F	C		C			M	M	C	C	CC	C	C	C			CC	C	CM	CC					CCC		CC			
2476								2015 February																					
	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		
F			CC	C	MC	M		C		CC	C																C		
2477									2015 March																				
	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		
F								CC	C	CMCCM	CC	CC	CM	MCCC		C	CCMC	C	MMCX	CMMM	C	CCCC	MCCC	CCMC		CCCC	C		
2478									2162				2015 April																
	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		
F				C		CC	CC	CCC	CC	CCCC	CC									M	CCCC	CCCC	C	CMCC	CCC		C		
2479									2163							2015 May													
	16	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		
F	CCCC	C	CCC			MMMM	CCMC	CMCC	C	C	C							C	CCC	MMMX	CCMC	CCCC	CC	CC	CCC		CC		
2480										2164													2015June						
	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	8		
F	CCCC	CCCC			B		C	C			CC										C		CC	CC		CC			
2481										2165															2015 July				
	9	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		
F		CCC	CMCC	CC	MCCC	C	CC	CC	CC	CCM	CCCC	MC	MCCM	CCCM	C	C	M			C	CCCC	C		C	CCCM				
2482										2166																			
	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	31	1		
F	MCCM	C			C				C				C						CC		C						C		
2483	2015 August										2167																		
	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		
F					C	CBCC	CC	C						C					CC	MCM	MCCM	CCCC	MCCM	CCCC	CC	M	CMCM		
2484			2015 September								2168																		
	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		
F	CCC	CC				C													CC	CMCC	C	C	CCM			CCC			
2485						2015 October					2169																		
	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	21		
F		C	CMCC	MCMM	MMCM	CMCM	CCM	CCMM	CCCC										CC	CC	CCCC	MCCC	CCCC		CCC	C	CCC		
2486												2015 November																	
	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	17		
F					C		C	CC	CCCC	CCCM	CCCC	CCCC		CMM					M	CC									
2487											2171		2015 December																
	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	14		
F				C																									