

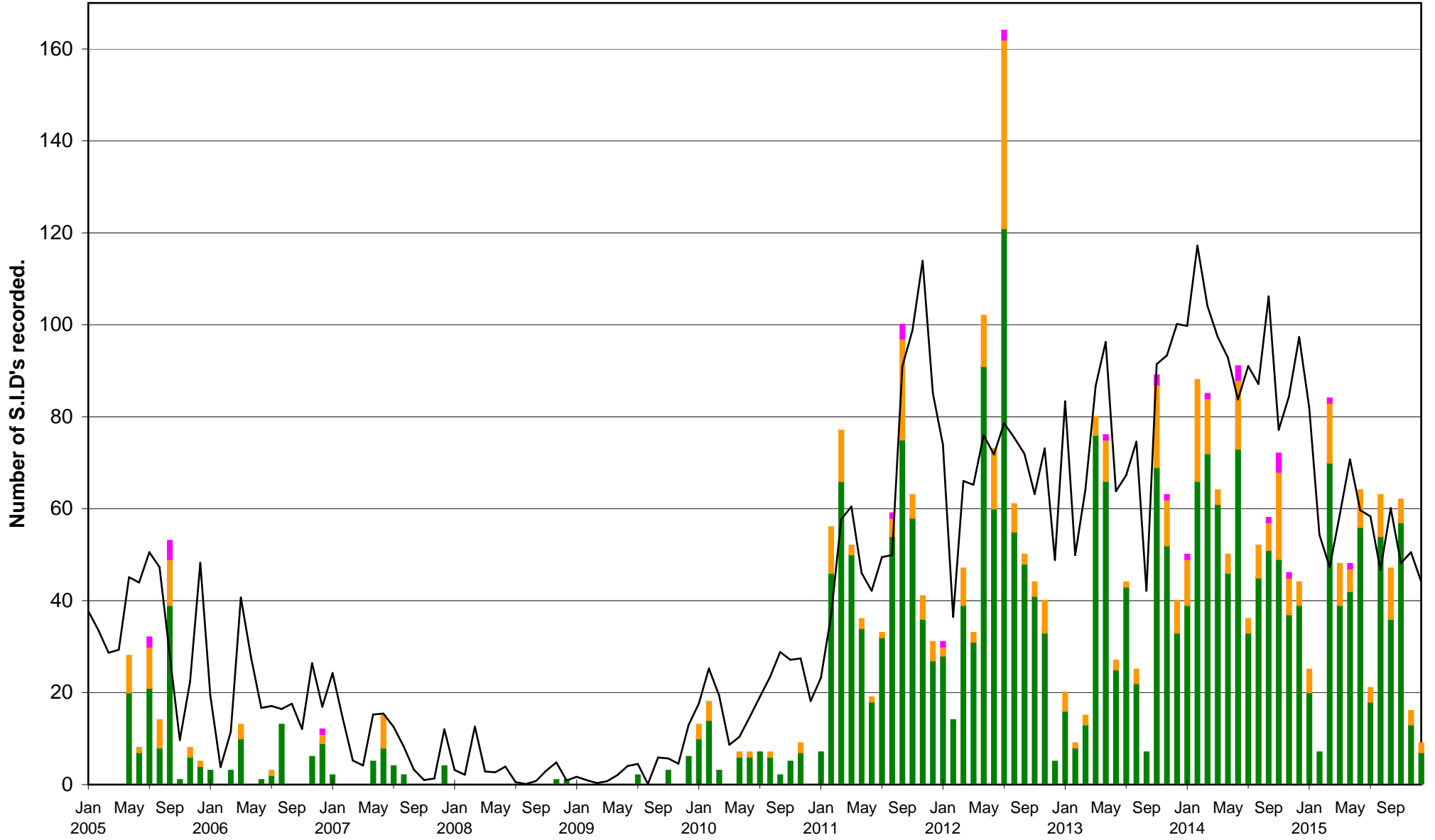
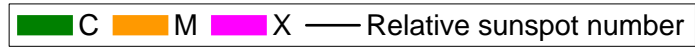
BAA Radio Astronomy Group.

2015 DECEMBER

DAY	Xray class	Observers	John Cook (23.4kHz/22.1kHz)	Roberto Battaiola (21.75kHz)	Paul Hyde (22.1/23.4kHz)	Mark Edwards (21.75/24.0/19.6kHz)	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.
			START PEAK END (UT)	START PEAK END (UT)	START PEAK END (UT)	START PEAK END (UT)	START PEAK END (UT)
5	C1.9	1					
10	C3.9	1		07:44 07:48 07:51 1-			
12	C2.1	5			11:43 11:45 11:54 1-	11:43 11:44 11:50 1-	11:39 11:43 11:56 1-
12	C7.8	6	13:36 13:45 13:52 1-		13:39 13:46 14:10 1+	13:40 13:46 14:10 1+	13:32 13:46 14:11 2
21	M1.1	4	10:13 10:18 10:52 2		10:13 10:19 10:39 1+		09:55 10:10 10:22 1+
22	C6.3	4	13:20 13:30 ? -		13:28 13:38 13:51 1	13:11 13:37 14:05 2+	
24	C2.0	1				11:07 11:13 11:18 1-	
28	M1.8	5	12:04 12:26 13:19 2+	11:40 12:26 14:07 3+		11:42 12:26 13:38 3	
29	C6.8	4	10:26 10:30 10:38 1-		10:26 10:32 10:42 1-	10:24 10:32 10:42 1-	

DAY	Xray class	Observers	Steve Parkinson (Various)	John Wardle (19.6/23.4kHz)	Phil Rourke (23.4kHz)	Jim Barber	John Elliott (18.3kHz)
			Tuned radio frequency receiver, frame aeral.	PC soundcard, 0.7m frame aerial.	Spectrum Lab, 0.6m frame aerial.	Spectrum Lab, 0.6m frame aerial.	Tuned radio frequency receiver, 0.5m frame aerial.
			START PEAK END (UT)	START PEAK END (UT)	START PEAK END (UT)	START PEAK END (UT)	START PEAK END (UT)
5	C1.9			15:23 15:24 15:27 1-			
10	C3.9						
12	C2.1		11:41 11:44 11:48 1-	11:39 11:47 12:00 1			
12	C7.8		13:40 13:45 13:56 1-	13:39 13:47 14:00 1			
21	M1.1		10:14 10:20 10:37 1				
22	C6.3			13:27 13:40 14:00 2			
24	C2.0						
28	M1.8		11:51 12:23 ? -	11:53 12:33 13:44 3			
29	C6.8			10:25 10:32 10:54 1+			

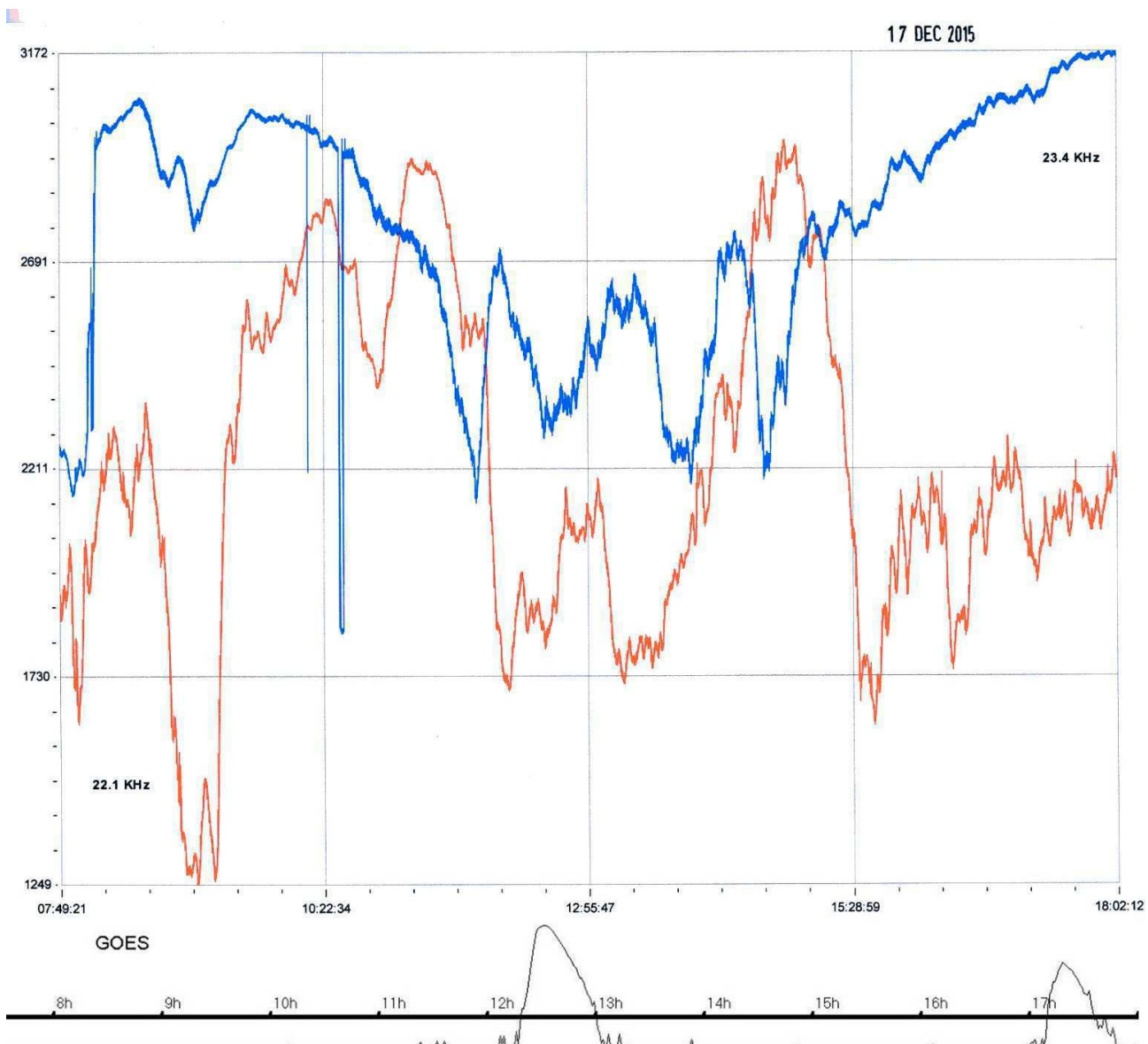
VLF flare activity 2005/15.



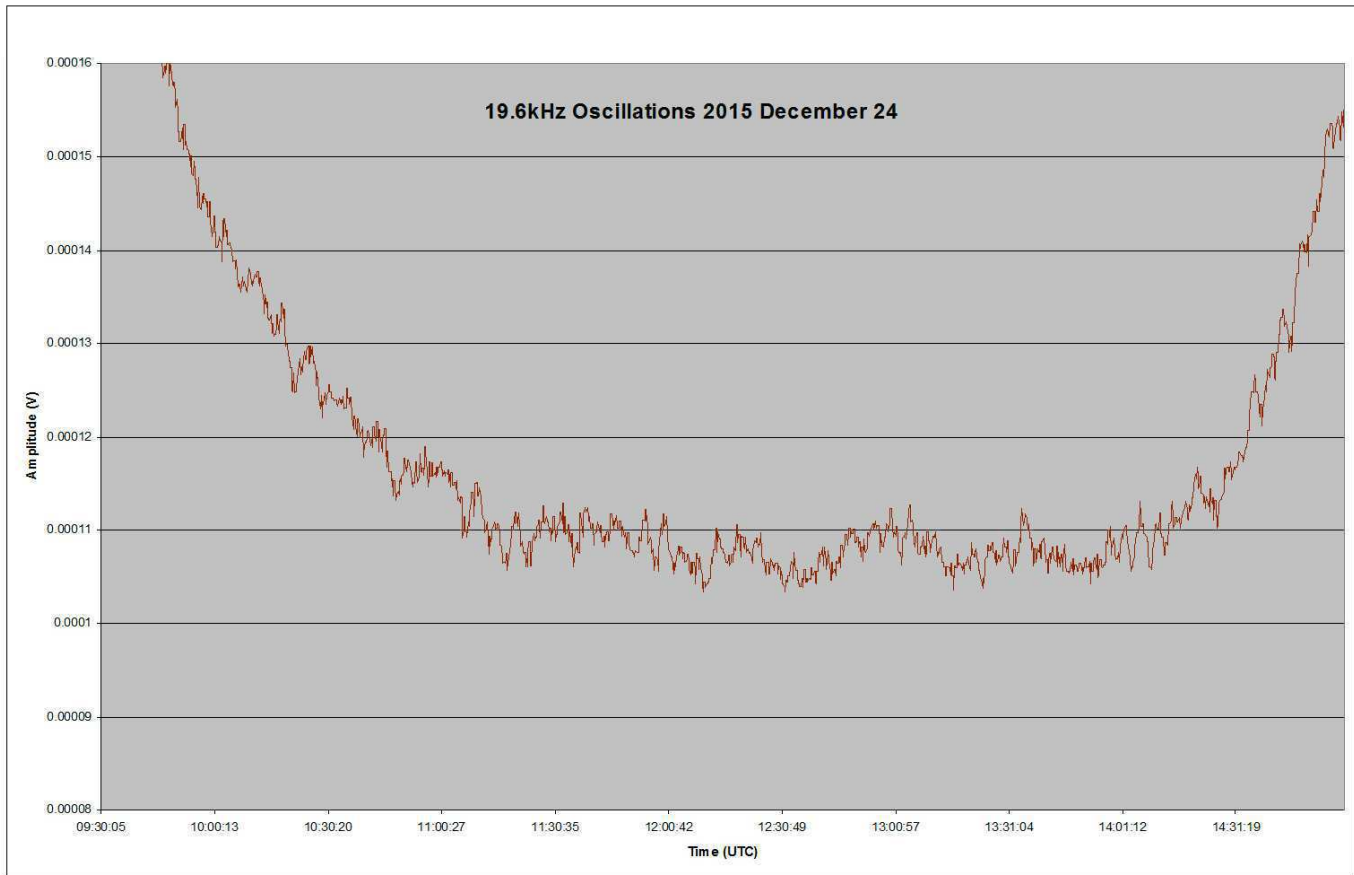
Although the activity chart for December shows just 9 flares recorded as SIDs, this figure is not a true indication of actual solar activity. The short day length significantly reduces our observing period (like night-time visual observing in the summer!), and when active regions repeatedly produce their most energetic flares close to midnight, we are at a distinct disadvantage. Looking at the GOES X-ray record reveals 16 strong flares during the night-time, plus many more smaller events. I have in the past included corrections for the day length and solar altitude, but these cannot account for regions that are simply more active during our night-time.

There were no X-class flares in the GOES data, the most energetic event being an M4.7 flare peaking at 00:40UT on the 23rd.

A major feature this month has been ionospheric instability, with some intense noise and oscillations present on recordings. This chart from the 17th by Colin Clements illustrates the effect:



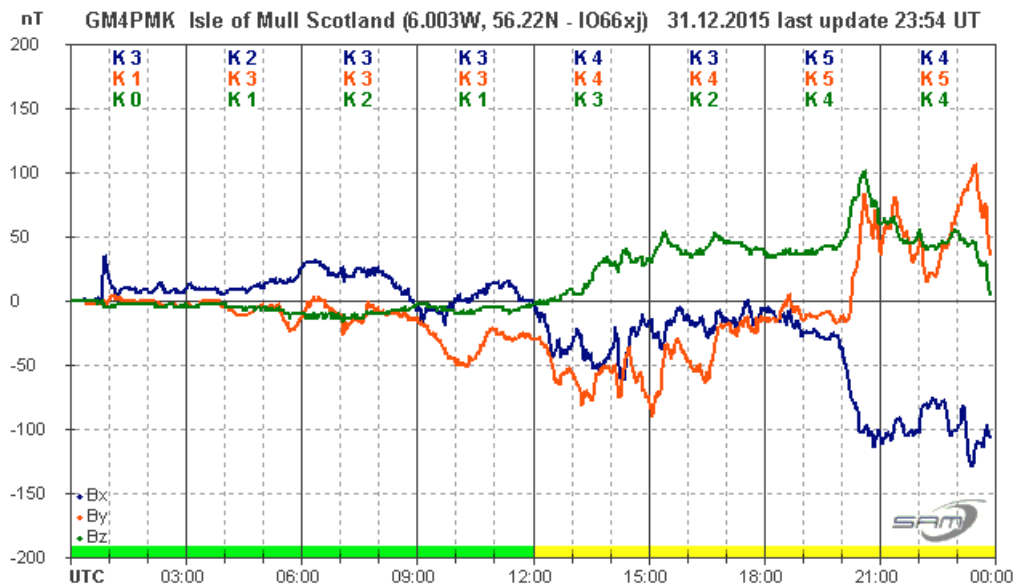
The GOES X-ray flux shows a small C1.7 flare at 12:35UT that has been completely lost in the noise.



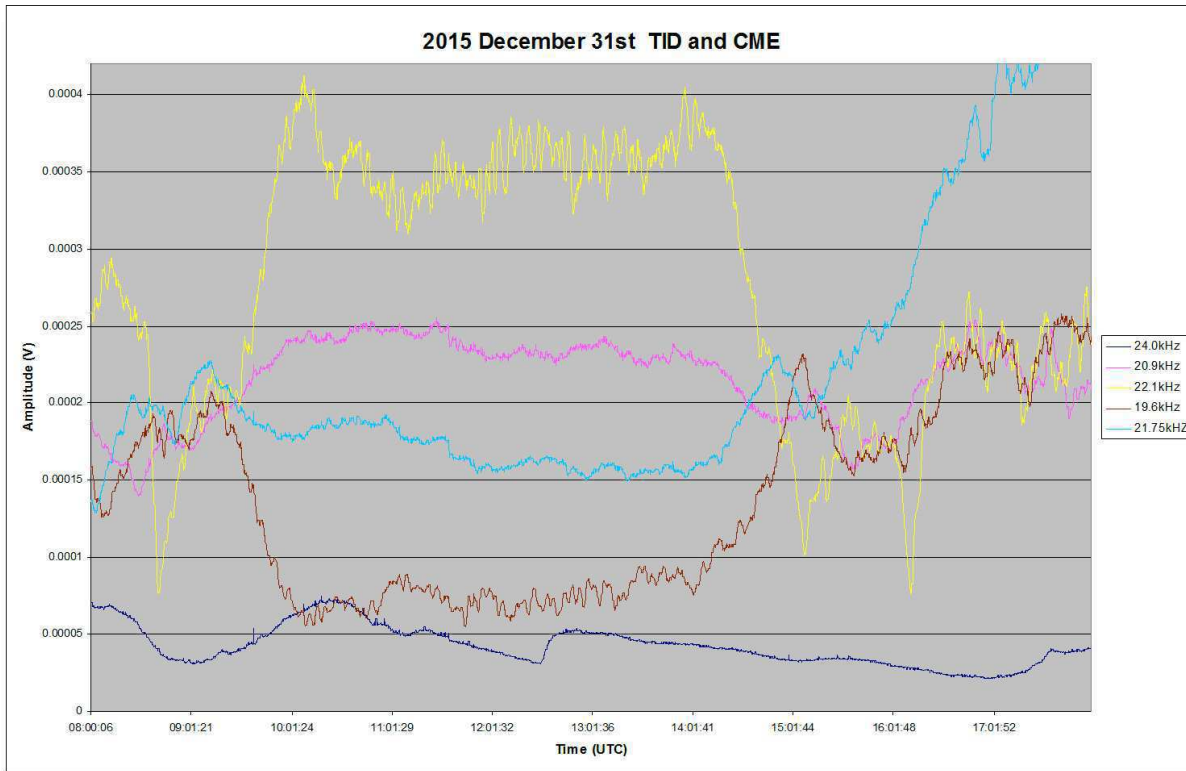
This chart by Mark Edwards shows a more organised oscillation on the 24th, with a period of about 5 minutes. There was a C2.0 flare at 11:02, again lost in the noise. This instability often occurs through winter with the sun very low in the daytime sky.

MAGNETIC OBSERVATIONS.

The last day of the year provided some interesting magnetic activity, with a strong SSC recorded at about 00:50 UT by Roger Blackwell, the sharp spike in Bx (blue) is very clear:

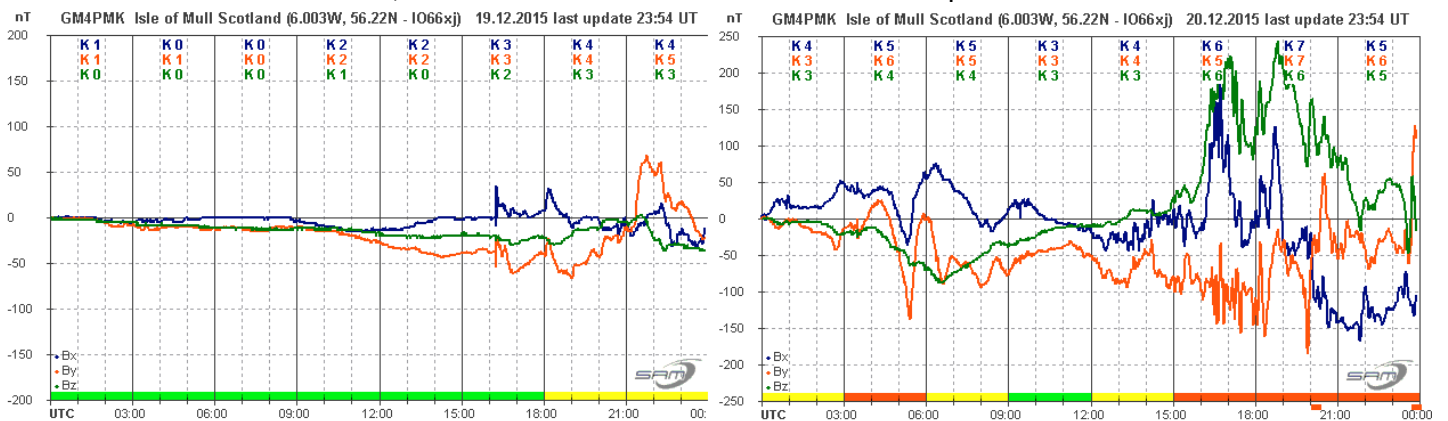


The main disturbance began around 12 to 12:30UT, and continued into the New Year with some excellent auroral displays in Scotland. Mark Edwards recorded some effects at 24kHz at the same time:



While there are some strong oscillations at 22.1 and 19.6kHz, 24kHz (dark blue) shows a well defined jump at 12:30, peaking at 12:52UT. The source of the SSC was a CME associated with the M1.8 flare recorded at 12:26 on the 28th. Our timings give a transit time of 60 hours 24 minutes for the CME.

A pair of CMEs on the 16th produced a much larger SSC at 16:16 on the 19th. The first was associated with a C6.6 flare seen at 09:24, the second associated with a filament eruption at 14:36.



Note the change in vertical scale between the two days in Roger's recording. Although we do not have a SID recorded for the flare, the magnetic recording is quite dramatic. The disturbance lasted until 09UT on the 21st. Aurorae were widely seen in Scandinavia.

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

BARTELS DIAGRAM

ROTATION	KEY:	DISTURBED.	ACTIVE	SFE	B, C, M, X = FLARE MAGNITUDE.	Synodic rotation start (carrington's).
2454	F	2138 10 11 12 13 14 15 16 17 18 19 BC	20 21 22 23 24 25 CC	26 27 28 29 30 C	2013 July 1 2 3 4 5 6 CC CC MCCC CCCC	
2455	F	2139 7 8 9 10 11 12 13 14 15 CB C C CC C C C C	16 17 18 19 20 21 22 23 24 25 26 C C C C C C C C	27 28 29 30 31 C C C C	2013 August 1 2 C C	
2456	F	2140 3 4 5 6 7 8 9 10 11 12 13 C C C C C C C C	14 15 16 17 18 19 20 C C C C C C	21 22 23 24 25 26 27 28 29 C C C C C C C C		
2457	F	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 C				
2458	F	2142 26 27 28 29 30 C C C C	2013 October 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 C			
2459	F	2143 23 24 25 26 27 28 29 30 31 C C C C C C C C C C	2013 November 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 C			
2460	F	2144 19 20 21 22 23 24 25 26 27 28 29 30 X C C M C	2013 December 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 C			
2461	F	2145 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 C	2014 January 1 2 3 4 5 6 7 8 9 10 11 C			
2462	F	2146 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 C	2014 February 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 27 28 29 30 31 C			
2463	F	2147 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 C	2014 March 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 27 28 29 30 31 C			
2464	F	2148 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 C	2014 April 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 27 28 29 30 31 C			
2465	F	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 C				
2466	F	2014 May 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 C	2150 C			
2467	F	2014 June 27 28 29 30 31 C	2014 July 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 C			
2468	F	2152 23 24 25 26 27 C	2014 August 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 C			
2469	F	2014 August 20 21 22 23 24 25 26 27 28 29 30 31 C	2014 September 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 C			
2470	F	2154 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 C	2014 September 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 27 28 29 30 31 C			
2471	F	2155 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 C	2014 October 1 2 3 4 5 6 7 8 C			
2472	F	2156 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 C	2014 November 1 2 3 4 C			
2473	F	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 C				
2474	F	2014 December 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 C	2158 C			
2475	F	2015 January 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	2159 C			
2476	F	2015 February 25 26 27 28 29 30 31 C				
2477	F	2015 March 21 22 23 24 25 26 27 28 29 30 31 C	2015 April 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 27 28 29 30 31 C			
2478	F	2015 April 20 21 22 23 24 25 26 27 28 29 30 31 C	2162 C			
2479	F	2015 May 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 C	2163 C			
2480	F	2015 June 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 C	2164 C			
2481	F	2015 July 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 C	2165 C			
2482	F	2015 August 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 C	2166 C			
2483	F	2015 August 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 C	2167 C			
2484	F	2015 September 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	2168 C			
2485	F	2015 October 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 C	2169 C			
2486	F	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 C	2170 C			
2487	F	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 C	2171 C			
2488	F	2016 January 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 10 C	2172 C			