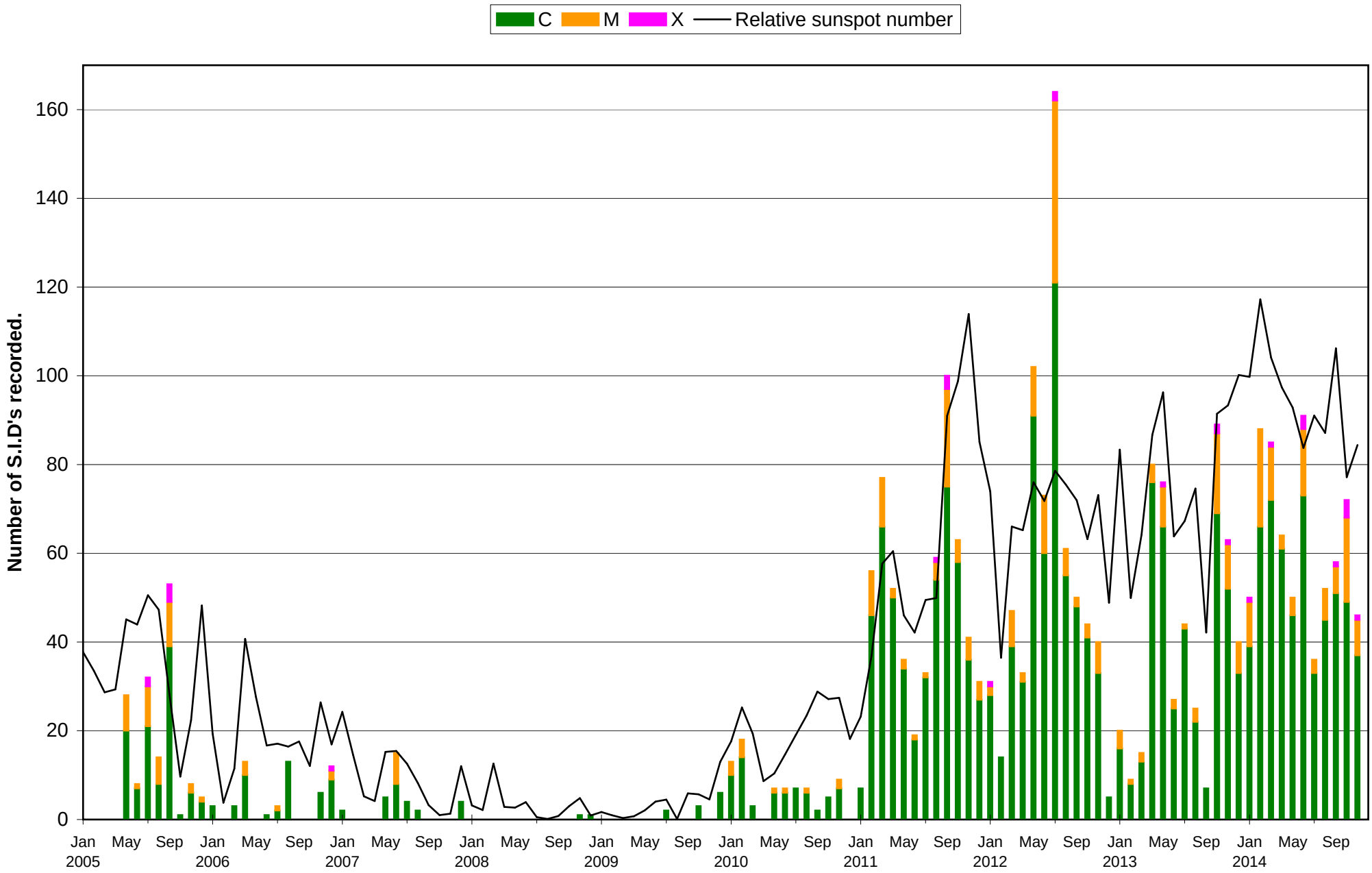
BAA Radio Astronomy Group. **2014 NOVEMBER**

			John Cook (23.4kHz/*22.1kHz*)				Roberto Battaiola (21.75kHz)				Paul Hyde (22.1/*23.4kHz*)				Bob Middlefell (22.1kHz)				Mark Edwards (**20.9**/24.0/*19.6kHz*)			
	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	C4.5	6	09:22	09:39	?	-	09:22	09:38	10:11	2+	09:22	09:39	?	-					09:22	09:34	10:23	2+
1	C4.1	5	10:22	10:26	10:47	1					10:22	10:27	10:54	1+					*10:23*	*10:26*	*10:37*	*1-*
1	C2.6	4	13:46	13:48	13:54	1-					13:45	13:52	14:08	1					13:47	13:52	14:05	1-
1	C7.2	1																	16:43	16:48	17:07	1
3	**M2.2**	6	11:27	11:52	12:53	3	11:23	11:52	12:34	2+	11:27	11:47	12:57	3					11:37	11:56	12:48	2+
4	**M2.6**	5	08:17	08:40	?	-	08:22	08:39	08:47	1	*08:25*	*08:40*	*?*	-					*08:27*	*08:42*	*?*	-
4	**M2.3**	5	08:51	09:05	09:42	2+	08:51	09:10	09:23	1+	*08:54*	*09:08*	*09:59*	*2+*					*08:52*	*09:08*	*09:26*	*2*
5	**M7.9**	6	09:39	09:48	10:45	2+	09:37	09:46	10:11	2	09:38	09:44	11:46	3+					09:41	09:46	10:06	1
5	C2.1	1																	14:28	14:30	14:35	1-
6	?	1																				
6	C3.8	2	14:15	14:24	14:36	1													14:15	14:27	14:49	2
7	**M1.0**	4	10:17	10:24	11:07	2+													10:17	10:27	11:16	2+
7	C3.9	3	12:04	12:08	12:14	1-													12:05	12:08	12:22	1-
7	C1.3	1																	13:21	13:28	13:32	1-
7	C2.3	2	13:58	14:01	14:08	1-													13:57	14:04	14:19	1
7	C7.0	3	15:00	15:06	?	-													14:59	15:07	?	-
7	?	1																	15:28	15:35	16:05	2
7	C7.0	1																	16:13	16:19	16:33	1
7	?	1																	16:39	16:43	16:50	1-
7	**X1.6**	1																	17:03	17:18	17:43	2
8	?	1																	13:26	13:29	13:40	1-
9	C4.4	1	*07:15*	*07:20*	*07:31*	*1-*																
9	C4.0	4	13:37	13:40	13:45	1-													13:38	13:44	14:13	2
9	**M2.3**	5	15:29	15:32	15:50	1	15:26	15:35	15:54	1+									15:28	15:33	16:29	2+
10	C2.1	1																	*10:18*	*10:20*	*10:23*	*1-*
10	C5.0	5	12:29	12:34	?	-					12:29	12:35	12:48	1					*12:30*	*12:35*	*12:47*	*1-*
11	C6.7	6	11:18	11:23	11:40	1	11:15	11:23	11:39	1	11:20	11:23	11:32	1-					11:21	11:23	11:33	1-
11	*	1																	14:05	14:07	14:15	1-
12	?	3	10:31	10:35	?	-													**10:30**	**10:39**	**?**	**-**
12	C5.1	4	10:40	10:45	?	-	10:25	10:47	11:09	2									**10:40**	**10:49**	**11:35**	**2+**
12	?	1																	***12:03***	***12:08***	***?***	**-**
12	?	1																	***12:12***	***12:18***	***?***	**-**
12	?	1																	***12:28***	***12:31***	***12:50***	***1***
13	C2.2	2	*07:11*	*07:13*	*07:27*	*1-*	06:59	07:15	07:22	1												
13	?	1																	15:31	15:35	15:39	1-
14	C5.4	3	*07:46*	*07:52*	*07:58*	*1-*	07:44	07:50	07:59	1-									***07:45***	***07:49***	***07:55***	***1-***
14	C3.1	1																	14:52	14:56	15:03	1-
15	**M3.2**	6	11:43	12:03	13:14	3	11:55	12:03	12:36	2	11:54	11:57	12:50	2+					11:53	12:05	12:36	2
16	C2.0	1					09:08	09:12	09:16	1-												
16	C2.4	3	10:01	10:04	10:10	1-													**10:02**	**10:04**	**10:12**	**1-**
16	C3.9	1																	16:43	16:48	16:55	1-
16	**M5.7**	1																	17:41	17:53	18:47	2+
17	C6.5	3	08:53	09:04	09:28	2					08:59	09:04	09:28	1+					***08:59***	***09:03***	***09:09***	***1-***
22	C2.1	1																	13:28	13:32	13:43	1-
23	C3.5	5	10:46	10:55	11:01	1-					10:42	10:56	11:28	2+					10:43	10:53	11:41	2+
24	C4.1	5	10:52	11:04	11:32	2					10:52	11:06	11:30	2					**10:52**	**11:07**	**12:26**	**3**
27	C4.8	1																	09:36	09:44	09:47	1-
27	C4.6	1																	***10:21***	***10:22***	***10:26***	***1-***
27	C5.1	5	10:55	11:00	11:07	1-					10:55	11:00	11:14	1					***10:56***	***11:01***	***11:06***	***1-***
27	*	1																	14:18	14:22	14:36	1-
28	?	1																				
28	C2.0	1																				
29	C6.7	2	08:18	08:21	08:40	1													*08:19*	*08:21*	*08:26*	*1-*
29	C4.0	4	09:59	10:01	10:10	1-					10:01	10:02	10:16	1-					*10:01*	*10:05*	*10:14*	*1-*
29	C1.7	2									12:45	12:47	12:54	1-					*12:44*	*12:49*	*12:56*	*1-*
29	C6.5	3	13:43	13:47	14:02	1					13:43	13:49	13:59	1-					13:44	13:50	14:17	2
29	*	1																	14:24	14:24	14:30	1-
29	*	1																	14:33	14:38	14:43	1-
30	C1.4	1																	*13:19*	*13:22*	*13:24*	*1-*
30	C1.9	1																	*13:45*	*13:49*	*13:57*	*1-*

BAA Radio Astronomy Group. **2014 NOVEMBER**

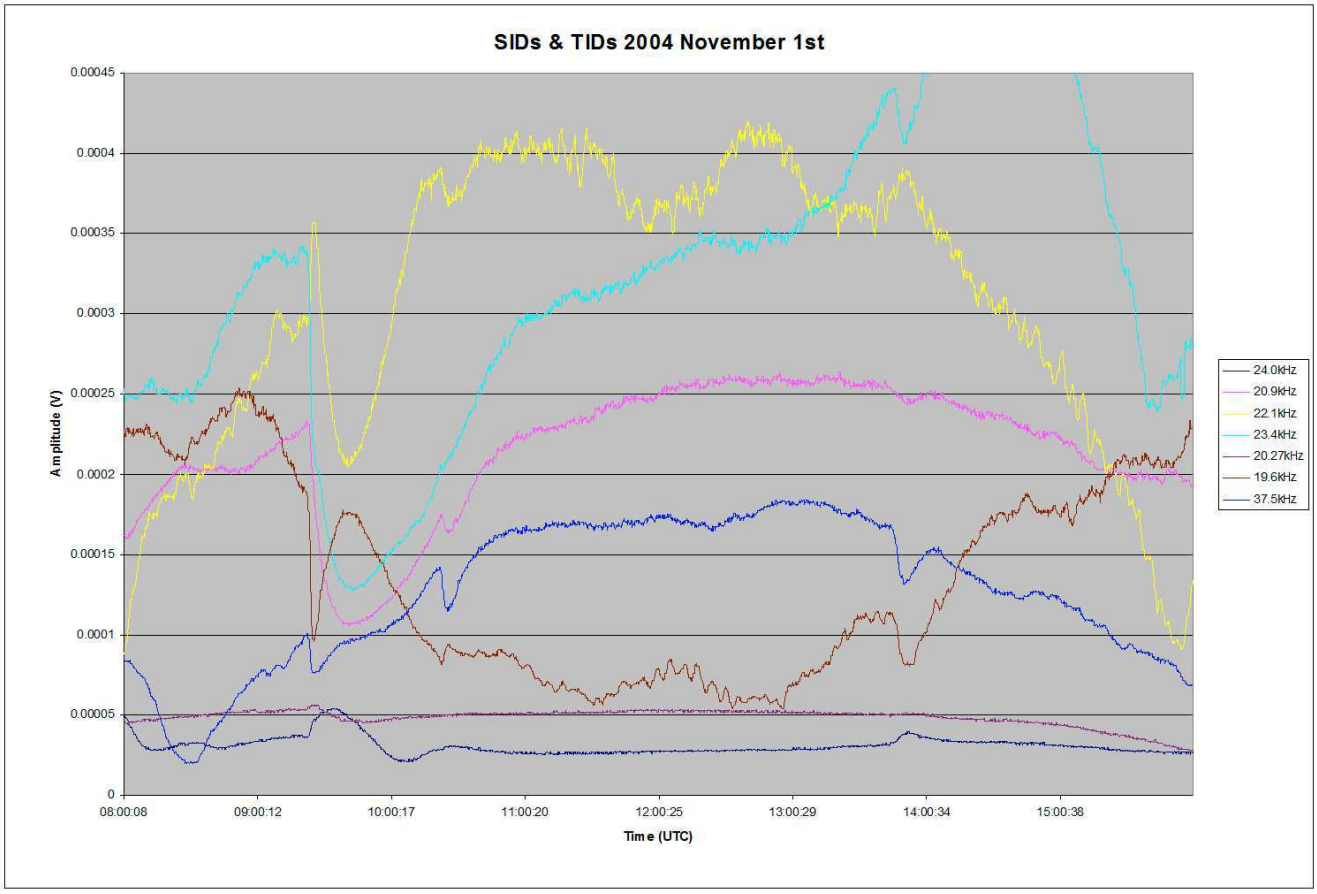
			Colin Clements (23.4kHz/*22.1kHz*)				Steve Parkinson (Various)				John Elliott (19.6kHz/*22.1kHz*)				John Wardle (19.6/23.4kHz)				Richard Kaye (Various)			
			AAVSO receiver, 0.76m screened loop aerial.				Tuned radio frequency receiver, frame aerials.				Tuned radio frequency receiver, 0.5m frame 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	C4.5		09:22	09:40	10:22	2+	09:23	09:41	?	-												
1	C4.1		*10:22*	*10:27*	*10:37*	*1-*	10:22	10:26	10:37	1-												
1	C2.6		13:44	13:50	14:11	1+																
1	C7.2																					
3	**M2.2**		11:28	11:56	12:44	2+	11:28	11:56	12:44	2+												
4	**M2.6**		08:30	08:37	08:50	1																
4	**M2.3**		08:50	09:08	09:41	2+																
5	**M7.9**		09:39	09:47	10:44	2+	09:40	09:45	10:50	2+												
5	C2.1																					
6	?		11:02	11:16	11:31	1+																
6	C3.8																					
7	**M1.0**		10:16	10:23	10:51	2	10:16	10:24	10:52	2												
7	C3.9						12:04	12:07	12:21	1-												
7	C1.3																					
7	C2.3																					
7	C7.0						15:01	15:06	15:19	1-												
7	?																					
7	C7.0																					
7	?																					
7	**X1.6**																					
8	?																					
9	C4.4																					
9	C4.0		13:34	13:43	14:07	2	13:38	13:42	13:56	1-												
9	**M2.3**		15:27	15:31	15:54	1+	15:28	15:34	15:56	1+												
10	C2.1																					
10	C5.0		12:26	12:32	13:23	2+	12:30	12:36	12:52	1												
11	C6.7		11:16	11:22	11:43	1+	11:20	11:24	11:48	1+												
11	*																					
12	?						10:31	10:36	?	-												
12	C5.1						10:41	10:47	10:53	1-												
12	?																					
12	?																					
12	?																					
13	C2.2																					
13	?																					
14	C5.4																					
14	C3.1																					
15	**M3.2**		11:39	12:02	13:29	3	11:49	12:02	13:04	2+												
16	C2.0																					
16	C2.4		09:58	10:05	10:31	2																
16	C3.9																					
16	**M5.7**																					
17	C6.5																					
22	C2.1																					
23	C3.5						10:42	10:56	11:25	2	*11:10*	*11:15*	*11:30*	*1*								
24	C4.1						10:52	11:04	11:37	2	10:59	11:10	11:45	2+								
27	C4.8																					
27	C4.6																					
27	C5.1		10:52	10:58	11:14	1	10:55	11:00	11:10	1-												
27	*																					
28	?						09:50	09:58	10:15	1												
28	C2.0						11:16	11:28	11:38	1												
29	C6.7																					
29	C4.0						10:01	10:04	10:20	1												
29	C1.7																					
29	C6.5																					
29	*																					
29	*																					
30	C1.4																					
30	C1.9																					


VLF flare activity 2005/14.
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

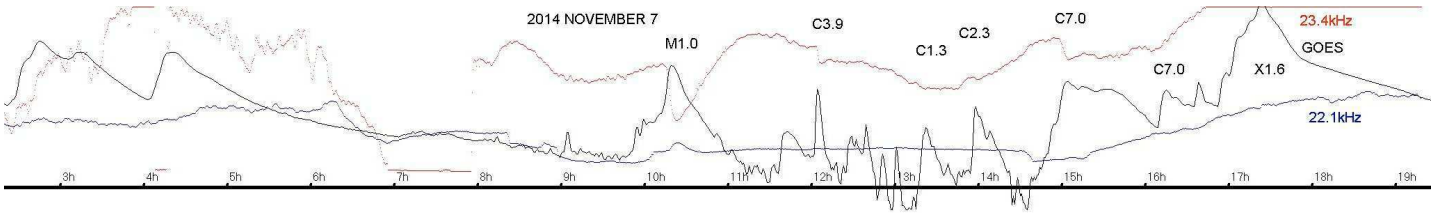
BAA Radio Astronomy Group. **2014 NOVEMBER.**

After the high activity in October, SID numbers were down in November. There was just a single X class flare shown in GOES15 data, recorded as a SID at 24kHz. There were plenty of M-class and strong C-class flares, some of which were particularly slow and long-lasting. As expected, old region AR12192 re-appeared during November, renumbered as AR12209. It was responsible for much of the flare activity between the 14th and 22nd.

Four SIDs on November 1st were accompanied by some strong oscillations, shown in this recording by Mark Edwards:

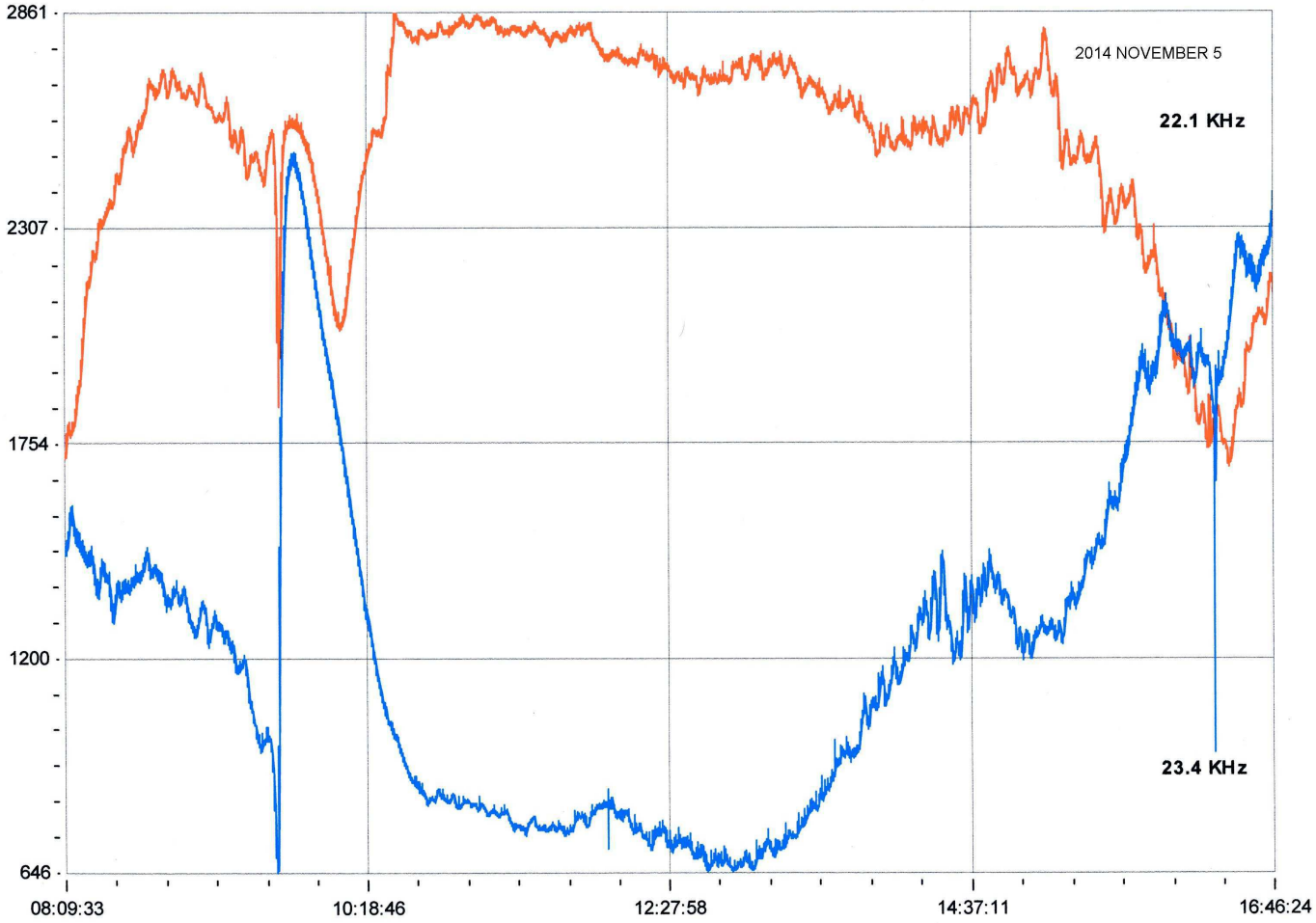


The shorter paths at 19.6kHz (Brown) and 22.1kHz (Yellow) show these oscillations well, while the longer paths are much more stable between the SIDs. Similar oscillations were reported by Colin Clements on the 8th, 12th,13th, 14th, 17th, and 24th. My own recordings also showed very disturbed conditions away from the SIDs, and some very high day-time signal strengths.



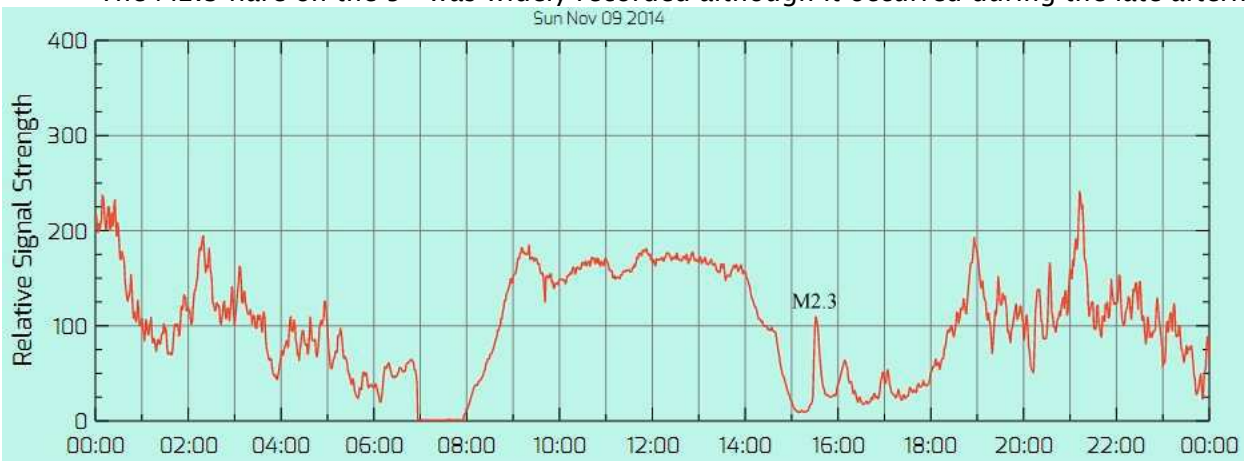
My own recording, above, shows some of the flare activity on the 7th, with GOES X-ray data added. The C7.0 flares were very slow to decay, merging with the later X1.6 flare. While the first C7.0 has produced a good SID, the second is nearly lost in the local sunset. The X1.6 was well after sunset at 23.4kHz and 22.1kHz, although caught by Mark on the trans-Atlantic path at 24kHz.

November 5th started with an M7.9 flare, well recorded by Colin Clements at 23.4 and 22.1kHz:



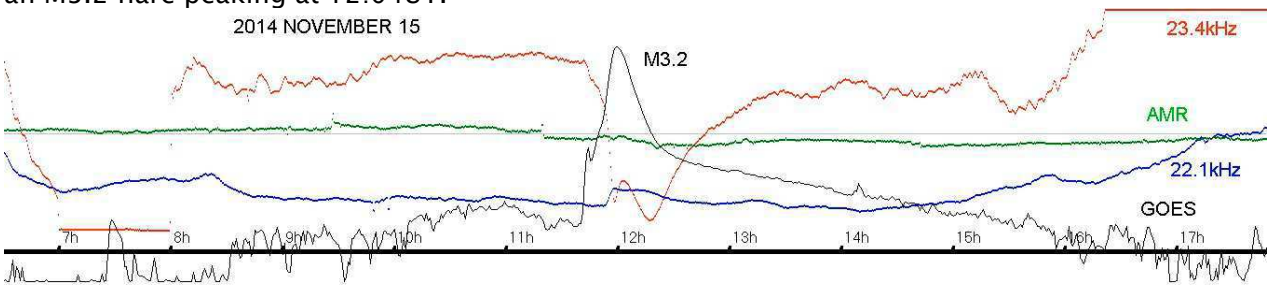
The SID at 22.1kHz shows a very strong 'spike and wave' shape from the ground/sky wave interference pattern moving over the receiver. The phase change from cancelling to adding results in the SID peak being inverted relative to its start and end direction. The flare had fairly short rise and fall times, often leading to this sort of response.

The M2.3 flare on the 9th was widely recorded although it occurred during the late afternoon.

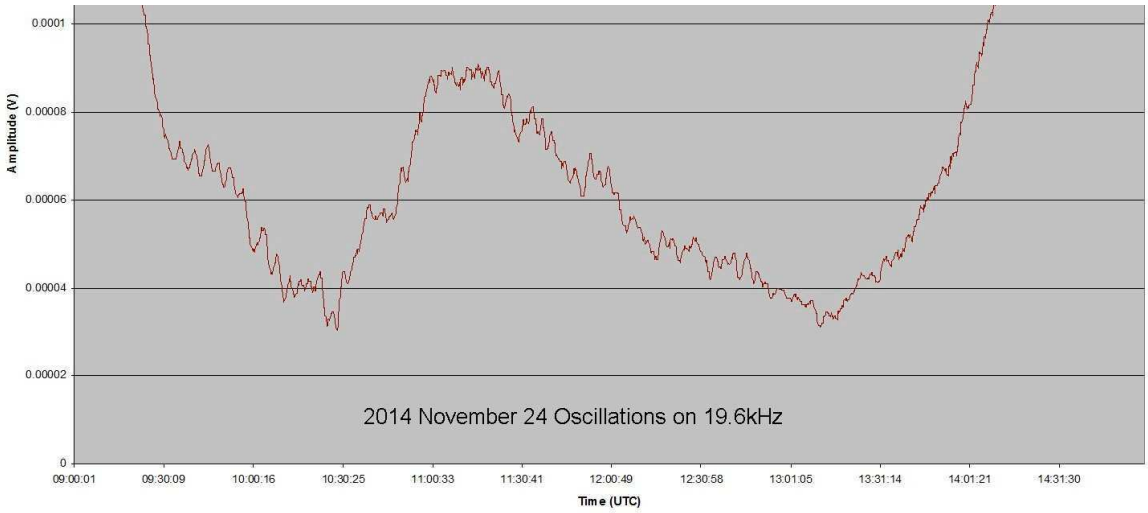


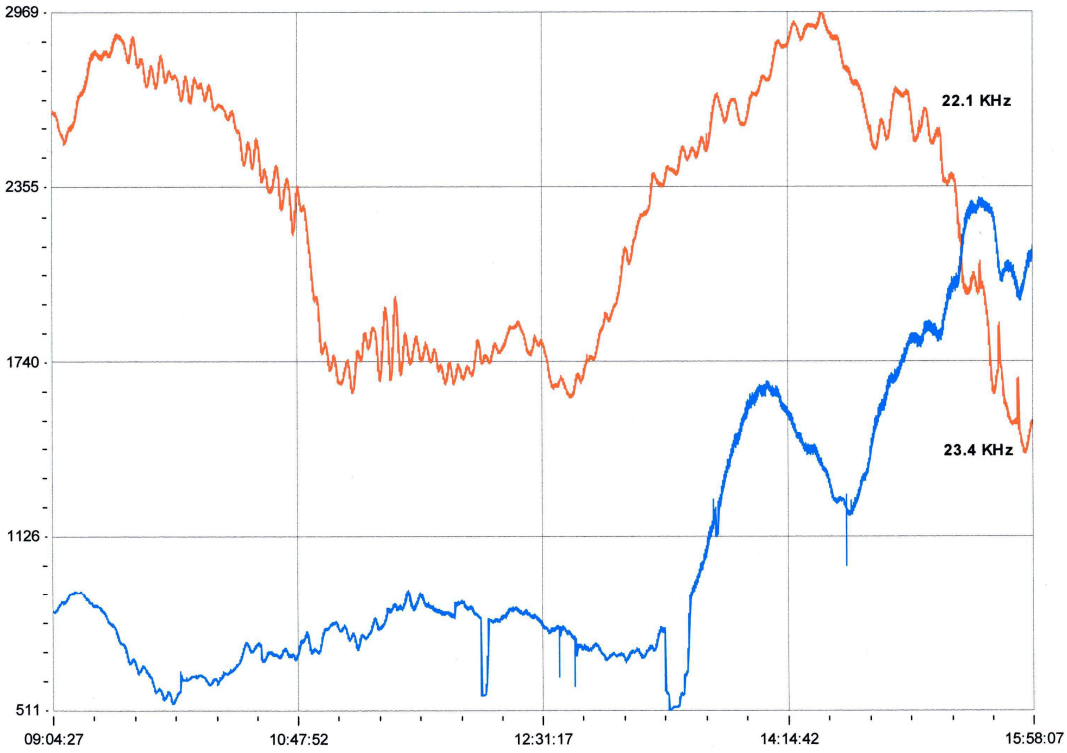
This chart by Peter Meadows shows the SID at 23.4kHz, during the sunset dip. The two following peaks are not SIDs, as there were no X-ray peaks present. A hint of the earlier C4.0 flare is also visible. Colin Clements noted that both of these flares produced inverted SIDs at 23.4kHz, an effect that may be due to the combination of flare and sunset conditions.

Flare activity from AR12209 began on the 14th with two modest C-class flares. On the 15th it produced an M3.2 flare peaking at 12:04UT.



My own chart (above) shows the SID at both 22.1 and 23.4kHz. Both signals also show a high noise level throughout the day. The 23.4kHz signal is also well above its normal daytime signal strength before the start of the SID. Colin Clements noted several periods of 151MHz noise following this flare, continuing past 17:00UT when his recording ended. AR12209 was responsible for three more flares on the 16th, and a much smaller C2.1 on the 22nd.





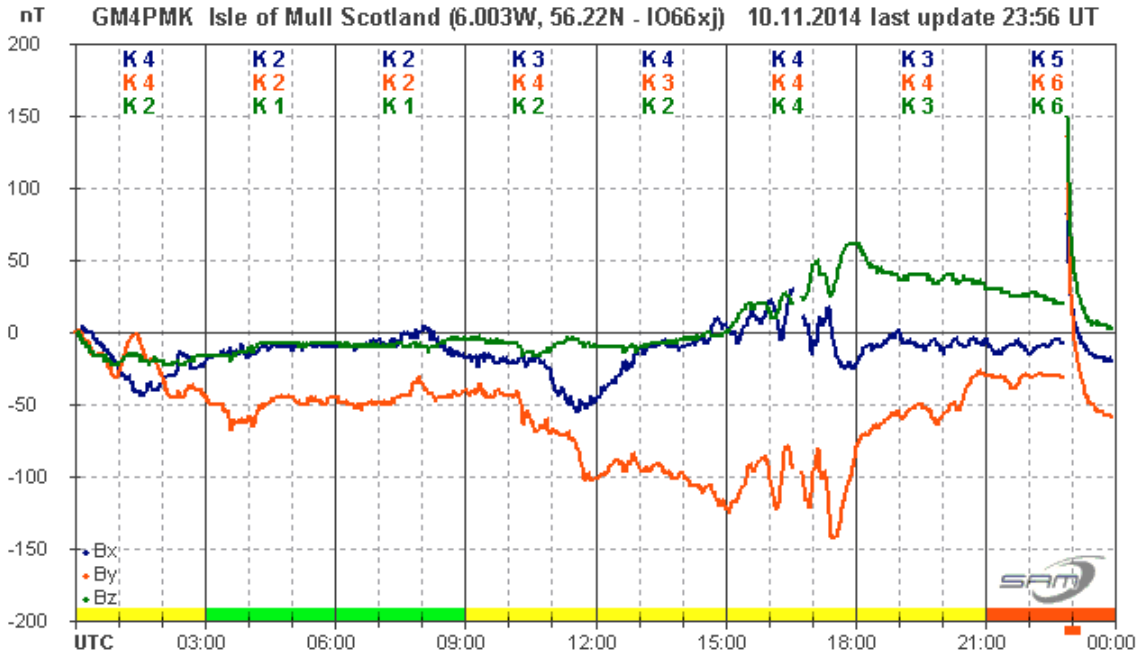
Both of the charts on the previous page show oscillations on the 24th. The first is from Mark Edwards, the second from Colin Clements. Both show a strong 4 minute period. Path length at 19.6kHz for Mark is about 264km bearing 340 degrees NW, and for Colin at 22.1kHz is about 182km bearing 75 degrees NE. Mark also brought to my attention a 2013 paper "GPS observations of medium-scale travelling ionospheric disturbances over Europe." by Y. Otsuka. This finds a strong correlation between gravity waves (buoyancy, not gravitational in the cosmological sense) travelling in a southerly direction during the daytime in the winter. GPS signals were used to measure the electron distribution in the E-layer at various times. It would seem reasonable that travelling waves at the base of the E-layer would be echoed within the D-layer when solar X-ray flux was fairly stable. This link is not restricted to winter time however, as I reported in the 2014 June summary. Included is a chart of D-layer height for June 2nd clearly showing a wave travelling southwards during a period of low flare activity.

Colin Clements recorded some strong 151MHz noise from flares on the 15th, 16th and 27th, as well as some dawn to dusk noise on the 10th and 20th.

If you use the GOES15 data files for checking SIDs against flares, you may have noticed that the space weather prediction centre web site has been updated. These daily files can now be found at ftp://ftp.swpc.noaa.gov/pub/lists/xray/ The format remains the same, they have just moved location.

MAGNETIC OBSERVATIONS.

As with last month, magnetic activity has not really kept up with the number of strong flares. The X1.6 flare on the 7th did produce a CME though, creating some magnetic disturbance on the 10th.



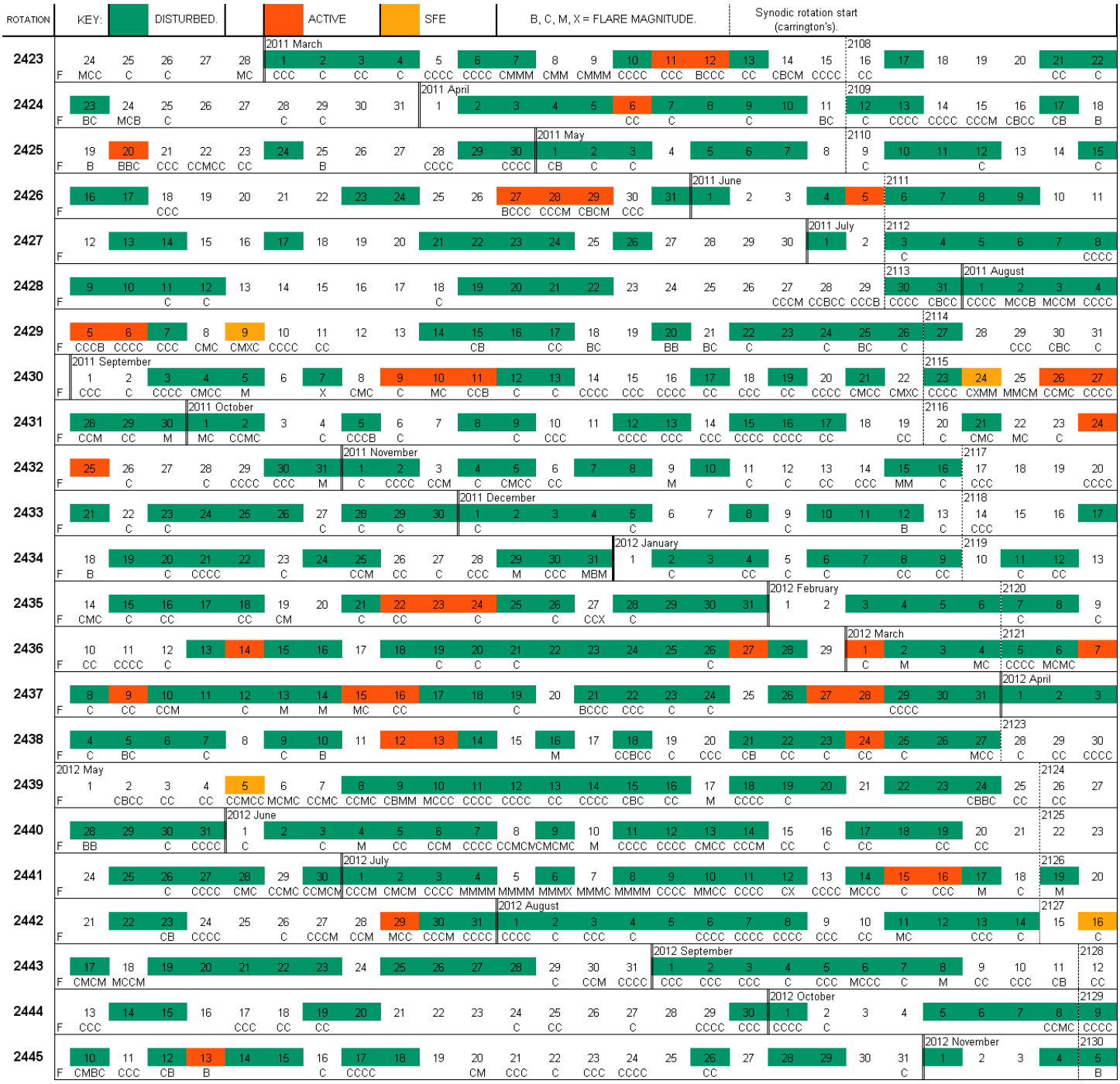
This recording by Roger Blackwell shows the sudden storm commencement at about 02:20UT, most visible in the blue Bx trace, followed by a more active period starting about 11UT. The spike just before 23:00 is local interference. Using Mark's SID timing of 17:18 gives a CME transit time of 57 hours 12 minutes.

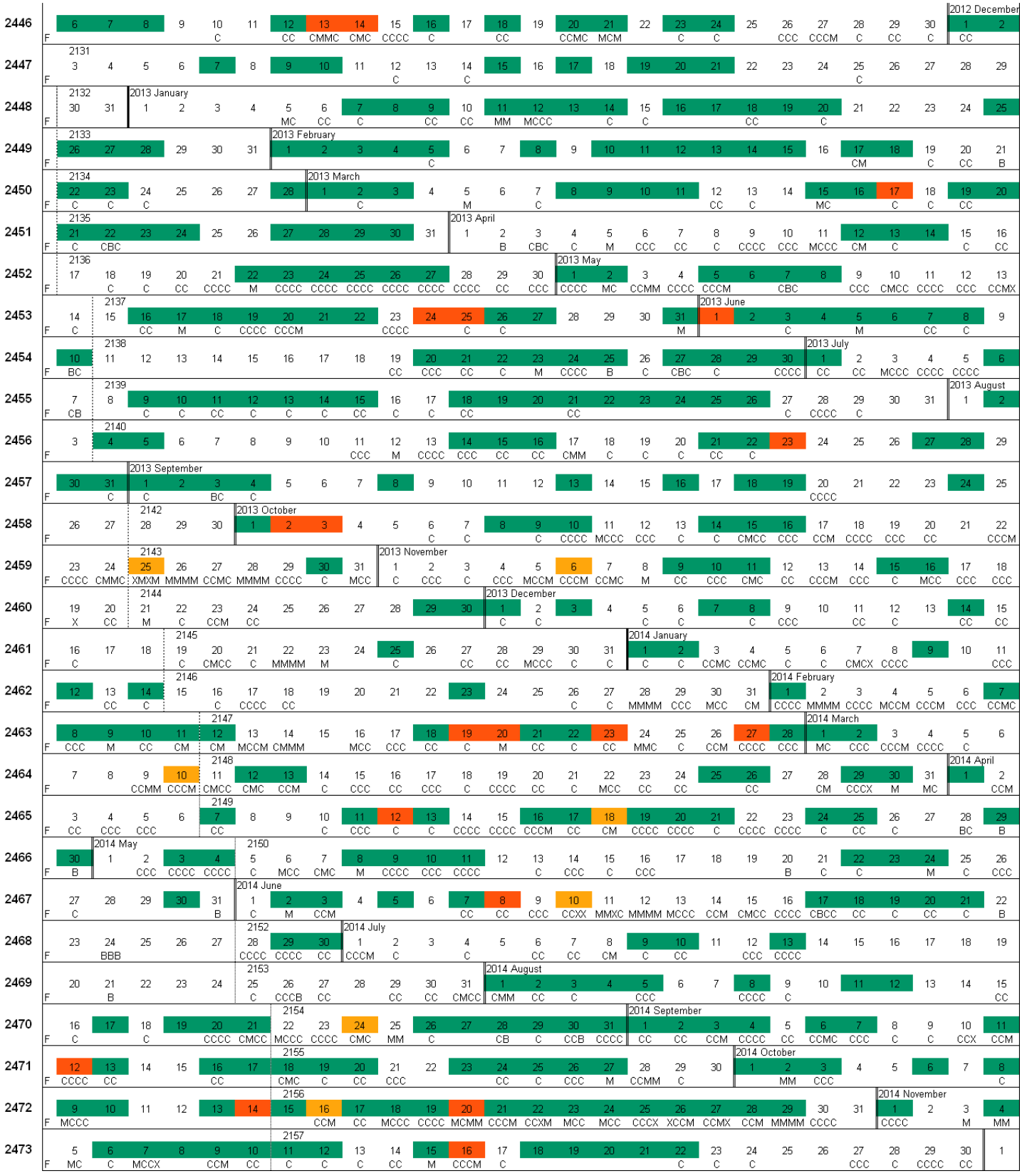
The SID chart for November 15th on the previous page shows small symmetrical disturbances on the rise and decay of the M3.2 flare. No SFE has been reported for this flare, and so the alignment is probably just coincidental. The disturbance became quite active on the 16th, due to a co-rotating interaction region.

Weak CHHSS effects were responsible for the low-level disturbances from the 18th to 22nd.

Magnetic observations received from Colin Clements, Roger Blackwell, Gonzalo Vargas and John Cook.
Reports and observations to jacook@jacook.plus.com

BARTELS CHART.




2446 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 2012 December 1 2
F C CC CMMC CMC CCCC C CC CCMC MCM C C CCC CCCM C CC C CC
2447 2131 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 C C C C
2448 2132 30 31 2013 January 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 MC CC C CC CC MM MCCC C C CC C
2449 2133 26 27 28 29 30 31 2013 February 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
F C CM C CC B
2450 2134 22 23 24 25 26 27 28 2013 March 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
F C C C C C M C CC C MC C C CC
2451 2135 21 22 23 24 25 26 27 28 29 30 31 2013 April 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
F C CBC B CBC C M CCC CC C CCCC CCC MCCC CM C C CC
2452 2136 17 18 19 20 21 22 23 24 25 26 27 28 29 30 2013 May 1 2 3 4 5 6 7 8 9 10 11 12 13
F 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 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 2013 June 1 2 3 4 5 6 7 8 9
F C CC M C CCCC CCCM CCCC C C M C M CC C
2454 2138 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 2013 July 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 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 2013 August 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 26 27 28 29 30 2013 October 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 CC CMCC CCC CCM CCCC CCC CC CCCM
2459 2143 23 24 25 26 27 28 29 30 31 2013 November 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 CCMC M CC CCC CMC CC CCCM CCC C MCC CCC CCC
2460 2144 19 20 21 22 23 24 25 26 27 28 29 30 2013 December 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 C CC CCC CC C CC CC
2461 2145 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 2014 January 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 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 2014 February 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 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 2014 March 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 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 2014 April 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 30 1 2 3 4 2150 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 27 28 29 30 31 2014 June 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 23 24 25 26 27 2152 28 29 30 2014 July 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 20 21 22 23 24 2153 25 26 27 28 29 30 31 2014 August 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 16 17 18 19 20 21 2154 22 23 24 25 26 27 28 29 30 31 2014 September 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 CCMC CCC C C CCX CCM
2471 12 13 14 15 16 17 2155 18 19 20 21 22 23 24 25 26 27 28 29 30 2014 October 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 9 10 11 12 13 14 2156 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 2014 November 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 5 6 7 8 9 10 2157 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