

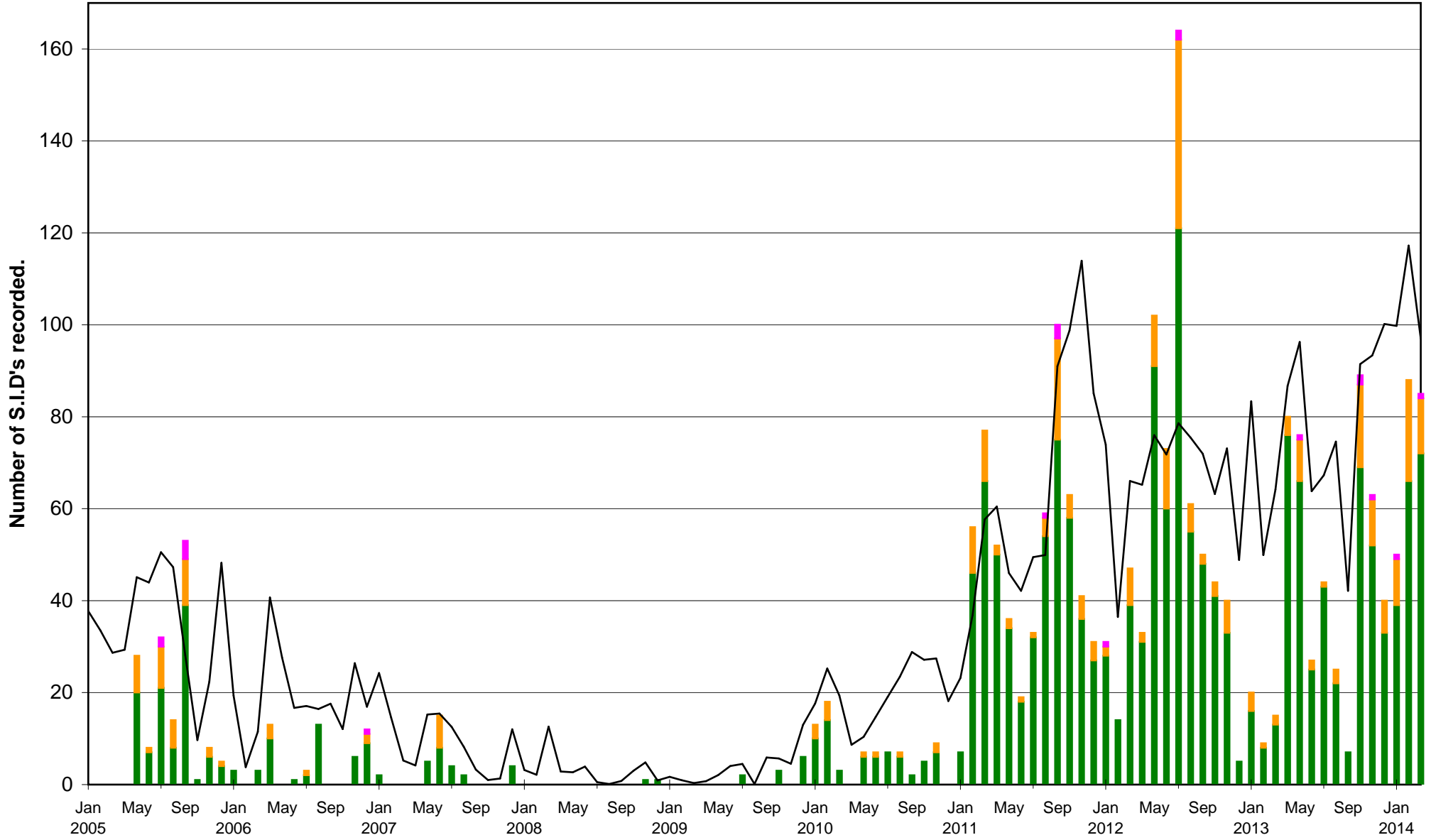
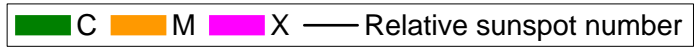
BAA Radio Astronomy Group.

2014 MARCH

DAY	Xray class	Observers	John Cook (23.4kHz/22.1kHz)				Roberto Battaiola (18.3kHz)				Paul Hyde (22.1kHz/23.4kHz)				Bob Middlefell (22.1kHz)			Mark Edwards (20.9/24.0/19.6kHz)			
			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.			
			START	PEAK	END (UT)		START	PEAK	END (UT)		START	PEAK	END (UT)		START	PEAK	END (UT)	START	PEAK	END (UT)	
1	?	1																11:02	11:05	11:11	1-
1	M1.1	7	13:21	13:34	14:12	2+	13:20	13:33	13:46	1+	13:21	13:28	14:35	2+	13:21	13:31	13:56	13:21	13:31	13:56	2
1	?	1													14:06	14:07	14:11	14:06	14:07	14:11	1-
1	C3.1	2													15:54	16:00	16:09	15:54	16:00	16:09	1-
2	C2.4	7	12:00	12:04	12:18	1-	11:59	12:04	12:16	1-	11:56	12:05	12:37	2	12:00	12:05	12:12	12:00	12:05	12:12	1-
2	C2.5	7	12:47	12:52	13:08	1	12:48	12:52	13:07	1	12:46	12:53	13:07	1	12:49	12:53	13:08	12:49	12:53	13:08	1
2	*	1													13:16	13:23	13:40	13:16	13:23	13:40	1
2	C2.5	1													16:41	16:44	16:47	16:41	16:44	16:47	1-
3	C3.3	1					06:57	07:09	07:22	1								09:14	09:16	09:21	1-
3	E	2													09:56	09:59	10:06	09:56	09:59	10:06	1-
3	C2.9	4									09:56	09:59	10:06	1-							
3	C2.0	1									10:52	10:56	11:01	1-							
3	C1.8	4	12:24	12:25	12:30	1-					12:24	12:26	12:30	1-				12:24	12:26	12:31	1-
3	C1.4	1	13:17	13:22	13:32	1-															
3	M1.2	6	15:57	15:58	?	-	15:58	16:00	16:03	1-	15:57	16:00	16:19	1				15:57	15:59	16:12	1-
4	C2.7	1																08:30	08:34	08:39	1-
4	C1.6	2													10:00	10:02	10:08	10:00	10:02	10:08	1-
4	C4.4	6	10:22	10:26	10:38	1-					10:22	10:26	10:32	1-	10:21	10:26	10:41	10:21	10:26	10:41	1
4	?	4	10:44	11:03	?	-									10:56	11:05	?				
4	C7.6	6	11:16	11:23	11:49	2					11:15	11:25	12:50	3	11:16	11:24	12:29	11:16	11:24	12:29	2+
5	C2.0	5	13:00	13:04	13:10	1-					13:00	13:04	13:22	1	13:00	13:04	13:17	13:00	13:04	13:17	1-
9	E	6	08:35	08:38	08:45	1-	08:29	08:36	08:44	1-	08:32	08:41	09:07	2				08:34	08:44	09:00	1+
9	C2.1	3	10:15	10:22	10:32	1-									10:21	10:22	10:28	10:21	10:22	10:28	1-
9	C1.9	3	10:42	10:46	10:51	1-									10:42	10:46	10:51	10:42	10:46	10:51	1-
9	*	3	11:35	11:39	11:49	1-									11:36	11:38	11:51	11:36	11:38	11:51	1-
9	C1.3	1													12:38	12:41	12:48	12:38	12:41	12:48	1-
9	C7.1	7	13:28	13:33	13:48	1	13:29	13:34	13:53	1	13:28	13:33	?	-	13:29	13:33	?				
9	M1.0	7	13:53	13:59	14:30	2	13:54	14:00	14:25	1+	13:53	14:00	?	-	13:53	14:00	14:33	13:53	14:00	14:33	2
9	C7.7	7	14:36	14:42	14:58	1	14:36	14:43	14:58	1	14:35	14:43	15:06	1+	14:35	14:44	15:12	14:35	14:44	15:12	2
9	*	1													15:38	15:41	15:47	15:38	15:41	15:47	1-
9	*	1													15:55	15:57	16:06	15:55	15:57	16:06	1-
9	C2.1	3					16:42	16:44	16:46	1-	16:42	16:44	?	-	16:43	16:45	16:53	16:43	16:45	16:53	1-
9	?	1													17:14	17:24	17:39	17:14	17:24	17:39	1
9	M1.0	1													20:16	20:25	20:52	20:16	20:25	20:52	2
10	E	4	09:18	09:21	09:26	1-					09:17	09:22	09:41	1				09:16	09:22	09:32	1-
10	C6.1	7	10:35	10:44	?	-	10:32	10:42	11:07	2	10:35	10:44	11:27	2+	10:36	10:44	10:58	10:36	10:44	10:58	1
10	C6.0	7	11:31	11:43	12:13	2	11:29	11:42	11:57	1+	11:31	11:40	12:23	2+	11:31	11:42	12:07	11:31	11:42	12:07	2
10	C2.8	4	13:47	13:51	14:00	1-					13:45	13:51	14:01	1-	13:46	13:50	14:03	13:46	13:50	14:03	1-
10	M1.7	7	15:24	15:29	?	-	15:21	15:29	15:54	2	15:24	15:29	15:53	1+	15:24	15:30	16:04	15:24	15:30	16:04	2
11	*	3	08:13	08:16	08:22	1-					08:13	08:17	08:28	1-				08:12	08:17	08:24	1-
11	E	5	09:02	09:05	09:24	1	09:00	09:08	09:29	1+	09:01	09:06	09:29	1+	09:02	09:04	09:22	09:02	09:04	09:22	1
11	C6.7	7	10:08	10:16	10:29	1	10:05	10:16	10:30	1	10:08	10:17	10:33	1	10:10	10:15	10:27	10:10	10:15	10:27	1-
11	?	3													11:04	11:10	11:37	11:04	11:10	11:37	2
11	M1.7	7	12:00	12:08	13:17	2+	11:58	12:04	12:31	2	11:56	12:09	12:56	2+	11:59	12:08	13:03	11:59	12:08	13:03	2+
11	*	1																			
11	C3.3	5	14:13	14:17	14:33	1					14:12	14:19	14:40	1+	14:13	14:21	14:35	14:13	14:21	14:35	1
11	*	3													14:50	14:55	15:02	14:50	14:55	15:02	1-
11	?	5									15:20	15:30	15:43	1	15:22	15:31	15:44	15:22	15:31	15:44	1
11	?	3													15:51	16:00	16:15	15:51	16:00	16:15	1
11	C9.7	7	16:23	16:26	?	-	16:22	16:28	16:40	1-	16:19	16:27	?	-	16:22	16:29	17:03	16:22	16:29	17:03	2
11	?	2													18:21	18:27	18:50	18:21	18:27	18:50	1+
12	C7.2	4					07:46	07:52	07:58	1-	07:46	07:52	07:56	1-				07:45	07:54	08:08	1
12	M2.5	8	10:58	11:07	11:59	2+	10:56	11:02	11:46	2+	10:59	11:04	11:52	2+	11:18	11:23	?	11:00	11:06	11:53	2+
12	?	2	17:04	17:24	?	-									17:24	17:29	?				
12	C5.3	4	17:29	17:36	?	-					17:24	17:29	17:43	1	17:34	17:39	18:07	17:34	17:39	18:07	2
13	E	5	09:26	09:28	09:41	1-	09:23	09:28	09:39	1-	09:24	09:29	09:41	1-				09:25	09:31	09:41	1-
13	C1.7	6	13:41	13:44	?	-	13:40	13:44	13:52	1-	13:41	13:45	14:03	1	13:41	13:45	13:54	13:41	13:45	13:54	1-
13	?	2													15:23	15:26	15:42	15:23	15:26	15:42	1
13	C1.7	1													17:13	17:15	17:23	17:13	17:15	17:23	1-
13	M1.2	1													19:13	19:20	19:36	19:13	19:20	19:36	1-
14	?	1													10:09	10:20	?				
14	C5.0	6	10:09	10:14	10:38	1+	10:05	10:21	10:39	2	10:07	10:14	10:41	2	10:24	10:26	10:41	10:24	10:26	10:41	1-
14	?	1													13:49	13:56	14:01	13:49	13:56	14:01	1-
14	?	1													14:35	14:38	14:46	14:35	14:38	14:46	1-
15	C5.0	7	09:28	09:36	09:56	1+	09:26	09:36	10:06	2	09:27	09:36	10:24	2+	09:28	09:36	09:53	09:28			

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19	C3.3	16:21	16:30	16:44	1	16:24	16:30	16:48	1	16:26	16:29	16:35	1-
20	C2.7					08:36	08:40	08:53	1-				
20	?	12:21	12:24	12:44	1	12:21	12:24	12:41	1	12:21	12:23	12:37	1-
20	?					13:14	13:19	13:29	1-				
20	C2.9	13:50	13:53	14:03	1-	13:52	13:55	14:15	1	13:51	13:53	14:03	1-
20	*					14:18	14:21	14:25	1-				
21	C2.7					10:31	10:45	11:06	2				
22	M1.1												
22	C4.8												
22	C1.4					13:02	13:04	13:11	1-	13:01	13:03	13:12	1-
23	C2.9												
23	C2.3					11:16	11:20	11:34	1-	11:16	11:20	11:36	1
24	?												
24	C2.0	13:41	13:47	13:55	1-	13:43	13:46	13:55	1-	13:43	13:46	14:00	1-
24	C1.9	14:27	14:36	15:06	2	14:32	14:45	14:50	1-	14:31	14:34	14:55	1
26	E												
26	C1.1												
26	C1.5									12:44	12:49	13:05	1
28	C1.1												
28	C2.3					17:44	17:56	18:08	1				
28	M2.0												
29	C2.1					08:02	08:04	08:21	1				
29	C1.4												
29	C1.7												
29	C1.5					12:43	12:51	13:05	1				
29	C3.3					14:29	14:34	14:48	1	14:29	14:33	14:48	1
29	?												
29	X1.0					17:38	17:51	18:38	2+	17:45	17:49	18:08	1
30	M2.1	11:47	11:56	13:10	2+					11:47	11:57	12:50	2+
31	*												
31	M1.4	08:01	08:10	08:37	2	07:58	08:05	08:57	2+				
31	*												
31	C3.6	14:09	14:17	14:58	2+	14:10	14:19	14:41	1+	14:11	14:17	14:36	1

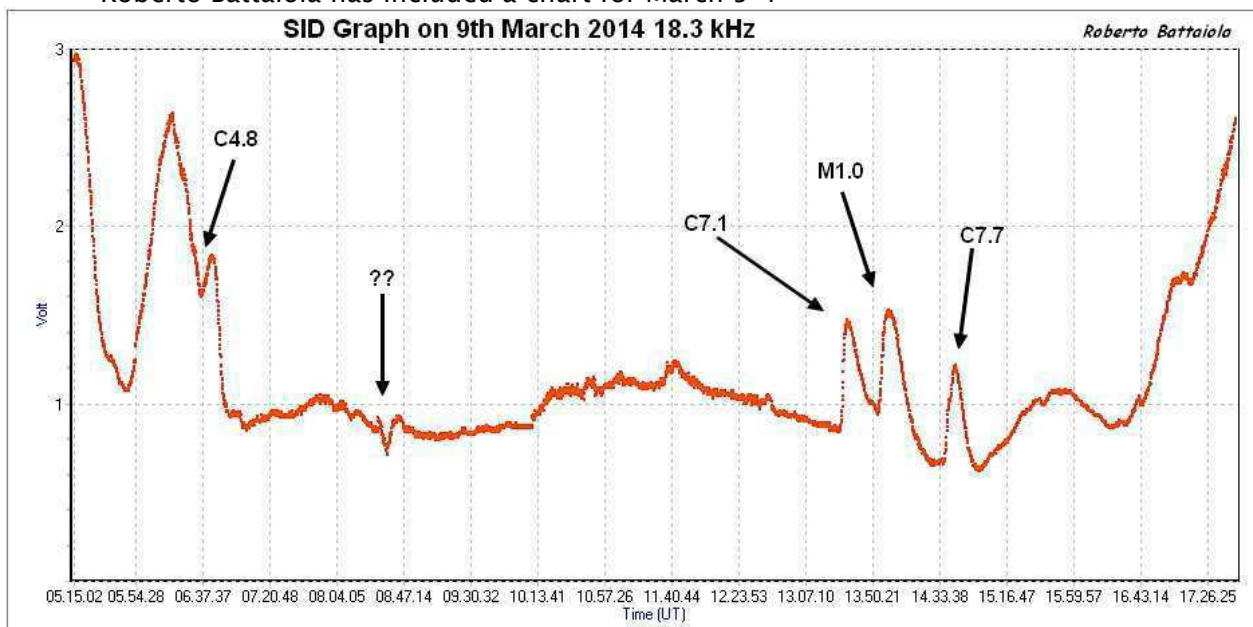
VLF flare activity 2005/14.



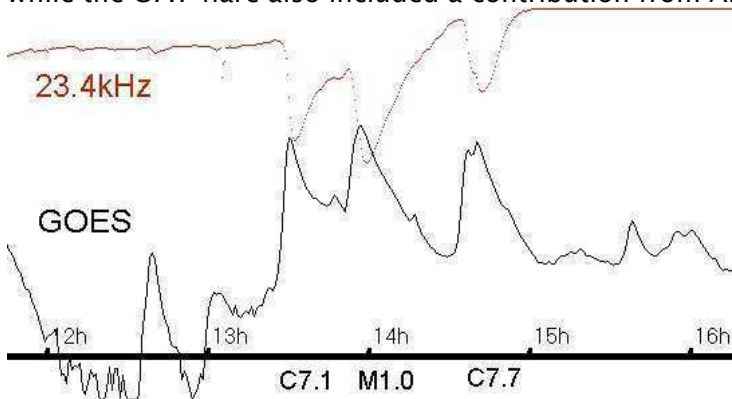
Activity remained at a high level through March, with a succession of strong flares in the middle of the month. Active region AR12002 was responsible for much of the activity, appearing over the eastern limb on the 9th. It extended over 15 degrees of latitude by the 11th, decaying a little as it approached the western limb on the 18th. A single X-class flare was recorded by GOES, caught as a SID by some observers just before local sunset on the 29th.

The GOES orbit creates an 'eclipse season' lasting about a month each year, such that no X-ray flux can be recorded for a period of about an hour each day when the satellite is in the Earth's shadow. GOES15 is the only one active this year, so there are gaps in the X-ray data. Where we have recorded SIDs during these eclipses, I have labelled the X-ray class as 'E'. I have added these to the count of C-class flares in the activity chart, increasing the total by seven.

Roberto Battaiola has included a chart for March 9th:

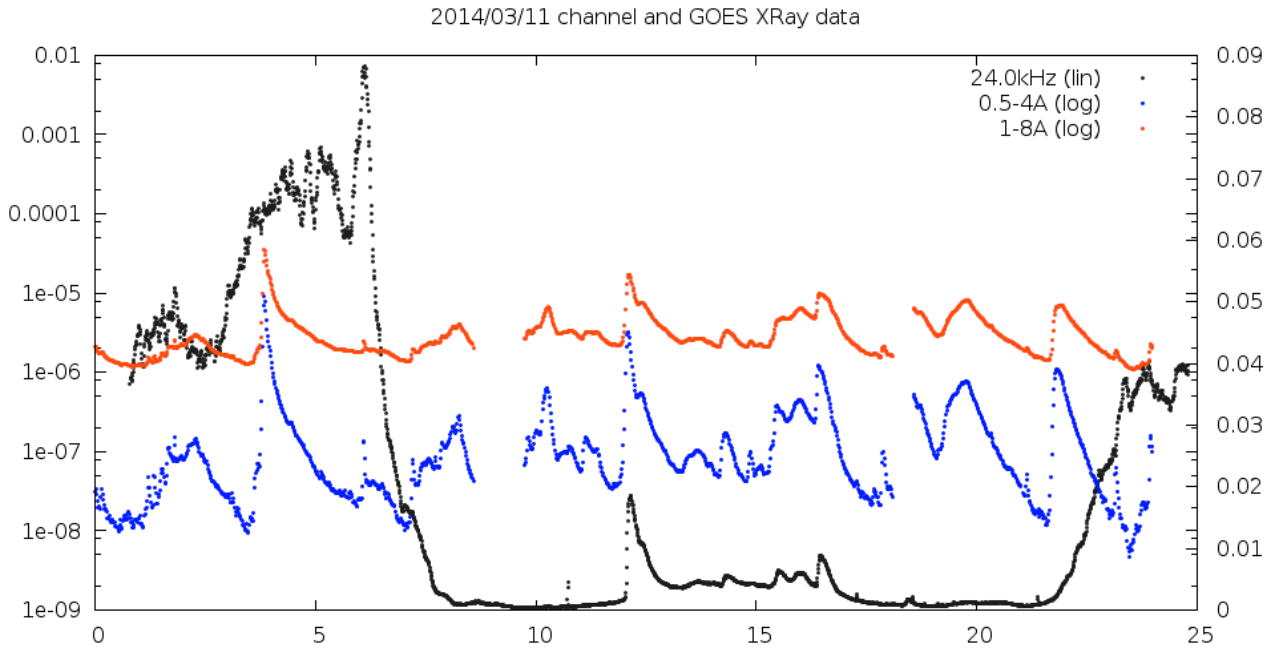


The SID marked '??' occurred during a GOES eclipse period. AR12002 was responsible for most of this activity, while the C7.7 flare also included a contribution from AR12001.



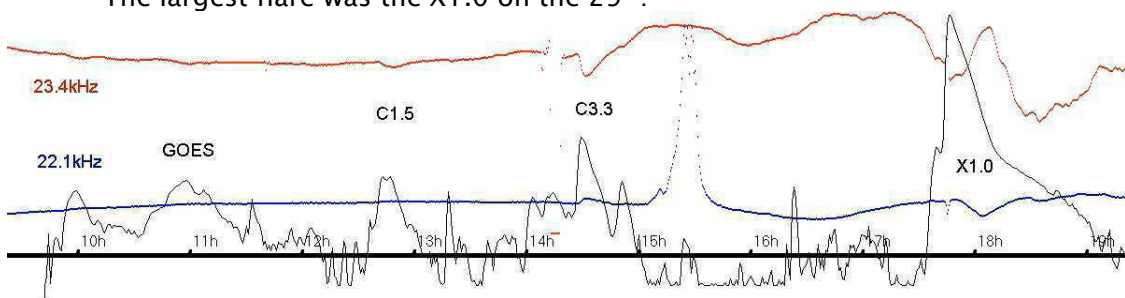
I have added the GOES data to my own chart, above, showing the dual peak of this event. The SWPC lists the main C7.7 peak at 14:42UT from AR12002, with the contribution from AR12001 peaking at 14:34. A hint of the dual flare can be seen in both SID recordings.

March 11th was equally active, as shown in the chart by Richard Kaye:



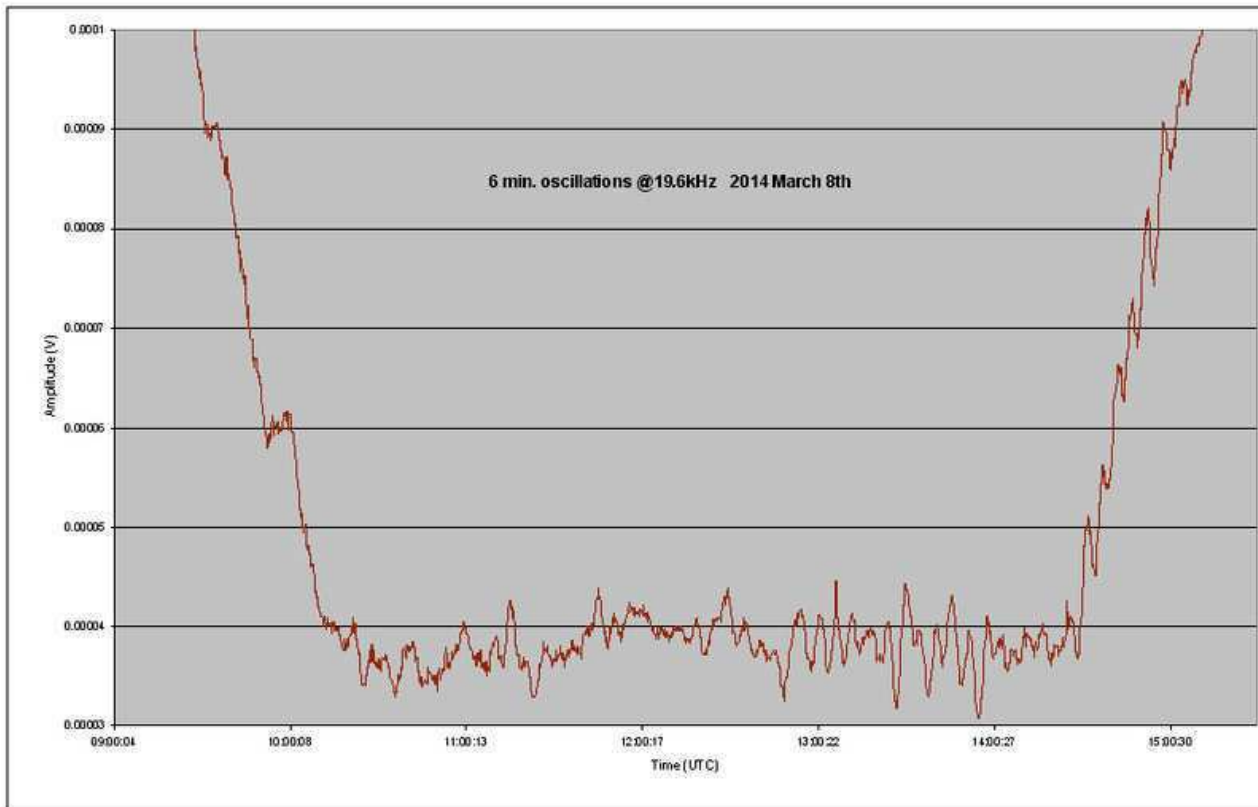
He has added both X-ray channels from GOES to his 24kHz recording (black). Two eclipse periods are evident in this recording (08:30–09:45 and 18:00–18:05).

The largest flare was the X1.0 on the 29th:



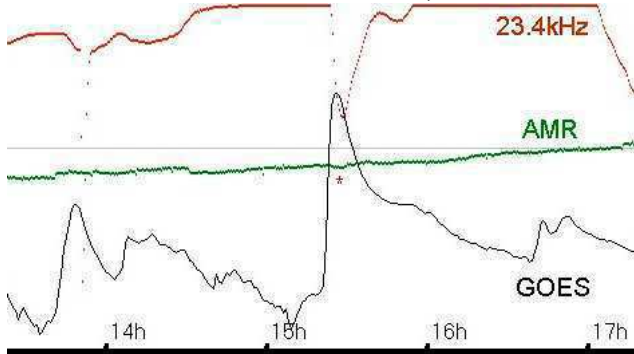
I have added the GOES X-ray data to my own chart, above. For European signals, this flare occurred during sunset, and so gave some odd SID shapes. My best response was at 22.1kHz where the path is a little West of North. The 22.1kHz spike at 15:20 is from local interference.

There has been a lot of E-mail discussion recently about the oscillations that we often record during the winter months. They were again evident in March during the quieter days without SIDs. It has been suggested that they are caused by 'gravity waves'. These are not the gravity waves that cosmologists search for, but may well be caused by volumes of buoyant warmer air rising within the atmosphere. The D-region that we monitor is at a similar altitude to that of mesospheric clouds (Noctilucent clouds), seen when illuminated from below by the setting sun. They usually have a distinctive wave-like appearance, and research is still underway into their formation. Mark Edwards found this link: <http://gmao.gsfc.nasa.gov/researchhighlights/SSW/> that describes a Stratospheric Sudden Warming event in 2013 January that may well be linked to these oscillations. The low altitude of the winter sun means that the base of the D-region is much higher, and thus nearer to this part of the stratosphere. Whether this is a real link I do not know, but signals are often much noisier at this time of year, as if the reflecting layer is more turbulent. Mark's recording for March 8th is at the top of the next page, showing a strong oscillation after 13:00.



MAGNETIC OBSERVATIONS.

Given the large number of SIDs recorded, magnetic activity has been very low. There was a small SFE recorded at 15:24UT on the 10th, co-incident with the M1.7 flare.



My own recording (above) shows about -3nT disturbance co-incident with the flare. Luckily there was little interference at the time, as this is a very small SFE. Colin Clements also recorded the SFE, although with rather more interference present. The SWPC reports a small magnetic crochet associated with the X1 flare on the 29th, but we have not recorded it.

Although a number of CMEs are shown in satellite images, they were mostly directed well away from Earth. A C5 flare at 03:48UT on the 23rd produced an Earth directed CME that arrived at about 20:00 on the 25th. This was a very weak disturbance, peaking about 30nT by midnight. The other disturbed periods shown in the Bartels diagram were also very weak.

Magnetic observations received from Colin Clements, John Cook.
Reports to jacook@jacook.plus.com

BARTELS DIAGRAM

ROTATION	KEY:	DISTURBED.	ACTIVE	SFE	B, C, M, X = FLARE MAGNITUDE.	Synodic rotation start (carrington's).																									
2423			2011 March			2108																									
F	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	19	20	21	22	
	MCC	C	C		MC				CCC	C	CC	C	CCCC	CCCC	CMMM	CMM	CMMM	CCCC	CCC	BCCC	CC	CBCM	CCCC								
2424			2011 April			2109																									
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				
	BC	MCB	C			C	C												CC	C					CCCC	CCCC	CCCM	CBCC	CB	B	
2425			2011 May			2110																									
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				
	B	BBC	CCC	CCMCC	CC		B			CCCC	CCCC		CB	C	C																
2426			2011 June			2111																									
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				
			CCC																												
2427			2011 July			2112																									
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				
2428			2011 August			2113																									
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				
2429			2011 September			2114																									
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	31				
	CCCB	CCCC	CCC	CMC	CMXC	CCCC	CC						CB	CC	BC																
2430			2011 October			2115																									
F	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		
	CCC	C	CCCC	CMCC	M		X	CMC	C	MC	CCB	C	C	CCCC	CCC	CCCC	CC	CCC	CC	CCCC	CMCC	CMXC	CCCC	CXMM	MMCM	CCMC	CCCC				
2431			2011 November			2116																									
F	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	23	24	25	26		
	CCM	CC	M	MC	CCMC																										
2432			2011 December			2117																									
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				
2433			2012 January			2118																									
F	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	16	17				
2434			2012 February			2119																									
F	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	13				
	B																														
2435			2012 March			2120																									
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				
	CMC	C	CC	CC	CC	CM																									
2436			2012 April			2121																									
F	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	1	2	3	4	5	6	7				
	CC	CCCC	C																												
2437			2012 May			2122																									
F	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	3				
	C	CC	CCM	C	M	M	MC	CC																							
2438			2012 June			2123																									
F	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				
	C	BC	C																												
2439			2012 July			2124																									
F	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				
2440			2012 August			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																														
2441			2012 September			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				
2442			2012 October			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				
2443			2012 November			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																													
2444			2012 December			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																														
2445			2013 January			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																											
2446			2013 February			2131																									
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				
2447			2013 March			2132																									
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				
2448			2013 April			2133																									
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				
2449			2013 May			2134																									
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				