

BAA Radio Astronomy Group.

2014 MAY

DAY	Xray class	Observers	John Cook (23.4kHz/22.1kHz)				Roberto Battaiola (18.3kHz)				Paul Hyde (22.1kHz)				Bob Middlefell (22.1kHz)			Mark Edwards (18.3/24.0/37.5kHz)		
			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)
2	C1.3	1							08:02	08:04	08:15	1-								
2	?	1														09:21	09:34	?		
2	C4.4	9	09:20	09:34	10:37	2+		09:18	09:31	10:26	2+	09:20	09:33	10:32	2+	09:37	09:43	10:33		
2	C1.4	6	14:06	14:12	14:28	1		14:03	14:14	14:29	1+					14:07	14:13	14:47		
3	C5.3	1														<b>05:45</b>	<b>06:08</b>	<b>06:23</b>		
3	?	2							07:05	07:10	07:25	1								
3	C1.8	8	09:26	09:29	09:46	1		09:23	09:31	09:44	1					09:27	09:31	09:49		
3	C1.1	3							09:24	09:31	09:45	1				<b>10:14</b>	<b>10:27</b>	<b>10:41</b>		
3	C1.7	6	16:05	16:13	16:20	1-		16:05	16:14	16:20	1-					16:07	16:15	16:38		
3	C1.4	2							16:05	16:14	16:51	2+				16:51	16:52	17:03		
4	C2.5	7	09:01	09:09	09:41	2		09:00	09:09	09:27	1+					09:01	09:06	09:23		
4	C9.2	9	12:26	12:34	13:48	2+		12:24	12:31	12:59	2					12:25	12:35	13:33		
4	C1.3	3							15:56	16:03	16:32	2				16:03	16:05	16:17		
4	C1.4	1														17:39	17:41	17:46		
4	C1.2	1														18:45	18:46	18:55		
5	?	1														10:56	10:59	11:05		
5	C8.0	2														<b>18:21</b>	<b>18:29</b>	<b>18:55</b>		
6	M1.8	7	08:27	09:13	10:28	3										08:30	09:09	10:14		
6	C1.4	1																		
6	C4.7	6	17:23	17:32	17:58	2										17:14	17:30	18:21		
7	C3.6	2	06:25	06:29	06:35	1-														
7	?	1														06:27	06:31	06:47		
7	?	2														09:04	09:13	09:17		
7	?	1														11:40	12:06	12:18		
7	?	4	12:38	12:42	12:53	1-										12:30	12:33	?		
7	M1.2	9	16:09	16:32	17:18	2+		16:06	16:25	17:37	3		16:08	16:27	17:43	3	16:09	16:26		
7	C3.9	2														19:16	19:21	20:35		
8	?	2														09:22	09:31	09:38		
8	M5.2	9	10:00	10:10	11:33	3		09:58	10:06	10:15	1-		10:00	10:11	11:10	2+	10:00	10:11		
9	C3.3	8	08:18	08:24	08:39	1		08:12	08:22	08:47	2		08:18	08:26	09:34	2+	<b>08:18</b>	<b>08:27</b>		
9	C1.6	8	11:17	11:24	11:38	1		11:12	11:21	11:38	1+		11:10	11:24	11:46	2	11:20	11:24		
9	C1.2	2														<b>11:47</b>	<b>11:51</b>	<b>12:03</b>		
9	C1.9	6	12:56	13:01	13:19	1		12:48	13:02	13:17	1+		12:56	13:03	13:17	1	<b>12:58</b>	<b>13:07</b>		
9	*	1														<b>13:20</b>	<b>13:24</b>	<b>13:48</b>		
9	C3.6	9	14:16	14:24	?	-		14:09	14:21	14:44	2		14:16	14:23	?	-	<b>14:16</b>	<b>14:26</b>		
9	C7.8	9	14:53	15:00	16:08	2+		14:48	14:58	15:59	2+		14:53	15:01	15:50	2+	<b>14:52</b>	<b>15:01</b>		
10	C8.7	7	06:55	07:03	07:54	2+		06:50	07:11	07:48	2+		06:56	07:05	08:20	2+	06:58	07:12		
10	*	1																		
10	C2.4	1																		
10	C1.8	2														18:43	18:50	19:10		
11	C1.6	2						08:05	08:11	08:18	1-					<b>08:09</b>	<b>08:15</b>	<b>08:18</b>		
11	C1.3	1	09:19	09:27	09:46	1+														
11	C3.1	3											17:11	17:14	17:54	2	17:12	17:15		
11	?	2															18:44	18:52		
11	C3.4	2															18:56	19:13		
13	C1.5	2						09:15	09:22	09:36	1		09:20	09:22	09:31	1-				
14	C2.6	6	08:53	08:57	09:25	1+							08:51	08:59	09:30	2	08:53	09:00		
14	C1.5	4	12:17	12:22	12:34	1-							12:18	12:22	12:35	1-	12:19	12:24		
14	?	5	13:14	13:21	13:47	2							13:14	13:21	?	-	13:15	13:21		
14	?	5	13:58	14:20	?	-							13:57	14:16	15:22	2+	14:02	14:12		
14	C8.3	3	15:01	15:05	15:34	2											15:01	15:08		
14	*	7	15:47	15:51	16:08	1		15:44	15:50	16:06	1		15:46	15:54	16:28	2	15:47	15:55		
15	C3.2	1	05:26	05:33	06:07	2														
16	C5.7	5	07:01	07:05	07:40	2							07:00	07:06	08:16	2+	07:02	07:06		
16	C1.5	3	13:28	13:33	13:55	1+											13:31	13:33		
16	C2.5	1															20:18	20:22		
18	*	2											06:28	07:00	07:44	2+				
20	B9.2	1															16:49	16:52		
21	C1.6	3											07:12	07:24	07:58	2+				
22	C1.4	3											13:16	13:32	13:40	1	13:18	13:31		
24	M1.3	6	18:32	18:37	18:45	1-							18:32	18:38	?	-	18:33	18:37		
25	C2.5	4											17:49	17:55	18:19	1+	17:51	17:56		
26	C1.0	3	12:39	12:45	13:04	1											12:40	12:51		
26	C2.1	7						15:55	16:05	16:24	1+		15:55	16:11	16:53	2+	15:58	16:05		
26	C1.6	1															20:07	20:11		
27	C4.9	10	14:11	14:17	14:45	2		14:07	14:17	14:46	2		14:11	14:18	15:12	2+	14:12	14:19		
31	B9.2	1															15:51	15:58		

## BAA Radio Astronomy Group.

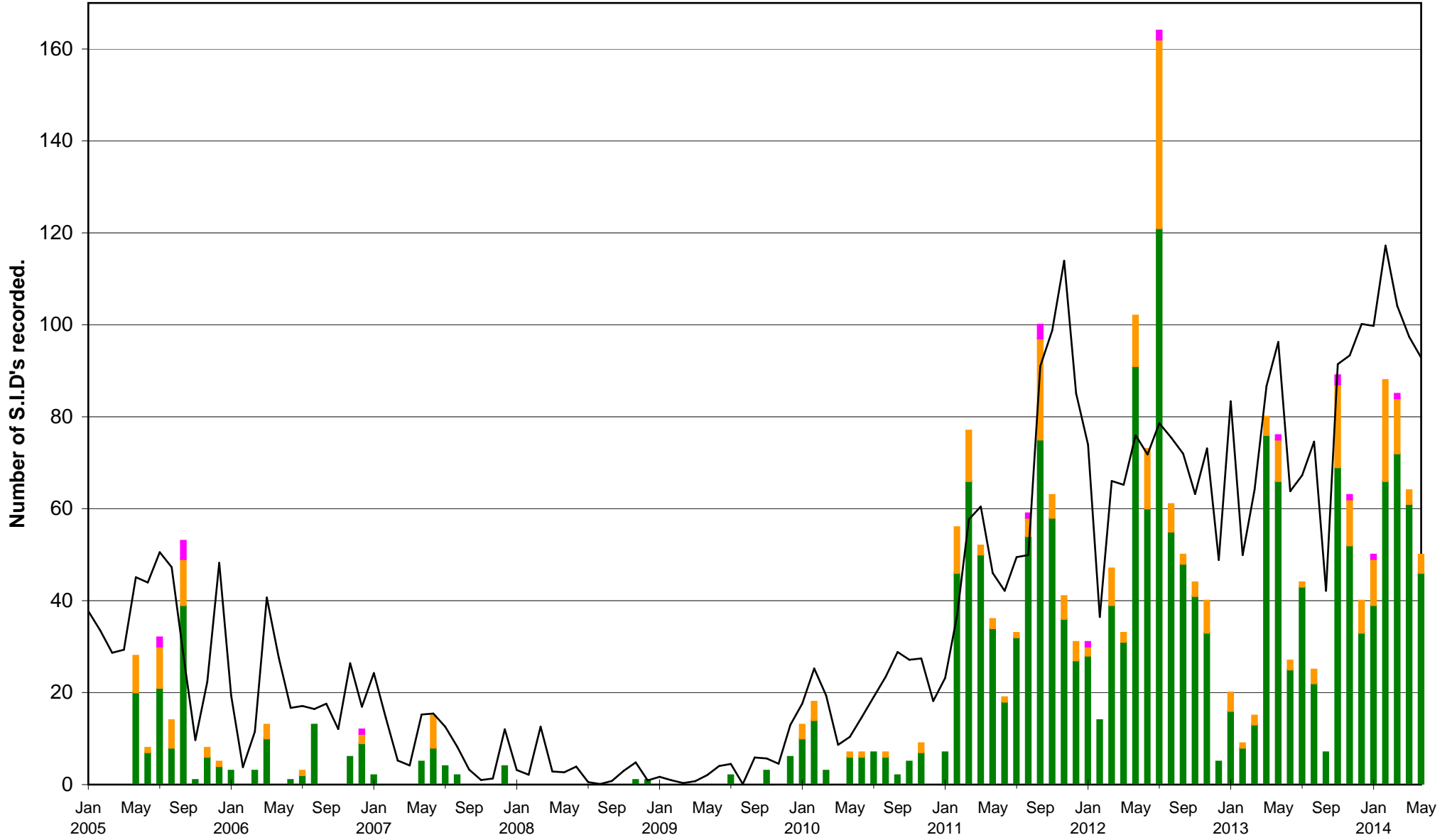
2014 MAY

DAY		Colin Clements (23.4kHz/22.1kHz)	Gordon Fiander (19.6/22.1kHz)	Richard Kaye (Various)	John Wardle (19.6/23.4kHz)	Steve Parkinson (Various)
		AAVSO receiver, 0.76m screened loop aerial.	PC sound card.	Pre-amplifier + PC software receiver.	PC soundcard, 0.7m frame aerial.	Tuned radio frequency receiver, Spectrum Lab, frame aeriels.
		START PEAK END (UT)	START PEAK END (UT)	START PEAK END (UT)	START PEAK END (UT)	START PEAK END (UT)
2	C1.3					
2	?					
2	C4.4	09:16 09:40 10:47 3		09:21 09:42 10:37 2+	09:20 09:38 10:46 3	09:19 09:31 10:20 2+
2	C1.4	14:03 14:14 15:04 2+		14:06 14:14 14:27 1		14:05 14:13 14:29 1
3	C5.3					
3	?					
3	C1.8	09:21 09:28 09:58 2		09:25 09:30 09:43 1-	09:26 09:31 09:46 1	07:05 07:10 07:23 1-
3	C1.1					09:25 09:30 09:46 1
3	C1.7			16:07 16:16 16:43 2		10:14 10:24 10:42 1+
3	C1.4			16:51 16:52 17:01 1-		16:03 16:13 16:33 1+
4	C2.5	08:58 09:09 09:40 2		09:01 09:10 09:38 2	09:00 09:12 09:41 2	09:00 09:07 09:35 2
4	C9.2	12:22 12:34 13:52 3		12:25 12:34 13:28 2+	12:25 12:30 13:02 2	12:25 12:36 13:37 2+
4	C1.3			16:01 16:08 16:19 1-		
4	C1.4					
4	C1.2					
5	?					
5	C8.0					18:21 18:27 18:40 1
6	M1.8	08:21 09:05 10:22 3		08:30 09:05 10:11 3	08:28 08:47 10:13 3	08:21 09:07 10:24 3
6	C1.4			11:53 12:16 12:47 2+		
6	C4.7			17:13 17:30 18:19 2+	17:17 17:36 17:56 2	17:20 17:33 18:03 2
7	C3.6					
7	?					
7	?			11:31 12:00 12:23 2+		
7	*					
7	M1.2	12:20 12:41 13:08 2+		12:39 12:43 13:00 1		
7	C3.9	15:58 16:27 17:49 3		16:09 16:17 18:00 3	16:08 16:27 17:30 2+	16:08 16:25 17:35 3
7	C3.9			19:13 19:25 19:50 2		
8	?			09:18 09:31 09:39 1		
8	M5.2	09:58 10:10 11:52 3		10:01 10:10 11:34 3	09:59 10:06 11:00 2+	10:01 10:15 11:10 2+
9	C3.3	08:15 08:25 08:45 1+		08:19 08:23 08:43 1	08:18 08:27 08:47 1+	08:18 08:27 08:44 1+
9	C1.6	11:15 11:25 11:31 1-		11:19 11:22 11:43 1	11:18 11:26 11:41 1	11:17 11:25 11:36 1
9	C1.2	11:40 11:52 12:01 1				
9	C1.9	12:55 13:05 13:34 2				12:57 13:02 ? -
9	*					
9	C3.6	14:13 14:25 14:50 2		14:18 14:22 14:42 1	14:16 14:24 14:53 2	14:16 14:25 ? -
9	C7.8	14:50 15:00 15:39 2+		14:55 15:02 15:39 2	14:53 15:02 15:32 2	14:53 14:57 ? -
10	C8.7			06:56 07:02 07:15 1		06:52 07:13 08:10 2+
10	*			08:35 08:45 08:59 1		
10	C2.4			09:35 09:45 09:59 1		
10	C1.8			18:40 18:48 19:03 1		
11	C1.6					
11	C1.3					
11	C3.1			17:11 17:15 17:35 1		
11	?			18:44 18:46 19:00 1-		
11	C3.4			19:00 19:14 19:39 2		
13	C1.5					
14	C2.6	08:46 08:59 09:17 1+		08:51 08:57 09:15 1		08:52 09:00 09:22 1+
14	C1.5	12:15 12:22 12:50 2				
14	?	12:59 13:20 13:55 2+		13:15 13:22 13:45 1+		
14	?	13:55 14:25 14:59 2+		14:00 14:26 15:37 3		
14	C8.3	14:59 15:05 15:45 2+				
14	*	15:45 15:51 16:17 1+		15:46 15:54 16:13 1+		15:48 15:53 16:16 1+
15	C3.2					
16	C5.7			07:02 07:04 07:25 1		07:01 07:07 07:59 2+
16	C1.5			13:29 13:35 13:52 1		
16	C2.5					
18	*			06:33 07:02 08:12 3		
20	B9.2					
21	C1.6			07:14 07:18 07:27 1-		07:14 07:30 08:00 2+
22	C1.4			13:17 13:29 14:01 2		
24	M1.3			18:31 18:39 19:16 2	18:30 18:40 19:22 2+	18:32 18:37 19:12 2
25	C2.5			17:49 17:55 18:15 1+	17:49 17:57 18:24 2	
26	C1.0			12:40 12:49 13:04 1		
26	C2.1	15:53 16:08 16:43 2+		15:55 16:09 16:54 2+	15:55 16:09 16:43 2+	15:56 16:09 16:40 2
26	C1.6					
27	C4.9	14:09 14:20 15:03 2+		14:12 14:19 15:03 2+	14:11 14:21 14:53 2	14:11 14:18 14:47 2
31	B9.2					



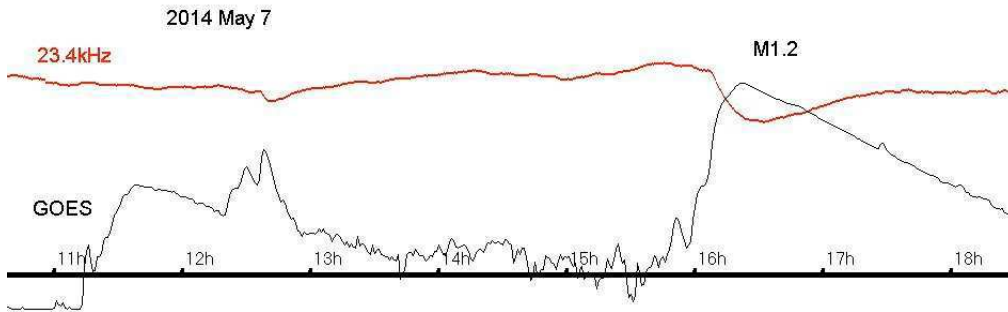
# VLF flare activity 2005/14.

C M X — Relative sunspot number



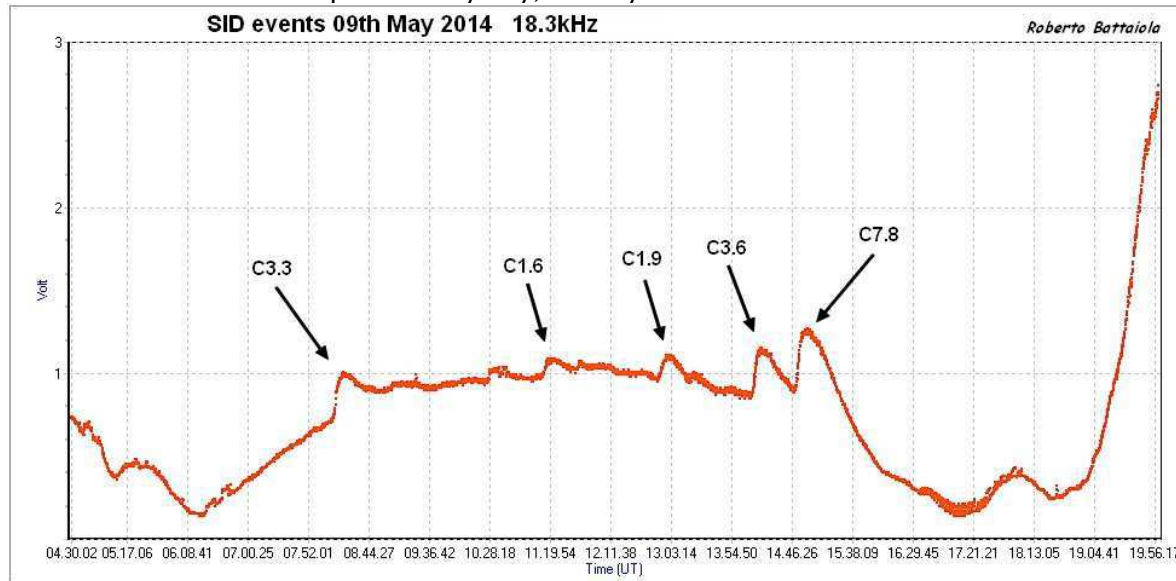
Although the number of SIDs recorded in May is down again on previous months, there has been plenty of interesting activity to investigate.

The M1.2 flare on the 7<sup>th</sup> was well recorded by many observers, but there were several more X-ray peaks between 11 and 13UT that have not been classified.



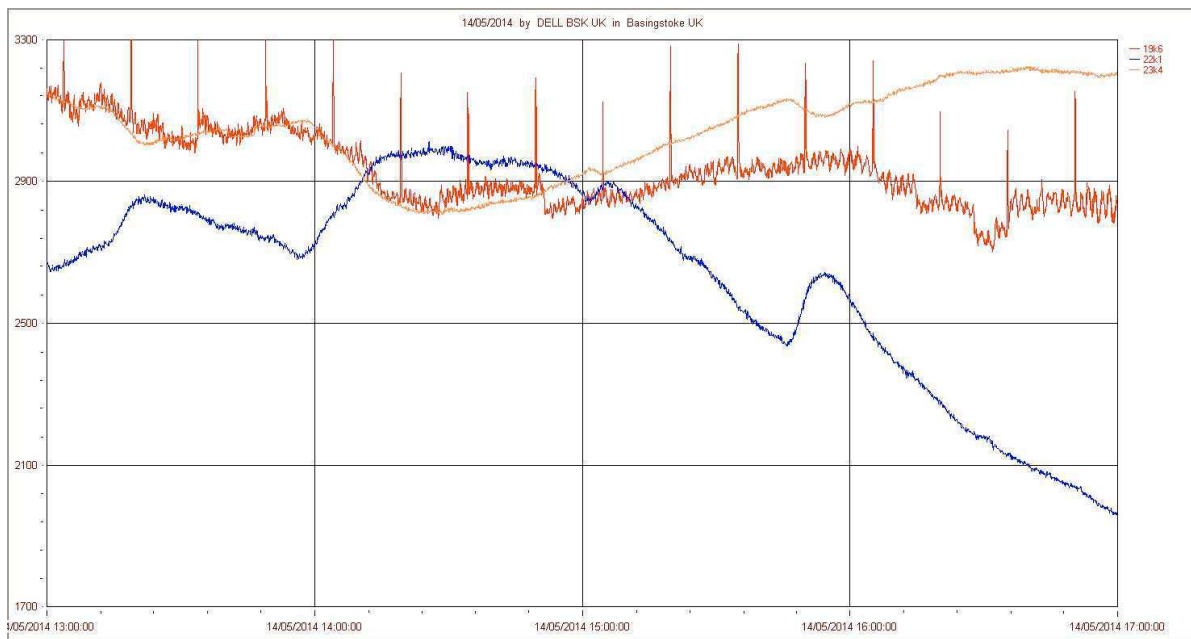
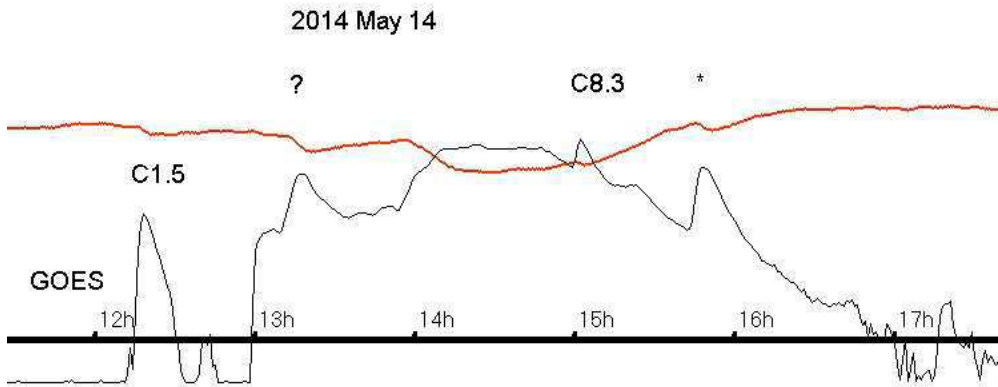
My own recording (above) shows at least one further SID, peaking at 12:42UT. The SWPC lists a flare from AR2053 peaking at 12:48, but makes no mention of the initial peak at about 11:30. Both Mark Edwards and Richard Kaye have reported a SID peaking at about 12UT that does not appear to have a corresponding X-ray peak. I do not normally include events in the tables where X-ray peaks cannot be found, but as this one has been reported by two observers I have included it this time.

The 9<sup>th</sup> was also quite a busy day, activity well shown in this chart from Roberto Battaiola:



May 14<sup>th</sup> was also very active, with a particularly long flare from AR2056. This is listed by SWPC starting at 12:59, peaking at 15:04 and ending at 15:28UT. Superimposed are two flares from AR2063 (peaks at 13:59 and 15:03), and one from AR2060 peaking at 15:48UT. None of these have individual X-ray classifications. I have added the X-ray data from GOES to my own recording at the top of the next page. This shows an additional peak at about 13:20 that has not been listed, but does give a small SID at 23.4kHz on my recording.

The second chart is from Paul Hyde, and shows 19.6kHz (red), 22.1kHz (blue) and 23.4kHz (Yellow). The disturbance at 22.1kHz shows particularly well.

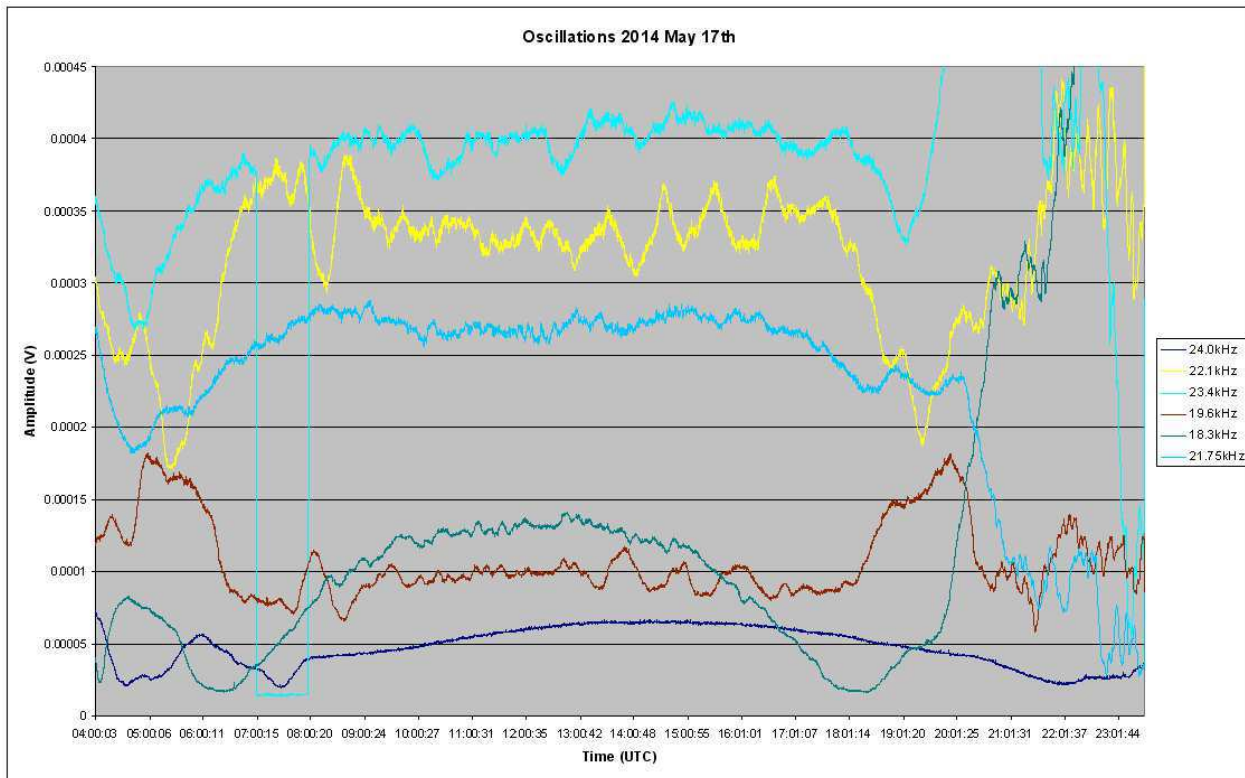


Paul Hyde.

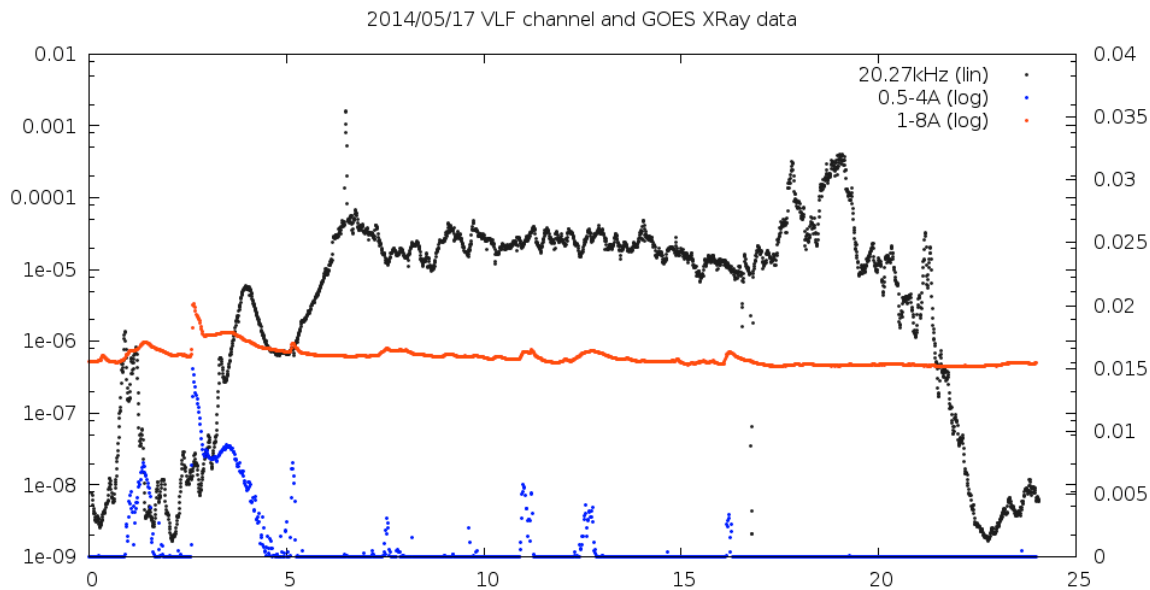
A further multiple flare early in the morning of the 16<sup>th</sup> resulted in just a single SID for all observers. Region AR2056 produced a C5.7 flare peaking at 07:04, and a C2.9 flare peaking at 07:16. SID timings were somewhere between these events, and so I have listed them all as from the earlier C5.7 flare.

While many of us were enjoying the Radio Astronomy Group meeting at the National Space Centre in Leicester on the 17<sup>th</sup>, the sun was rather less active although the ionosphere became very disturbed. There were no X-ray flares after 04UT on the 17<sup>th</sup>, but strong oscillations were recorded by Mark Edwards, Richard Kaye, Paul Hyde and John Cook. Various frequencies were effected, as shown in Mark's chart at the top of the next page. The paths at 19.6 and 22.1kHz are very similar (to the west of north), and show very strong oscillations. The 23.4kHz path is to the East with a mid-point over the North Sea and also shows some strong oscillation. The only clean signal is that at 24kHz over the North Atlantic. The signals at 21.75kHz and 18.3kHz are in central France. They show some limited (but distinct) disturbance.

Richard Kaye is located about 20..25km from Mark, and recorded very similar effects. His recordings included the signal at 20.27kHz from Isola di Tavolara, Italy, at a range of about 1500km. Shown on the next page, oscillations are again very distinct. The X-ray flux is also shown.



Mark Edwards.



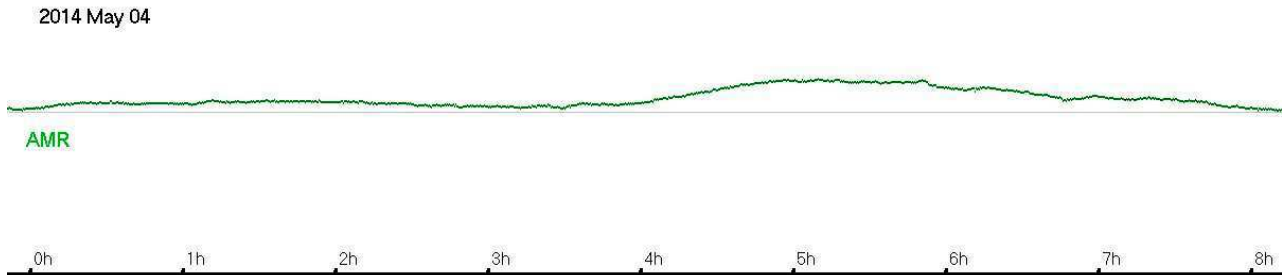
Richard Kaye.

May 17<sup>th</sup> was a particularly hot day here in central England, and there is a suggestion that there may be a link between these ionospheric oscillations and masses of buoyant hot air rising through the atmosphere causing instability at the lower boundary of the D-region. This can be imagined as the upside-down equivalent of a pebble being dropped into a pool of water, creating small waves moving over the surface.

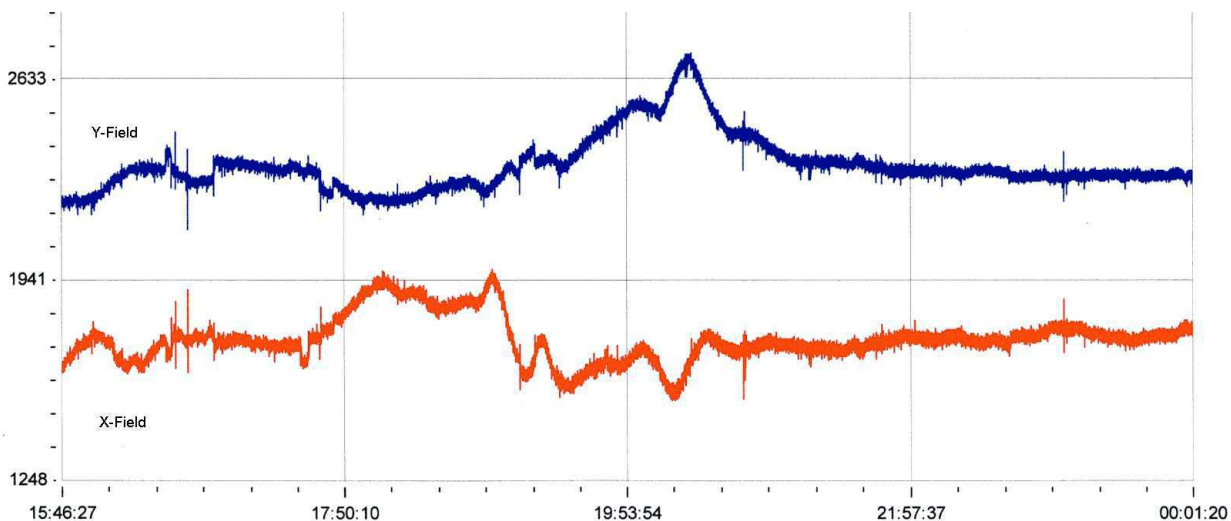
Activity remained fairly quiet for the second half of the month, with an isolated M1.3 flare on the 25<sup>th</sup>. A pair of B9.2 flares were recorded as SIDs on the 20<sup>th</sup> and 31<sup>st</sup>.

## MAGNETIC OBSERVATIONS.

Magnetic activity was at a very low level in May. Most of the flares were very slow and did not have associated CMEs. The CMEs that did occur were directed away from Earth, and so no effects were felt. A B9 flare near midnight on April 29<sup>th</sup> produced a weak CME that disturbed the magnetosphere with a glancing blow on May 3<sup>rd</sup>. Very little was recorded from this disturbance, with just a slight distortion of the normal diurnal curve between 04:00 and 06:30 on May 4<sup>th</sup>.



Short periods of weak disturbance were recorded 8<sup>th</sup>, 9<sup>th</sup>, 10<sup>th</sup> and 11<sup>th</sup>, mostly from interaction with a southward pointing Bz. CHSS effects added another small disturbance on 22<sup>nd</sup> and 23<sup>rd</sup> May. The strongest disturbance of the month occurred late on the 30<sup>th</sup>, as shown in the recording by Colin Clements:



This also resulted from interaction with a southward pointing Bz. Normal conditions returned by 21UT. My own measurement indicated about 70nT peak disturbance at 20UT.

There were no direct CME hits, or Solar Flare Effects recorded in May.

The Bartels diagram shows mostly random periods of activity over the last few months, with very little sign of long-lived active areas making return visits to the visible side of the sun. Although there have been some more persistent sunspots, so far solar cycle 24 has seen mostly small and short-lived sunspots. A notable exception was AR1944 that was first seen in early January and was visible to the protected naked-eye for a few days. It re-appeared as AR1967 and was again a naked-eye group in early February. Its third appearance was as AR1990, seen to decay in early March. Although it produced many flares and CMEs, they were mostly directed away from Earth and so had little effect.

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



ROTATION	KEY	DISTURBED	ACTIVE	SFE	B, C, M, X = FLARE MAGNITUDE	Synodic rotation start (arrington's)
2423			2011 March			2108
F	MCC	C	C	C	C	C
2424			2011 April			2109
F	BC	MCB	C	C	C	C
2425			2011 May			2110
F	BBC	CC	CCMC	C	C	C
2426			2011 June			2111
F	CC	C	C	C	C	C
2427			2011 July			2112
F	CC	C	C	C	C	C
2428			2011 August			2113
F	CC	C	C	C	C	C
2429			2011 September			2114
F	CCCB	CC	CC	CC	CC	CC
2430			2011 October			2115
F	CC	C	C	C	C	C
2431			2011 November			2116
F	CCM	CC	M	CC	CC	CC
2432			2011 December			2117
F	CC	C	C	C	C	C
2433			2012 January			2118
F	B	C	C	C	C	C
2434			2012 February			2119
F	CC	C	C	C	C	C
2435			2012 March			2120
F	CC	C	C	C	C	C
2436			2012 April			2121
F	CC	C	C	C	C	C
2437			2012 May			2122
F	CC	C	C	C	C	C
2438			2012 June			2123
F	CC	C	C	C	C	C
2439			2012 July			2124
F	CC	C	C	C	C	C
2440			2012 August			2125
F	CC	C	C	C	C	C
2441			2012 September			2126
F	CC	C	C	C	C	C
2442			2012 October			2127
F	CC	C	C	C	C	C
2443			2012 November			2128
F	CC	C	C	C	C	C
2444			2012 December			2129
F	CC	C	C	C	C	C
2445			2013 January			2130
F	CC	C	C	C	C	C
2446			2013 February			2131
F	CC	C	C	C	C	C
2447			2013 March			2132
F	CC	C	C	C	C	C
2448			2013 April			2133
F	CC	C	C	C	C	C
2449			2013 May			2134
F	CC	C	C	C	C	C
2450			2013 June			2135
F	CC	C	C	C	C	C
2451			2013 July			2136
F	CC	C	C	C	C	C
2452			2013 August			2137
F	CC	C	C	C	C	C
2453			2013 September			2138
F	CC	C	C	C	C	C
2454			2013 October			2139
F	CC	C	C	C	C	C
2455			2013 November			2140
F	CC	C	C	C	C	C
2456			2013 December			2141
F	CC	C	C	C	C	C
2457			2014 January			2142
F	CC	C	C	C	C	C
2458			2014 February			2143
F	CC	C	C	C	C	C
2459			2014 March			2144
F	CC	C	C	C	C	C
2460			2014 April			2145
F	CC	C	C	C	C	C
2461			2014 May			2146
F	CC	C	C	C	C	C
2462			2014 June			2147
F	CC	C	C	C	C	C