

BAA Radio Astronomy Group.

2013 DECEMBER

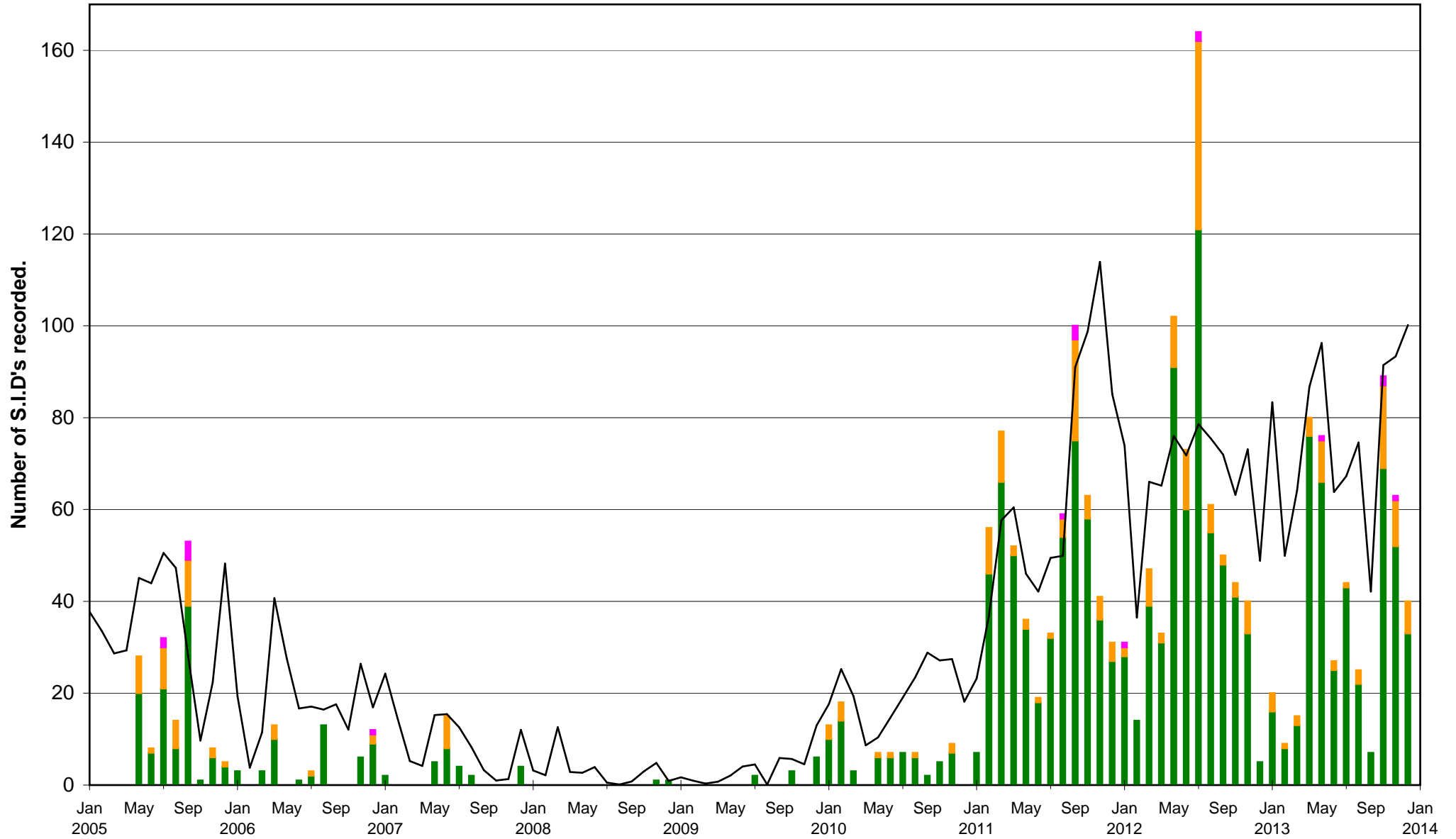
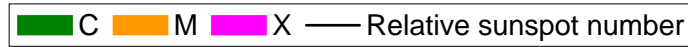
DAY	Xray class	Observers	John Cook (23.4kHz/22.1kHz)	Roberto Battaiola (21.75kHz)	Paul Hyde (22.1kHz)	Bob Middlefell (22.1kHz)	Mark Edwards (37.5/24.0/21.75kHz)
			Tuned radio frequency receiver, 0.58m frame aerial.	Modified AAVSO receiver.	Tuned radio frequency receiver, 0.96m frame aerial.	Tuned radio 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	C1.4	3					11:20 11:23 11:36 1-
2	C2.5	1					
5	C4.9	4	11:25 11:27 11:31 1-		11:23 11:30 12:08 2		11:26 11:28 11:33 1-
5	?	2					11:41 11:46 12:29 2+
5	C5.8	2			14:57 15:00 ? -		14:51 14:56 15:13 1
6	C2.2	1					
8	C2.2	3			10:03 10:09 10:15 1-		10:04 10:10 10:17 1-
9	C2.9	2					
9	C2.3	1					
9	C1.8	1					
11	C1.7	2					11:49 11:57 12:10 1
11	C1.2	1					
12	C2.3	1					
14	C1.1	1					
14	C2.3	1					
15	C2.8	1		09:07 09:13 09:17 1-			
15	C1.3	1					
16	C1.9	2					
19	C1.8	1					
20	C2.2	1					
20	M1.6	6	11:40 11:47 12:18 2		11:40 11:47 12:20 2		11:43 11:57 12:15 1+
20	?	2					13:38 13:42 13:48 1-
20	?	1					14:56 14:58 ? -
20	C3.2	2					15:02 15:05 15:17 1-
20	C8.5	1					15:28 15:35 16:03 2
21	C9.2	6	10:30 10:36 10:46 1-	10:28 10:30 10:37 1-	10:31 10:38 10:57 1+		10:30 10:36 10:45 1-
22	M1.9	2		08:06 08:10 08:25 1			
22	M1.1	1		08:31 08:37 08:46 1-			
22	C3.7	2	11:22 11:29 11:35 1-				11:22 11:25 11:41 1
22	M1.6	5	14:29 14:34 14:42 1-	14:25 14:37 14:55 1+			14:29 14:39 15:06 2
22	M3.3	6	15:09 15:11 15:27 1-	15:06 15:11 15:23 1-	15:10 15:13 15:21 1-		15:08 15:12 15:43 2
23	M1.6	1	09:04 09:07 09:14 1-				
25	C1.2	1					
27	C4.4	5	12:09 12:14 12:19 1-	12:08 12:12 12:21 1-			12:11 12:14 12:24 1-
27	C1.7	1					13:28 13:42 13:51 1
28	C3.0	2					12:44 12:48 13:04 1
28	C2.6	1					13:11 13:16 13:21 1-
29	M3.1	1		07:48 07:53 08:05 1-			
29	C3.8	2		08:53 08:57 09:04 1-			
29	C1.8	2					11:49 11:52 11:59 1-
29	C5.1	3		14:38 14:42 14:50 1-			14:43 14:46 15:11 1+
30	C2.3	1		15:07 15:14 15:30 1			
31	C8.8	2					10:50 11:43 12:38 3

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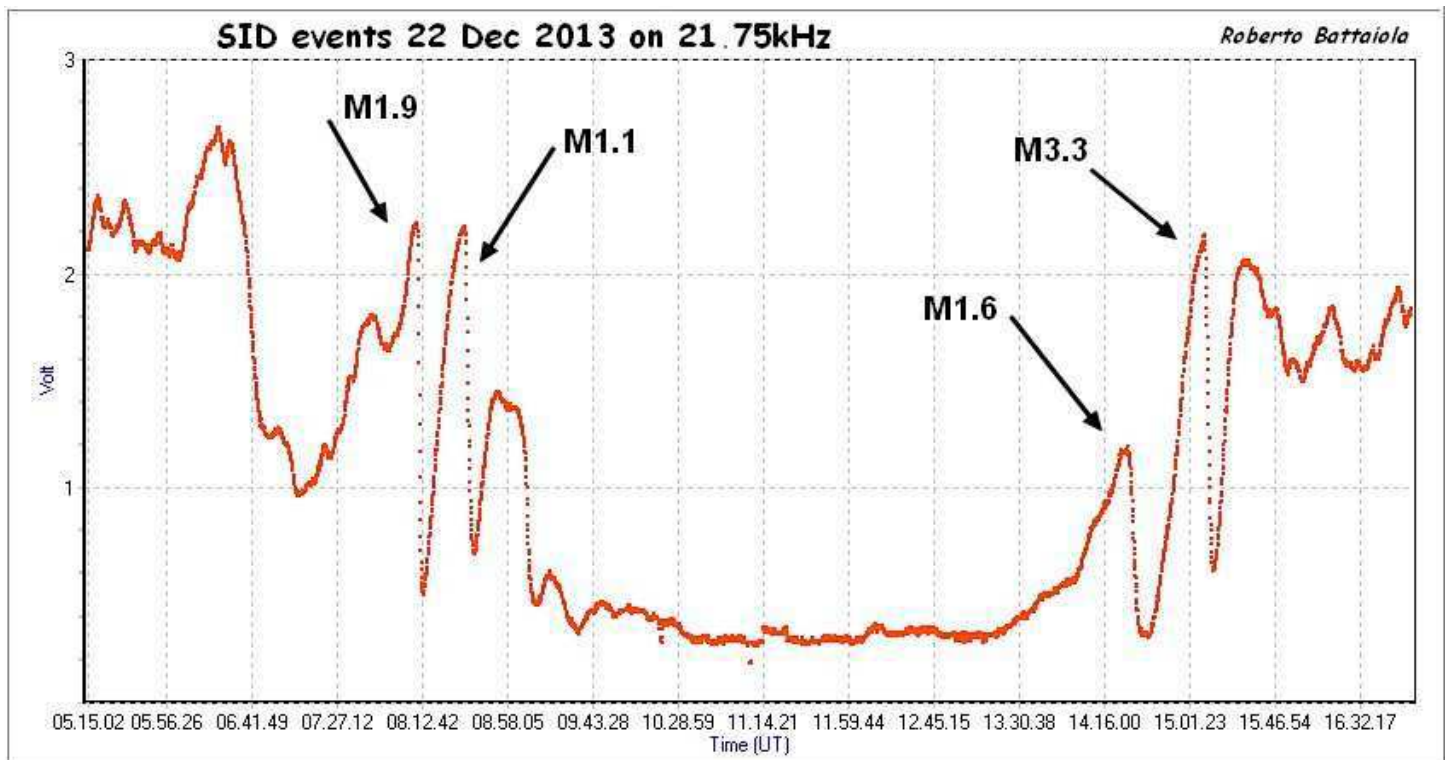
DAY		Colin Clements (23.4kHz)				Peter King (18.3kHz)				Richard Kaye (Various)				John Wardle (19.6/23.4kHz)			Steve Parkinson (Various)			
		AAVSO receiver, 0.76m screened loop aerial.				Own designed receiver, 1.4m loop aerial.				Pre-amplifier + PC software receiver.				PC soundcard, long wire aerial.			Tuned radio frequency receiver, Spectrum Lab, frame aerials.			
		START	PEAK	END (UT)		START	PEAK	END (UT)		START	PEAK	END (UT)		START	PEAK	END (UT)		START	PEAK	END (UT)
1	C1.4					11:15	11:24	11:27	1-	11:18	11:30	11:40	1							
2	C2.5					14:36	14:47	15:13	2											
5	C4.9									11:24	11:29	11:40	1-							
5	?									11:40	11:53	12:03	1							
5	C5.8																			
6	C2.2					09:41	09:45	09:50	1-											
8	C2.2					10:04	10:12	10:22	1-											
9	C2.9					11:18	11:30	11:50	1+	11:17	11:37	12:17	2+							
9	C2.3					12:35	13:23	13:56	2+											
9	C1.8					15:50	15:55	15:58	1-											
11	C1.7					11:48	11:56	12:05	1-											
11	C1.2					13:55	14:00	14:15	1											
12	C2.3					11:33	11:40	12:12	2											
14	C1.1					09:28	09:43	09:46	1-											
14	C2.3					11:08	11:26	11:43	2											
15	C2.8																			
15	C1.3					10:24	10:30	10:36	1-											
16	C1.9					08:40	08:45	08:50	1-	08:32	08:53	09:05	2							
19	C1.8					09:06	09:20	09:28	1											
20	C2.2					11:03	11:19	11:30	1+											
20	M1.6					11:40	12:00	12:15	2	11:43	11:59	12:17	2	11:42	11:56	12:25	2			
20	?									13:41	13:46	13:50	1-							
20	?																			
20	C3.2					15:00	15:10	15:25	1											
20	C8.5																			
21	C9.2									10:21	10:22	10:51	1+				10:30	10:37	10:50	1
22	M1.9					08:12	08:17	08:24	1-											
22	M1.1																			
22	C3.7									14:29	14:38	15:10	2	14:29	14:35	14:54	1			
22	M1.6									15:10	15:14	15:47	2	15:09	15:13	15:28	1			
22	M3.3																			
23	M1.6																			
25	C1.2									11:28	11:32	11:54	1+							
27	C4.4									12:09	12:19	12:25	1-	12:12	12:15	12:25	1-			
27	C1.7																			
28	C3.0													12:45	12:50	12:57	1-			
28	C2.6																			
29	M3.1																			
29	C3.8													08:57	09:00	09:12	1-			
29	C1.8													11:48	11:54	12:12	1			
29	C5.1									14:43	14:46	15:04	1							
30	C2.3																			
31	C8.8													10:45	11:40	?	-			

VLF flare activity 2005/13.

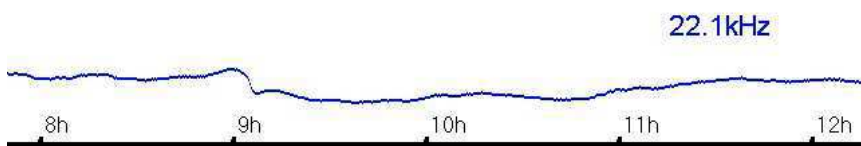


Although SID numbers are down compared to the last two months, levels are still reasonable given the weakness of the current solar cycle. There are no X-class flares in the GOES X-ray data, the largest flare being an M6.4 at 21:58 on the 31st. The 23.4kHz signal from DHO38 took its usual break over the holiday period, switching off at 10UT on the 20th and remaining off for the rest of the month.

December started quietly with a series of SIDs from small C-class flares. Many of these were quite difficult to detect and measure against very variable background signal levels. With the sun at its lowest altitude in the northern hemisphere at this time of year, daytime D-region ionisation can be quite low and unstable. The peak of activity was on the 22nd, with four M-class flares. Roberto Battaïola in Milan recorded all four SIDs:

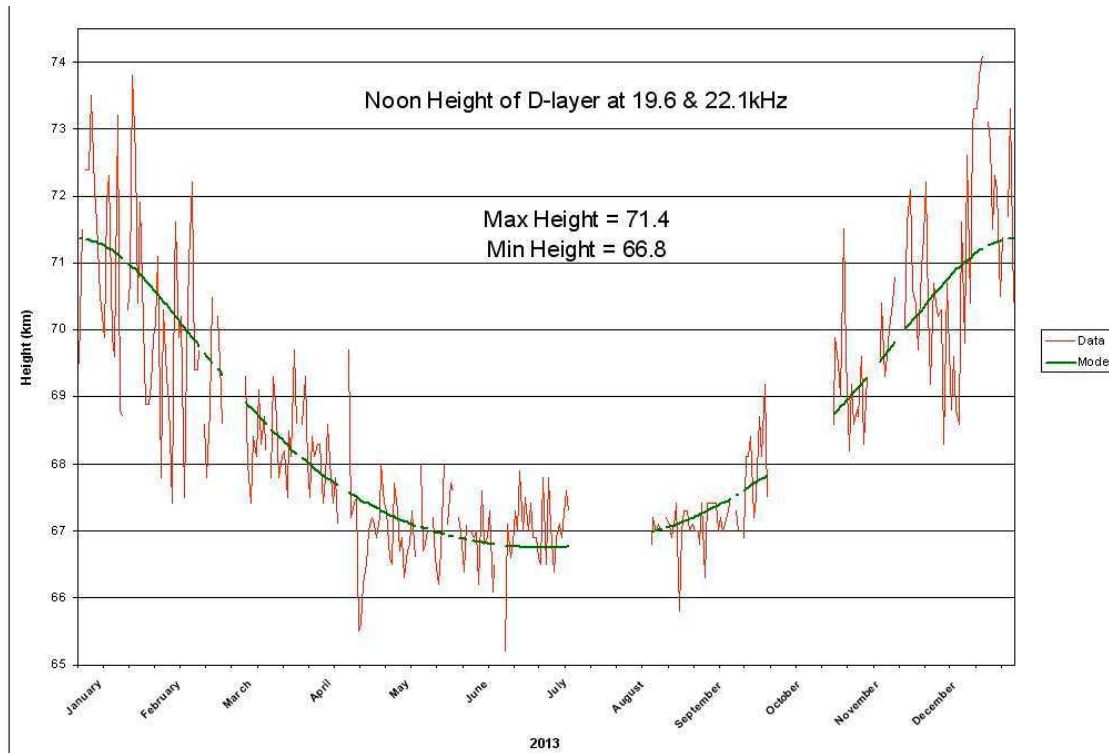
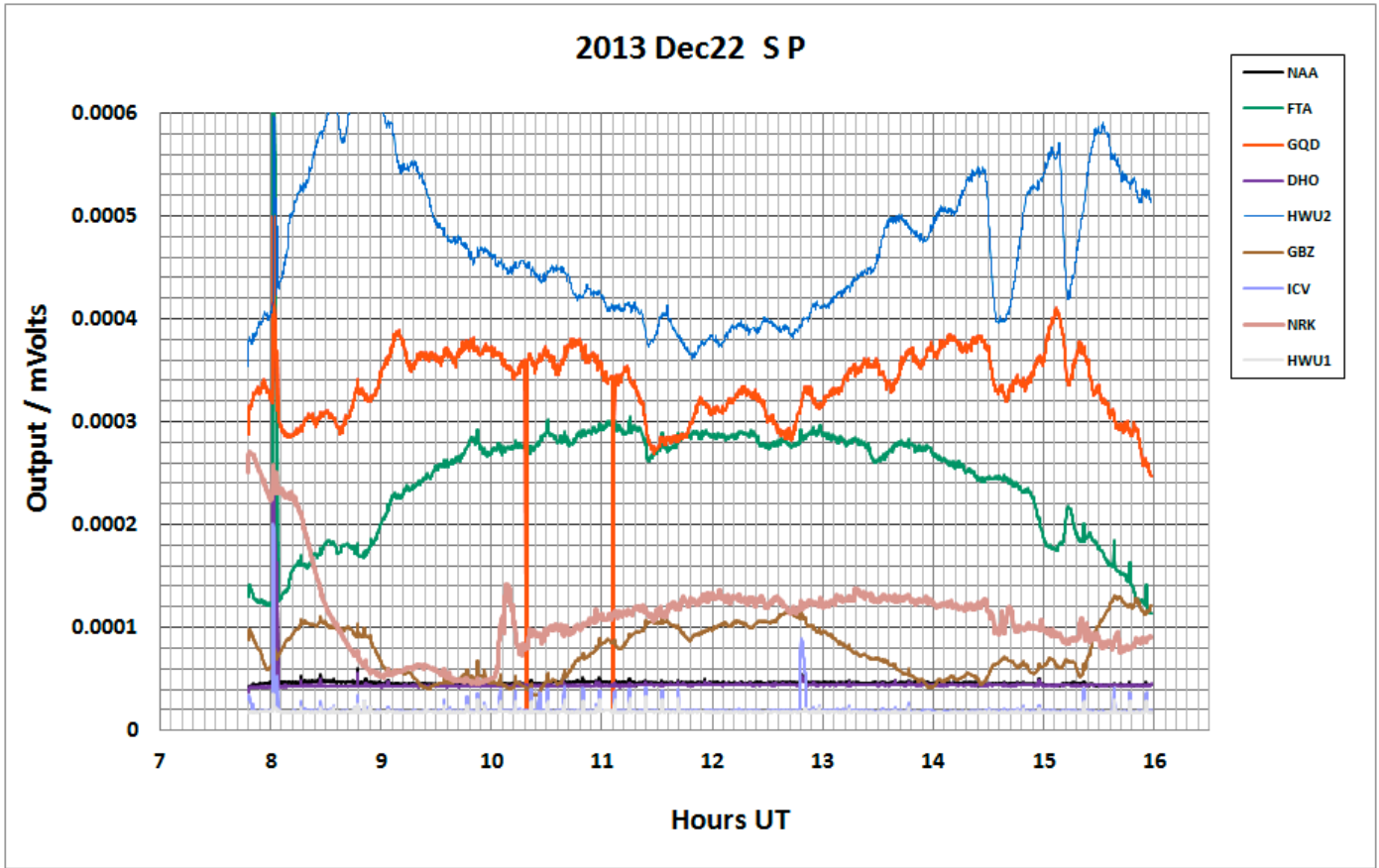


The first two of these flares were produced by AR1928, a large complex sunspot region approaching the western limb of the visible disc. It covered about 15 degrees of longitude, and I counted 23 individual spots when making a disc drawing. The third flare was from AR1934, a much smaller (but growing) region close to the eastern limb in which I counted just 7 spots. AR1928 was also responsible for the last of the SIDs on the 22nd, as well as the M1.6 on the 23rd.



My own recording shows a SID from the M1.6 flare on the 23rd producing a small 'blip' in the morning dip at 22.1kHz.

Here in the UK, SIDs from the M1.9 and M1.1 flares early on the 22nd were a lot harder to record, although the M1.6 and M3.3 flares in the afternoon were well recorded just before local sunset. Steve Parkinson included a chart showing both of these at several frequencies:



Mark Edwards has again provided his annual chart of D-region height at noon over the year.

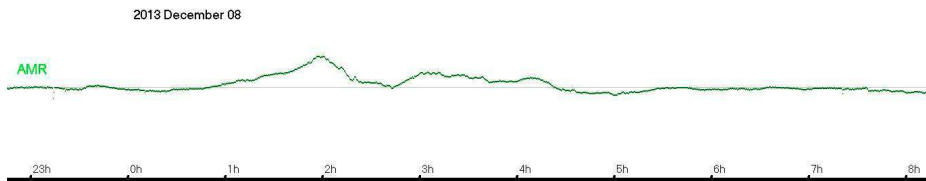
His model fits data recorded at 19.6 and 22.1kHz to provide a smooth curve over the year. A paper describing his model can be found at www.britastro.org/radio/downloads.html. The graph shows the minimum heights derived using a single reflection fit to both frequencies simultaneously. Comparing his results over the last four years:

Year:	2010	2011	2012	2013
Minimum:	67km	67km	66.8km	66.8km
Maximum:	73.6km	71.6km	71.8km	71.4km

To round off 2013, a very slow SID was recorded by some observers on the 31st. With a rise time of over an hour, X-ray flux from the C8.8 flare peaked at 11:50 with a decay lasting until about 14:00UT. I can see no evidence of a SID in my 22.1kHz recording, and Paul Hyde also noted that he had not recorded it. Steve Parkinson saw some disturbance, but was unable to accurately measure it.

MAGNETIC OBSERVATIONS.

Although there were a number of strong flares in December, most were produced from activity close to the solar limb as seen from Earth. CMEs from these flares were directed away from Earth so that very little magnetic activity was observed. A strong disturbance was recorded Early on December 8th.



My own recording (above) shows a peak disturbance of about 90nT at 02UT. This was from a coronal hole high speed stream. CH HSS effects were also responsible for a smaller disturbance around 18 to 20UT on the 14th.

There were no SFEs in December, and although four SSCs are noted in the BGS bulletin, none have been recorded.

ROTATION	KEY:	DISTURBED.	ACTIVE	SFE	B, C, M, X = FLARE MAGNITUDE.	Synodic rotation start (carrington's).																										
2423						2108																										
	F	24 MCC	25 C	26 C	27 MC	28 1	29 2	30 3	31 4	1 5	2 6	3 7	4 8	5 9	6 10	7 11	8 12	9 13	10 14	11 15	12 16	13 17	14 18	15 19	16 20	17 21	18 22					
	F	23 BC	24 MCB	25 C	26	27	28 C	29 C	30 C	31	1	2	3	4	5	6	7	8	9	10	11 BC	12 C	13 CCCC	14 CCCC	15 CCCC	16 CCCC	17 CB	18 B				
2424						2109																										
	F	19 B	20 BBC	21 CCC	22 CCMCC	23 CC	24	25 B	26	27	28 CCCC	29 CCCC	30 CB	31 C	1 C	2	3	4	5	6	7	8	9 C	10 C	11 C	12 C	13 CCCC	14 CCCC	15 CCCC	16 CCCC	17 CB	18 B
2425						2110																										
	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	12	13	14	15
	F	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	8	9	10	11
2426						2111																										
	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	5	6	7	8
	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	1	2	3	4
2427						2112																										
	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	24	25	26	27
	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	24	25	26	27
2428						2113																										
	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	30	31
	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	30	31
2429						2114																										
	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	24	25	26	27
	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	24	25	26	27
2430						2115																										
	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	21	22	23	24
	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	21	22	23	24
2431						2116																										
	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	21	22	23	24
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2432						2117																										
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	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	21	22	23	24

