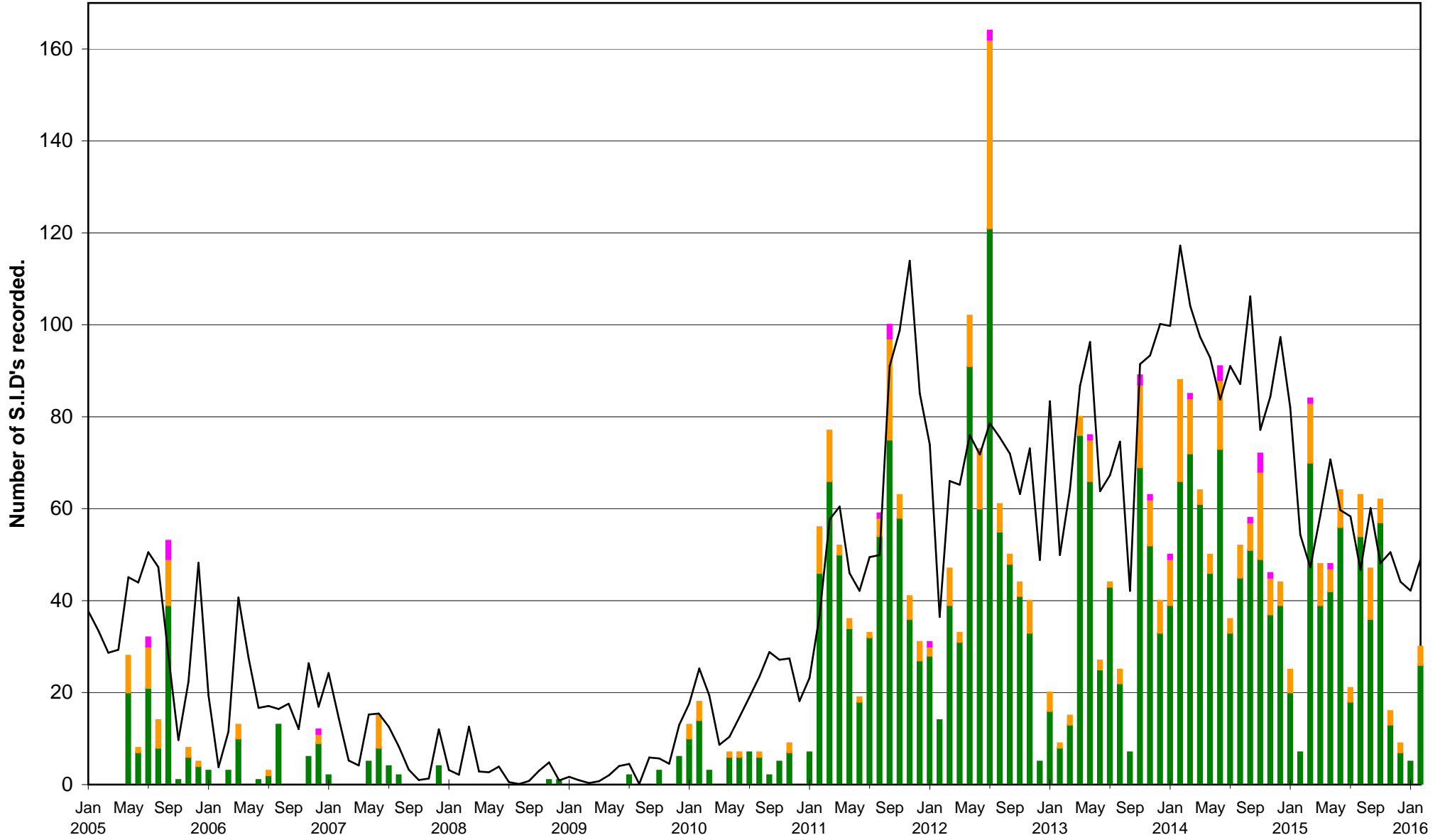


BAA Radio Astronomy Group.

2016 FEBRUARY

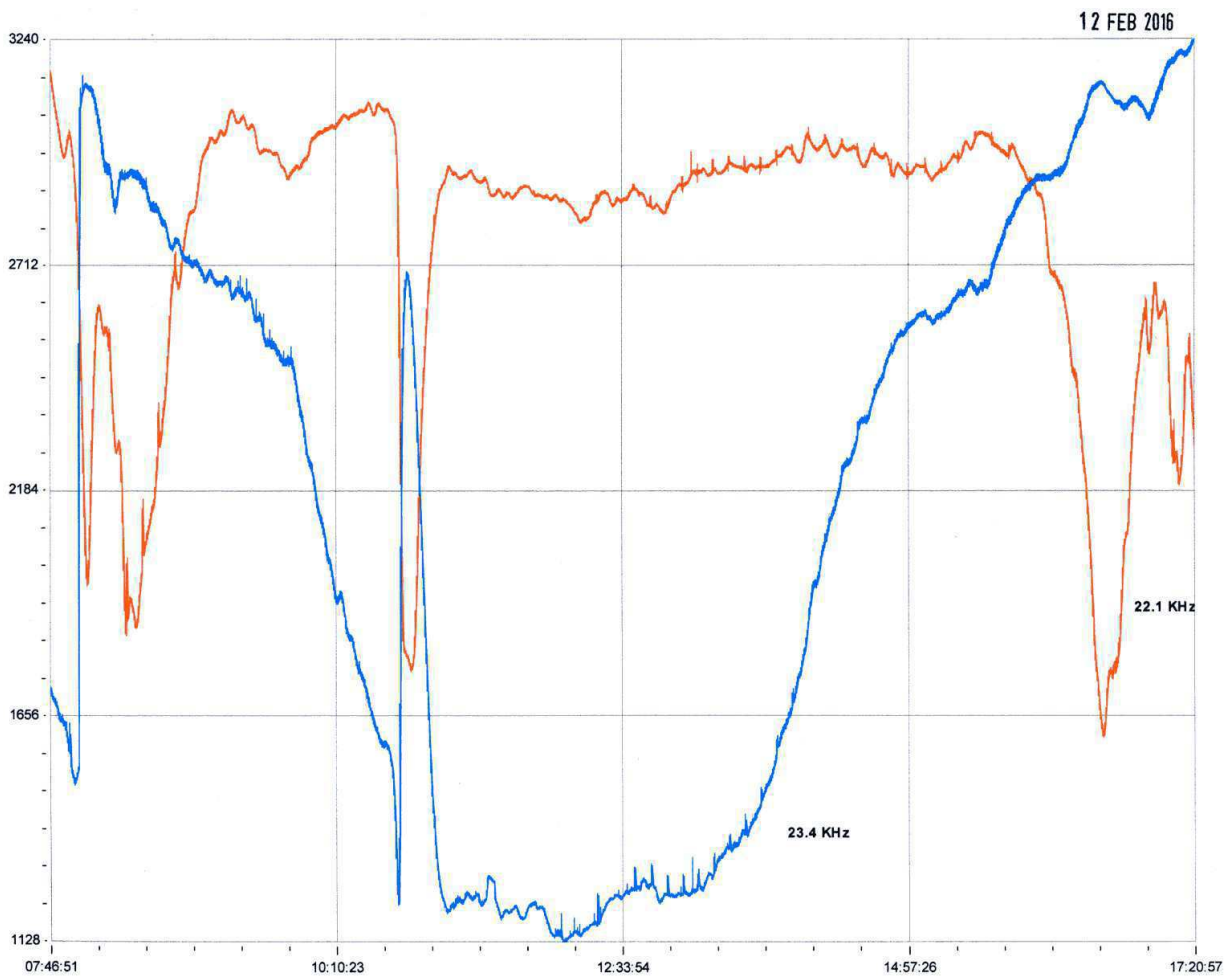
DAY	Xray class	Observers	John Cook (23.4kHz/22.1kHz)	Roberto Battaiola (18.3kHz)	Paul Hyde (22.1/23.4kHz)	Mark Edwards (20.9/24.0/18.3kHz)	Colin Clements (23.4kHz/22.1kHz)
			Tuned radio frequency receiver, 0.58m frame aerial.	Modified AAVSO receiver.	Tuned radio frequency receiver, 0.96m frame aerial.	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)
2	?	1				14:27 14:37 14:53 1+	
3	C1.0	1				14:53 14:54 14:55 1-	
3	C1.8	1				15:18 15:20 15:34 1-	
4	C2.4	6	12:19 12:22 12:29 1-	12:17 12:21 12:29 1-		12:20 12:22 12:29 1-	12:16 12:21 12:37 1
4	?	4		14:35 14:41 14:47 1-		14:37 14:43 14:47 1-	
4	C3.6	2				16:49 16:51 16:54 1-	
4	C5.1	1				18:19 18:25 18:34 1-	
7	C2.7	3	11:58 12:05 12:26 1+	11:53 12:01 12:31 2			11:50 12:00 12:20 1+
10	C1.3	2		15:14 15:18 15:23 1-		15:17 15:20 15:31 1-	
12	M1.0	6	10:40 10:47 11:17 2	10:37 10:48 11:17 2		10:41 10:48 11:05 1	10:40 10:46 11:05 1
12	?	1				12:15 12:18 12:24 1-	
12	C6.8	1				17:14 17:21 17:36 1	
13	C2.8	5	10:07 10:09 10:18 1-			10:07 10:10 10:19 1-	10:05 10:09 10:17 1-
13	M1.8	5	15:20 15:25 15:43 1	15:18 15:21 15:24 1-		15:19 15:25 16:16 2+	
14	C6.9	6	10:20 10:26 10:45 1	10:15 10:28 10:56 2		10:20 10:23 10:38 1-	10:18 10:24 10:38 1
14	C1.4	3		11:55 12:00 12:12 1-		11:56 11:58 12:06 1-	
14	M1.0	1				19:22 19:27 19:36 1-	
15	C5.2	4	08:37 08:41 08:54 1-	08:32 08:41 08:44 1-		08:37 08:43 08:57 1	
15	C2.3	3	09:31 09:35 09:46 1-			09:31 09:38 09:49 1-	
15	?	3	10:45 10:49 10:53 1-			10:45 10:49 ? -	
15	M1.1	6	10:55 11:02 11:25 1+	10:43 11:02 11:43 2+		10:56 11:01 11:30 2	10:54 11:00 11:33 2
15	*	1				13:04 13:11 ? -	
15	?	1				14:15 14:17 14:23 1-	
15	?	4	14:43 14:48 15:24 2			14:42 14:49 ? -	14:40 14:46 15:24 2
15	?	1				14:52 14:54 ? -	
15	C3.3	2				15:03 15:05 15:18 1-	
15	C2.5	1				17:18 17:24 17:28 1-	
15	C4.2	1				17:51 17:51 17:55 1-	
16	?	1				13:39 13:44 13:46 1-	
16	C1.9	2		13:47 13:55 14:01 1-		13:51 13:52 14:02 1-	
16	?	1				14:06 14:08 14:11 1-	
16	?	2		15:33 15:37 15:43 1-		15:33 15:36 ? -	
16	C2.1	1				15:46 15:48 15:58 1-	
17	C1.7	1				08:42 08:45 08:48 1-	
17	C2.0	2		09:57 10:05 10:20 1		09:58 10:05 10:09 1-	
17	C1.0	2		11:03 11:08 11:15 1-		11:02 11:07 11:10 1-	
17	C1.2	2		11:33 11:39 11:47 1-		11:33 11:36 11:41 1-	
17	C1.3	2		12:32 12:42 12:58 1+		12:30 12:42 12:53 1	
19	C1.4	1				08:52 09:04 09:15 1	
24	C1.4	4	12:26 12:28 12:32 1-	12:26 12:30 12:36 1-		12:27 12:30 12:38 1-	
26	C1.0	1	09:46 09:50 09:54 1-				

VLF flare activity 2005/16.



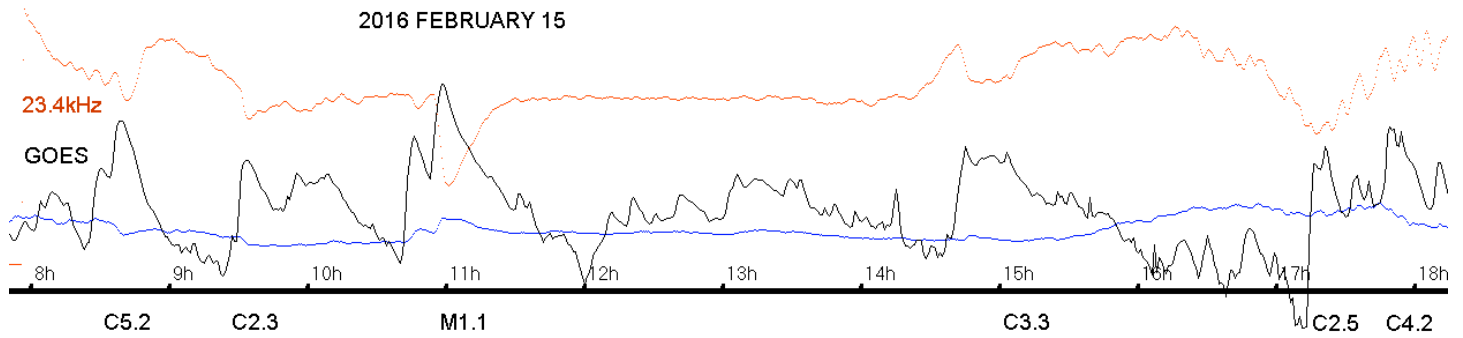
A short burst of activity mid-month has increased the SID count compared to recent months. Increasing day length has also enabled us to record more of the activity. At the start of February, the background X-ray flux level was around the B2 level. This started to rise on the 11th as AR12497 crossed the central meridian and started flaring. This region was responsible for all of the major flares over the following seven days until it rotated out of view. The background X-ray flux ended the month at B1 level. There were no X-class flares in the GOES record.

The first major flare was the M1.0 on the 12th, shown in this recording by Colin Clements:



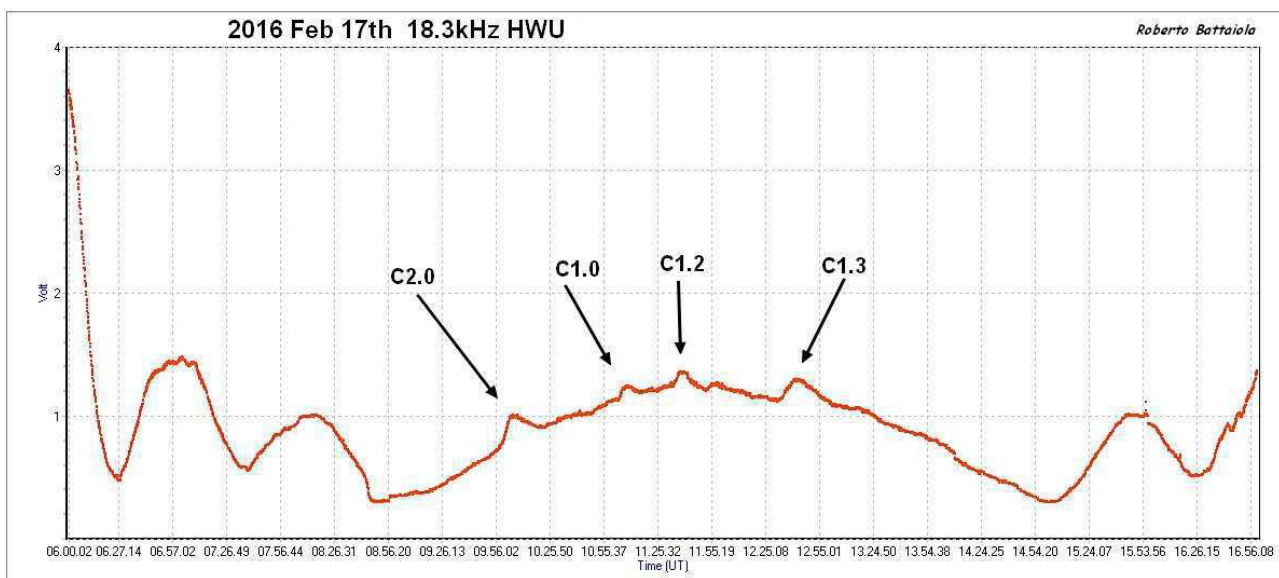
The shape of the 23.4kHz trace (blue) is unusual before the SID, falling slowly in amplitude after the usual early morning break at 07 to 08UT. The SID appears to be of the spike and wave type, but the signal remains at a very low level after the flare. After about 13:00UT the signal rises slowly through the afternoon back to its original level by sunset. The signal at 22.1kHz (red) shows a more normal diurnal curve, and a good SID for the M1.0 flare.

The 15th was the busiest day of the month, with a total of 11 SIDs reported. The M1.1 flare at 11:02 had a smaller peak just before the main peak, producing a separate SID for some observers. The C3.3 flare in the afternoon had a very flat top, with three minor peaks. These show clearly in the GOES X-ray data that I have added to my own recording:



The 23.4kHz signal had already started to rise before the flare, but still responded with a SID. This also has flat extended peak making the time of maximum effect difficult to measure. The 22.1kHz signal (blue) has hardly responded, with a very minor SID at the first peak of the flare.

A series of much smaller flares on the 17th were recorded by Roberto Battaola in Milan:



The series of four SIDs show clearly against a smooth diurnal curve, whereas my own recording showed a very noisy background.

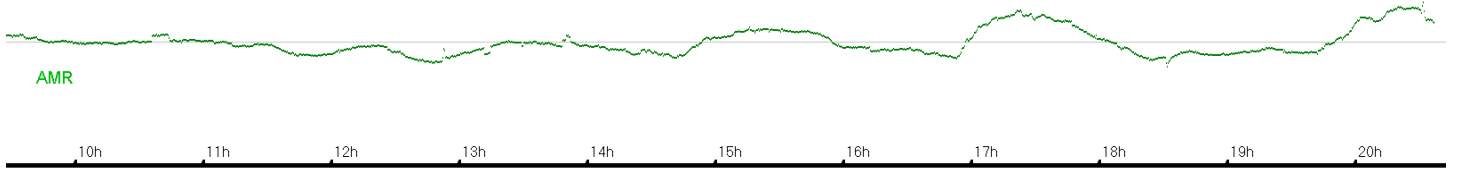
These were amongst the last few flares seen from AR12497 as it rotated out of view. Just three more SIDs were recorded in the remainder of the month, all fairly small.

MAGNETIC OBSERVATIONS.

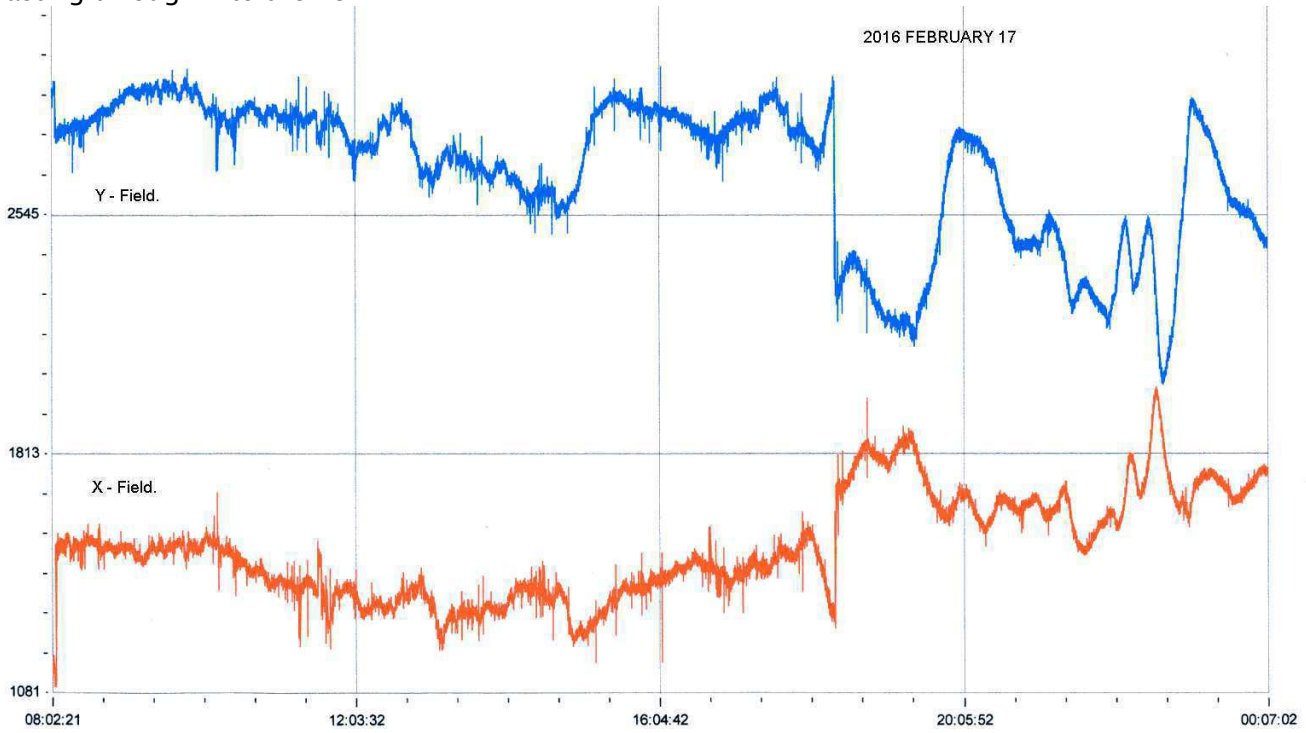
Despite the flaring activity there were no major Earth-directed CMEs in February. A large coronal hole developed near the solar south pole, which had stretched nearly to the equator by the 14th. The solar wind speed measured by the ACE satellite rose from 400km/s to 700km/s during the 16th, remaining high for several days. It had fallen back to 340km/s by the 21st. This CHSS led to some strong magnetic activity from the 16th to 18th. By the 24th a further large coronal hole had opened near the solar north pole. This one did not stretch quite as far towards the equator, and had much less effect on the terrestrial magnetic field.

My own recording from the 16th shows a disturbance starting at about 11:30UT, reaching a peak of 110nT by 17:30UT:

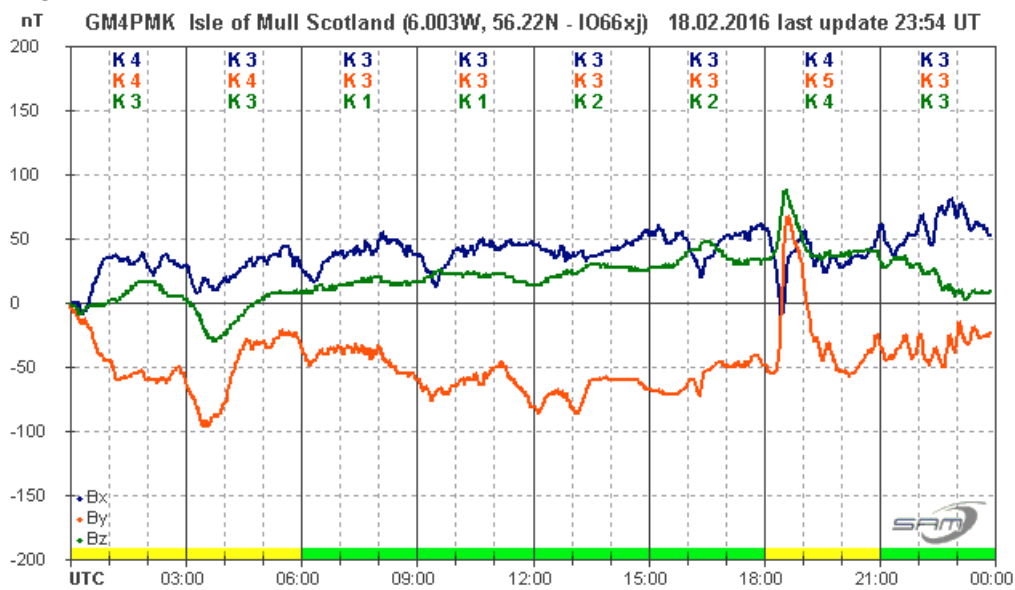
2016 FEBRUARY 16



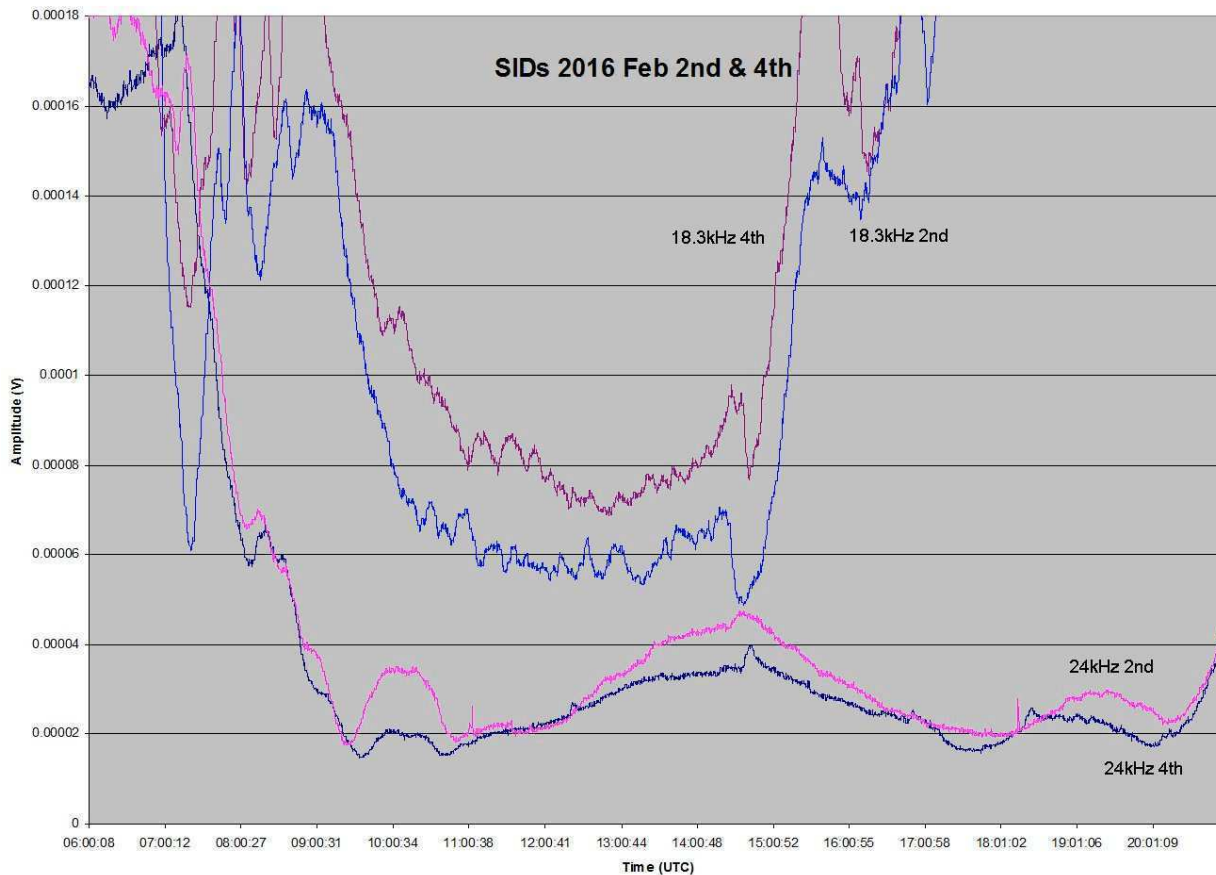
The recording from the 17th by Colin Clements shows the disturbance starting again around 15UT, and lasting through into the 18th:



It continued through the 18th, as shown in the recording by Roger Blackwell using his 3-axis magnetometer:



Mark Edwards reported a strange SID-like feature on February 2nd, although with a timing that was not consistent with a C1.2 flare occurring a little later:



The chart shows data from the 2nd and 4th, comparing the genuine SID at 14:43UT on the 4th with the event at 14:37 on the 2nd. The flare on the 4th was not included in the SWPC lists, but registered C2.1 in the GOES data. The C1.2 flare on the 2nd is listed peaking at 14:52. There may be a magnetic influence to this event as the ACE satellite recorded quite a sudden increase in solar wind speed at the time, along with a drop in solar wind density. Adding to the complexity, there was also a rapid transient in the 47–580keV proton flux at the same time. The SID that Mark has recorded may well be a combination of X-ray and solar wind effects on the ionosphere.

There were some short disturbances to the magnetic field from the northerly coronal hole, although very minor in duration and magnitude compared to those over the 16th to 19th.

There were no SFEs recorded in February.

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

BARTELS DIAGRAM

ROTATION	KEY:	DISTURBED.	ACTIVE	SFE	B, C, M, X = FLARE MAGNITUDE.	Synodic rotation start (carrington's).
2454	F	10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	2138	20 21 22 23 24 25 26 27 28 29 30 31	2013 July	1 2 3 4 5 6
2455	F	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	2139	18 19 20 21 22 23 24 25 26 27 28 29 30 31	2013 August	1 2
2456	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	2140	14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29		
2457	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	2013 September			
2458	F	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 22	2142	8 9 10 11 12 13 14 15 16 17 18 19 20 21 22	2013 October	
2459	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	2143	9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	2013 November	
2460	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	2144	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	2013 December	
2461	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	2145	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	2014 January	
2462	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	2146	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	2014 February	
2463	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 4 5 6	2147	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	2014 March	
2464	F	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	2148	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	
2465	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	2149	11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29		
2466	F	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	2150	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 May	
2467	F	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	2152	2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22	2014 June	
2468	F	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 18 19	2153	29 30 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19	2014 July	
2469	F	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	2154	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	2014 August	
2470	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	2155	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	2014 September	
2471	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	2156	18 19 20 21 22 23 24 25 26 27 28 29 30 1 2 3 4 5 6 7 8	2014 October	
2472	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	2157	16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 1 2 3 4	2014 November	
2473	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	2158	15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 1		
2474	F	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	2159	9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	2014 December	
2475	F	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	2160	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	2015 January	
2476	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	2161	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	2015 February	
2477	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 17 18 19	2162	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 28 29 30 31	2015 March	
2478	F	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	2163	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	2015 April	
2479	F	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 11 12	2164	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	2015 May	
2480	F	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	2165	22 23 24 25 26 27 28 29 30 31 1 2 3 4 5 6 7 8	2015 June	
2481	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	2166	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 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	2015 July	
2482	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 31 1	2167	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		
2483	F	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	2168	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 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	2015 August	
2484	F	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	2169	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 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	2015 September	
2485	F	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	2170	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 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	2015 October	
2486	F	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	2171	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 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	2015 November	
2487	F	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	2172	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 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 25 26 27 28 29 30 31	2015 December	
2488	F	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	2173	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 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 25 26 27 28 29 30 31	2016 January	
2489	F	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	2174	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 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	2016 February	
2490	F	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	2175	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	2016 March	