

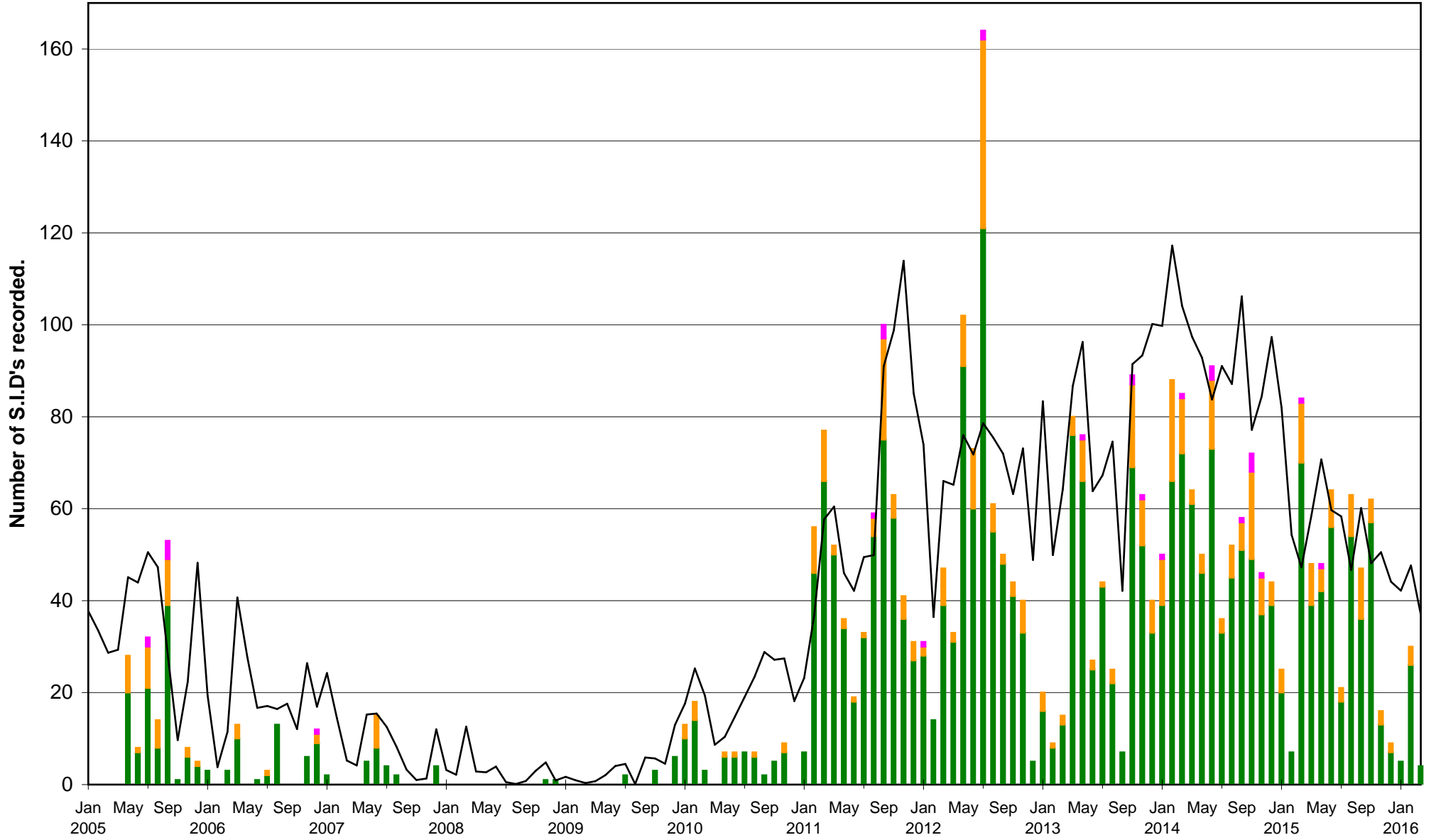
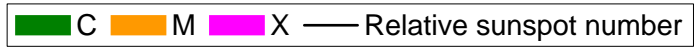
**BAA Radio Astronomy Group.**

**2016 MARCH**

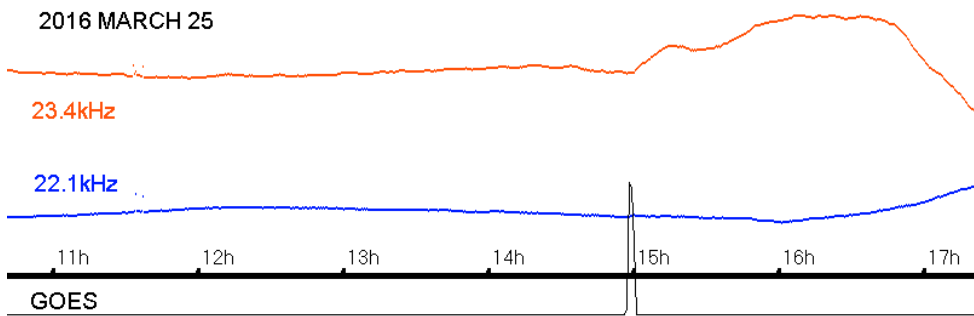
DAY	Xray class	Observers	John Cook (23.4kHz/22.1kHz)	Roberto Battaiola (20.9kHz)	Paul Hyde (22.1/23.4kHz)	Mark Edwards (20.9/24.0/19.6kHz)	Colin Clements (23.4kHz/22.1kHz)
			Tuned radio frequency receiver, 0.58m frame aerial.	Modified AAVSO receiver.	Tuned radio frequency receiver, 0.96m frame aerial.	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)
8	C1.5	5	13:05 13:08 ? -	13:04 13:09 13:22 1-		13:05 13:08 ? -	13:02 13:04 13:16 1-
8	B8.4	2	13:10 13:13 13:21 1-			13:12 13:13 13:24 1-	
9	C3.3	5	12:40 12:51 13:11 1+	12:38 12:53 13:26 2+		12:40 12:52 13:22 2	12:36 12:48 13:29 2+
15	C1.2	3	09:27 09:29 09:41 1-			09:27 09:33 09:37 1-	09:29 09:38 10:21 2+
15	C1.0	3		15:33 15:38 15:40 1-		15:36 15:40 15:57 1	15:31 15:36 16:07 2
25	B6.5	2	14:58 15:00 15:06 1-			14:58 15:01 15:03 1-	
27	B4.2	1					12:08 12:21 13:20 2+
27	B4.8	2	16:38 16:40 16:45 1-			16:38 16:39 16:43 1-	

DAY	Xray class	Observers	Steve Parkinson (Various)	John Wardle (19.6/23.4kHz)	Phil Rourke (23.4kHz)	Jim Barber	John Elliott (18.3kHz)
			Tuned radio frequency receiver, frame aerals.	PC soundcard, 0.7m frame aerial.	Spectrum Lab, 0.6m frame aerial.	Spectrum Lab, 0.6m frame aerial.	Tuned radio frequency receiver, 0.5m frame aerial.
			START PEAK END (UT)	START PEAK END (UT)	START PEAK END (UT)	START PEAK END (UT)	START PEAK END (UT)
8	C1.5		13:05 13:07 13:25 1				
8	B8.4						
9	C3.3		12:40 12:51 13:22 2				
15	C1.2						
15	C1.0						
25	B6.5						
27	B4.2						
27	B4.8						

# VLF flare activity 2005/16.



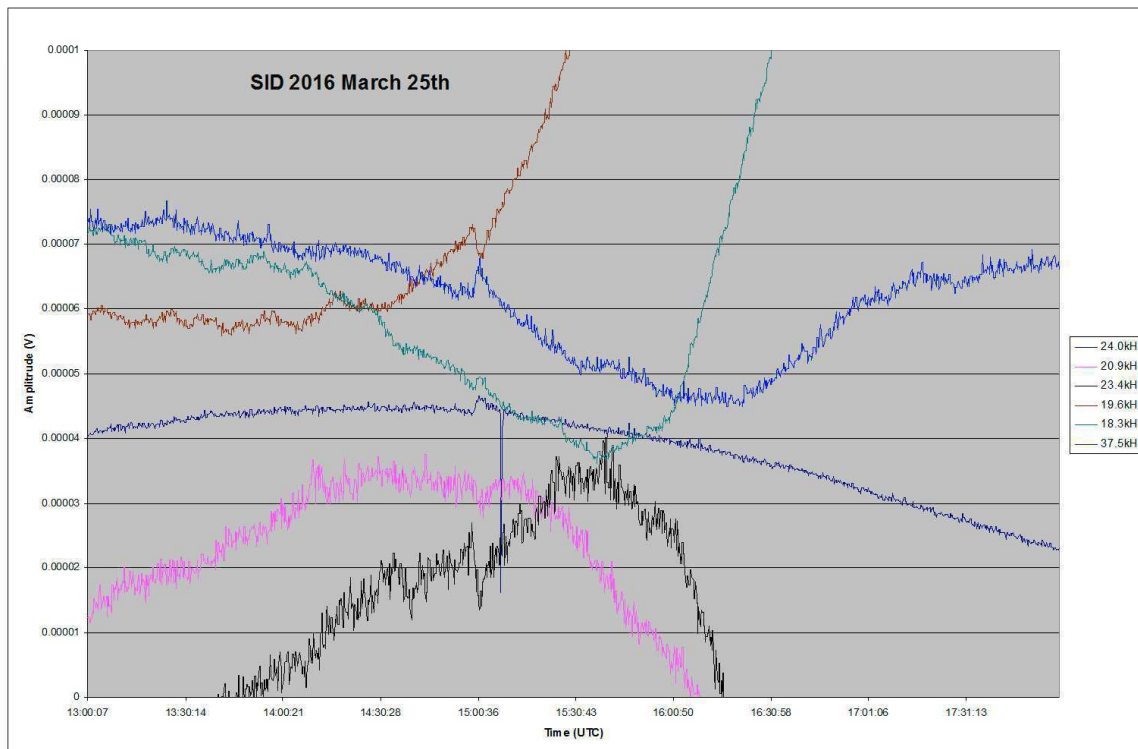
The most noticeable feature of the eight SIDs recorded this month is their small magnitudes; from four C-class and four B-class flares. The higher altitude of the Sun in March helps to concentrate the X-ray and UV over a smaller area of the ionosphere, so helping to create more distinct SIDs, but there is also a possible problem involved in assigning magnitudes to flares due to sampling rates. I use the GOES15 data files and SWPC weekly bulletins to obtain this data, but the X-ray magnitude is given at one minute intervals. The B6.5 flare on the 25<sup>th</sup> may show the problem as it was a very rapid event. I have added the GOES data to my own recording:



GOES15 (0.1–0.8nm) data is as follows:

- 14:58 B1.7
- 14:59 B5.5
- 15:00 B6.5
- 15:01 B4.0
- 15:02 B2.4
- 15:03 B1.6

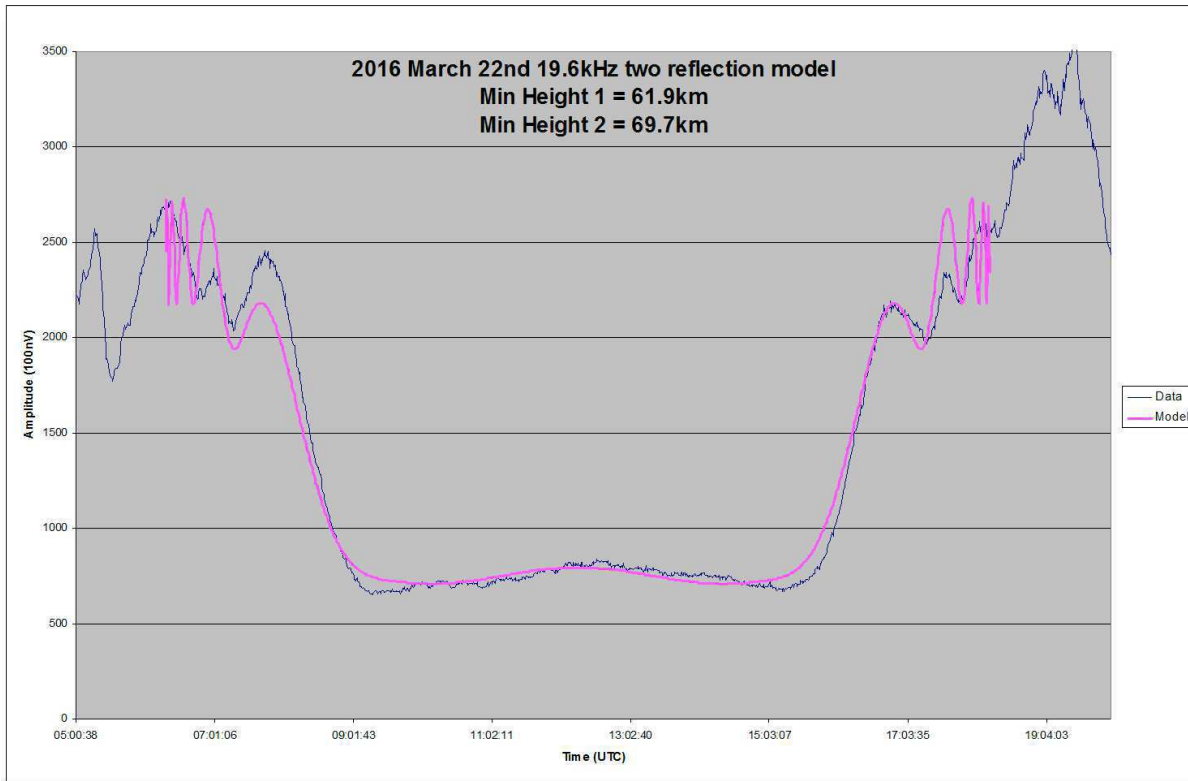
The background level was around B1 during most of the day.



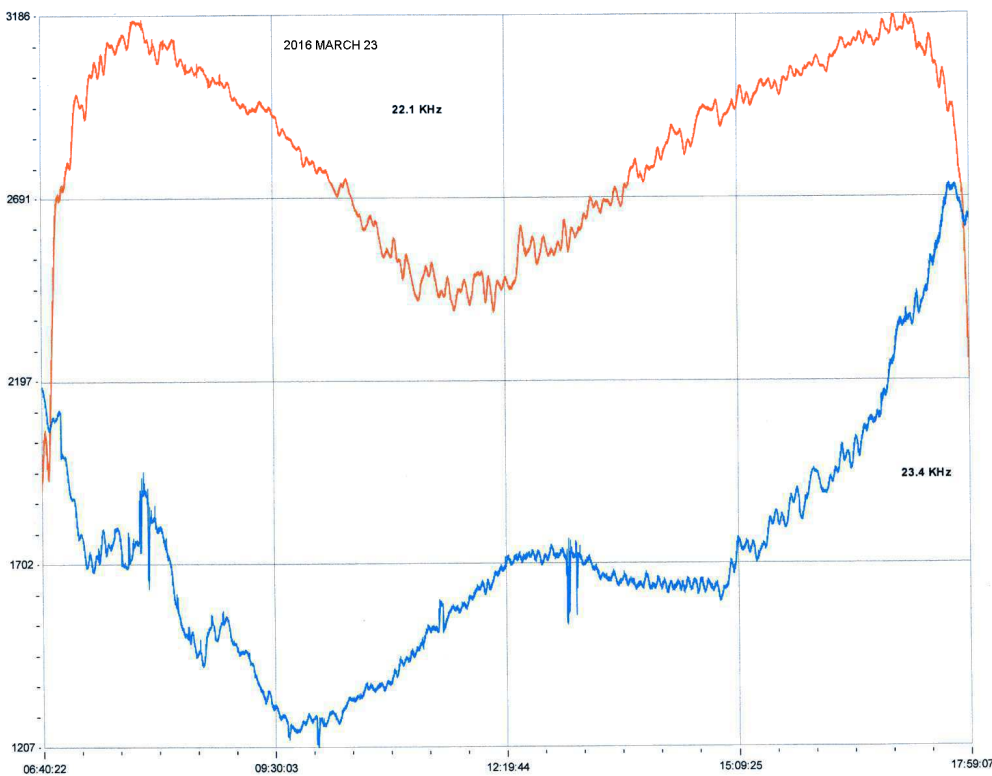
This chart is from Mark Edwards, showing well defined SIDs at six frequencies, emphasising the reality of the flare. Using his modelling software, Mark estimates that the flare must have peaked nearer to the C2 level to produce this level of ionospheric disturbance.

Mark gave a presentation at the 2011 RAG meeting in Leicester about this modelling. His paper on the subject can still be found on the RAG website at [www.britastro.org/radio/downloads/ModellingSIDs.pdf](http://www.britastro.org/radio/downloads/ModellingSIDs.pdf).

The generally calm conditions have allowed Mark to hone the software, producing a very accurate model for the 22<sup>nd</sup>:



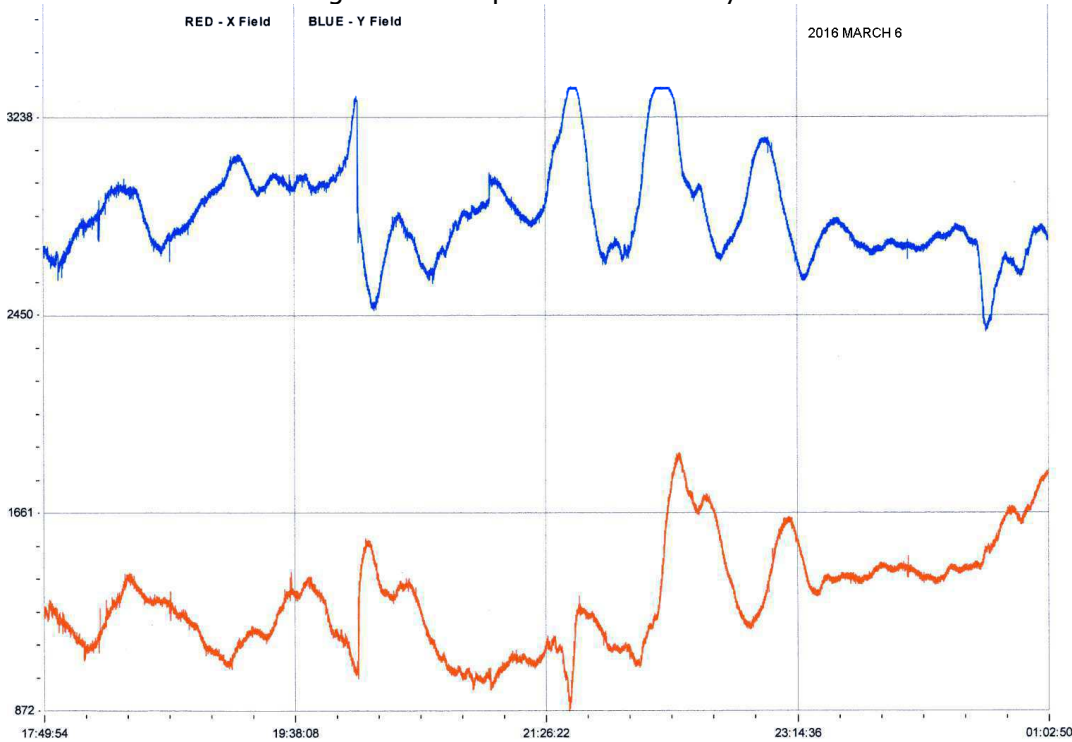
Apart from the larger amplitude variations before sunrise and after sunset, the model output (magenta trace) very accurately follows the received signal at 19.6kHz, based on two reflections from the ionosphere.



In contrast to these calm conditions, Colin Clements recorded rather noisy signals on several occasions in March. The chart on the previous page is his recording from the 23<sup>rd</sup>. From Lisburn, the path at 22.1kHz lies over the Irish Sea, compared to Mark's path over Central England.

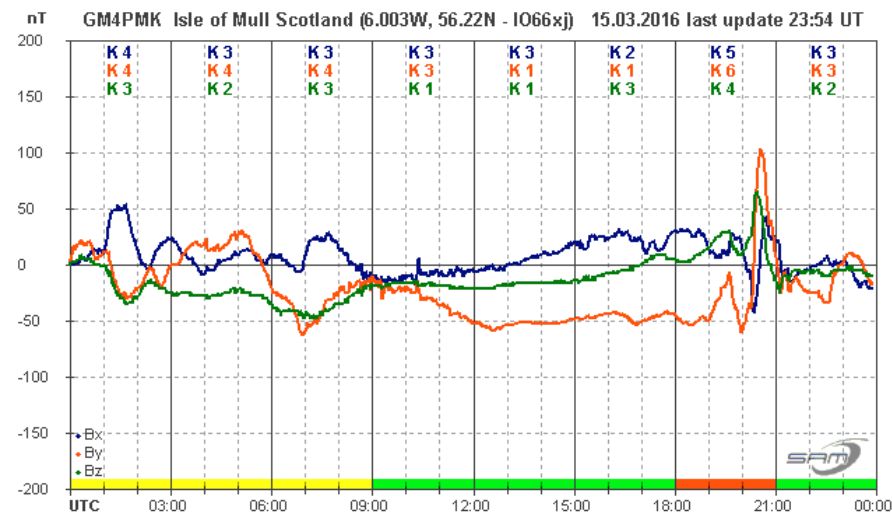
### MAGNETIC OBSERVATIONS.

All of the magnetic activity in March was from Coronal Hole High Speed Streams. At the start of the month a small hole opened crossing the solar equator, allowing the high speed wind to flow directly towards the Earth. This CHSS hit the Earth's magnetosphere on the 6<sup>th</sup>, with some strong activity lasting into the 7<sup>th</sup>. Colin Clements' recording shows the peak of the activity:



My own magnetometer recorded a shift of about 220nT, while Roger Blackwell (Mull) recorded a shift of about 280nT. His chart also suggests an SSC at about 11:30UT on the 6<sup>th</sup>.

Further CHSS activity resulted in a disturbed period on the 15<sup>th</sup> and 16<sup>th</sup> recorded by Roger Blackwell:



Magnetic observations received from Colin Clements, Roger Blackwell, 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				2013 July
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				2013 August
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				
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				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				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				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				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				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				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				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				
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				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				2014 June
2468	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 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				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				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				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				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				
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				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				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				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				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				2015 April
2479	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				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				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				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				
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				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				2015 September
2485	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				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				2015 November
2487	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 14				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				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				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				2016 March
2491	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				