Founded in 1890

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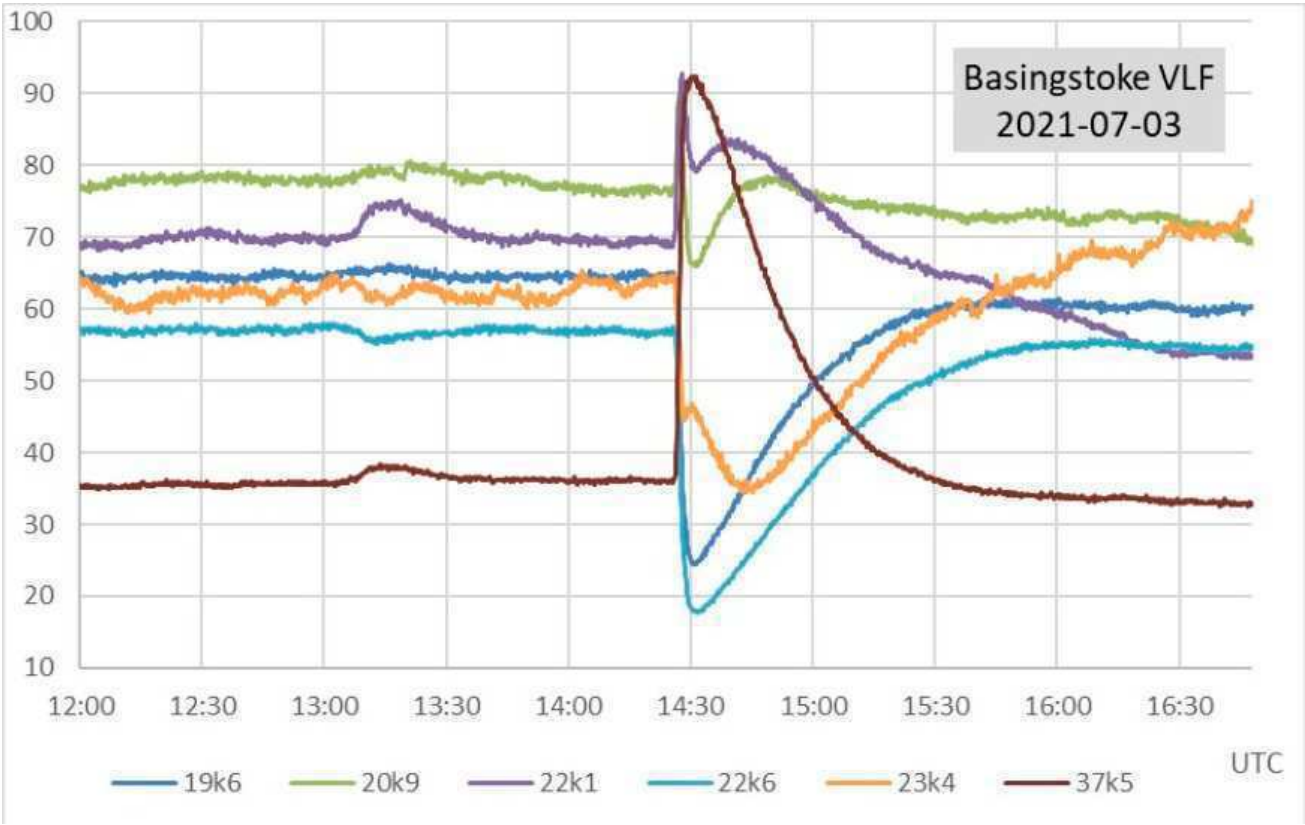
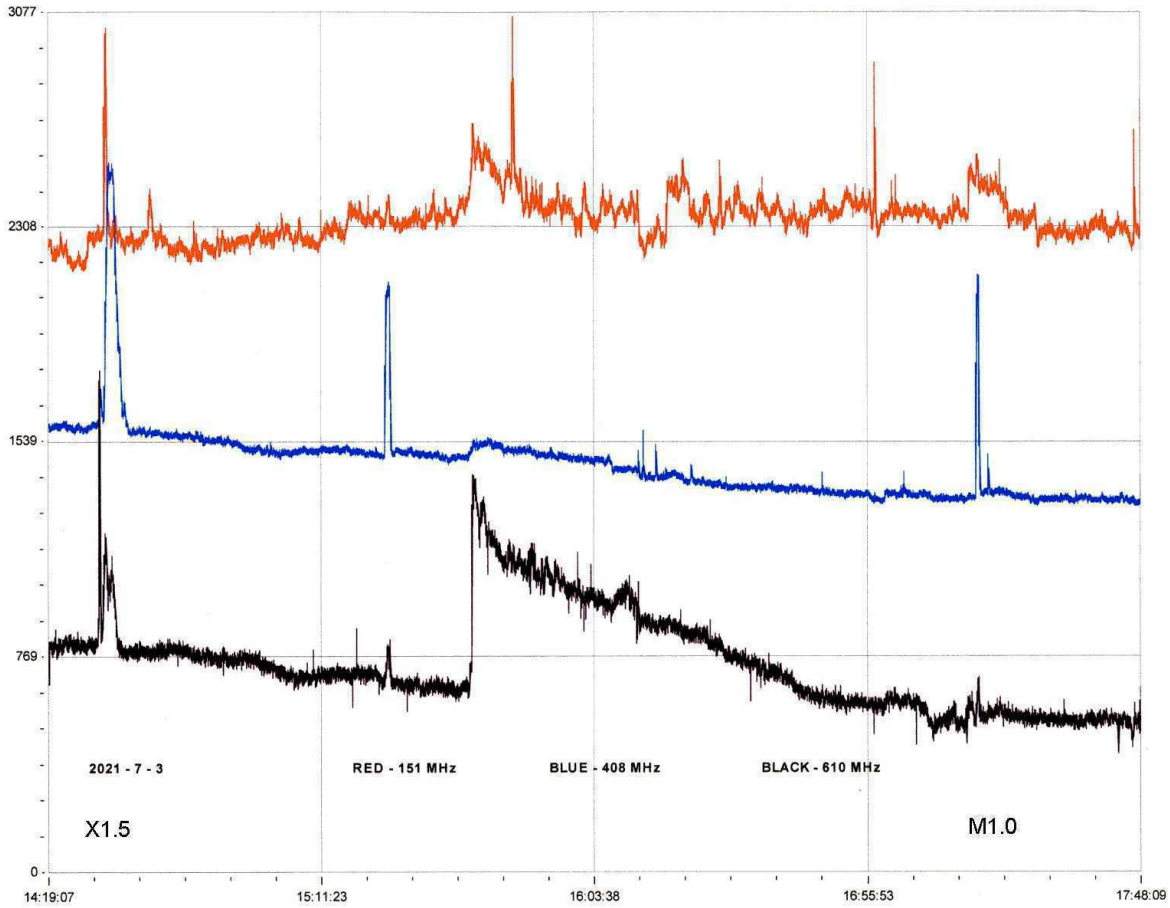
BAA Radio Astronomy Section. 2021 JULY.

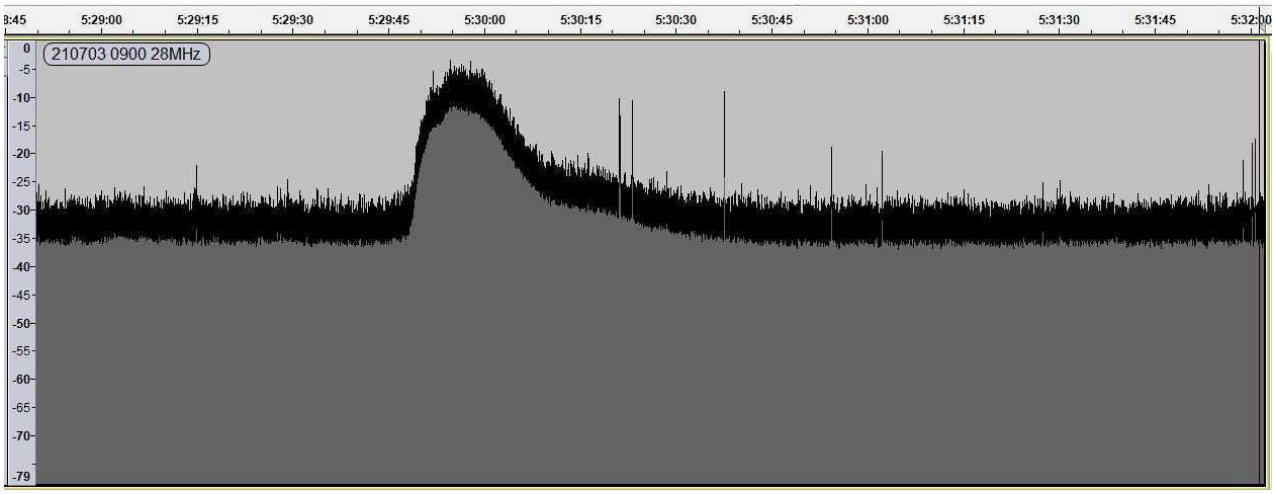
July started with a 'bang' as the first X-class flare of solar cycle 25 was recorded on the 3rd. Active region AR12838 was right on the North Western limb of the sun when the flare occurred, and was responsible for all of the activity that we recorded on the 3rd.



This recording by Paul Hyde shows a variety of SID profiles from the flare. The 37.5kHz SID is a conventional rising 'shark's fin', while the SID at 22.6kHz is inverted. The 23.4kHz signal shows a mild 'spike and wave' pattern as the phase shift between ground and sky waves moves from cancelling to adding and back again. 22.1kHz shows an inverted version of the 'spike and wave'. What is clear from them all is the very rapid rise time of the disturbance. The earlier C1.9 flare is just visible around 13:10-13:30UT.

Radio noise was also recorded at 151MHz, 408MHz and 610MHz by Colin Clements, and at 28MHz by Colin Briden as shown in the charts on the next page:

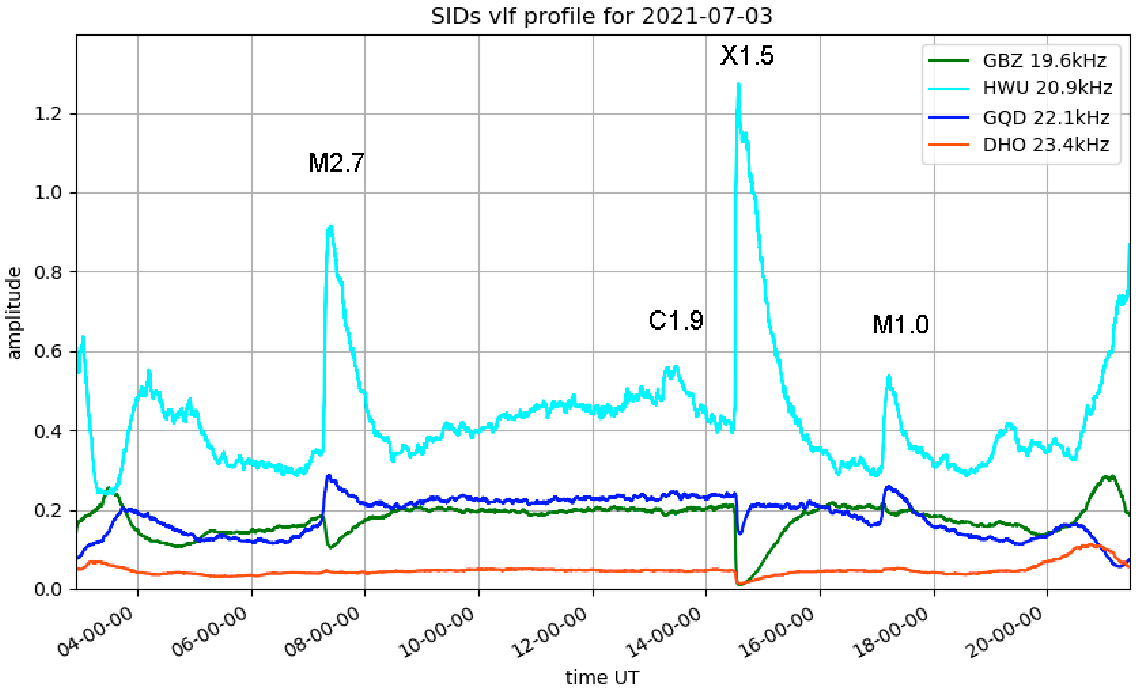




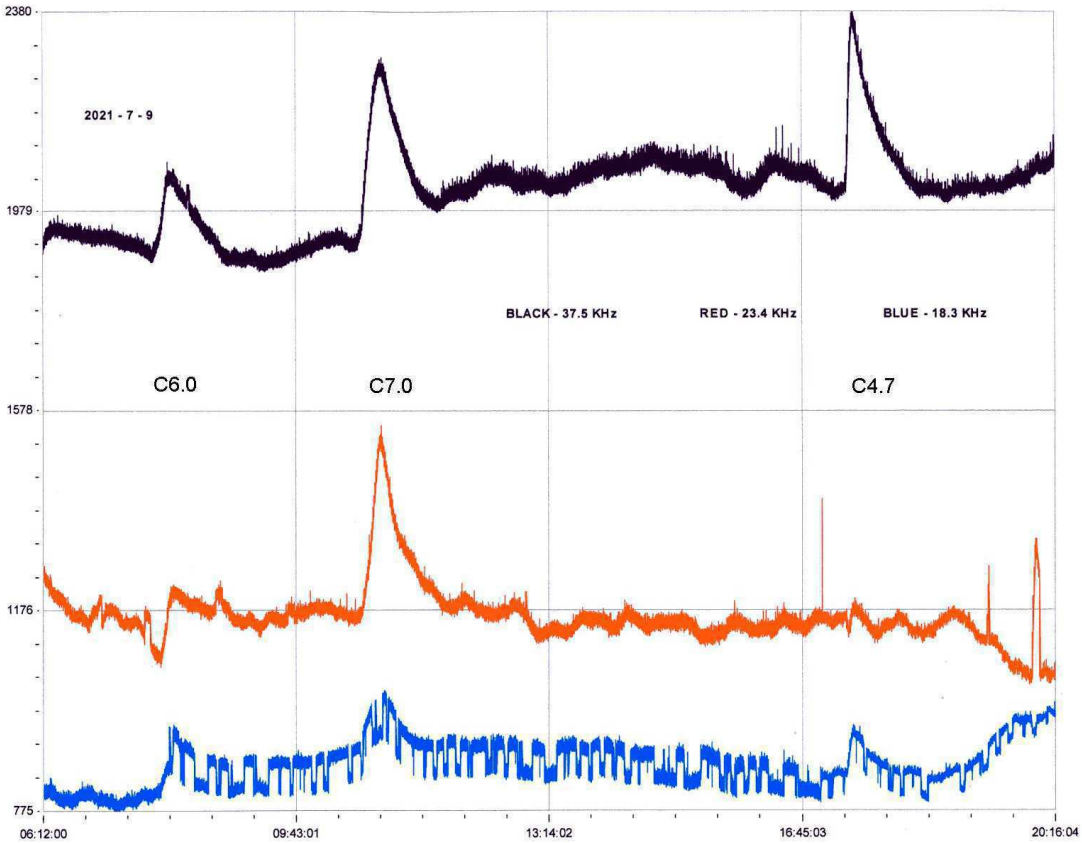
In Colin Clements' recording, 610MHz (black trace) shows a strong spike at the peak of the X1.5 flare, followed at about 15:32 by a sharp rise and long decay in signal strength. The X1.5 shows at all three frequencies, but the later M1.0 flare is only really strong at 408MHz (blue trace).

Colin Bridens' recording shows the 28MHz signal at the time of the X1.5 flare, lasting about 55 seconds before settling at its pre-flare level. The grey band is the signal average, the black band showing signal strength peaks.

The recording from Mark Prescott shows the full day's activity, starting with the M2.7 flare peaking at around 07:20UT. The C1.9 flare shows best at 20.9kHz, despite the noisy signal. The M1.0 flare is also clearly shown, although for some reason 23.4kHz has responded rather weakly to all of the events.

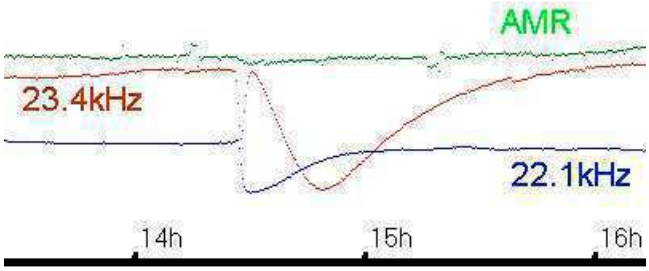


There was another M1.5 flare early on the 4th, after which the sun remained fairly quiet until the 9th when we recorded more strong C-class flares. Colin Clements' recording shows the three stronger events:

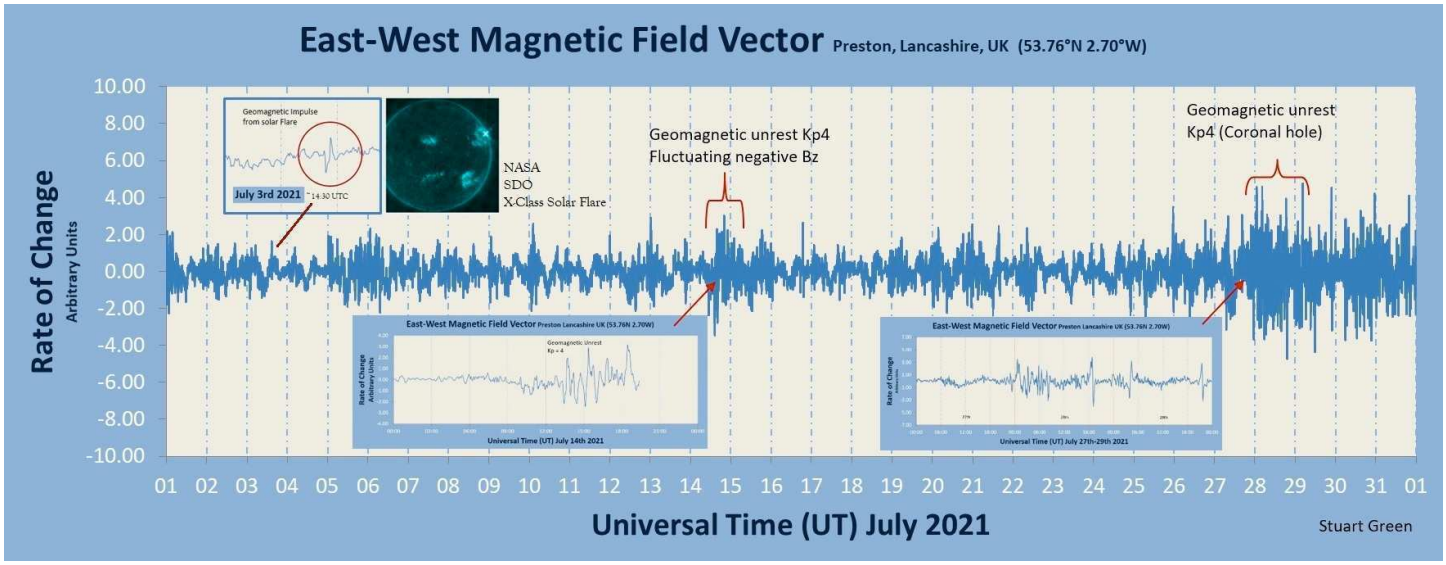


23.4kHz again shows some strange behaviour, with the C6 flare barely visible while the C7 flare produced a clear SID. The later C4.7 flare is also hidden in the noise. There is strong local interference at 18.3kHz, but the SIDs can still be seen. Colin also recorded some VHF activity with these flares. The rest of the month was much quieter with mostly B-class flares, the majority far too weak for us to record.

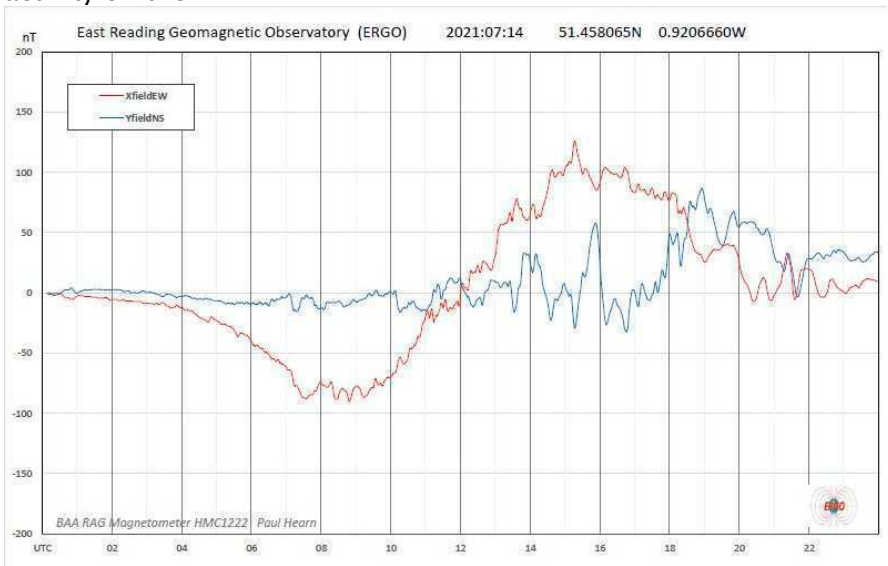
MAGNETIC OBSERVATIONS.

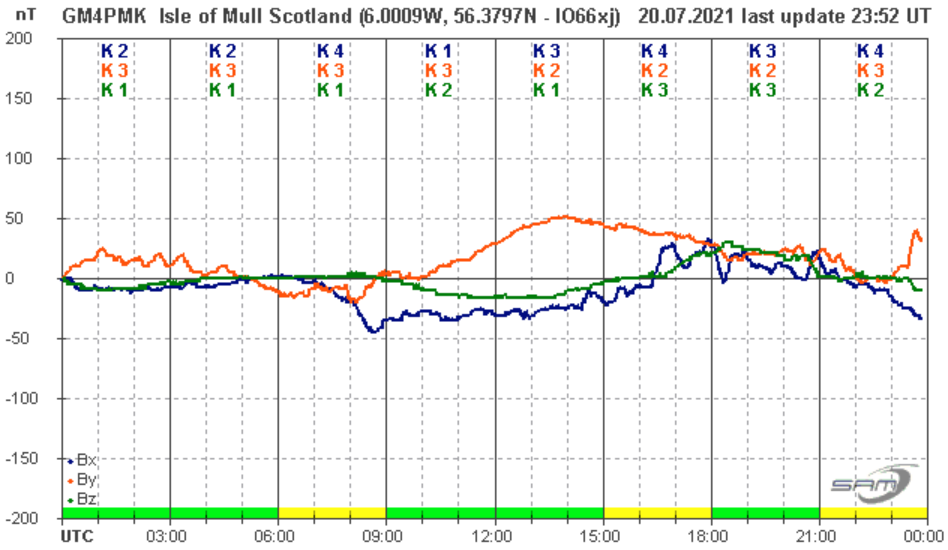


The X1.5 flare on the 3rd produced a magnetic SFE (Solar Flare Effect, or crotchet), shown in the green magnetometer trace in my recording. The SFE is quite small in amplitude (about -10nT) but the dip in the trace matches the upper peak of the 23.4kHz SID. The rectangular disturbances seen either side of the SFE are from local interference. The SFE is also indicated in the month's activity chart from Stuart Green:

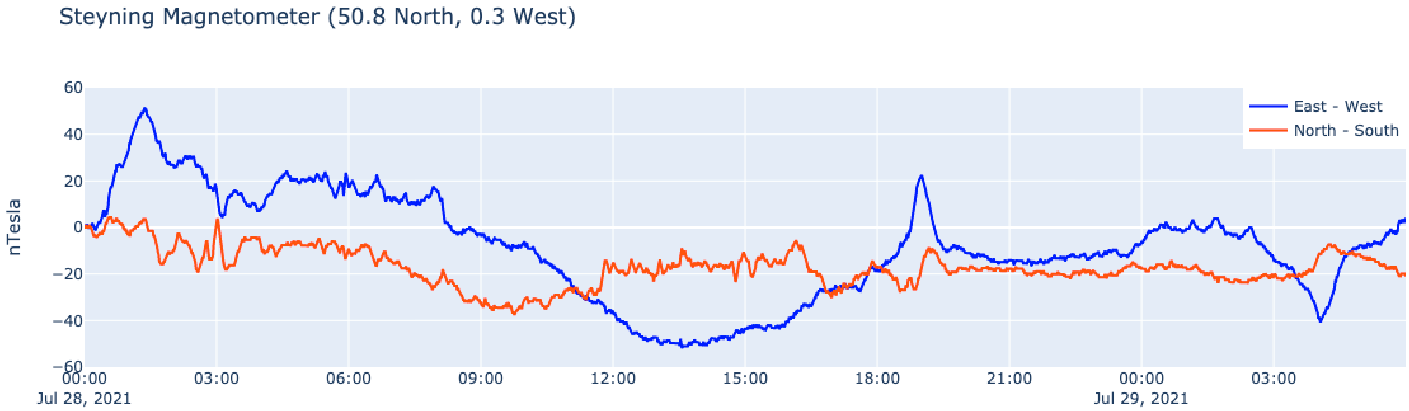


There was a CME from the flare, but occurring right on the solar limb it was not Earth directed. More CMEs were seen in satellite images, but none caused any magnetic disturbances. A generally higher speed solar wind was present mid-month, creating some periods of mild disturbance. The recording by Paul Hearn shows activity on the 14th:





Mild disturbance was also seen on the 20th, shown above in Roger Blackwell's recording. Towards the end of July a pair of coronal holes became effective with a stronger solar wind. This recording by Nick Quinn shows activity on the 28th:

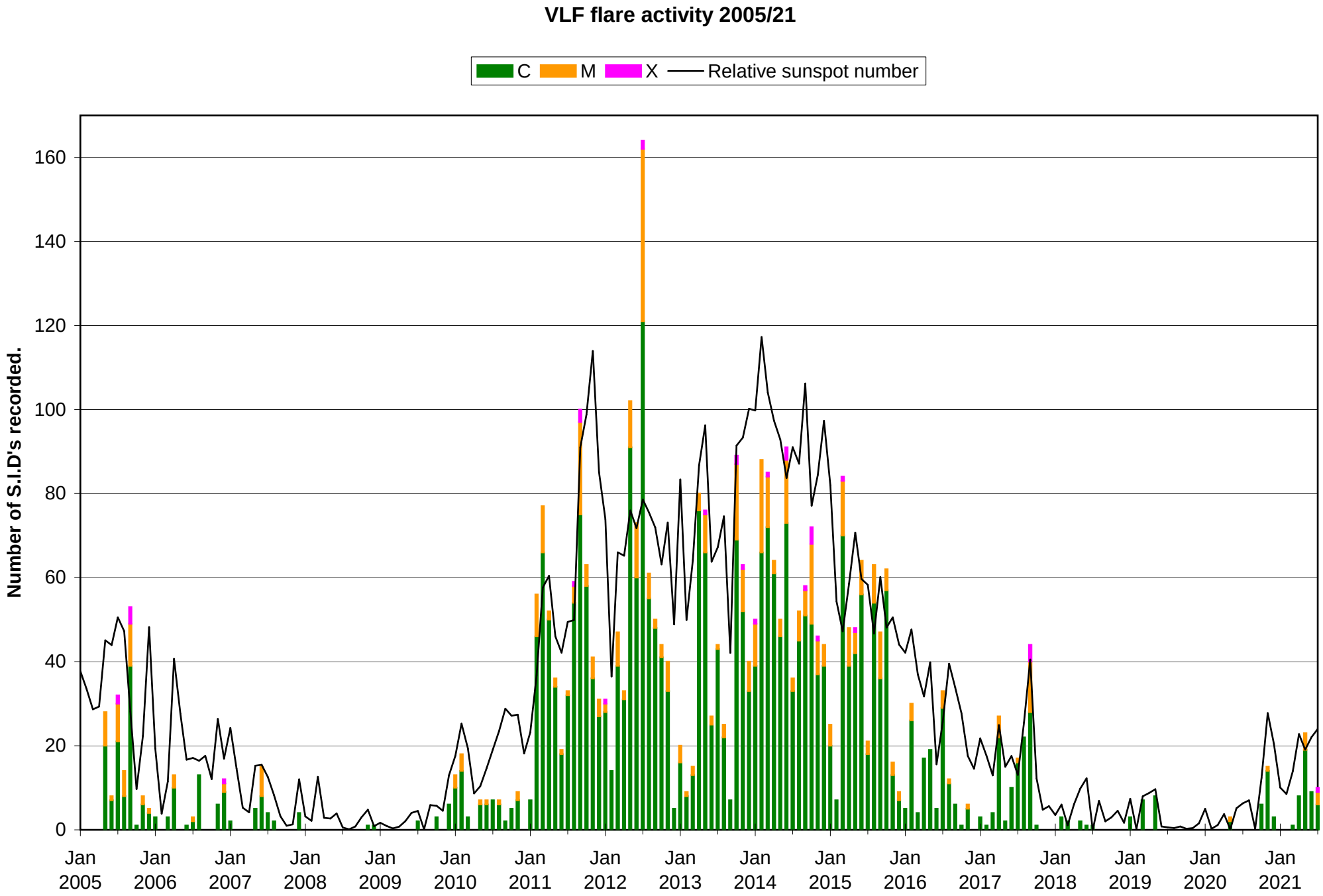


Magnetic observations received from Roger Blackwell, Colin Clements, Stuart Green, Paul Hearn, Nick Quinn and John Cook.

Our series of web-based meetings continues with a GNU radio training seminar on September 18th. Details of how to join the meeting can be found at www.britastro.org along with a programme of future events.

BAA Radio Astronomy Section.

BARTELS DIAGRAM


VLF flare activity 2005/21
C
M
X
Relative sunspot number
Number of S.I.D's recorded.
0
20
40
60
80
100
120
140
160
Jan 2005
Jan 2006
Jan 2007
Jan 2008
Jan 2009
Jan 2010
Jan 2011
Jan 2012
Jan 2013
Jan 2014
Jan 2015
Jan 2016
Jan 2017
Jan 2018
Jan 2019
Jan 2020
Jan 2021

BAA Radio Astronomy Section. **2021 JULY.**

	Xray class	Observers	John Cook (23.4kHz/*22.1kHz*)				Roberto Battaiola 21.75kHz				Paul Hyde (22.1kHz/*24kHz*)				Mark Edwards (24.0/*19.6*/***20.9*** kHz)				Colin Clements (23.4kHz/*37.5kHz*)			
			Tuned radio frequency receiver, 0.58m frame aerial.				Modified AAVSO receiver.				Spectrum Lab / PC 1.5m frame aerial.				Spectrum Lab / PC 2m loop aerial.				Tuned Radio Frequency receivers, 0.76m screened loop aerial.			
DAY			START	PEAK	END (UT)		START	PEAK	END (UT)		START	PEAK	END (UT)		START	PEAK	END (UT)		START	PEAK	END (UT)	
3	**M2.7**	8	07:13	07:19	08:20	2+	07:10	07:17	07:39	1+	07:10	07:18	08:20	2+	*07:11*	*07:19*	*08:41*	*3*	07:13	07:20	08:16	2+
3	C1.9	4	13:09	13:11	13:26	1-					13:07	13:14	13:42	2	13:09	13:14	13:58	2+	*13:09*	*13:18*	*13:52*	*2*
3	**X1.5**	9	14:26	14:31	16:00	3	14:24	14:28	15:04	2	14:25	14:31	16:00	3	14:26	14:32	15:20	2+	14:25	14:31	15:45	2+
3	**M1.0**	9	*17:02*	*17:08*	*17:50*	*2+*	16:58	17:04	17:34	2	17:01	17:08	17:59	2+	17:02	17:12	17:55	2+	17:04	17:11	17:44	2
4	**M1.5**	3									05:03	05:09	06:00	2+	*05:09*	*05:13*	*05:42*	*2*				
4	C1.7	1													18:10	18:14	18:28	1-				
9	C6.0	7	*07:44*	*07:53*	*08:11*	*1+*	07:35	07:54	08:04	1+	07:43	07:56	09:32	3	*07:49*	*08:00*	*08:24*	*2*	07:50	08:01	08:30	2
9	C7.0	8	10:37	10:51	11:40	2+	10:31	10:50	11:15	2	10:33	10:51	11:45	2+	10:37	10:53	11:55	2+	10:37	10:53	11:50	2+
9	B8.3	2									14:52	14:57	15:09	1-	14:54	15:01	15:12	1-				
9	C4.7	8	*17:20*	*17:26*	*18:10*	*2+*	17:16	17:24	17:50	2	17:17	17:25	18:46	3	17:20	17:20	18:30	2+	17:23	17:29	17:46	1
16	C1.7	4	*08:34*	*08:39*	*08:46*	*1-*					08:34	08:40	09:14	2	08:36	08:43	09:01	1				
18	B9.7	1													***07:08***	***07:10***	***07:33***	***1***				

	Xray class		Steve Parkinson (Various)				Andrew Thomas (19.6kHz/*22.1kHz*)				Phil Rourke (23.4kHz)				John Wardle				Chrostopher Bailey			
			Tuned radio frequency receiver, frame aerials.				Tuned radio frequency receiver, 0.6m frame aerial.				Spectrum Lab, 0.6m frame aerial.				SpetrumLab/Starbase, Active mini-whip aerial.				Spectrum Lab			
DAY			START	PEAK	END (UT)		START	PEAK	END (UT)		START	PEAK	END (UT)		START	PEAK	END (UT)		START	PEAK	END (UT)	
3	**M2.7**		07:11	07:18	08:15	2+	07:12	07:19	08:32	2+												
3	C1.9																					
3	**X1.5**		14:26	14:31	?	-	14:27	14:33	15:45	2+												
3	**M1.0**		17:01	17:10	18:00	2+	17:00	17:11	17:23	1												
4	**M1.5**						05:03	05:09	05:33	1+												
4	C1.7																					
9	C6.0		07:44	07:59	08:30	2+																
9	C7.0		10:33	10:51	11:30	2+	10:32	10:52	11:52	2+												
9	B8.3																					
9	C4.7		17:21	17:26	?	-	17:19	17:26	18:05	2+												
16	C1.7						*08:35*	*08:38*	*08:55*	*1*												
18	B9.7																					

	Xray class		Colin Briden (45.9kHz)				Andrew Lutley (23.4kHz)				Peter Meadows (23.4kHz)				John Elliott (18.3kHz)				Mark Prescott (20.9kHz)			
			Spectrum Lab / PC, 1.2m frame aerial.				Tuned radio frequency receiver, 0.6m frame aerial.				Tuned radio frequency receiver, 0.6m frame aerial.				Tuned radio frequency receiver, 0.5m frame aerial.							
DAY			START	PEAK	END (UT)		START	PEAK	END (UT)		START	PEAK	END (UT)		START	PEAK	END (UT)		START	PEAK	END (UT)	
3	**M2.7**																		07:15	07:24	08:12	2+
3	C1.9																					
3	**X1.5**		14:27	14:31	14:45	1-													14:29	14:33	15:52	2+
3	**M1.0**		17:01	17:10	17:34	2													17:05	17:13	17:38	2
4	**M1.5**																					
4	C1.7																					
9	C6.0																		?	08:14	08:39	-
9	C7.0																		10:38	10:55	11:34	2+
9	B8.3																					
9	C4.7																		17:23	17:30	17:47	1
16	C1.7																					
18	B9.7																					