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Registered Charity No. 210769

Burlington House, Piccadilly, London, W1J 0DU

Telephone: 020 7734 4145

Fax No.: 020 7439 4629

Email: office@britastro.org

Website: www.britastro.org



Please send all reports and observations to the editor, jacook@jacook.plus.com

BAA Radio Astronomy Section.

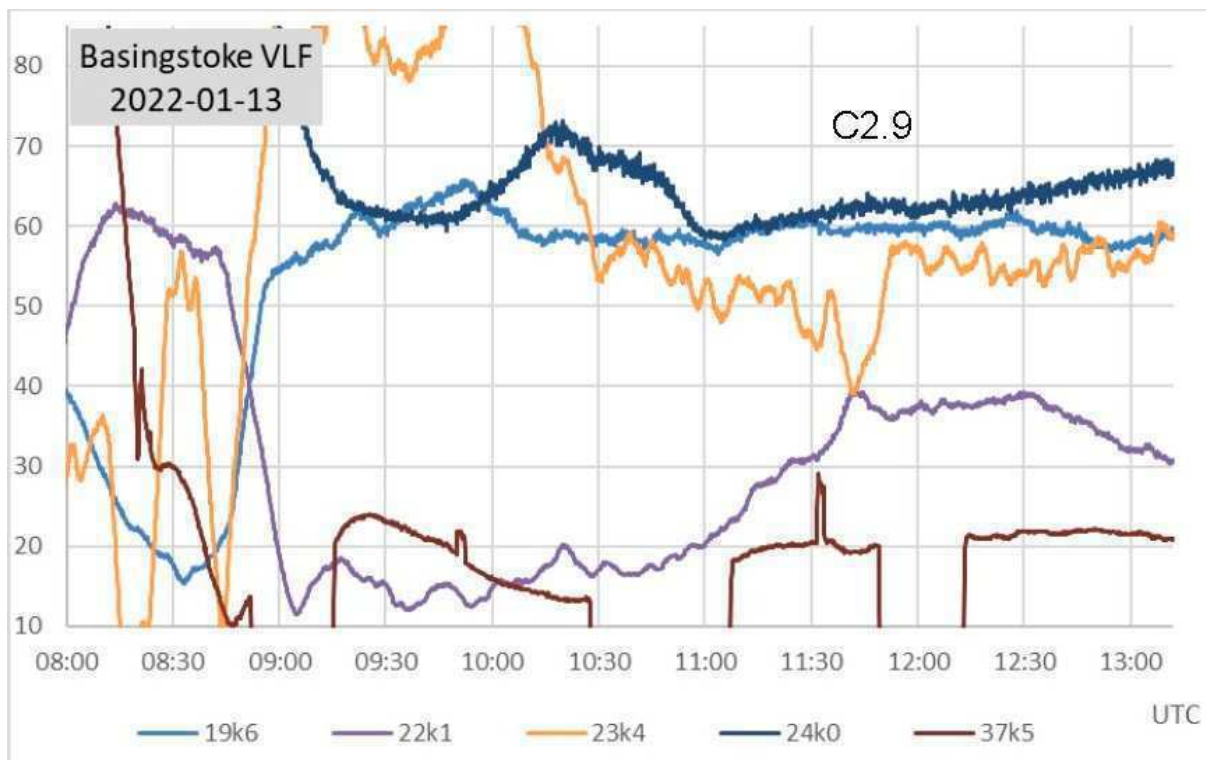
Director: Paul Hearn.

RADIO SKY NEWS

2022 JANUARY.

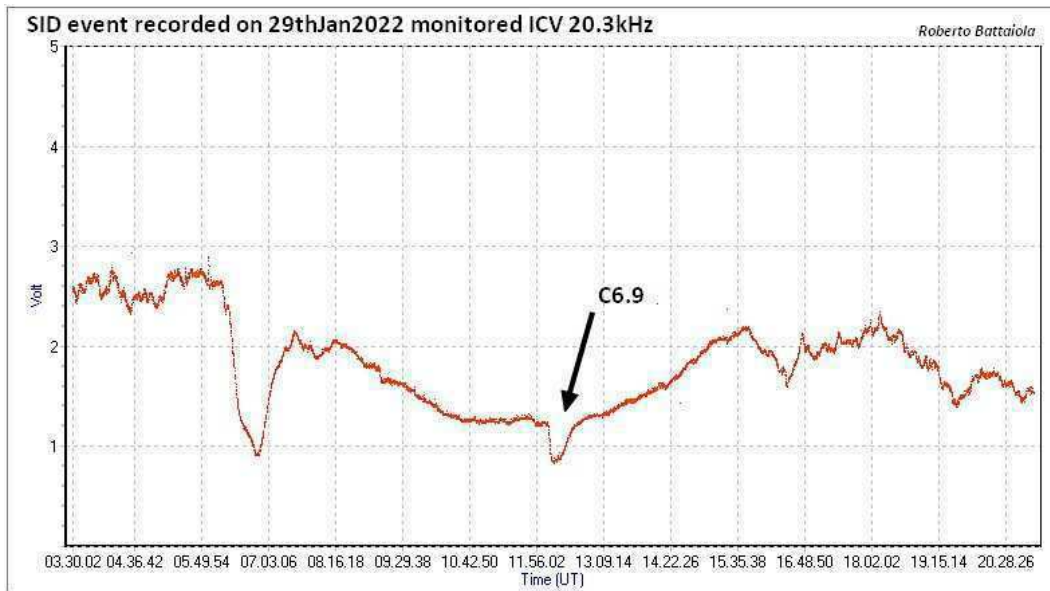
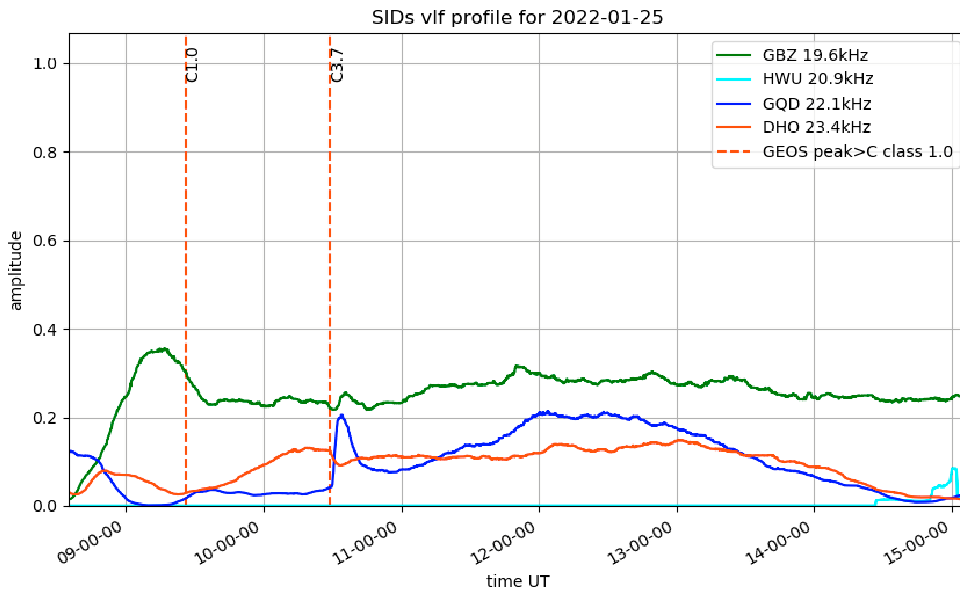
VLF SID OBSERVATIONS.

Solar activity was lower in January compared with December, with no M-class flares recorded as SIDs. The satellite X-ray data shows three M-class flares, but they were all hidden during the European night-time. The strongest was M5.5 at 06UT on the 20th.

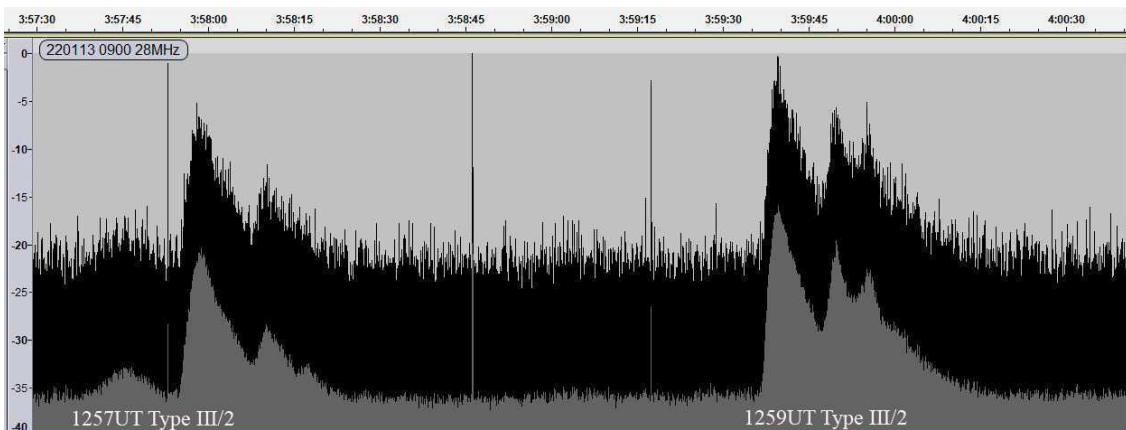


This recording by Paul Hyde shows the C2.9 flare peaking at 11:40UT on the 13th. The 22.1kHz signal from Anthorn shows a fairly clear SID, with a matching response at 23.4kHz almost hidden in the noise. Neither 19.6 or 24kHz show any response, while 37.5kHz has some drastic breaks that hide any useful data.

The C3.7 flare on the 25th was widely recorded, the chart by Mark Prescott showing the SID on some very clean signals. 22.1kHz has again given a very clear SID, with 23.4kHz smaller but very clear. Mark has also indicated the timing of an earlier C1 flare, although there are no signs of a SID on any of the three active signals.

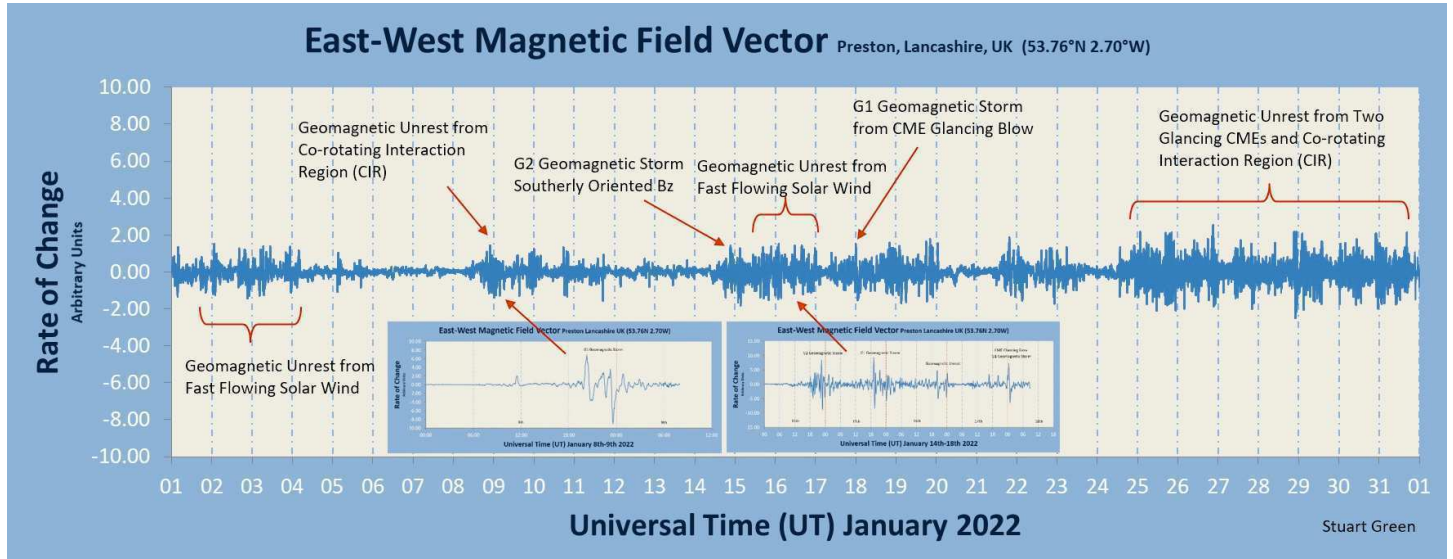


This recording by Roberto Battaiola shows the C6.9 flare on the 20.3kHz signal. This transmitter is located at Isola Di Tavolara, roughly 500km south of Roberto. It has provided a very clean day-time signal that also enabled him to catch the C7.3 flare at 07:32UT on the 16th, missed by observers here in the UK. Preceding the C6.9 in the tables is a SID marked '*'. The C6.9 flare appears to have had a fairly long rise time that included an extra peak that is not listed in the SWPC flare list. This does often happen with slower flares.



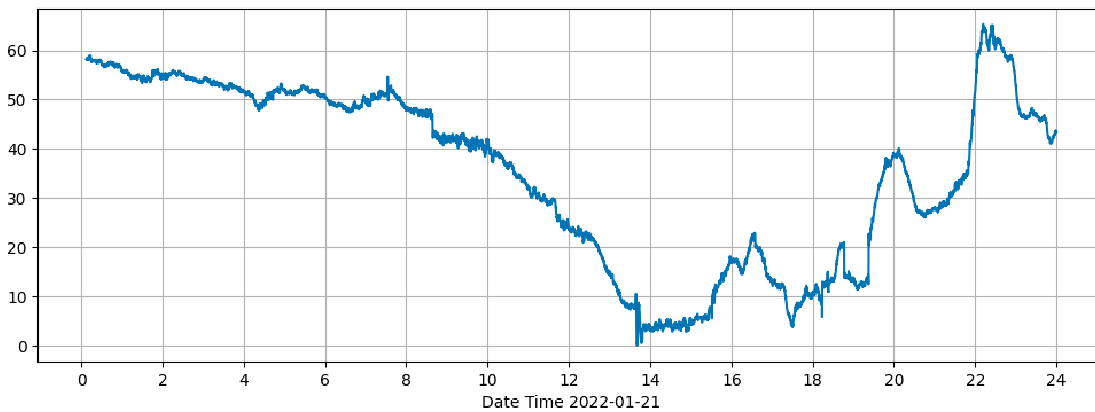
This recording by Colin Briden shows a pair of 28MHz noise bursts on the 13th. They are both of type III/2, the second being the stronger. There were no flares listed at this time, but they may possibly be related to the C2.9 flare recorded about an hour earlier.

MAGNETIC OBSERVATIONS.



Stuart Green's summary of the month's magnetic activity shows a good mixture of high speed winds and CMEs. It seems that a number of the stronger flares during our night-time produced CMEs. An M1.5 flare listed at 17:44UT on the 18th may have produced a CME that we recorded at 13:30–13:40UT on the 21st. Its arrival was recorded by several observers, and is shown here in the chart by Callum Potter:

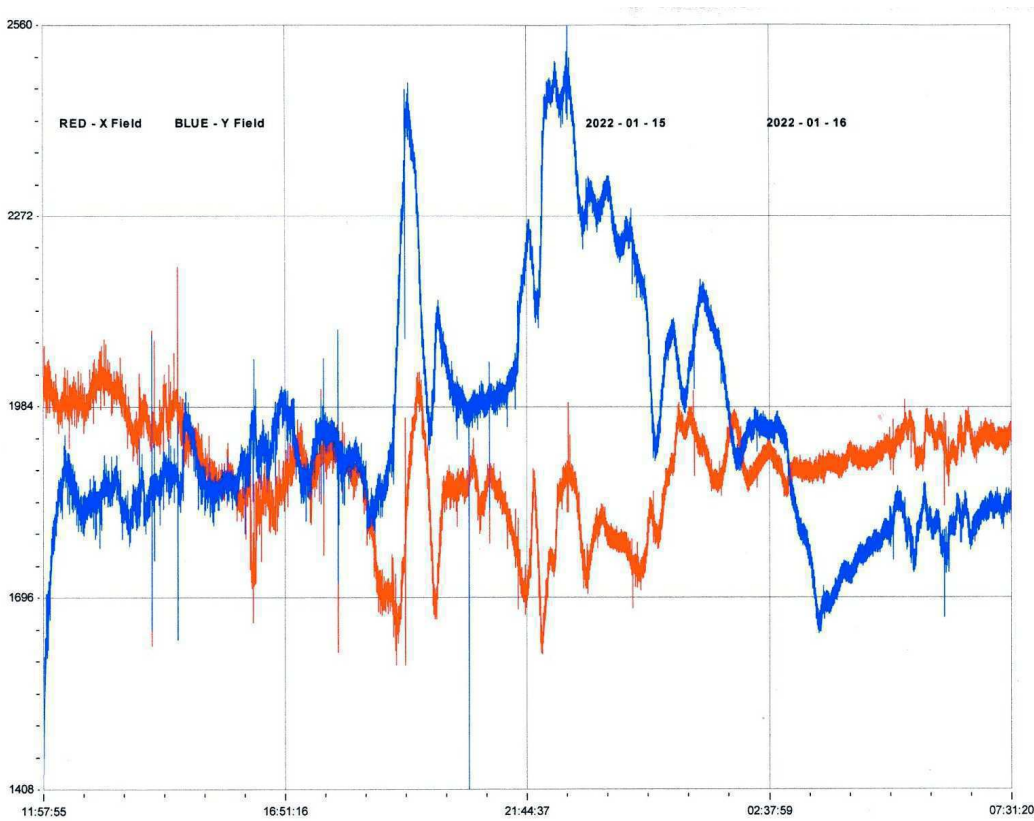
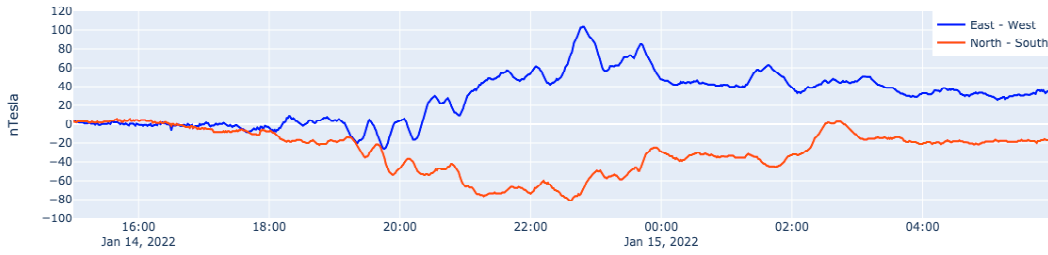
Bredons Hardwick Magnetometer (52.02N,2.13W)



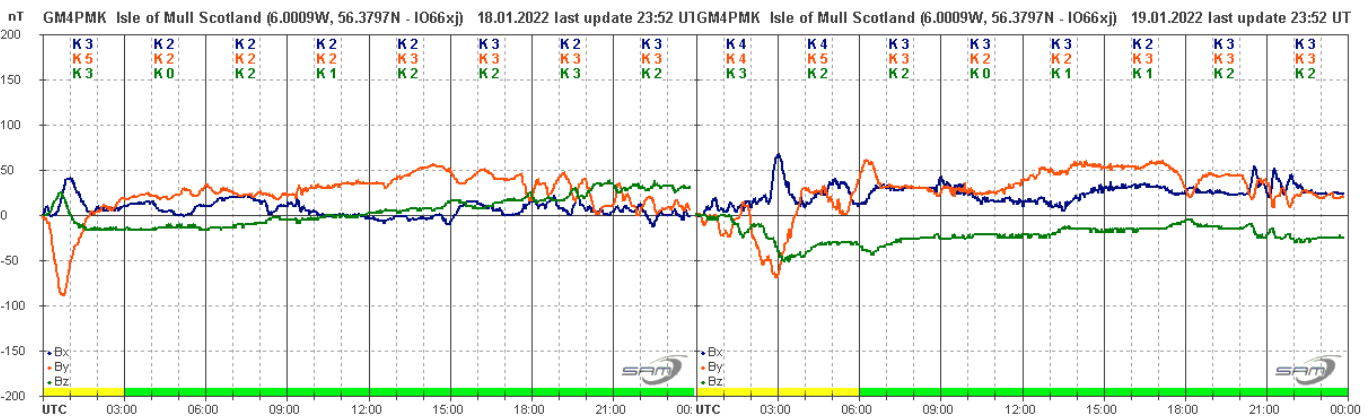
The impact shock does look like some local interference, but its appearance on a number of recordings proves that it is genuine. The following disturbance was very mild, and merged with a high speed wind as well as further weak CMEs.

An equatorial coronal hole wind stream produced a very mild disturbance to start the month, with a south polar coronal hole stream producing a short period of disturbance late in the evening of the 8th. Glancing blows from a CME added to a high speed wind to produce a disturbance on the 14th, continuing through to the 20th. This recording from Nick Quinn shows the disturbance starting around 18UT on the 14th:

Steying Magnetometer (50.8 North, 0.3 West)



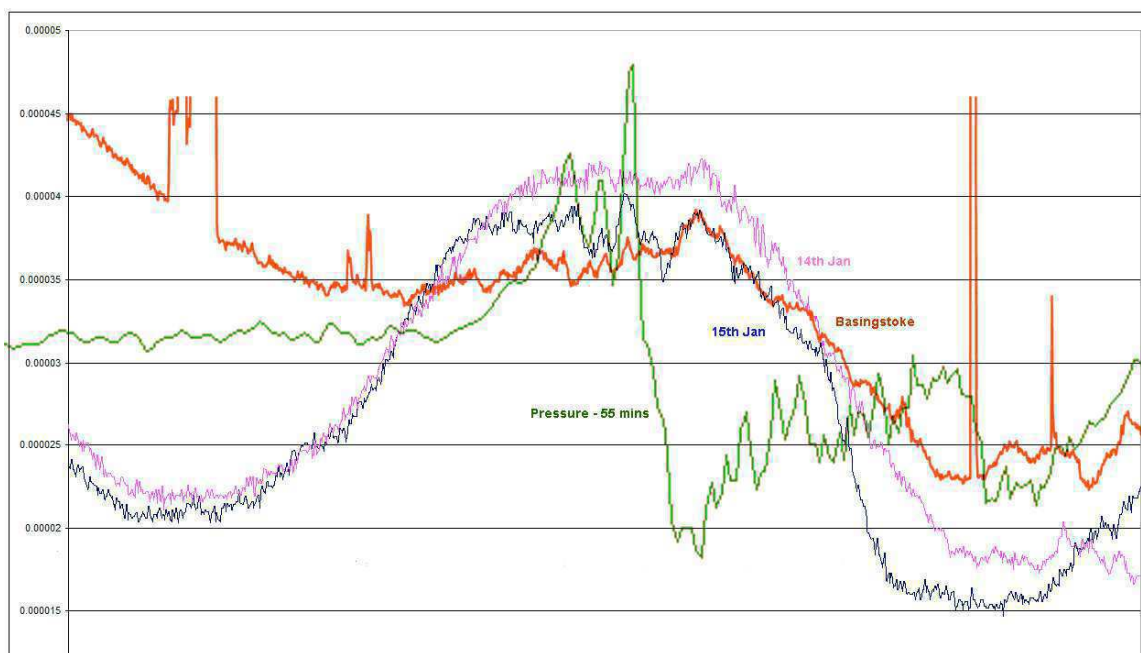
The disturbance faded out in the early morning of the 15th, but increased again later in the day, as shown above by Colin Clements. Activity remained low on the 17th, but increased again over the 18th and 19th, shown by Roger Blackwell:



Magnetic observations received from Roger Blackwell, Colin Clements, Stuart Green, Callum Potter, Nick Quinn, Andrew Thomas and John Cook.

TONGA VOLCANO.

The volcanic eruption near the Pacific island of Tonga caused considerable damage to the nearby islands, but the effects of its rising plume of gas were felt across the globe. Mark Edwards has been analysing the recordings made here. The gas cloud rose high into the atmosphere, creating a pressure wave that radiated outwards over the Pacific ocean. The Space Weather web site showed the pressure wave being recorded moving north eastwards over America, and weather stations here in the UK also detected sudden pressure changes. These waves also affected the lower ionosphere, with Magnetic and VLF recordings showing a disturbance as well as NASA measurements showing changes in the Total Electron Content above stations close to the volcano. The eruption occurred at about 04:10UT on January 14th, and Mark noted the pressure shock at 19:19UT on the 15th. UK Met office data shows a big pressure shock between 19:00 and 19:30 recorded at Brize Norton (near Oxford). David Farn also noted a small magnetic transient at the same time.

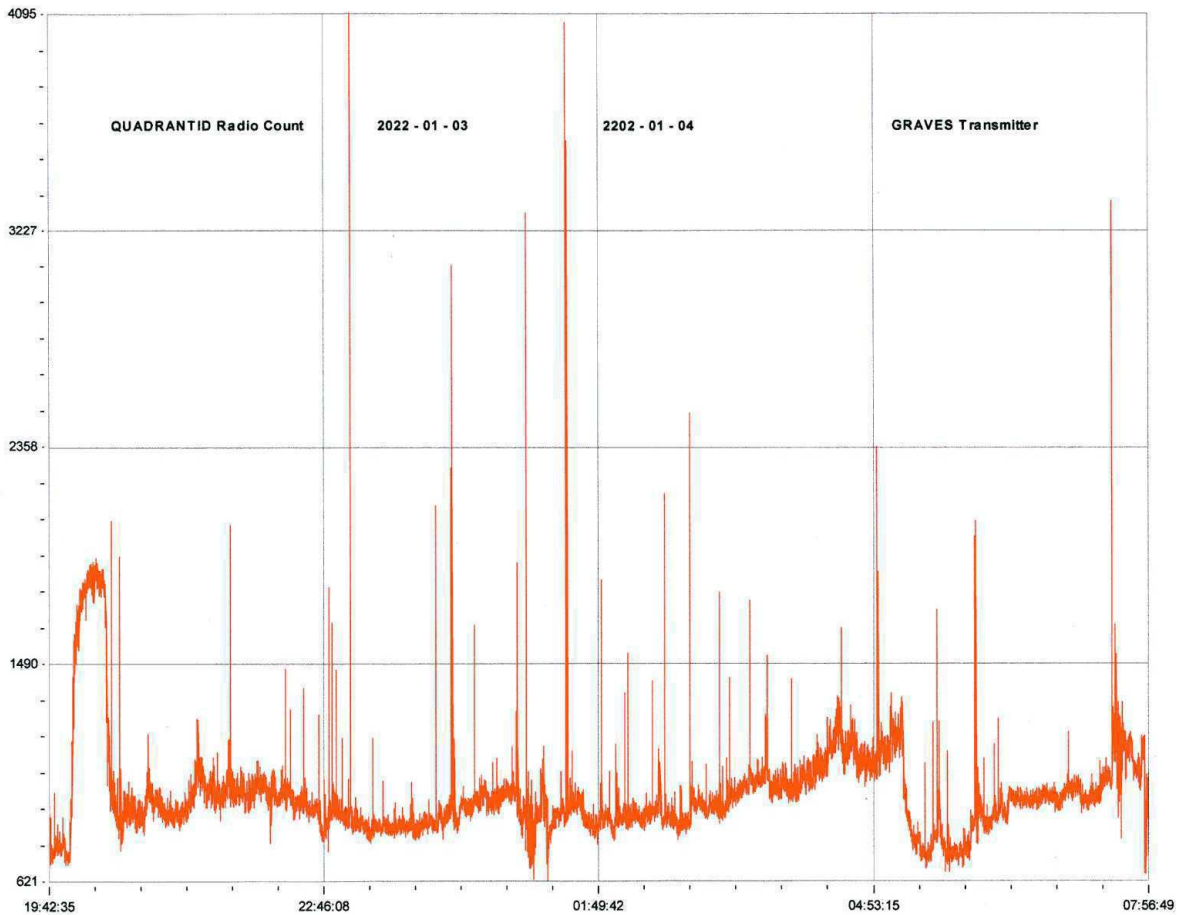


This chart is rather complicated, but shows the 24kHz trans-Atlantic signal recorded by Paul Hyde on the 15th (red) and by Mark Edwards (15th in blue, 14th in pink). There is a low level of general noise on the signals, but both traces from the 15th show some stronger waves between 18 and 19UT. The trace from the 14th does not show this activity. Using UK Met office pressure data, Mark has calculated that the pressure shock should have been about 1600km away from his location (Coventry). His path length at 24kHz is 4768km, so the shock would be about a third of the way along the path. The sunset time at this point is 17:40UT, but Mark has recorded SIDs in the past at around this time in January.

The green trace is the Met office pressure plot from Brize Norton, delayed by 55 minutes to match the VLF waves. There is a possible reason why these timings do not match: the great circle paths from Tonga to the UK and to the 24kHz signal reflection area are very different. The pressure wave would cross the 24kHz path at nearly a right angle, while the path into the UK would pass nearer to the pole, and be more nearly parallel here. Thus more of the path would be affected at the same time. The pressure wave speed to Brize Norton works out at 312m/s. This is quite a complex problem, so perhaps more work might be done in the future as other data becomes available.

METEOR OBSERVATIONS.

Colin Clements made recordings of the Quadrantid meteors using the GRAVES signal. Counts were made on the 2nd, 3rd and 4th, but significant counts were only seen late on the 3rd and into the morning of the 4th.



On this occasion no clear activity peak is visible, with counts fairly steady from about 21UT to 06UT.

LOGGING SID DATA.

We have received a paper by Richard Knott on the logging of SID data using the UKRAA receiver. The main text of the paper is included as a separate pdf, but the appendices have been omitted as they are quite lengthy. They do contain much information on the Python code used, and the full paper can be retrieved from the following link:

https://drive.google.com/file/d/1C-HxnNEKyxb09hsEFQCyU97geMUTO_if/view?usp=sharing

Papers on radio astronomy subjects will be welcomed for future editions of this report.

BAA Radio Astronomy Section.

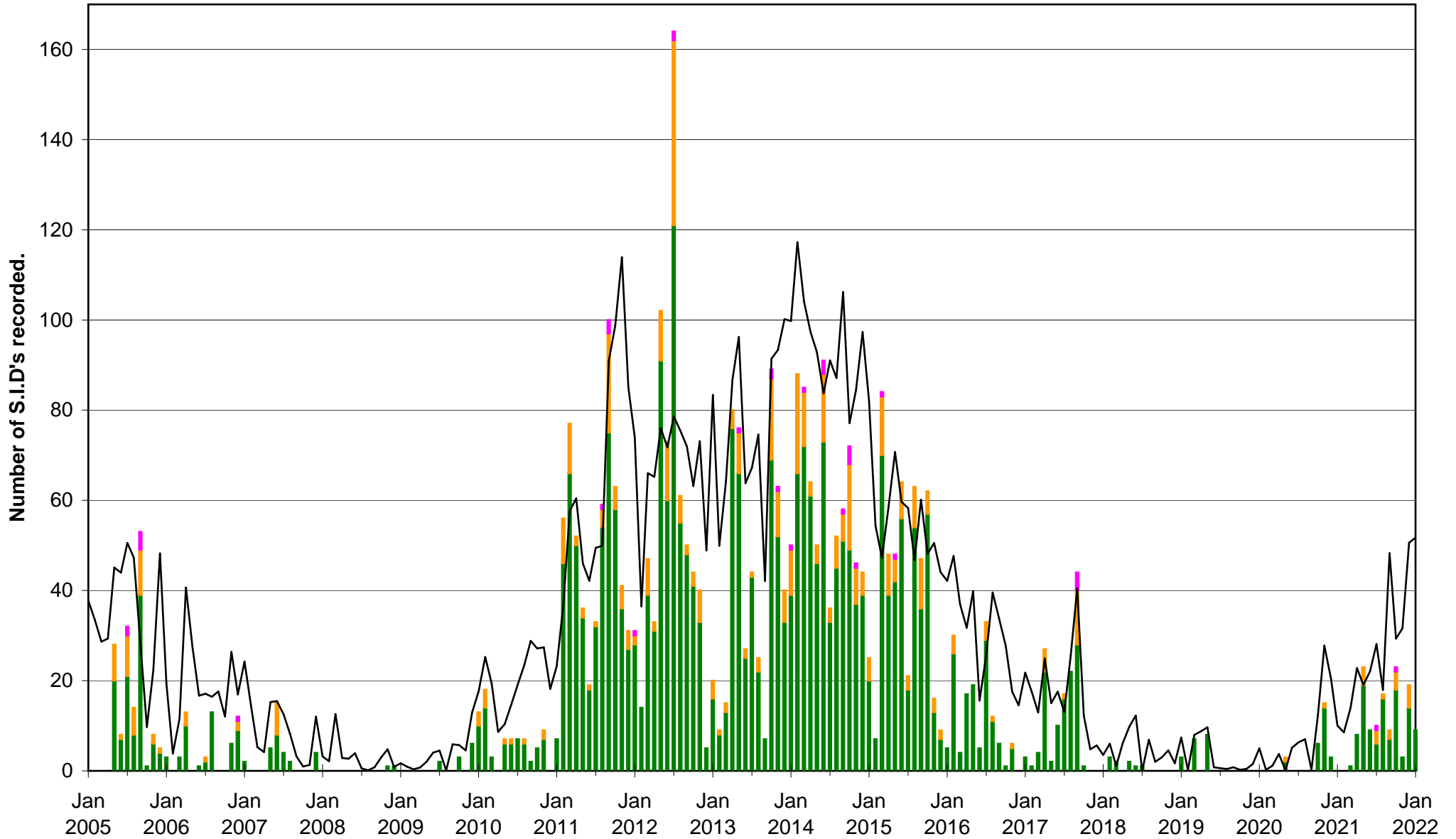
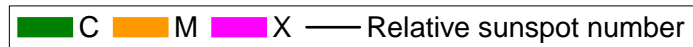
2022 JANUARY.

DAY	Xray class	Observers	John Cook (23.4kHz/22.1kHz)	Roberto Battaiola 20.3kHz	Paul Hyde (22.1kHz/24kHz)	Mark Edwards (23.4/19.6/24kHz)	Colin Clements (23.4kHz/18.3kHz)
			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.
			START PEAK END (UT)	START PEAK END (UT)	START PEAK END (UT)	START PEAK END (UT)	START PEAK END (UT)
13	C2.9	5	11:37 11:41 11:57 1	11:34 11:40 11:51 1-	11:35 11:42 11:52 1-	11:37 11:40 11:45 1-	
14	C2.1	1		11:42 11:51 11:59 1-			
25	C3.7	10	10:25 10:29 10:38 1-	10:23 10:29 10:53 1+	10:25 10:29 10:43 1-	10:26 10:29 10:46 1	10:28 10:32 10:45 1-
26	C7.2	1		07:29 07:32 07:37 1-			
26	C1.6	2				10:24 10:26 10:30 1-	
28	C2.6	1		08:33 08:40 08:46 1-			
29	B9.5	1				09:01 09:05 09:09 1-	
29	*	2				11:52 11:55 12:00 1-	
29	C6.9	10	12:08 12:13 12:42 2	12:04 12:13 12:40 2	12:07 12:15 12:44 2	12:07 12:13 12:28 1	12:09 12:15 12:50 2
29	C2.0	3			14:13 14:17 14:26 1-	14:16 14:17 14:22 1-	
29	C7.3	2			16:52 16:56 17:07 1-	16:52 16:56 17:06 1-	

DAY	Xray class	Observers	Steve Parkinson (Various)	Andrew Thomas (19.6kHz)	Phil Rourke (23.4kHz)	John Wardle	Christopher Bailey
			Tuned radio frequency receiver, frame aeriels.	Tuned radio frequency receiver, 0.6m frame aerial.	Spectrum Lab, 0.6m frame aerial.	SpectrumLab/Starbase, mini-whip aerial. Active	Spectrum Lab
			START PEAK END (UT)	START PEAK END (UT)	START PEAK END (UT)	START PEAK END (UT)	START PEAK END (UT)
13	C2.9			11:36 11:44 11:52 1-			
14	C2.1						
25	C3.7		10:25 10:30 10:45 1	10:24 10:30 10:44 1			10:26 10:29 10:47 1
26	C7.2						
26	C1.6						10:22 10:25 10:35 1-
28	C2.6						
29	B9.5						
29	*			11:53 11:56 12:08 1-			
29	C6.9		12:08 12:15 12:38 1+	12:08 12:15 12:47 2			12:09 12:15 12:47 2
29	C2.0			15:30 15:34 15:45 1-			
29	C7.3						

DAY	Xray class	Observers	Colin Briden (22.1kHz)	Andrew Lutley (23.4kHz)	Peter Meadows (23.4kHz)	John Elliott (18.3kHz)	Mark Prescott (22.1kHz)
			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.	
			START PEAK END (UT)	START PEAK END (UT)	START PEAK END (UT)	START PEAK END (UT)	START PEAK END (UT)
13	C2.9						
14	C2.1						
25	C3.7		10:26 10:30 10:36 1-				10:29 10:33 10:54 1
26	C7.2						
26	C1.6						
28	C2.6						
29	B9.5						
29	*						
29	C6.9		12:08 12:16 12:28 1				12:13 12:21 12:37 1
29	C2.0						
29	C7.3						

VLF flare activity 2005/22



BARTELS DIAGRAM

ROTATION	KEY:	DISTURBED	ACTIVE	SFE	B, C, M, X = FLARE MAGNITUDE.	Synodic rotation start (carrington's).		
2529	F	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	2019 January	2213		
2530	F	22	23 24 25 26 CB	27 28 29 30 31	2019 February	2214		
2531	F	18 19 20 21 22 23 24 25 26	27 28	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16	2019 March	2215		
2532	F	17 18 19 20 C	21 CCC	22 CCCB	23 B	24 25 26 27 28 29 30 31	2019 April	2216
2533	F	13 14 15 16 17 18 19 20 B	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 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	2019 May	2217		
2534	F	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	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	2019 June	2218		
2535	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	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	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	2019 July	2219		
2536	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	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	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	2019 August	2220		
2537	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	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	2019 September	2221		
2538	F	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	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21	2019 October	2222		
2539	F	22 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	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18	2019 November	2223		
2540	F	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	1 2 3 4 5 6 7 8 9 10 11 12 13 14	2019 December	2224		
2541	F	15 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	1 2 3 4 5 6 7 8 9 10 11	2020 January	2225		
2542	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 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	2020 February	2226		
2543	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 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	2020 March	2227		
2544	F	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	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	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	2020 April	2228		
2545	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	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	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	2020 May	2229		
2546	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	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24	2020 June	2230		
2547	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	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21	2020 July	2231		
2548	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	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17	2020 August	2232		
2549	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	1 2 3 4 5 6 7 8 9 10 11 12 13 14	2020 September	2233		
2550	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 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	2020 October	2234		
2551	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 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	2020 November	2235		
2552	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	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	2020 December	2236		
2553	F	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	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	2021 January	2237		
2554	F	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	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	2021 February	2238		
2555	F	27 28 C	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	2021 March	2239		
2556	F	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	2021 April	2240		
2557	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	2021 May	2241		
2558	F	16 17 18	19 20 21 22 23 24 25 26 27 28	1 2 3 4 5 6 7 8 9 10 11 12 13 14	2021 June	2242		
2559	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	2021 July	2243		
2560	F	11 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 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	2021 August	2244		
2561	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 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	2021 September	2245		
2562	F	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	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	2021 October	2246		
2563	F	2021 July	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	2021 November	2247		
2564	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	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23	2021 December	2248		
2565	F	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	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19	2022 January	2249		
2566	F	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 16	2022 February	2250		
2567	F	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	2022 March	2251		
2568	F	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 9	2022 April	2252		
2569	F	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	2022 May	2253		
2570	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	2022 June	2254		