HNRAO Observing Log
40.673181 N – 80.437885 W
EN90sq

Date: June 1, 2020

Object: Jupiter – Io-B

Observer: Unattended

Start - Time UT:	**0800**	**Planetary K-index:**	**1**
Jupiter Altitude (deg):	**27.7**	**Jupiter Azimuth (deg):**	**170.8**
Jupiter CML:	**66.74**	**Jupiter Io Phase:**	**060.16**
Jupiter RA (hr/min):	**19:55**	**Jupiter Dec (hr/min):**	**-21:02**
Hour Angle (hr/min):	**-00:35**	**Polarization**	**RCP**
Sun Altitude (deg):	**-16.1**	**Sun Azimuth (deg):**	**040.5**
Sun RA (hr/min):	**04:31**	**Sun Dec (hr/min):**	**21:52**

End – Time UT:	**1045**		
Jupiter Altitude (deg):	**21.3**	**Jupiter Azimuth (deg):**	**212.5**
Jupiter CML:	**166.09**	**Jupiter Io Phase**	**083.44**
Hour Angle (hr/min):	**02:10**	**Duration (min):**	**165**
Sun Altitude (deg):	**09.3**	**Sun Azimuth (deg):**	**069.1**
Max Frequency MHz		**Min Frequency MHz**	
J/S Angular Separation	**132.4**	**De:**	**-1.2**

Observatory Configuration

Spectrograph Receiver	Antenna	Polarization	System Loss	Multicoupler	Multicoupler port	Calibrated
FSX-8S	TFD	RCP LCP	-8.35 dB -7.59 dB	#2 RCP #1 LCP	Port 1 +10dB Port 1 +10dB	Twice daily Twice daily
FSX-2	LWA	RCP/LCP manual select		N/A	N/A	N/A
SDRPlay RSP2 #1	TFD	RCP	-8.35 dB	#2 RCP	Port 2 +3dB	Twice daily
SDRPlay RSP2 #2	TFD	LCP	-7.59 dB	#1 LCP	Port 2 +3dB	Twice daily
JOVE II HNRAO #2	Jove dipoles	Linear	-3.66 dB	#3 Linear	Port 4 +3 dB	Offline

Radio JOVE dipoles phased @ 32 degrees for 2020-2021 season
Typinski AN-TFD-24-4 array phased @ 35 degrees for 2020-2021 season
Four LWA antenna array phased @ 35 degrees and orientation for observation: 45 degrees
Radio Sky Spectrograph software version 2.9.30
Radio-SkyPipe software version 2.7.33 Radio-Jupiter Pro software version 3.8.2
Network Time Server GpsNtp-Pi, Reeve Engineering

All times are synced with a local GPS locked NTP server.

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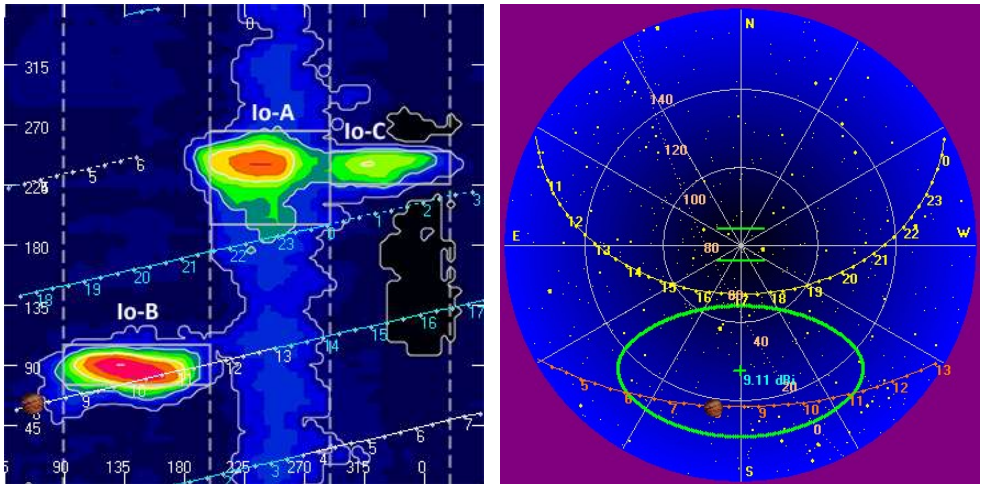

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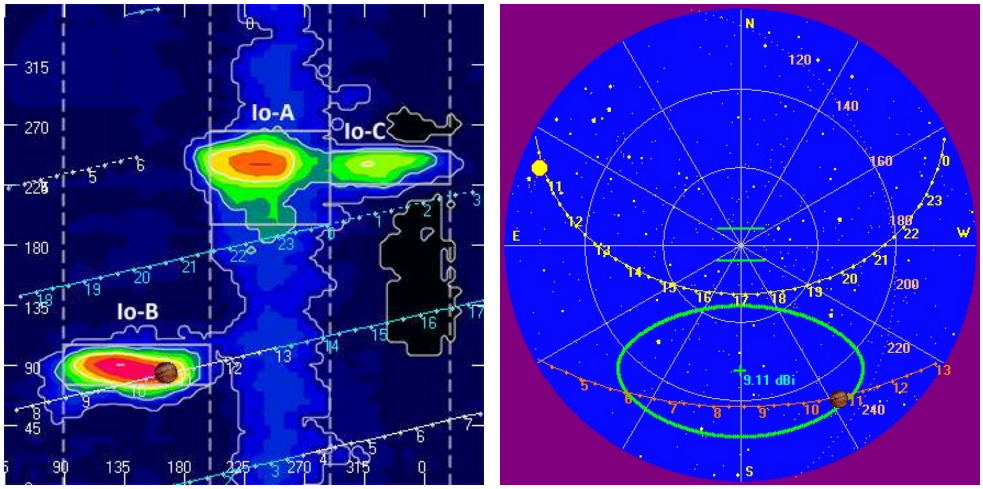

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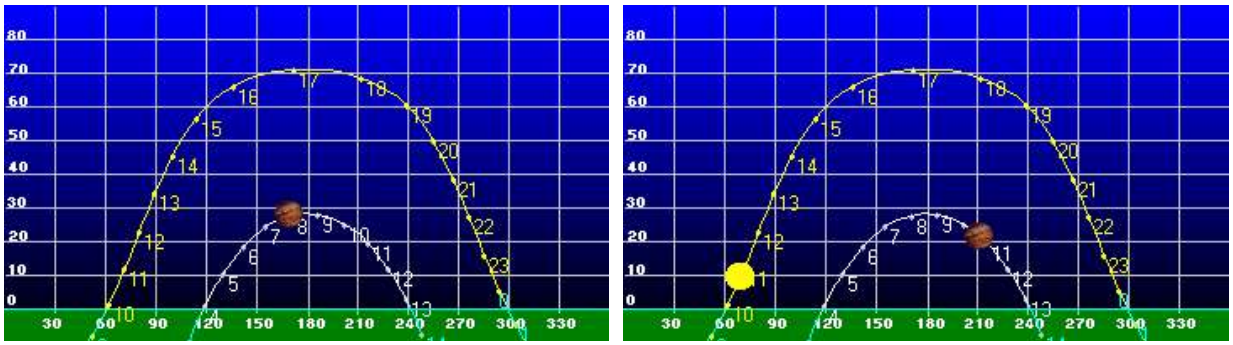

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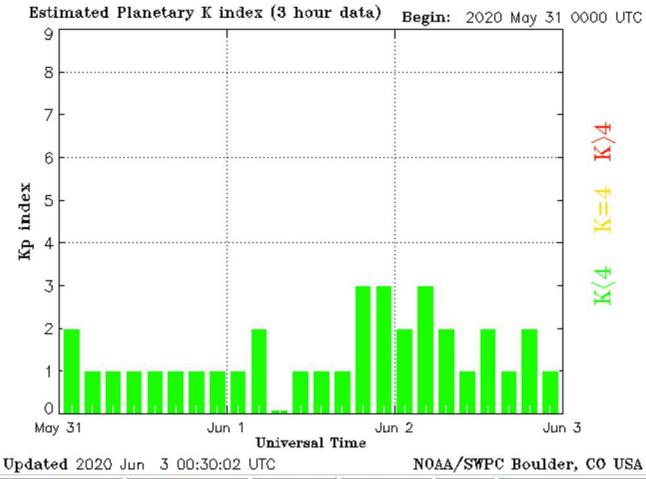

MODE	CML RANGE	Io RANGE	MAX F	POLAR	ARC	NOTES
Io-D	0-200	95-130	18	LH	Early	Also called "fourth source"
Io-B	(105 - 185)	(80-110)	39.5	RH	Early	Also called "early source"
non Io-B	80-200	0-360	38	RH	Early	Voyager info
Io-A	(200-270)	(205-260)	38	RH	Late	Also called "main source"
non-Io-A	(230-280)	0-360	38	RH	Late	
Io-C	(300-20)	(225-260)	36	RH&LH	Late	Also called "third source"
non-Io-C	300-360	0-360	32	RH&LH	Late	Voyager info

https://www.radiosky.com/jupmodes.html

Modulation Lanes Designations*	
L - Burst	S-Burst
L1 – No lanes	S1 – No lanes
L2 - Positive slope	S2 – Positive slope
L3 - Cross hatched	S3 – Cross hatched
L4 – Negative slope	S4 – Negative slope
*Modulation Lanes in the Dynamic Spectra of Jovian L-bursts, J.J. Riihimaa, Astron. & Astrophys. 4, 1970	

RCP Io-B storm with L2 modulation lanes. Both L-bursts and S-bursts observed. The observations below were made with the SDRPlay RSP2/RCP spectrograph. All narrated observations are seen in the images that follow.

First observed emission was at 0800:40 UT with very weak L-burst/L2 modulation lanes, 1-2 dB above GB, between 17 MHz and 18.5 MHz. There was no more observed emission until 0830:35 Ut which was also weak, perhaps 1-2 dB above GB. This grouping, from 0833:30 UT until 0834:20 UT had a frequency span of 18 MHz to 23 MHz.

While difficult to identify positively, there appears to be another very weak, 1+/- dB emission from 0852 UT to 0853:20 UT. This group spanned from 22.5 MHz to 23 MHz. More very weak emission, again perhaps 1 dB above GB at 0854:20 UT between 17 MHz and 19 MHz. Another brief emission cluster at 0855:40 UT between 21 MHz and 23 MHz.

Yet another barely detectable group from 18 MHz to 23 MHz lasting about 13 seconds starting at 0905:15 UT. At 0907:40 UT, some stronger L-bursts were observed. These were centered at about 22 MHz and about 1 MHz in bandwidth. This was followed by still stronger (3+ dB above GB) emissions at 0908:30 UT. This group started about 21 MHz and spanned to 24 MHz and possibly beyond.

At 0912 UT, there are several stronger L-burst emissions that might be considered N-events between 22.5 MHz and 23 MHz.

An interesting feature at 0923:14 UT resembles an N-event at 21 MHz and 22 MHz. More N-event or N like event were observed between 0925:30 UT and 0926:50 UT centered around 21 MHz.

More N-event or N like event emission between 0930:30 UT and 0931:40 UT has some interesting oscillating structure.

There was a 5 second L-burst at 0938 UT at 17 MHz and nothing else was seen until 1002:10 UT where S-bursts were recorded between 16 MHz and 17 MHz. A much stronger cluster of S-bursts between 16 MHz and 17 MHz started at 1024:34 UT and continued until 1022:08 UT.

There were stronger S-bursts, between 16 MHz and 18 MHz between 1021:50 UT and 1029:30 UT where S2 modulation lanes began to be observed in the S-burst emissions. The most intense emissions during this storm were a line of S-bursts from 1037:40 UT through 1039:50 UT.

The last emissions were at 1049 UT.

EOR

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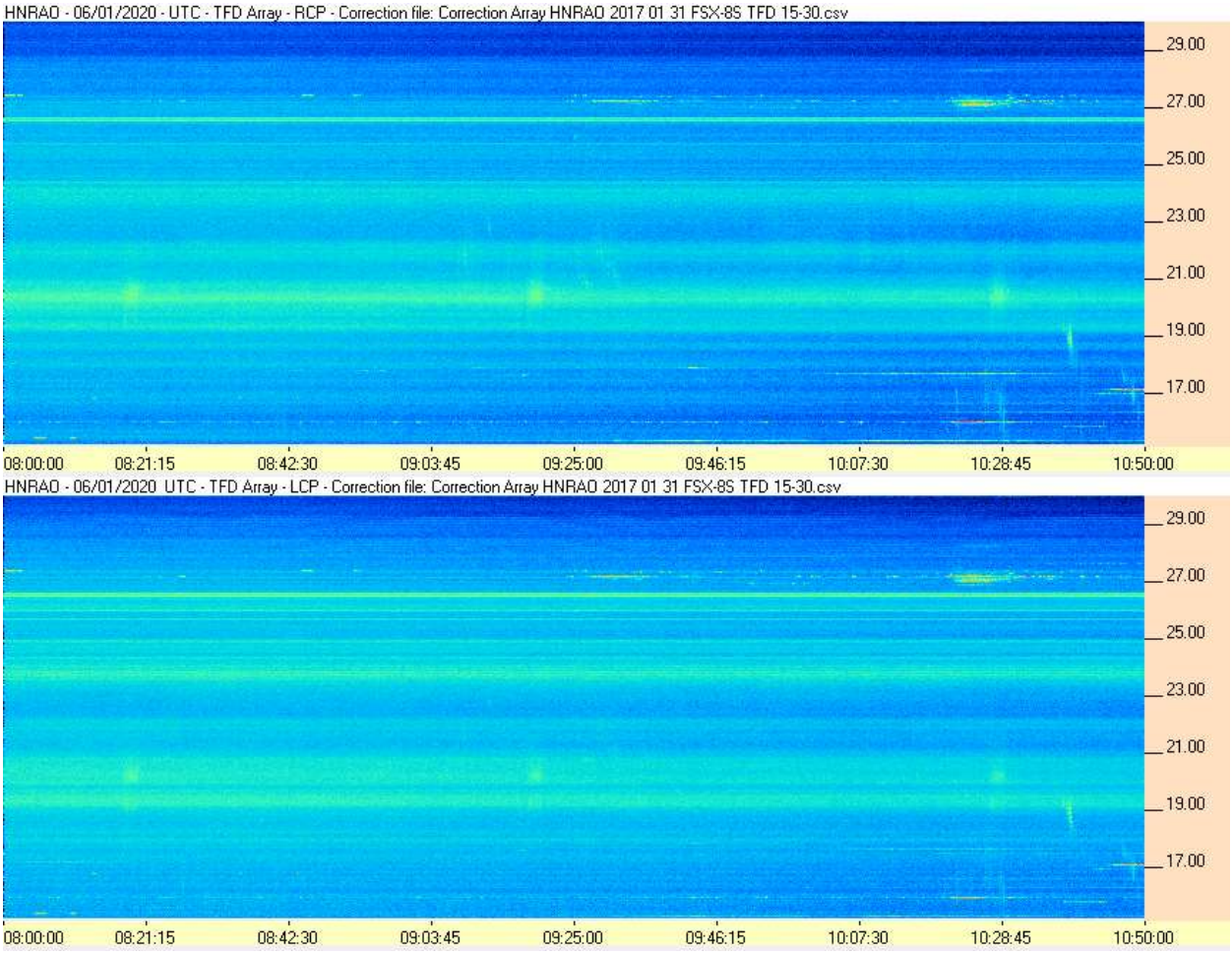
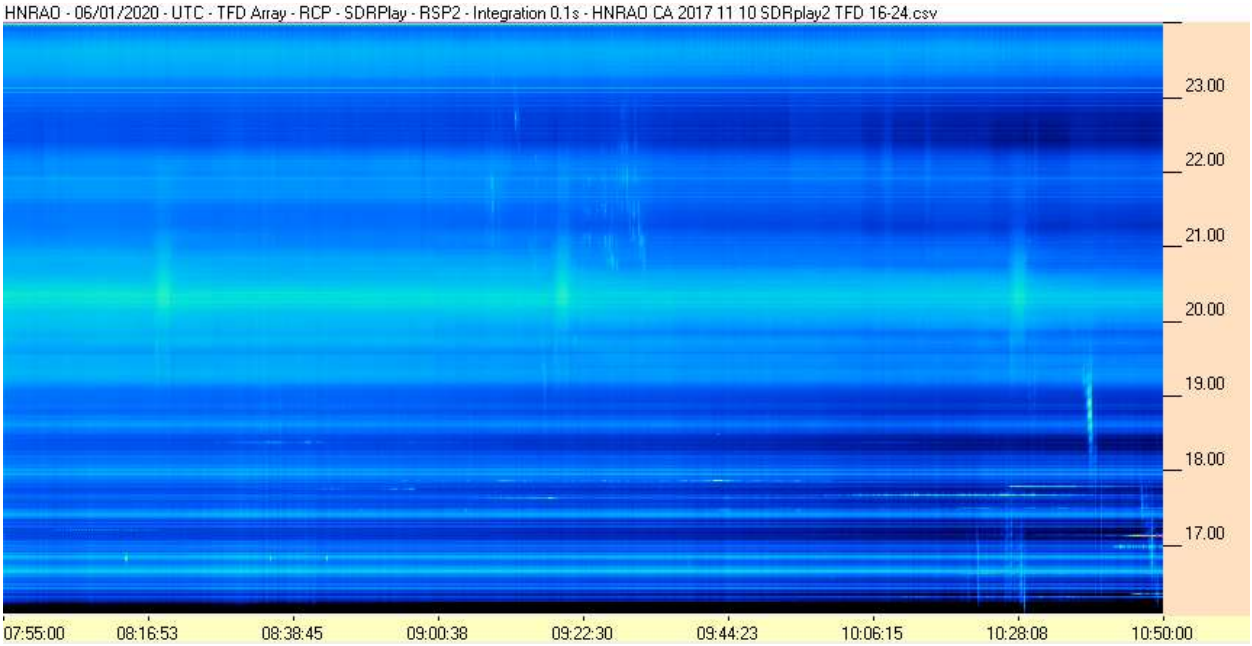
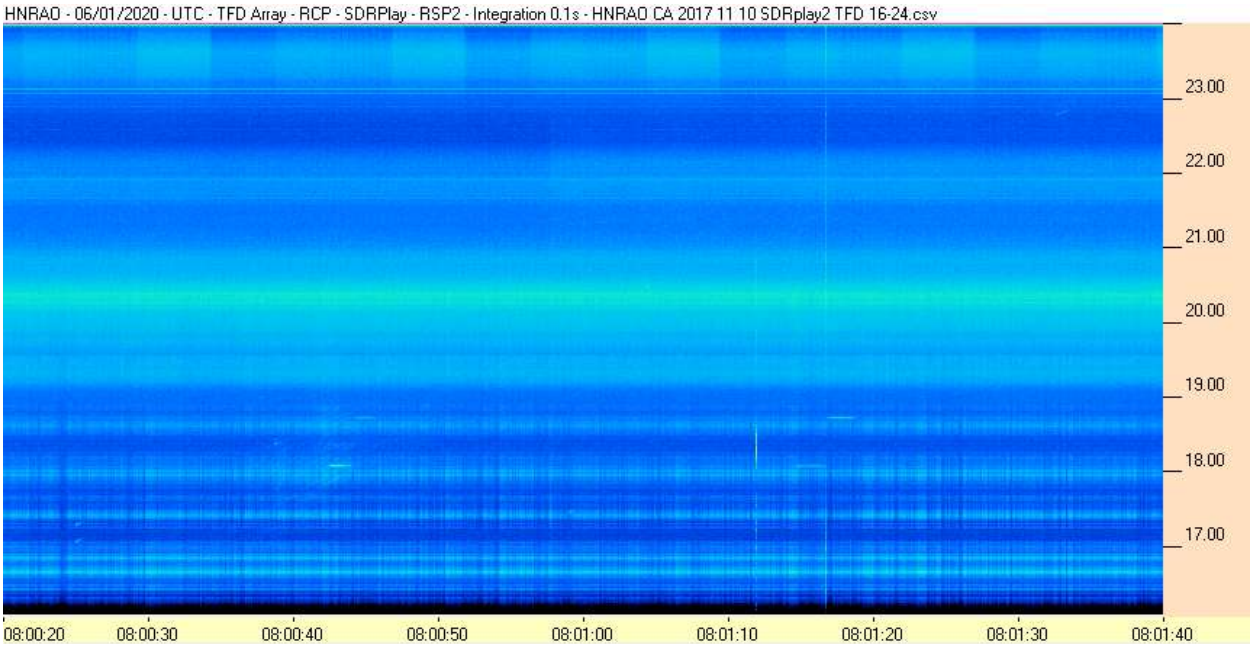
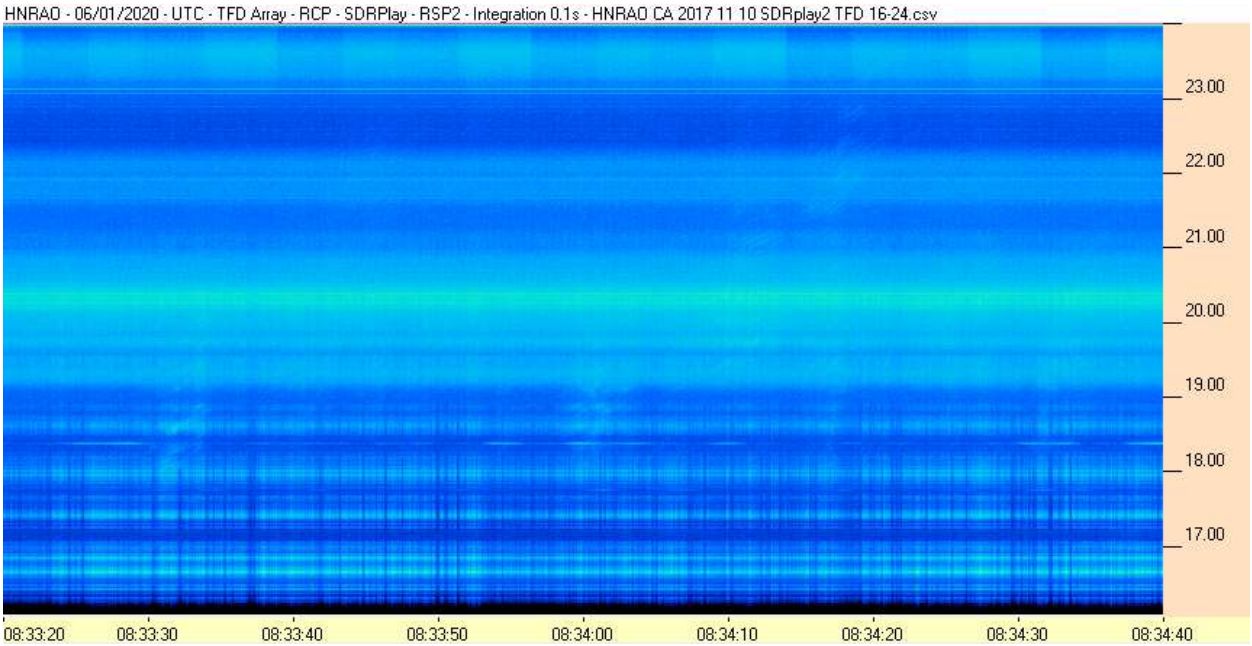
FSX-8S – TFD Array



SDRPlay RSP2/RCP – TFD Array



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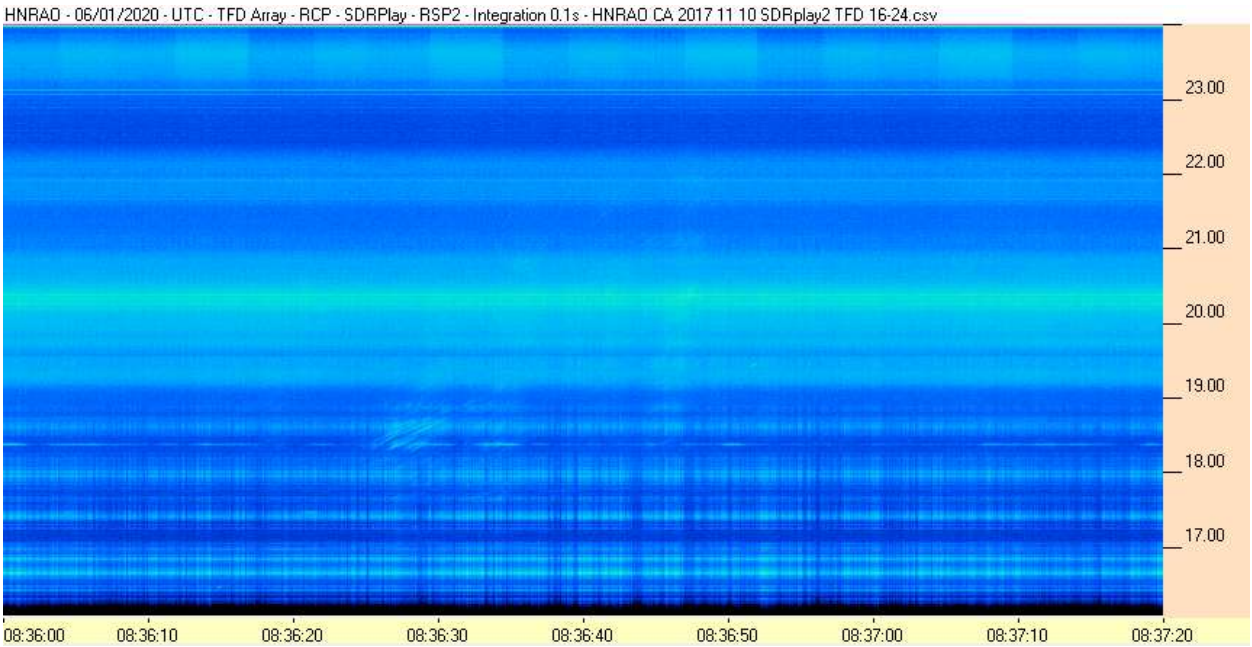
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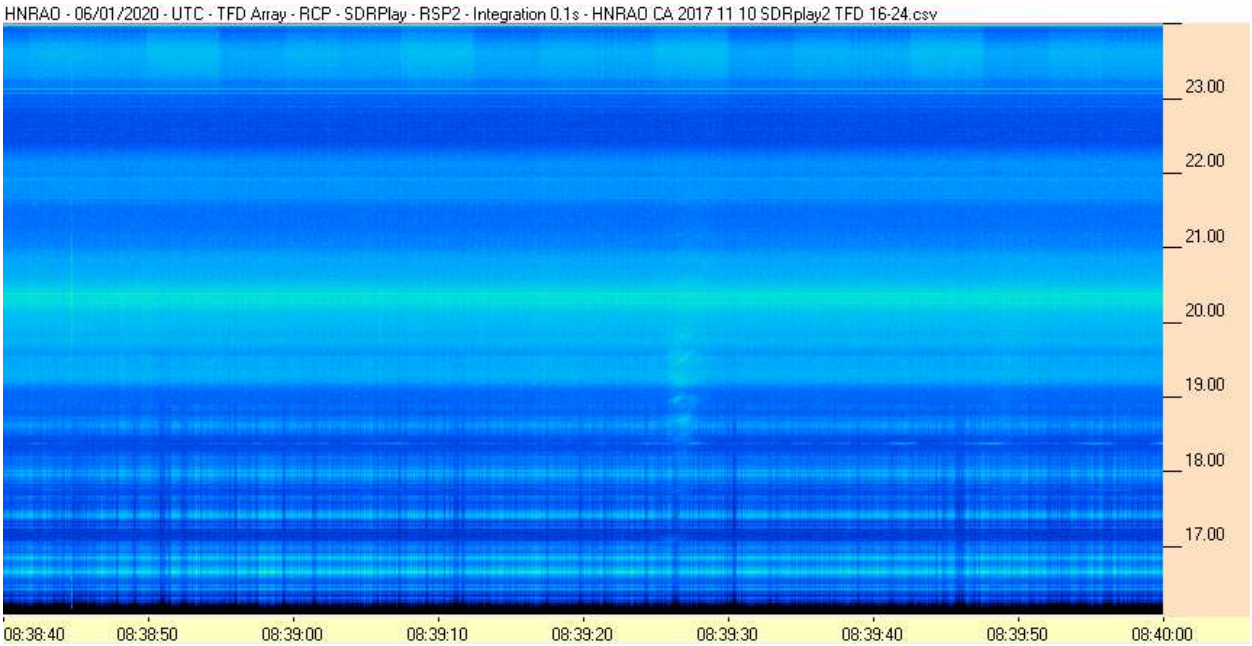
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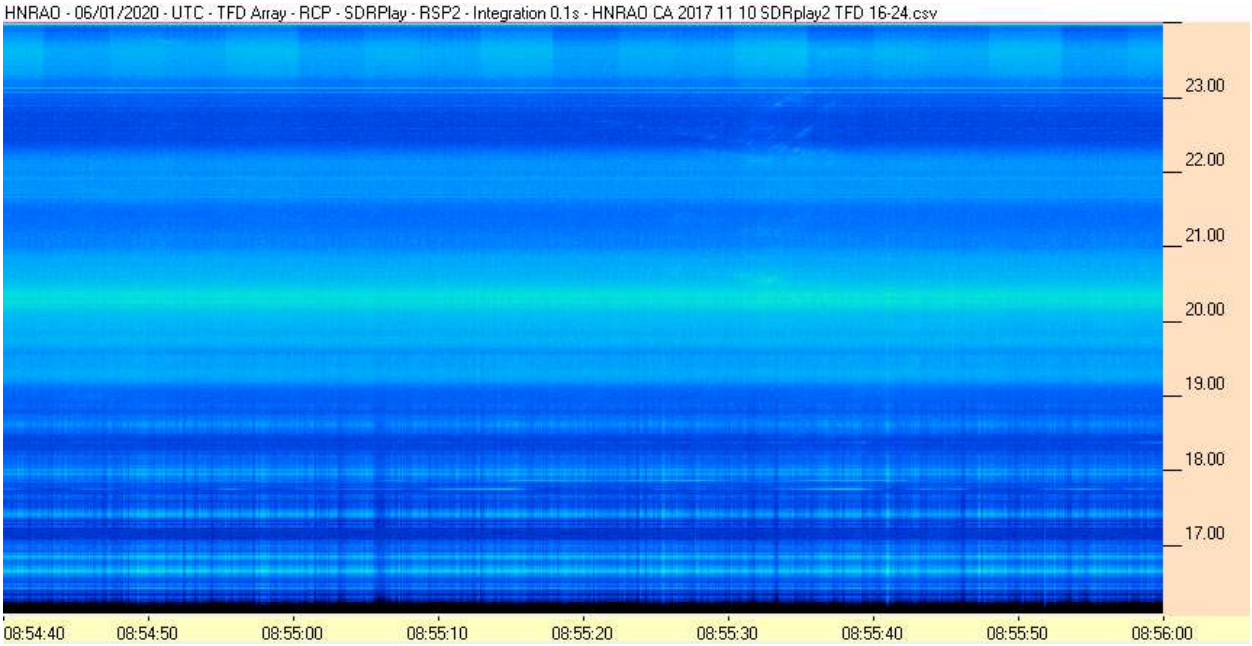
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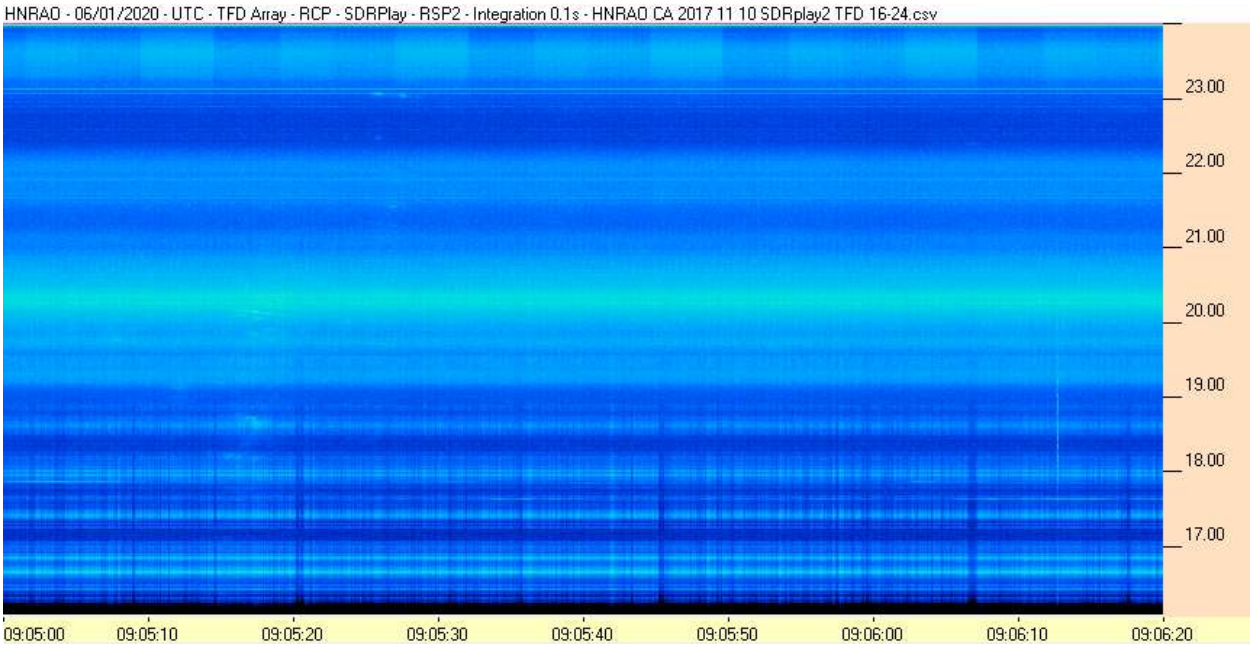
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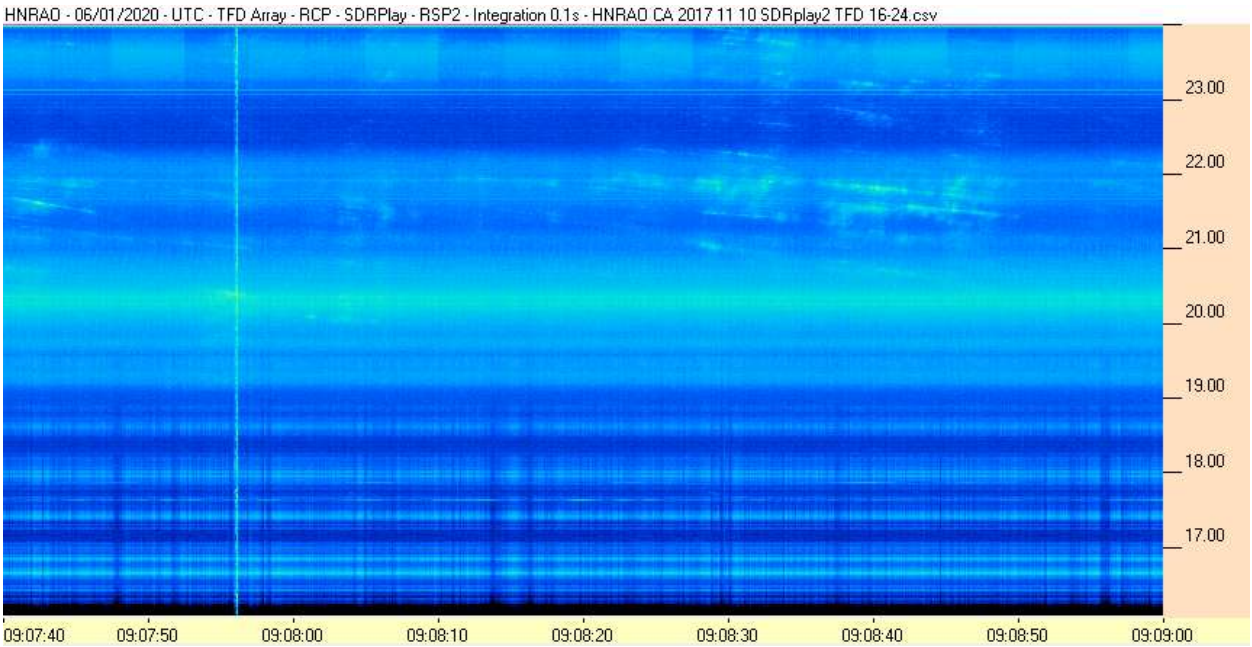
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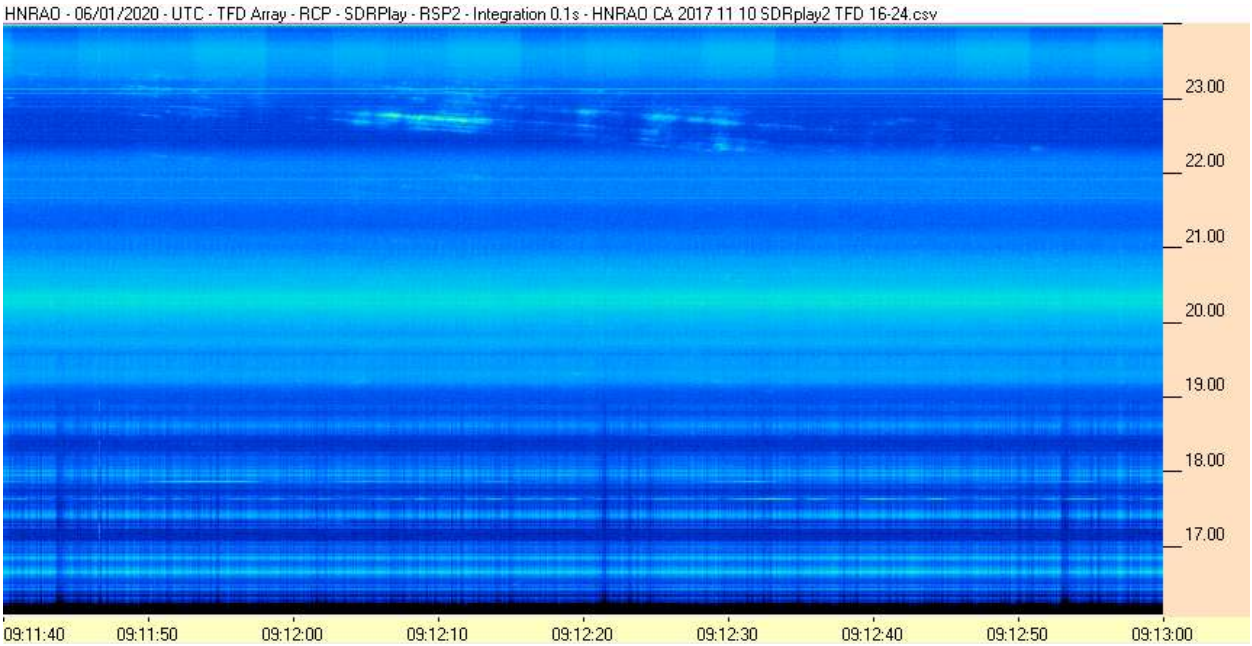
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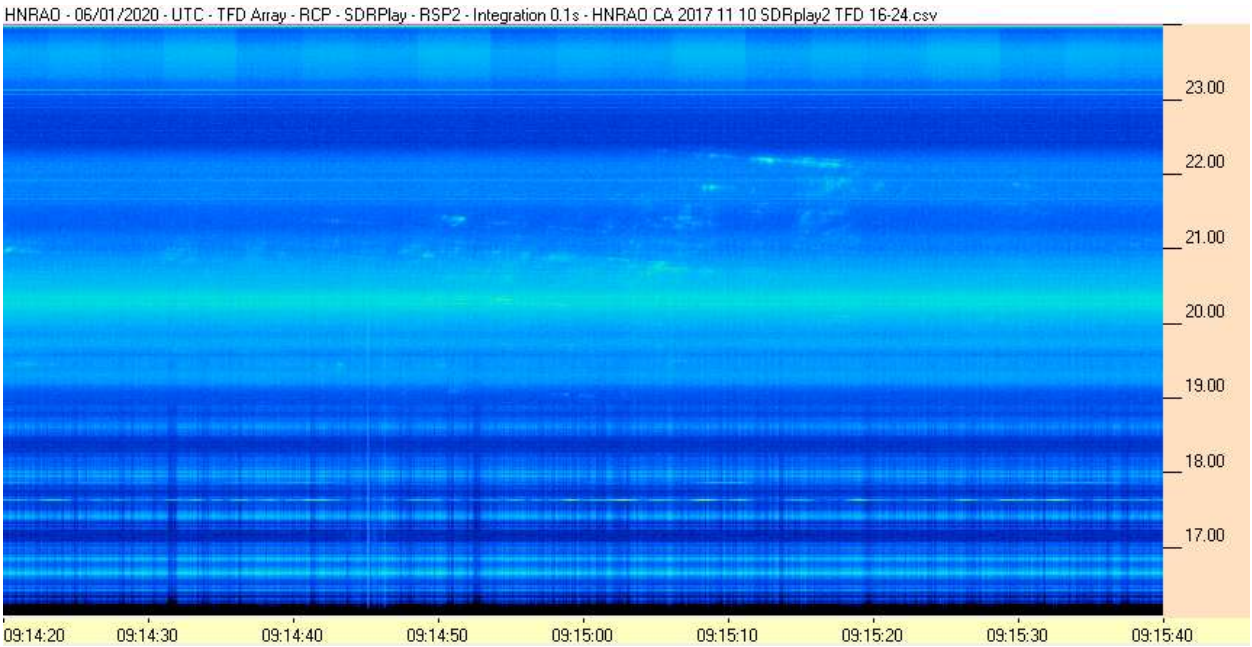
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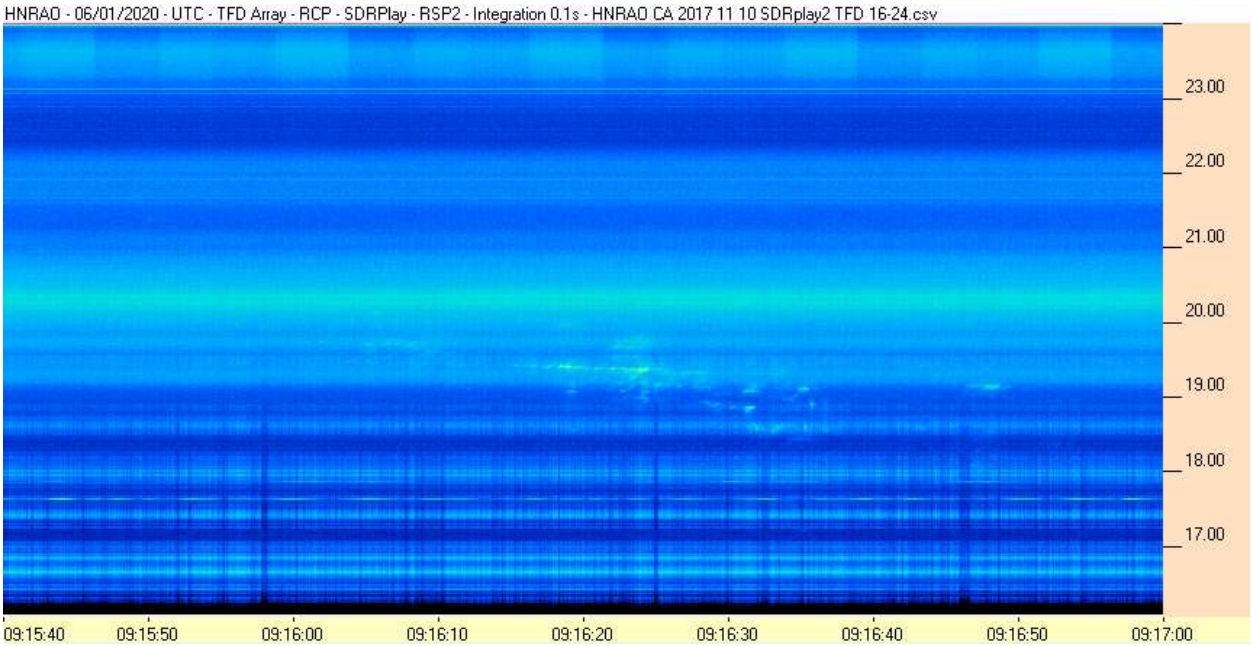
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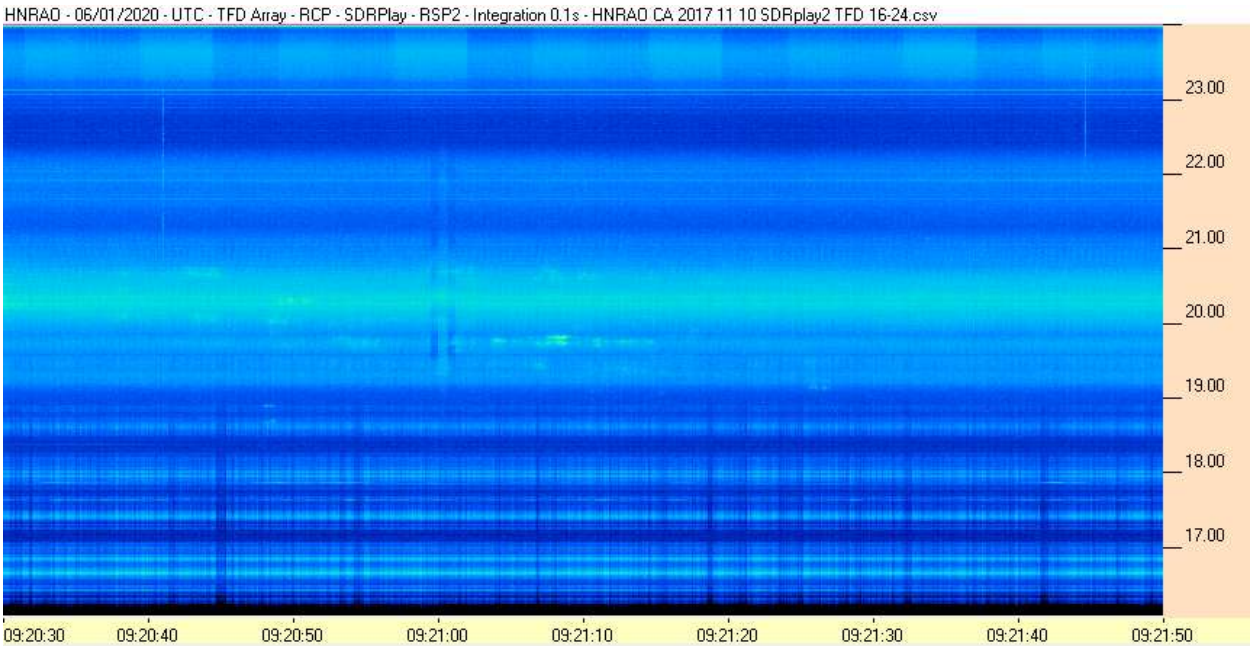
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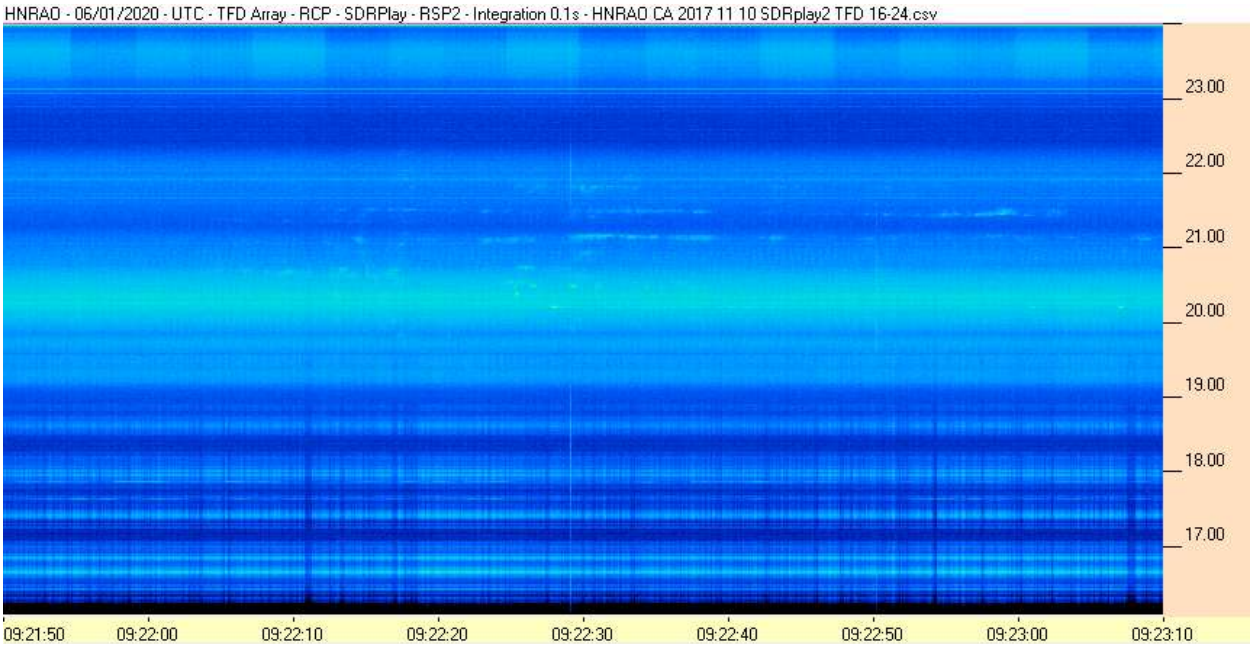
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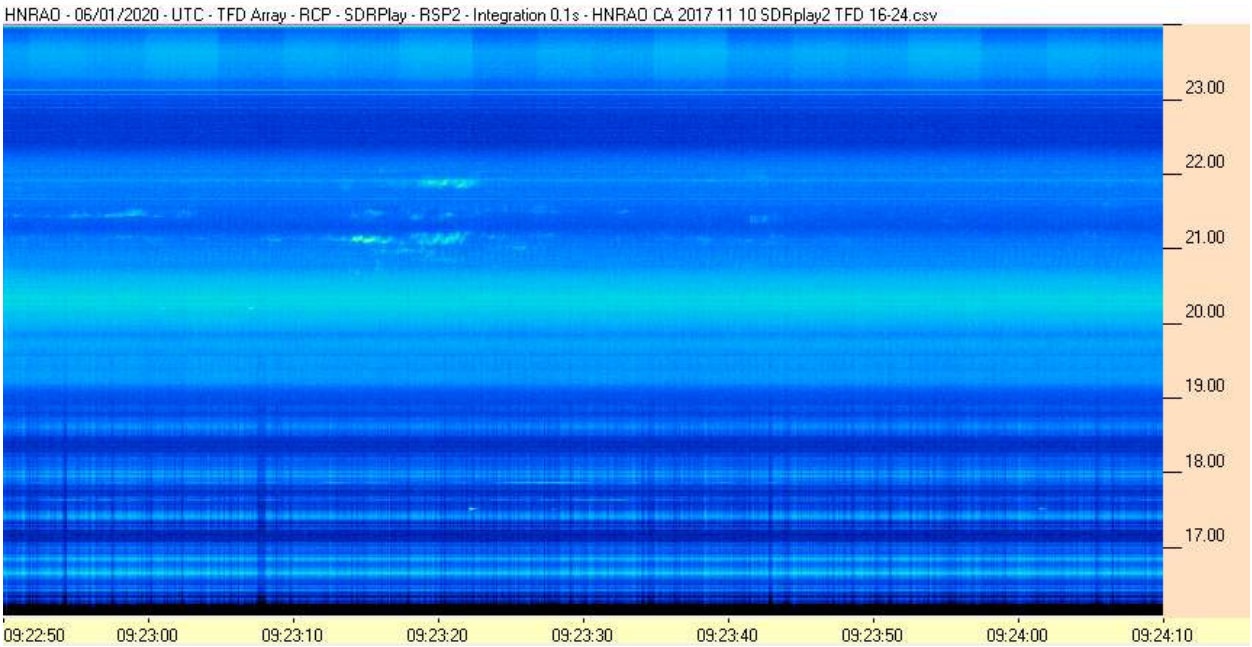
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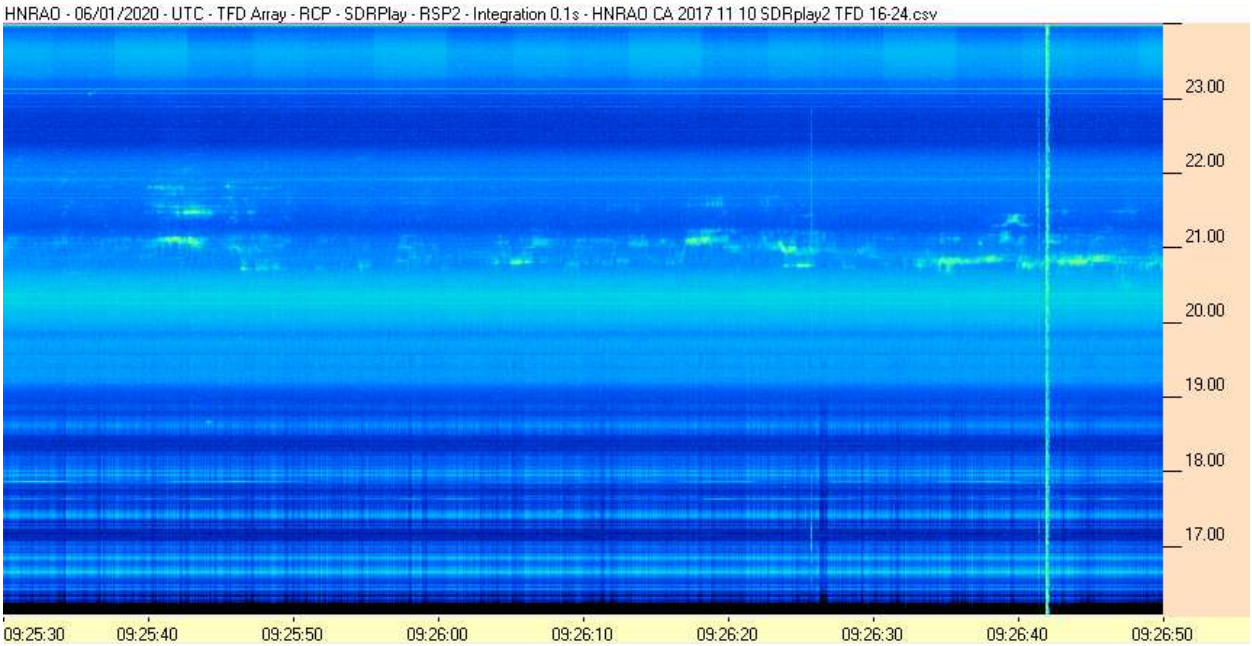
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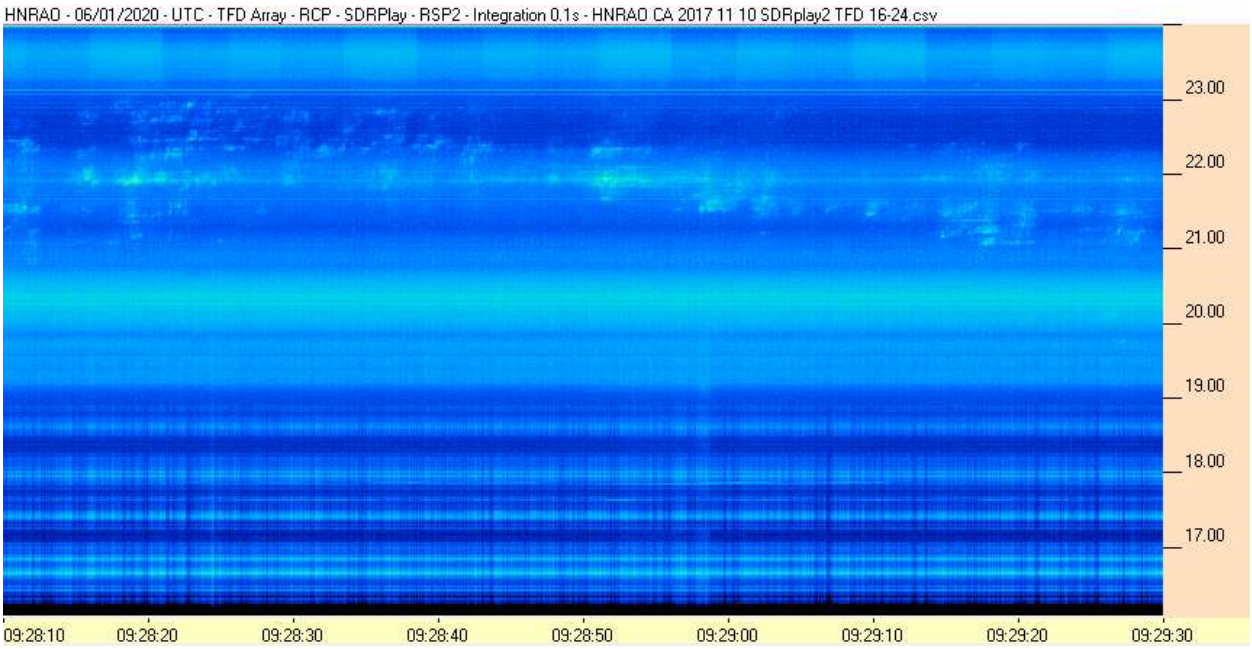
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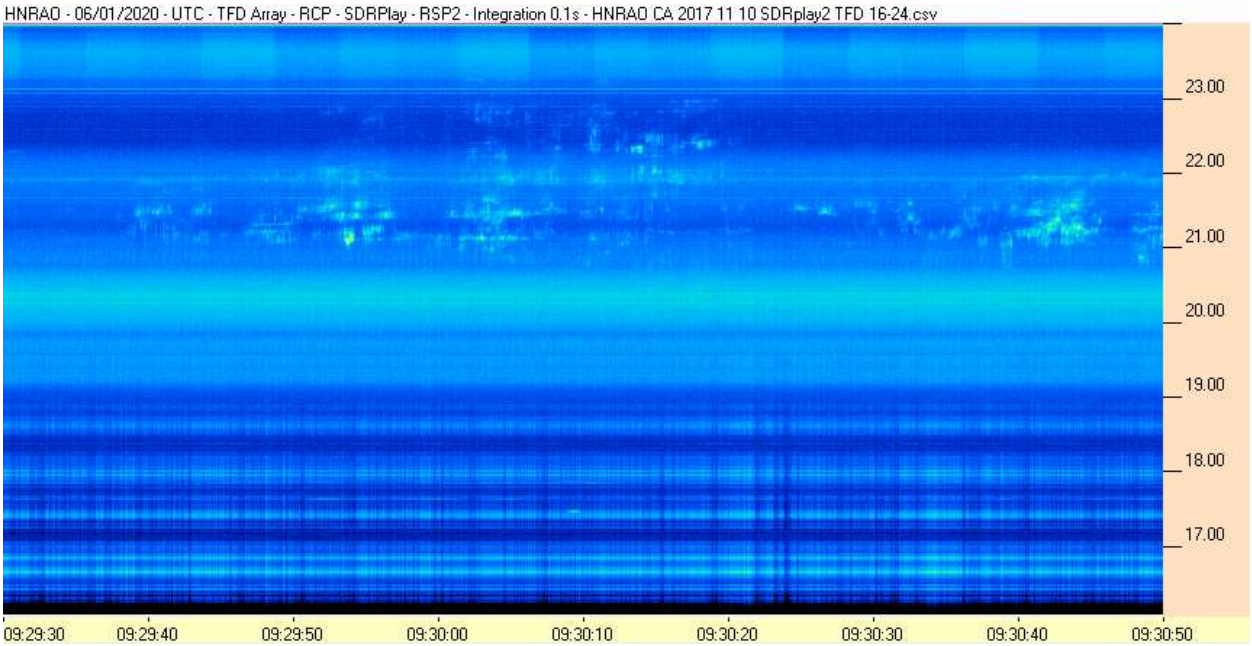
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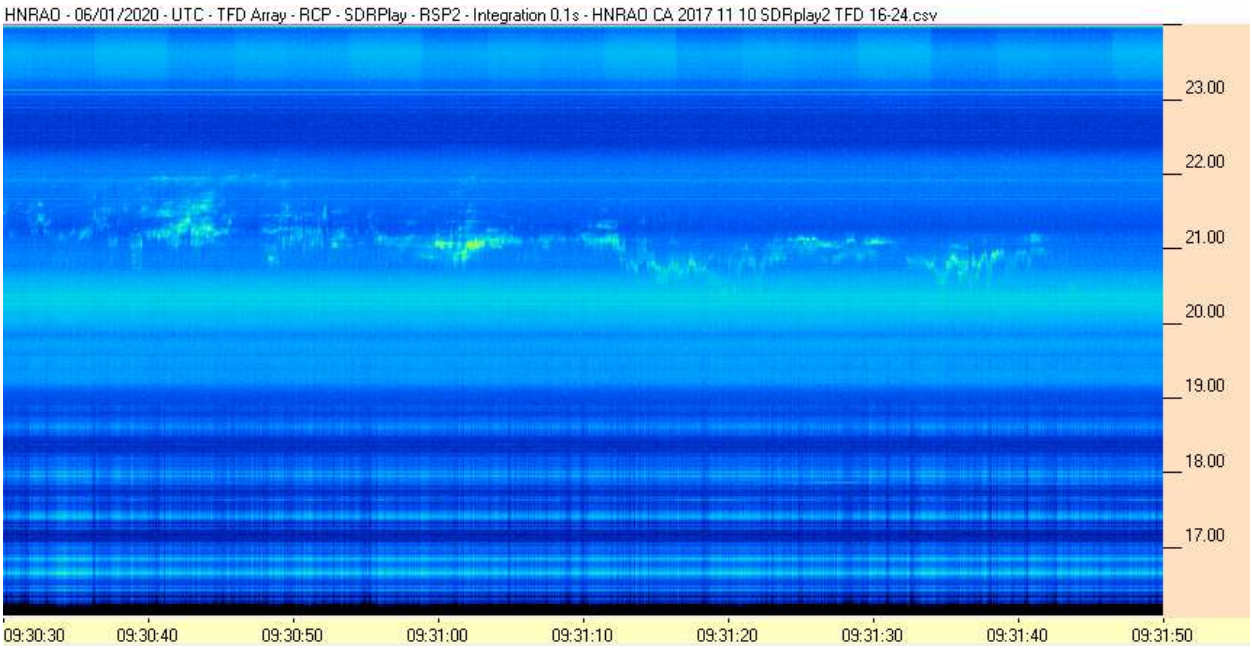
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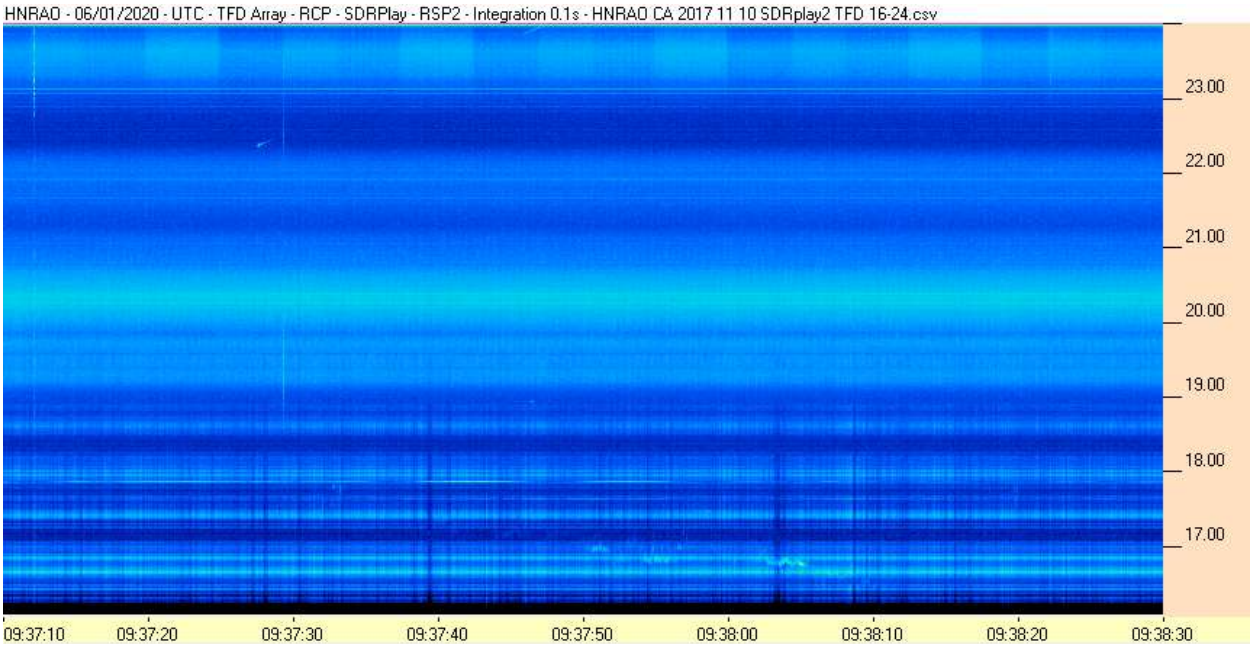
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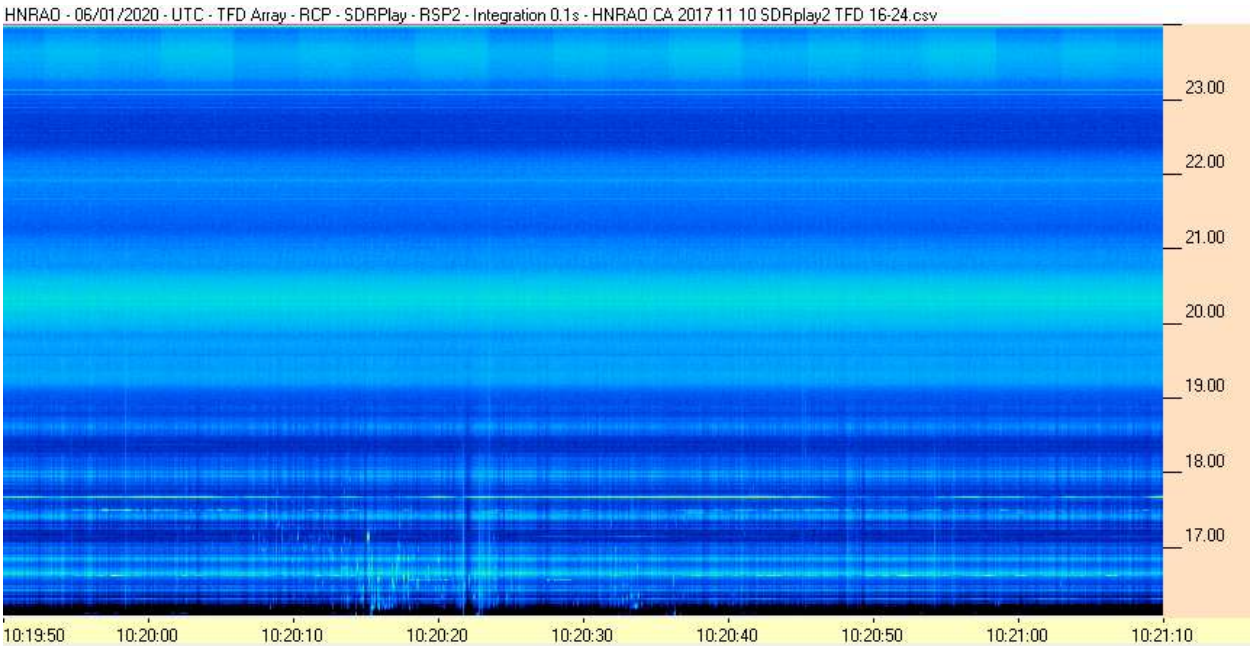
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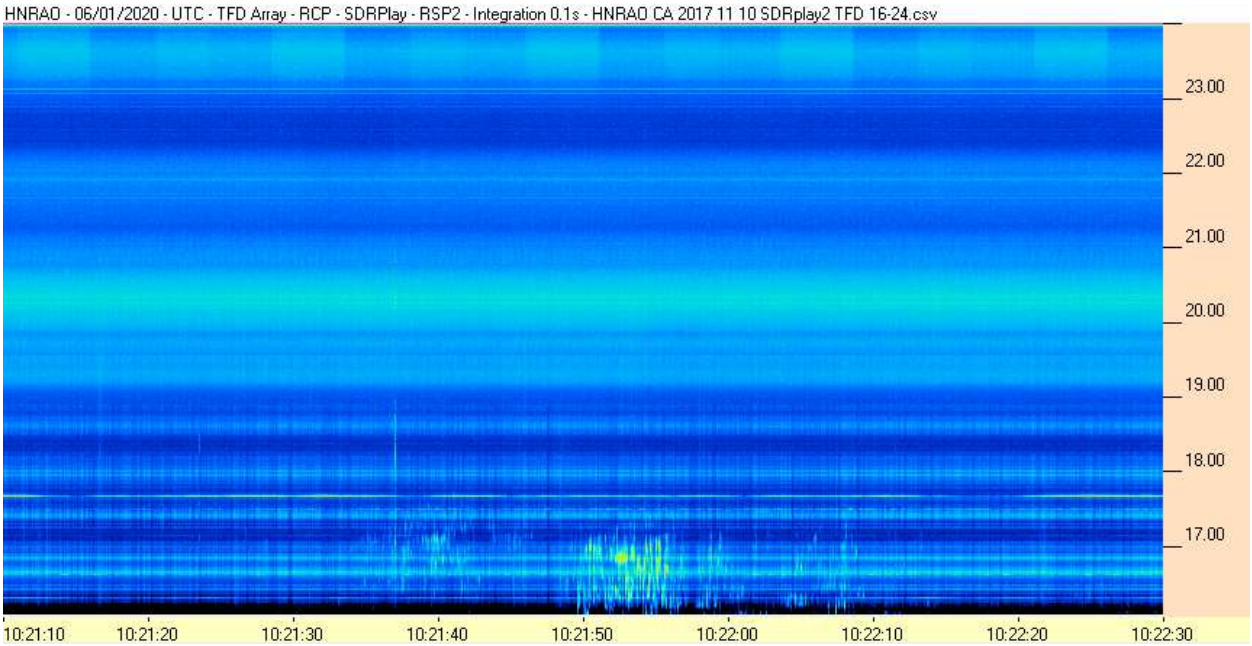
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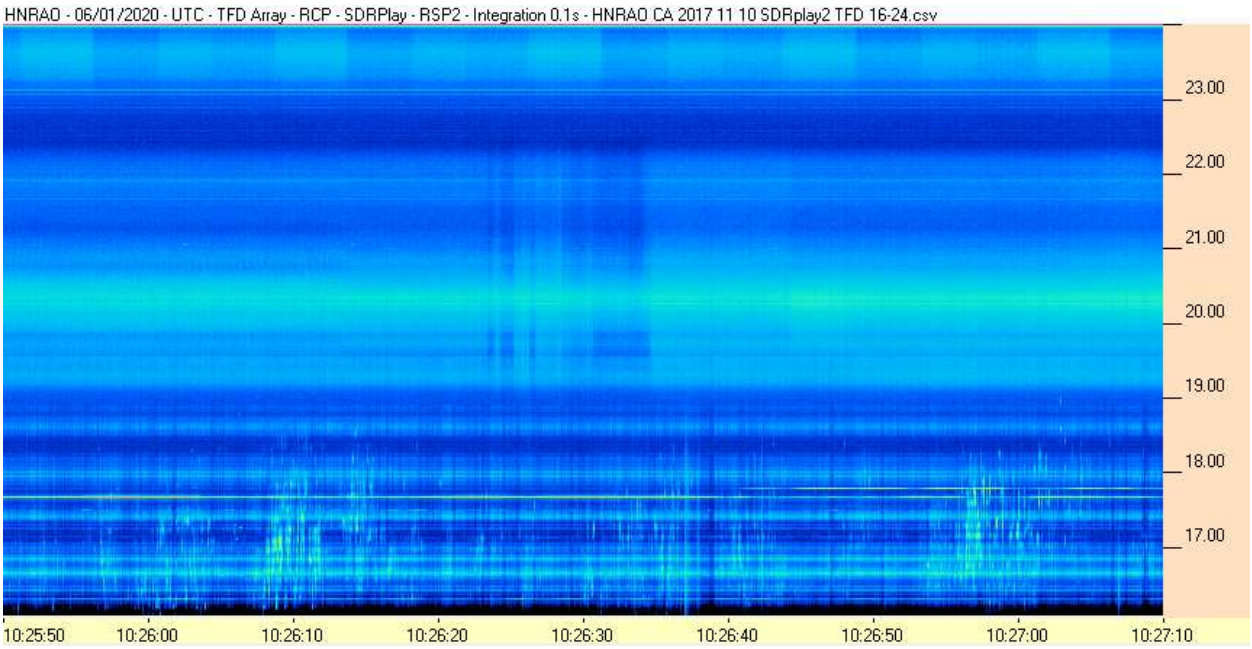
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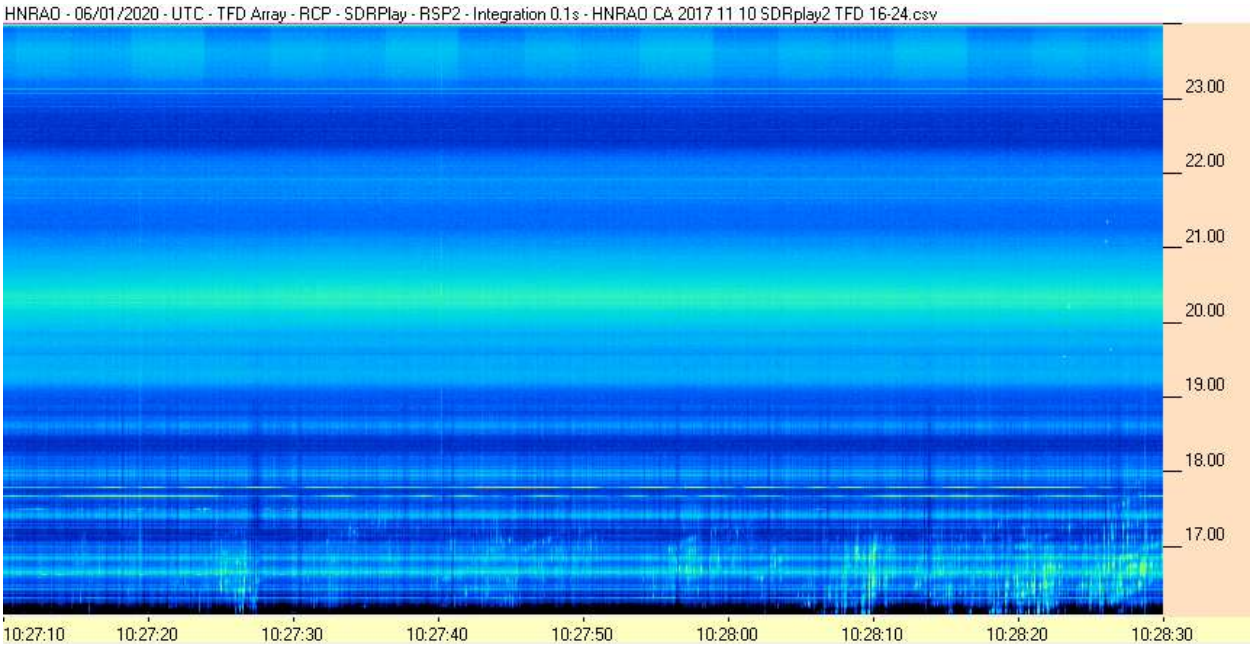
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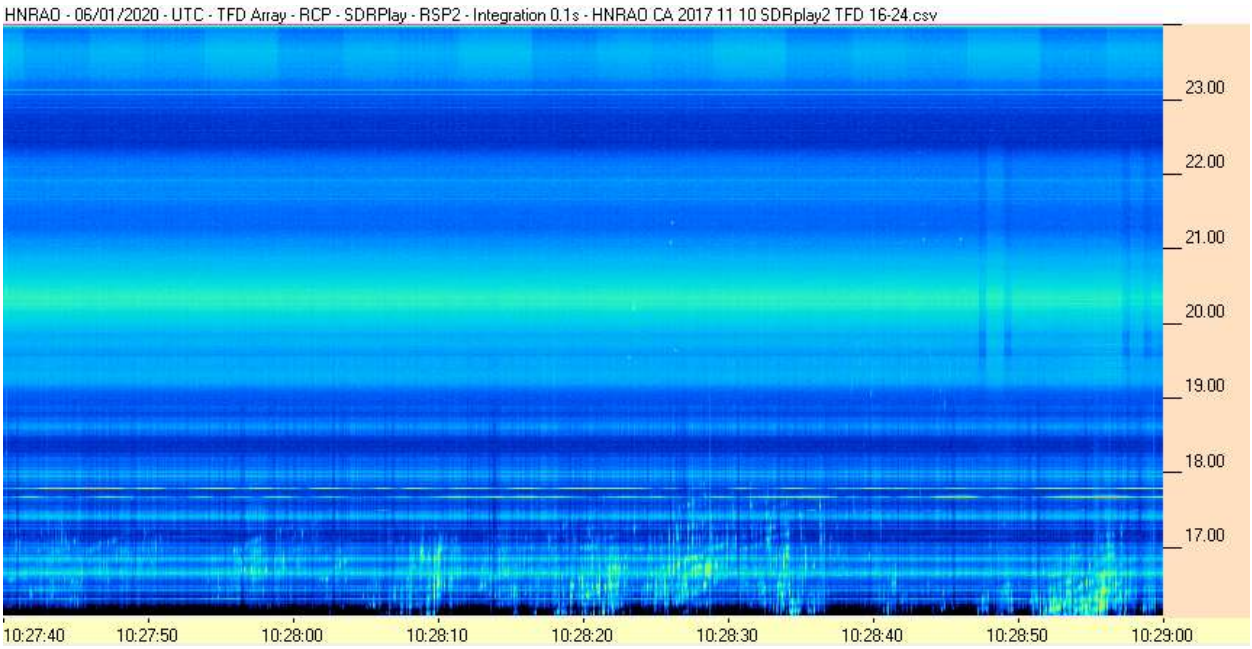
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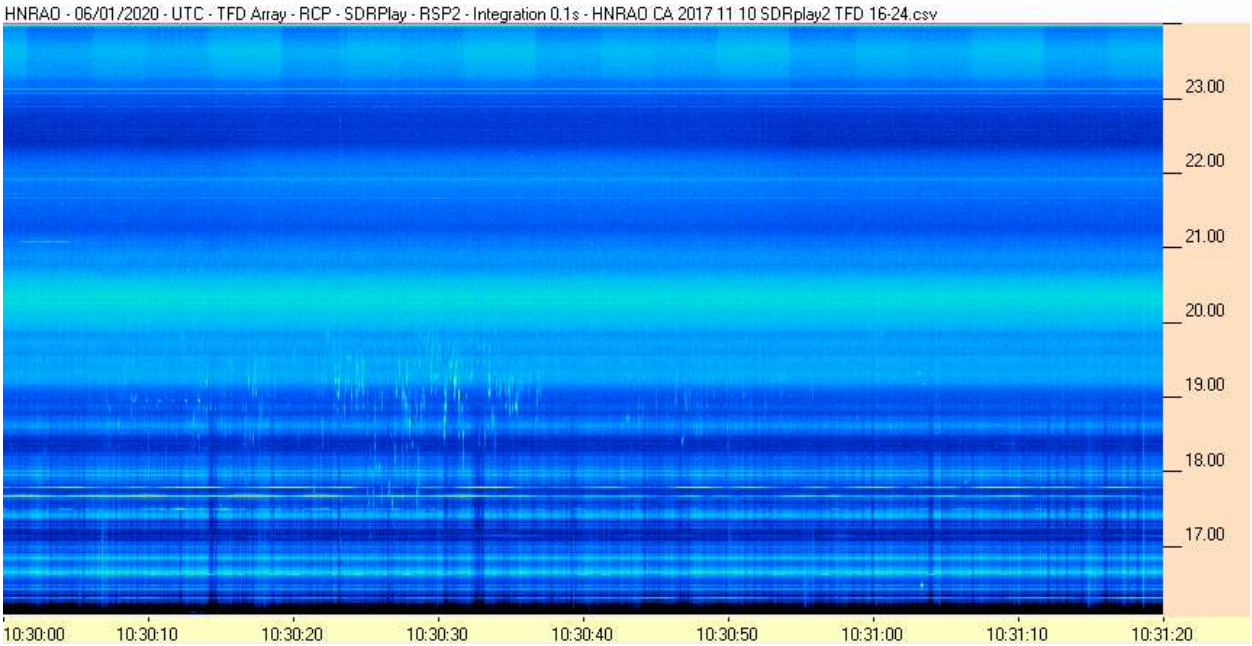
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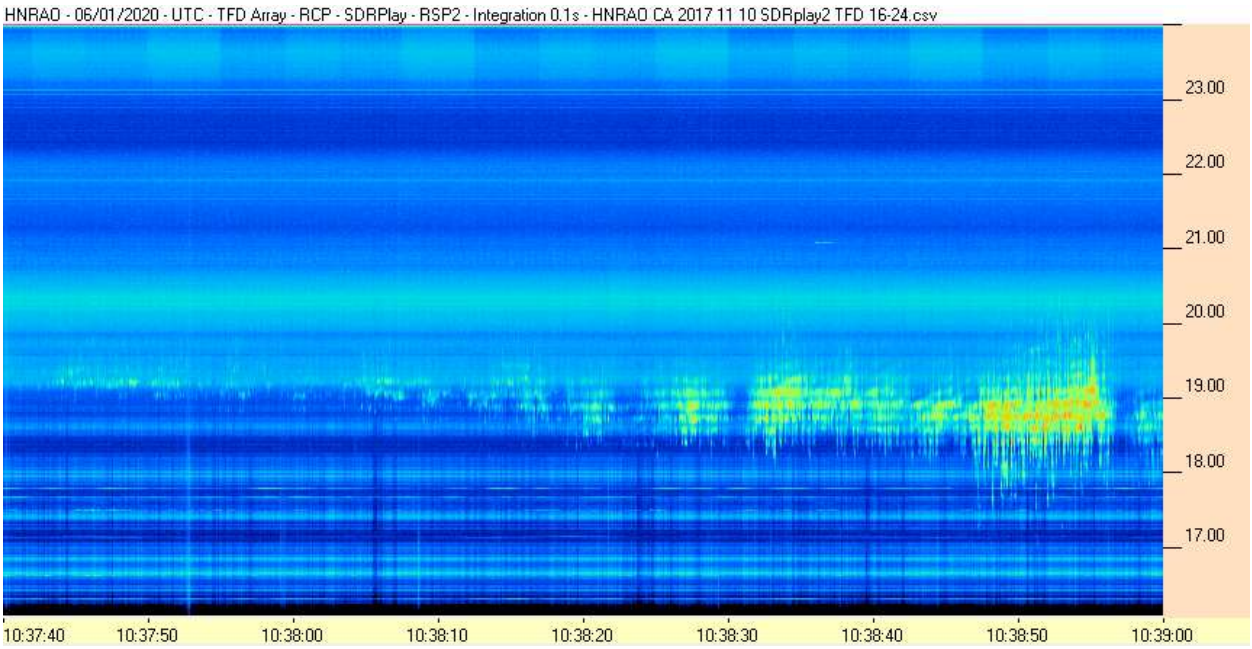
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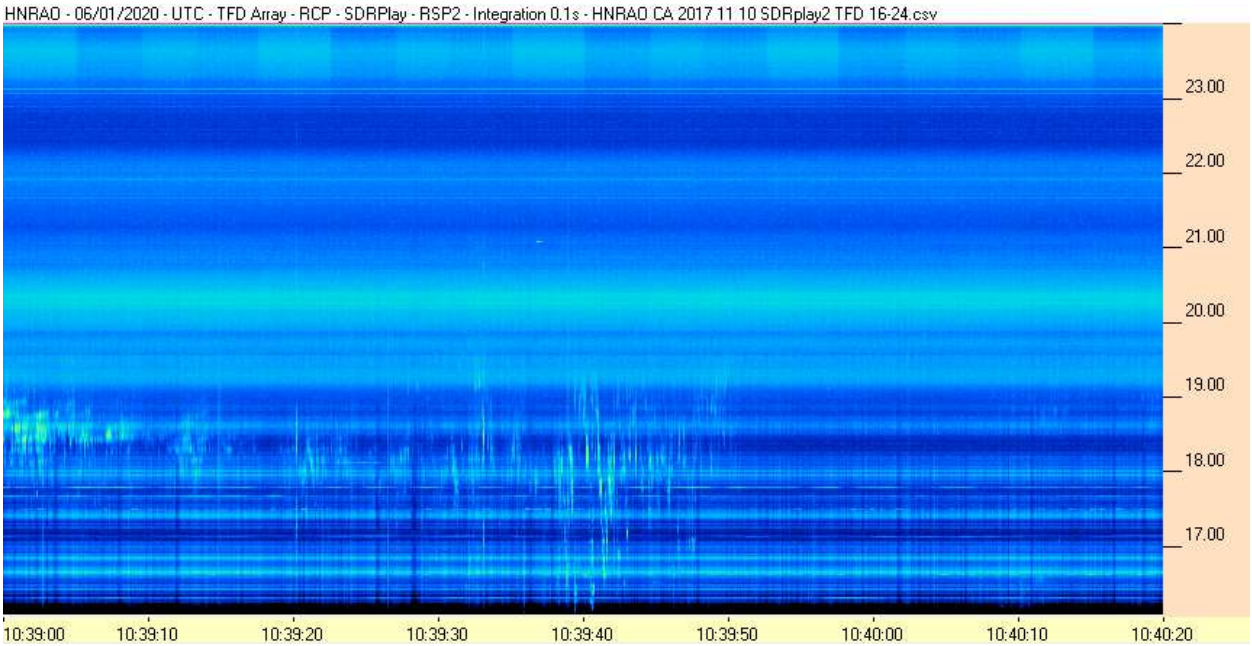
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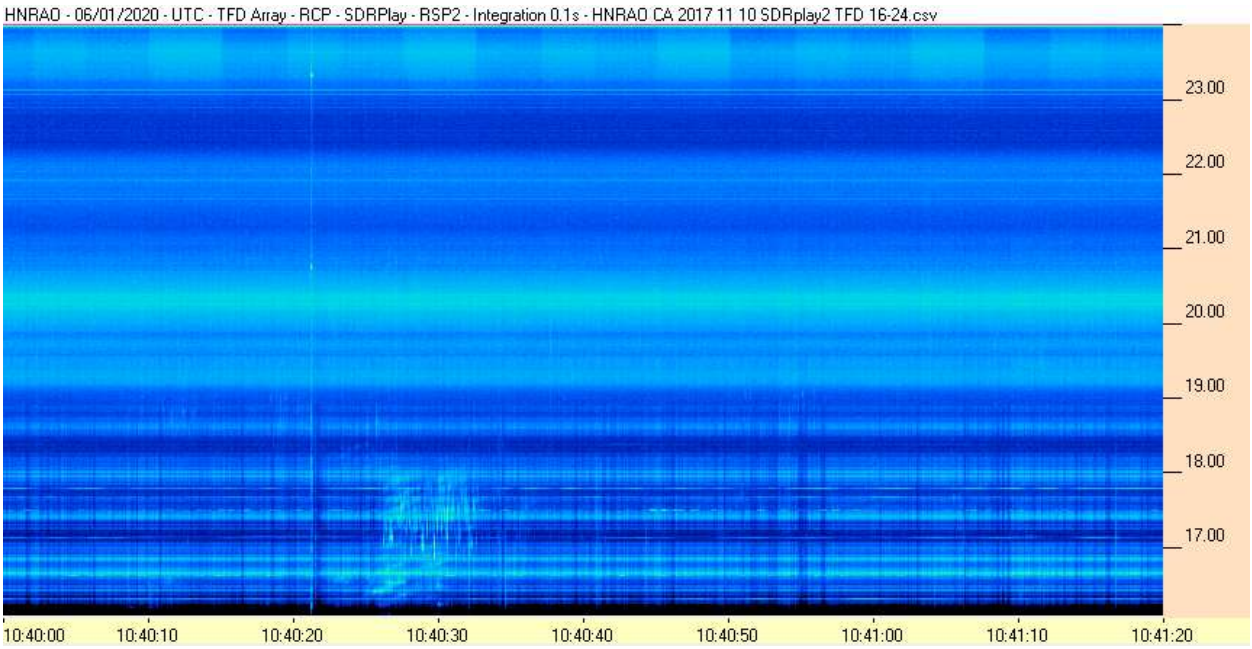
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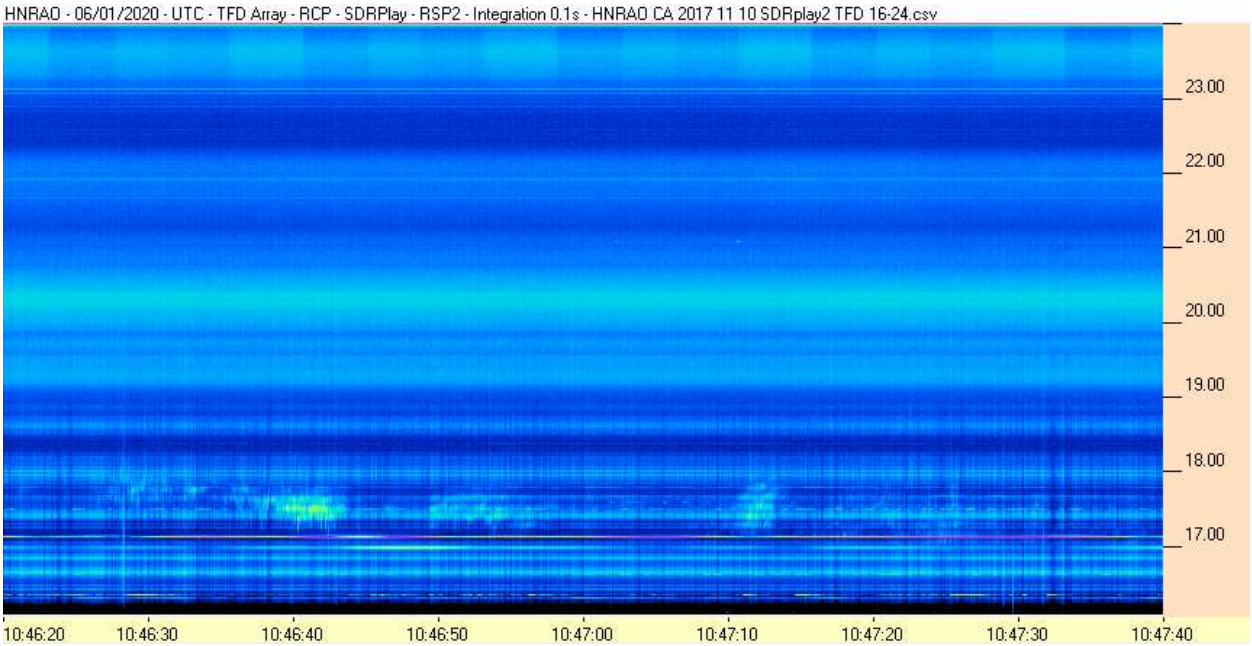
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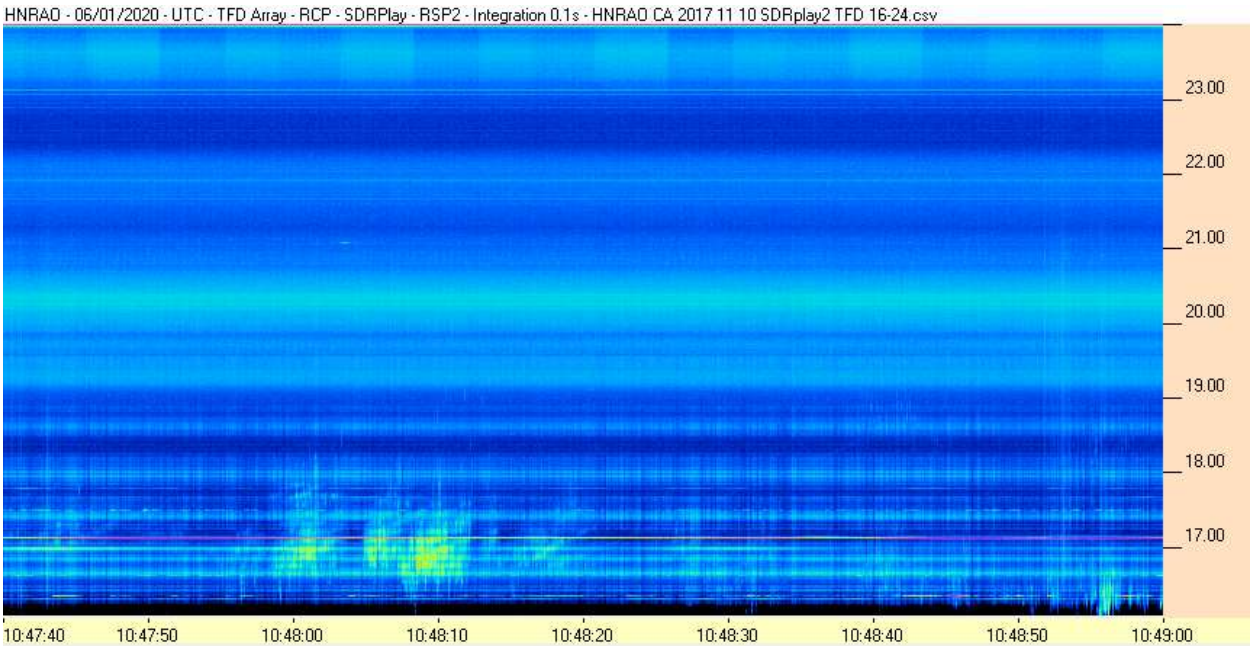
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