HNRAO Observing Log
40.673181 N – 80.437885 W
EN90sq

Date: April 21, 2019

Object: Jupiter – Io-B

Observer: Unattended

Start - Time UT:	**0926**	**Planetary K-index:**	**1**
Jupiter Altitude (deg):	**26.3**	**Jupiter Azimuth (deg):**	**186.9**
Jupiter CML:	**81.54**	**Jupiter Io Phase:**	**084.47**
Jupiter RA (hr/min):	**17:34**	**Jupiter Dec (hr/min):**	**-22.41**
Hour Angle (hr/min):	**00:27**	**Polarization**	**RCP**
Sun Altitude (deg):	**-12.1**	**Sun Azimuth (deg):**	**063.6**
Sun RA (hr/min):	**01:48**	**Sun Dec (hr/min):**	**11:09**

End – Time UT:	**1121**	**De:**	**-2.8**
Jupiter Altitude (deg):	**18.5**	**Jupiter Azimuth (deg):**	**214.5**
Jupiter CML:	**151.07**	**Jupiter Io Phase**	**100.65**
Hour Angle (hr/min):	**02:22**	**Duration (min):**	**195**
Sun Altitude (deg):	**08.7**	**Sun Azimuth (deg):**	**082.7**
Max Frequency MHz	**27**	**Min Frequency MHz**	**15**

Data from Radio-Jupiter Pro 3.8.2

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	TFD	RCP	-8.35 dB	#2 RCP	Port 2 +3dB	Twice daily
SDRPlay RSP2	TFD	LCP	-7.59 dB	#1 LCP	Port 2 +3dB	Twice daily
JOVE 1	TFD	RCP	-8.35 dB	#2 RCP	Port 3 +3 dB	04/20/2018
JOVE 1	TFD	LCP	-7.59 dB	#1 LCP	Port 3 +3 dB	04/20/2018
JOVE II	Jove dipoles	Linear	-3.66 dB	#3 Linear	Port 4 +3 dB	4/19/2019
SDRPlay RSP1	Experimental*					

JOVE dipoles phased @ 32 degrees for 2017-2018 season
TFD array phased @ 35 degrees for 2017-2018 season
LWA antenna phased @ 35 degrees and orientation for observation: 45 degrees
* Used for testing and evaluating antenna systems
Software Radio Sky Spectrograph 2.8.50
Red = Offline
All times are synced with a local GPS locked NTP server.

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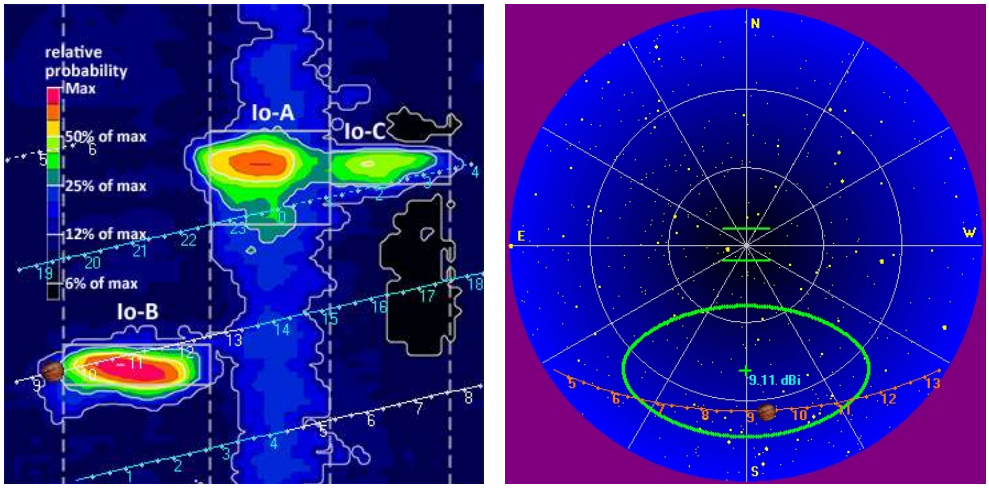
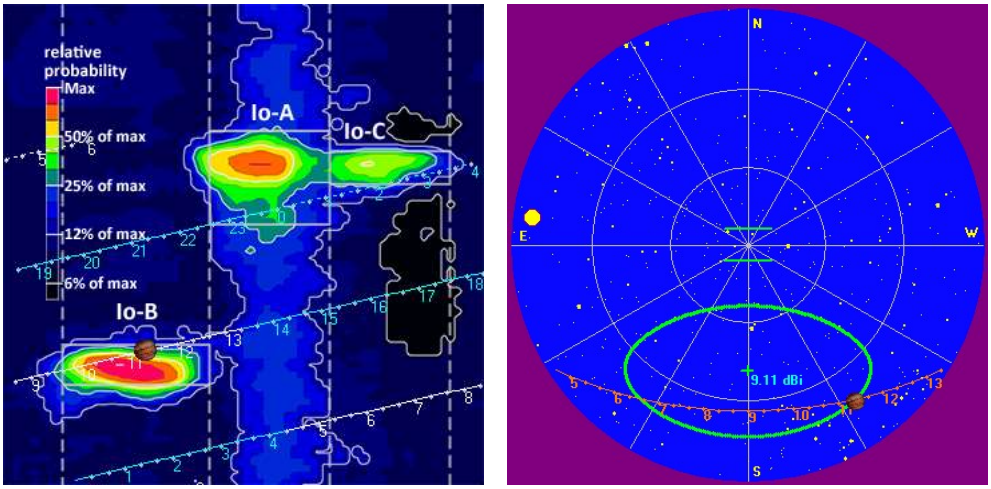
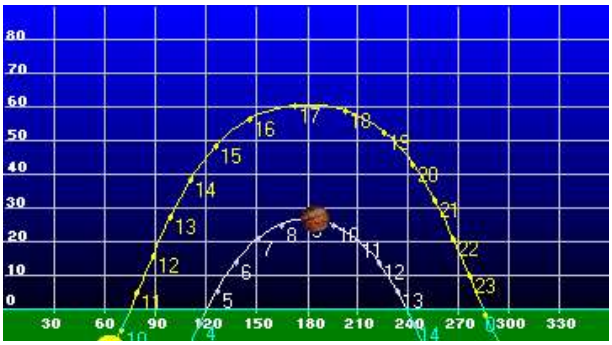
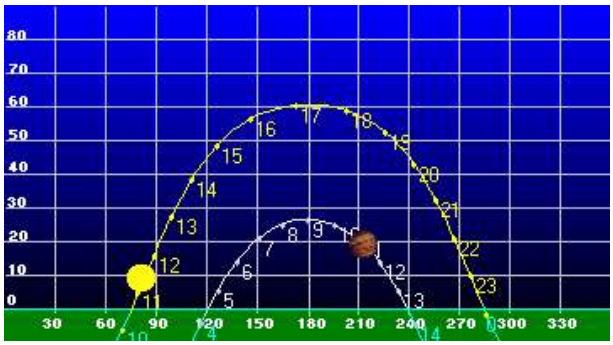


Beginning of Pass



End of Pass

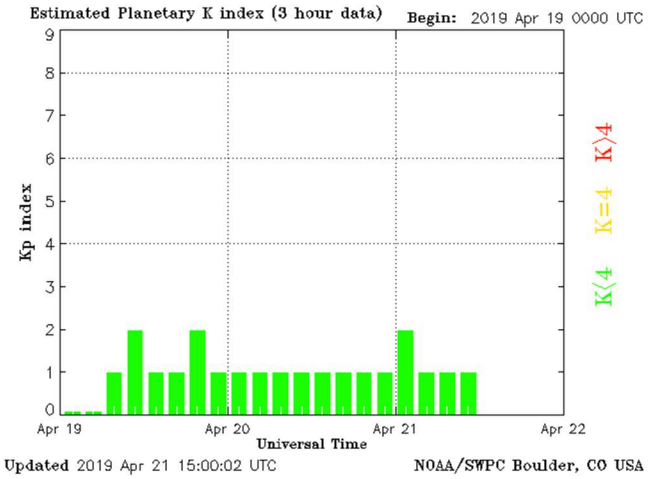




MODE	CML RANGE	Io RANGE	MAX F	POLAR	ARC	NOTES
Io-D	0-200	95-130	18	LH	Early	Also called "fourth source"
Io-B	(105 - 185)	(80-110)	39.5	RH	Early	Also called "early source"
non Io-B	80-200	0-360	38	RH	Early	Voyager info
Io-A	(200-270)	(205-260)	38	RH	Late	Also called "main source"
non-Io-A	(230-280)	0-360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



All spectrographs and the Radio JOVE array were working and recording data. All three RCP spectrographs recorded data as well as the Radio JOVE array. The weather at the observatory was cloudy.

Beginning approximately 30 minutes past transit, and lasting 195 minutes, this Io-B storm consisted of positive drift L-bursts and S-bursts with L2 modulation lanes. L3 modulation lanes were observed throughout the storm.

The first indication of emissions began at 0927 UT with L-bursts between 16 MHz and 20 Hz. These emissions began at 16 MHz and were just slightly above GB. S-bursts were observed starting at 1020 UT between 20 MHz and 21 MHz. Some emissions were, perhaps, 3+ dB above GB with the strongest emission near the end of the storm.

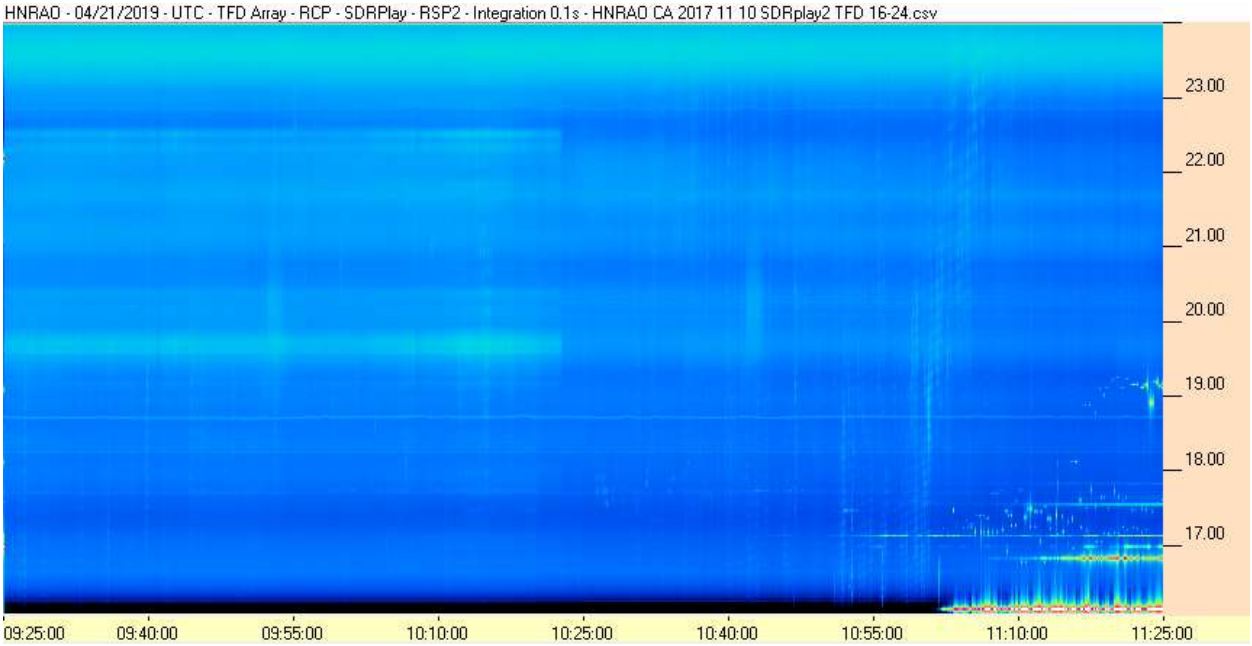
While emissions spanned 15 MHz to 27 MHz, the strongest bursts were below 21 MHz.

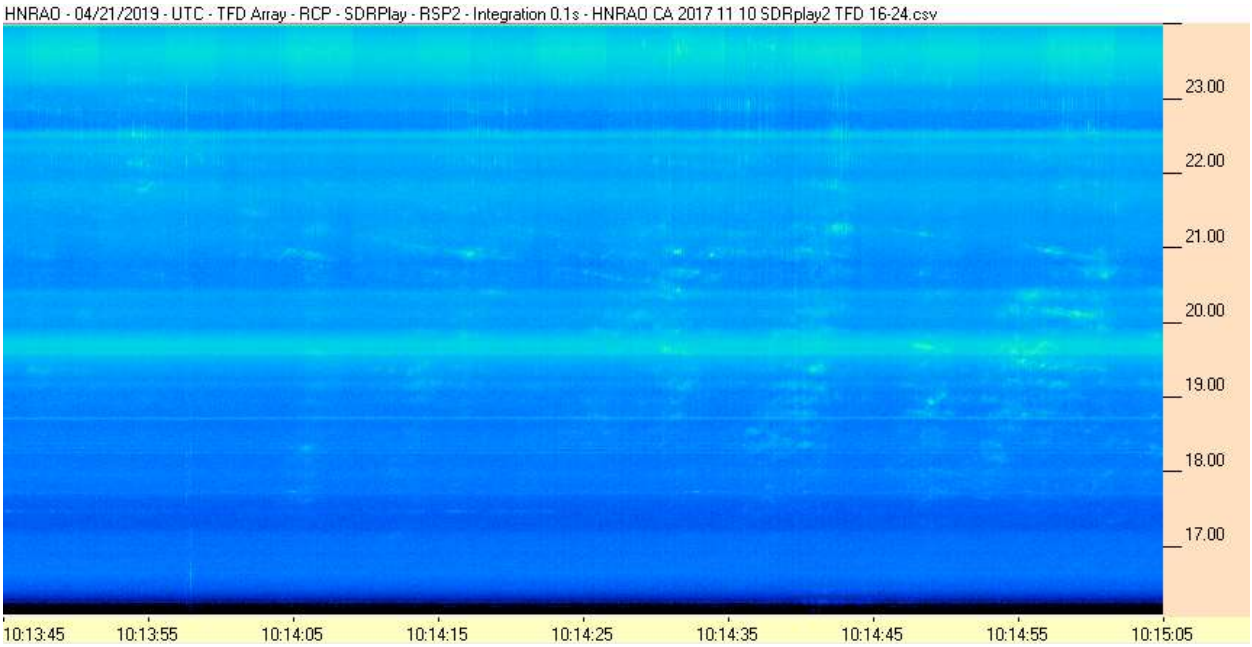
The same curious upswept lines appeared in this storm as were seen in the Io-C storm 4/20/2019. These lines are very apparent in first image below. One possible explanation is that these might be Faraday lines caused by the rapidly changing ionosphere at dawn, however, Faraday lines should not be present in a circularly polarized array.

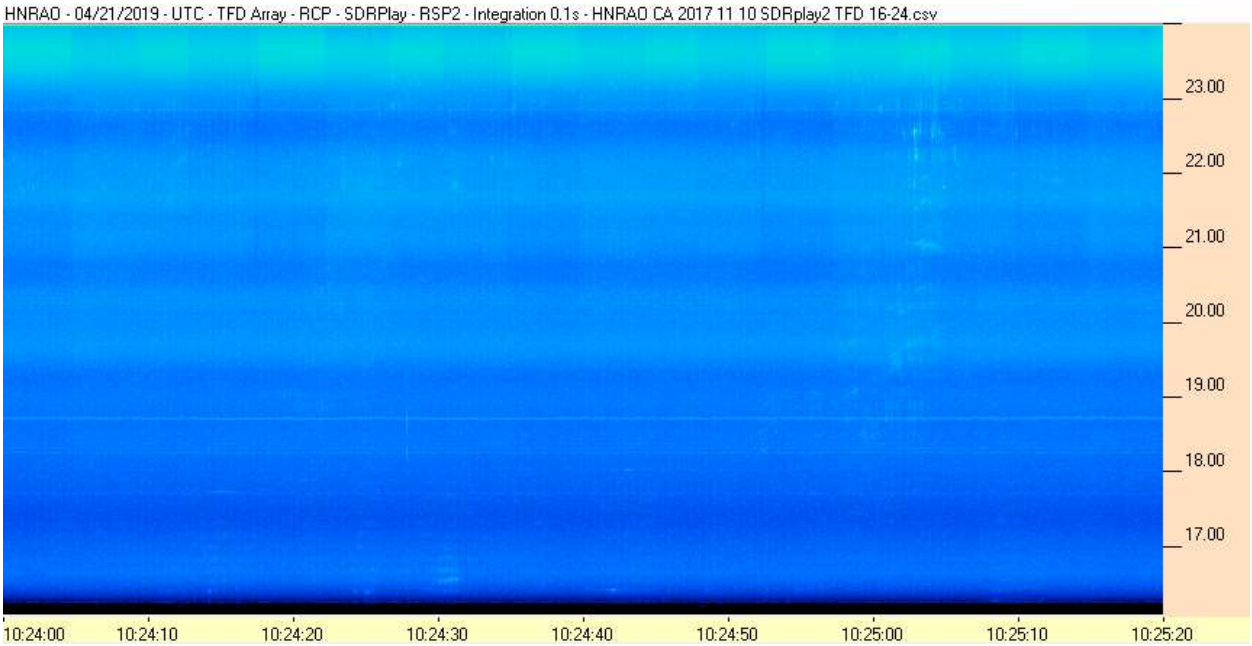
There was also an LCP Io-D storm occurring from 1015 UT through approximately 1053 UT.

EOR

SDRPlay RSP2 / TFD Array



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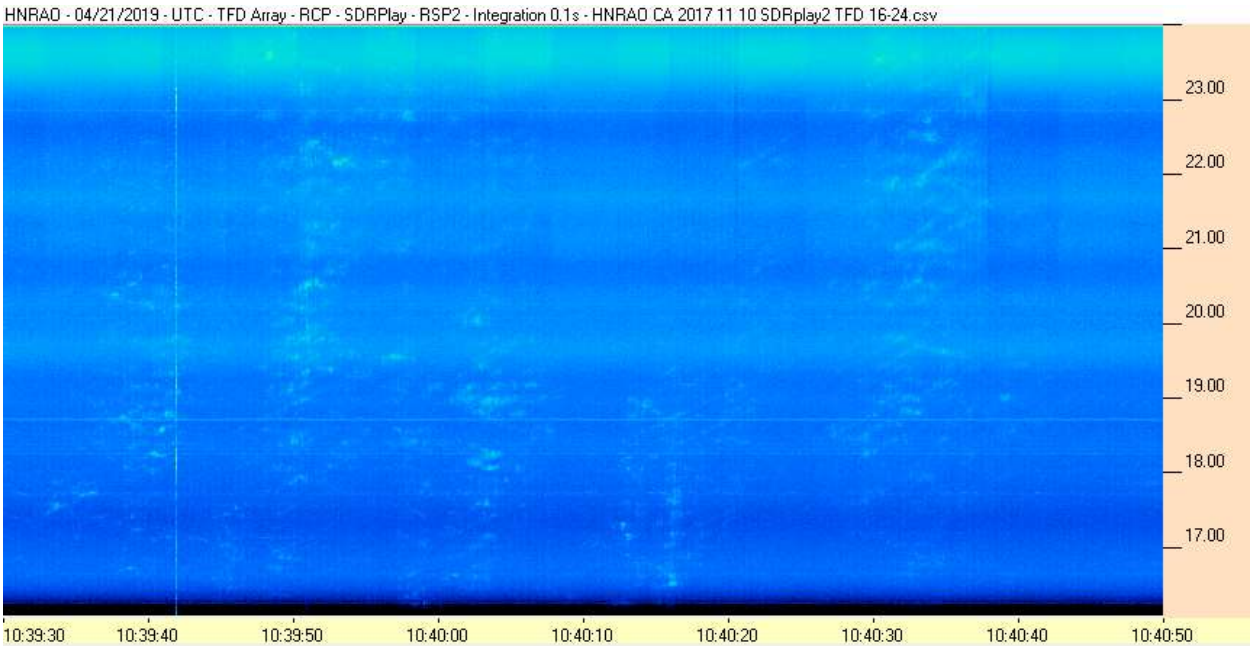
10:25:10
10:25:20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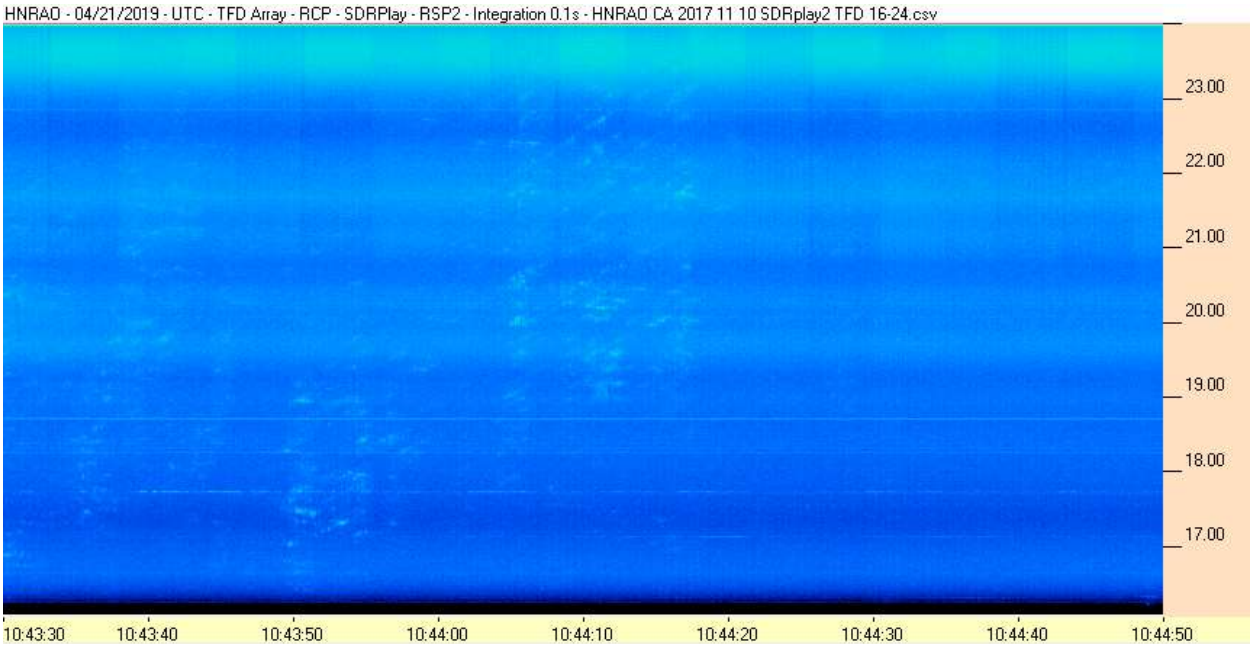
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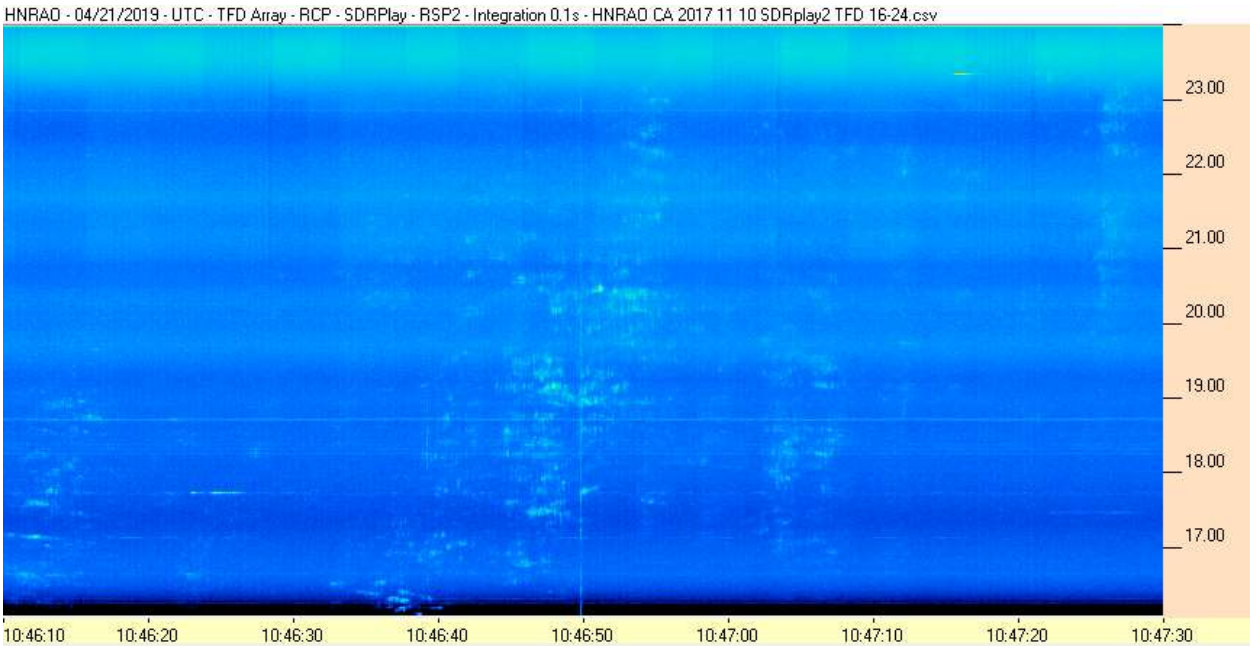
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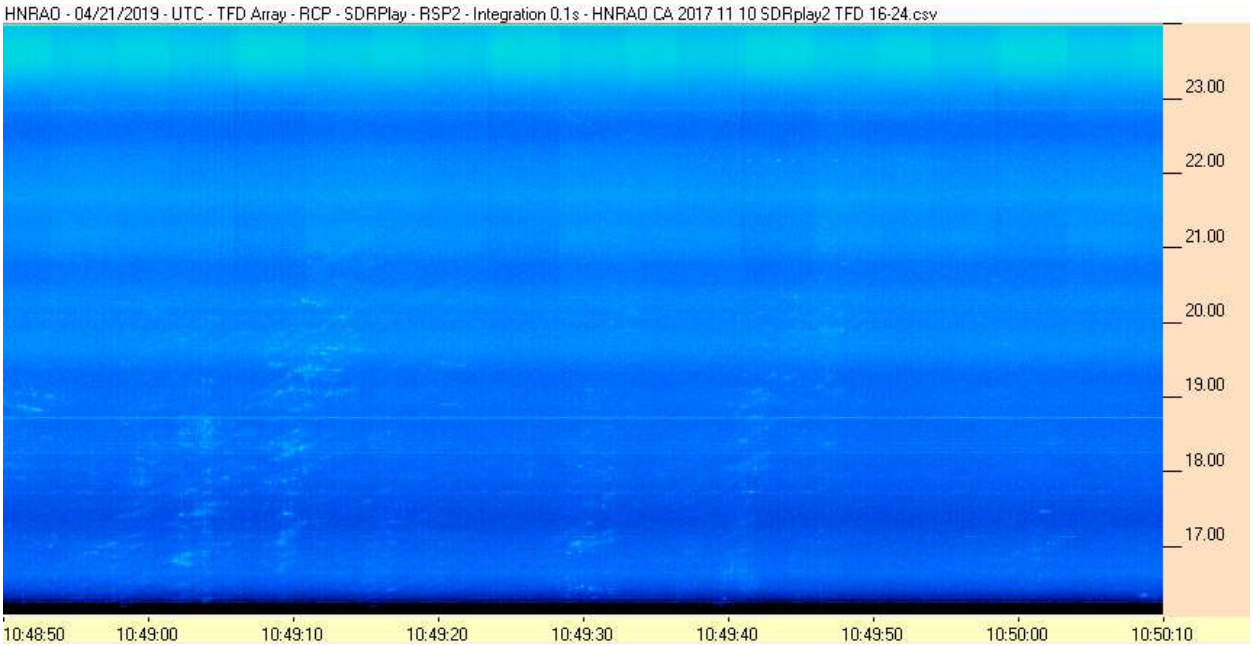
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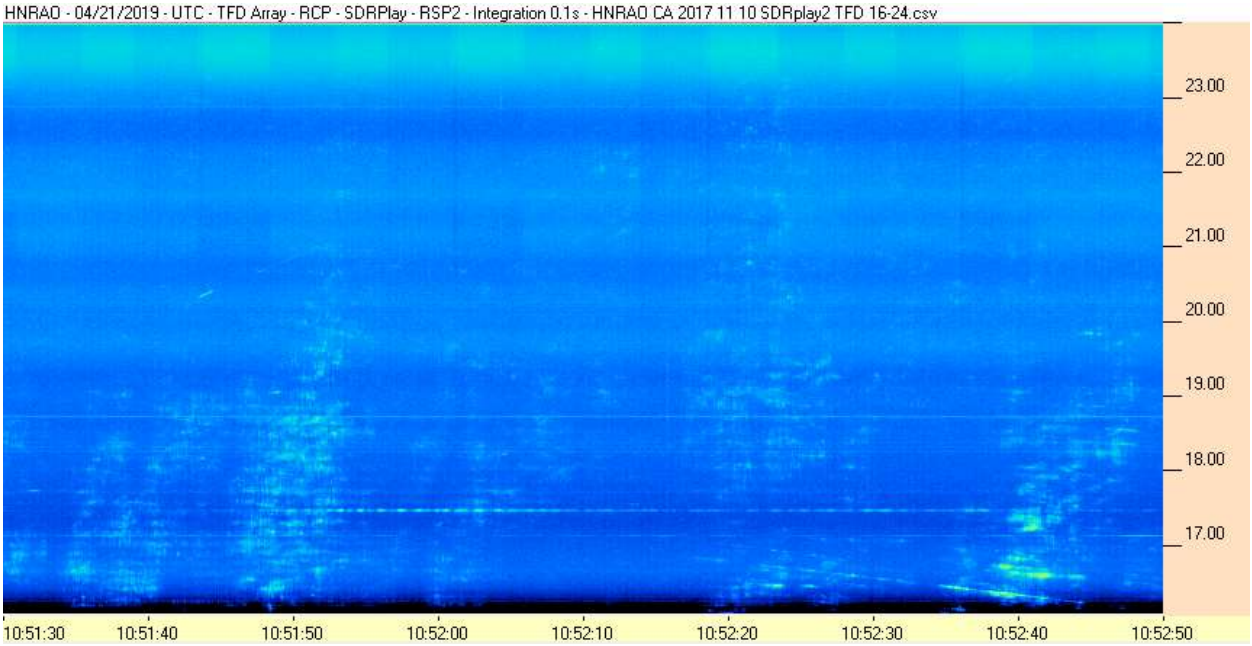
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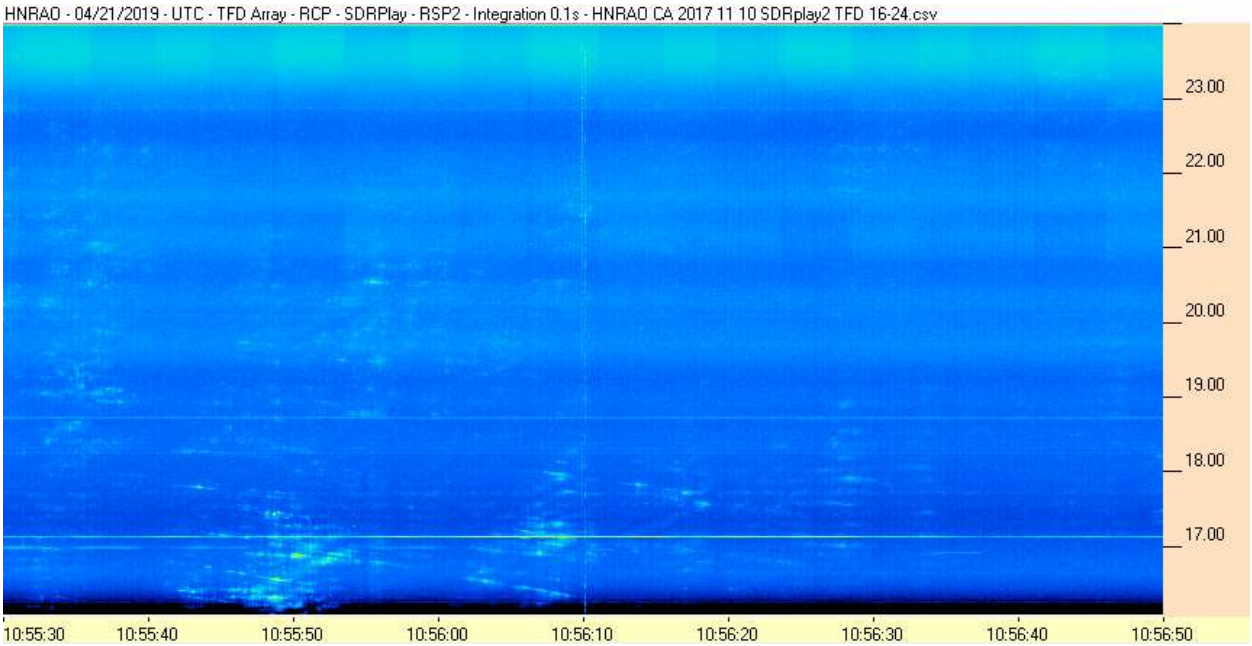
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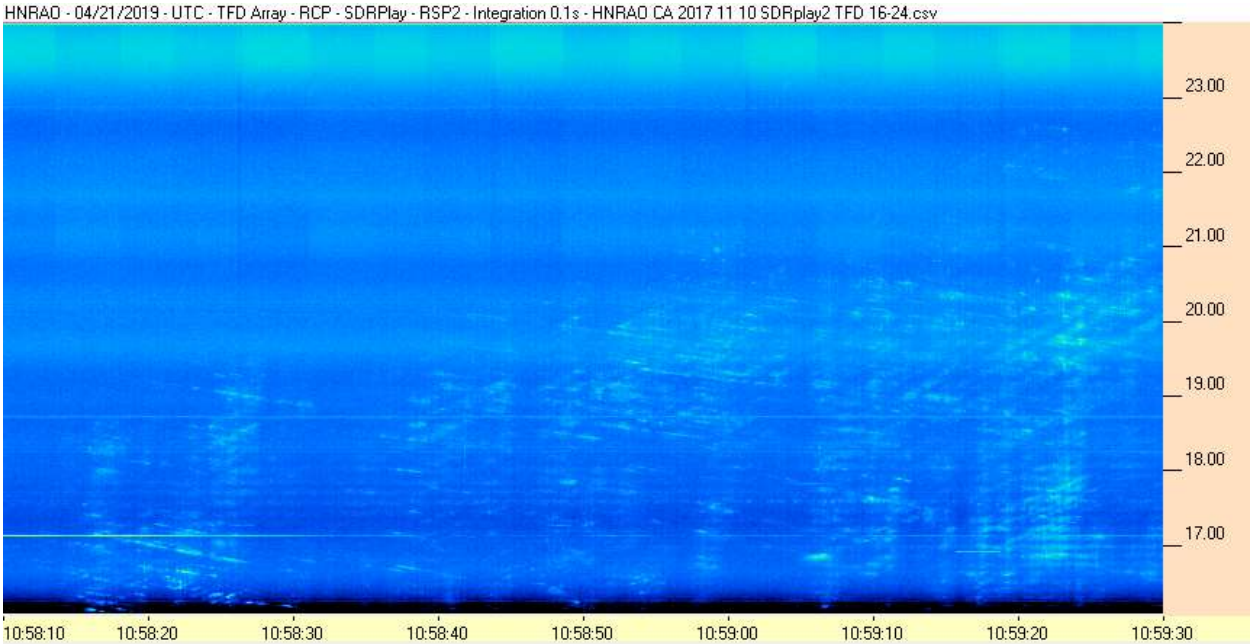
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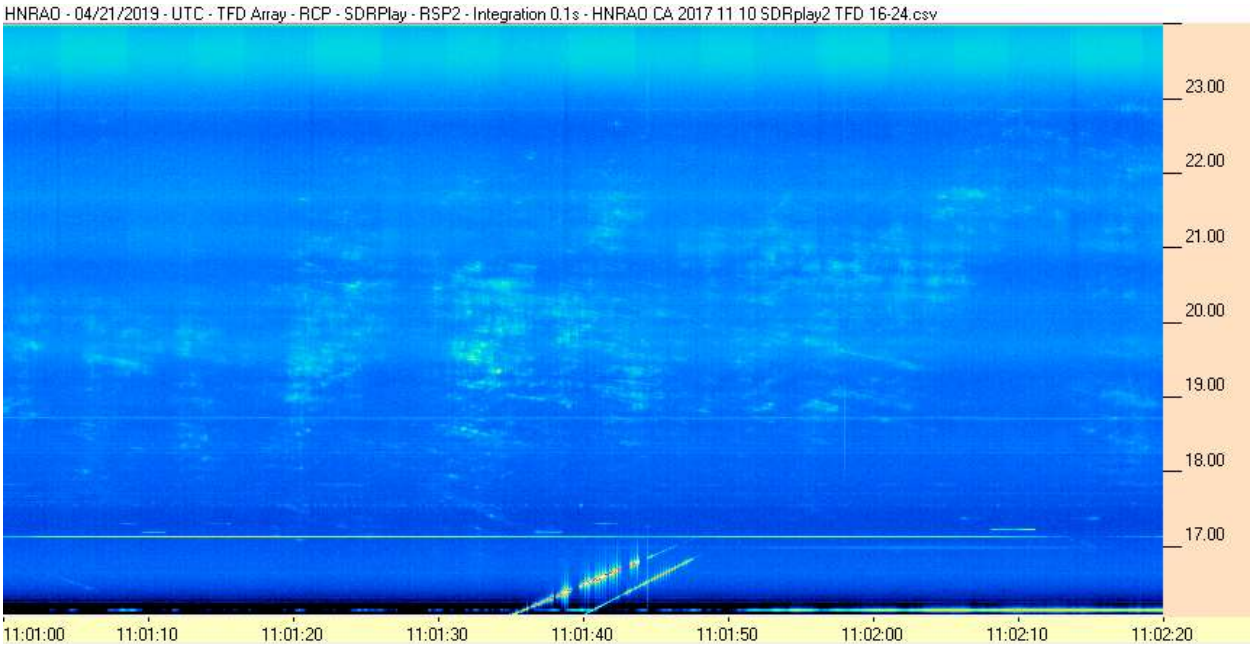
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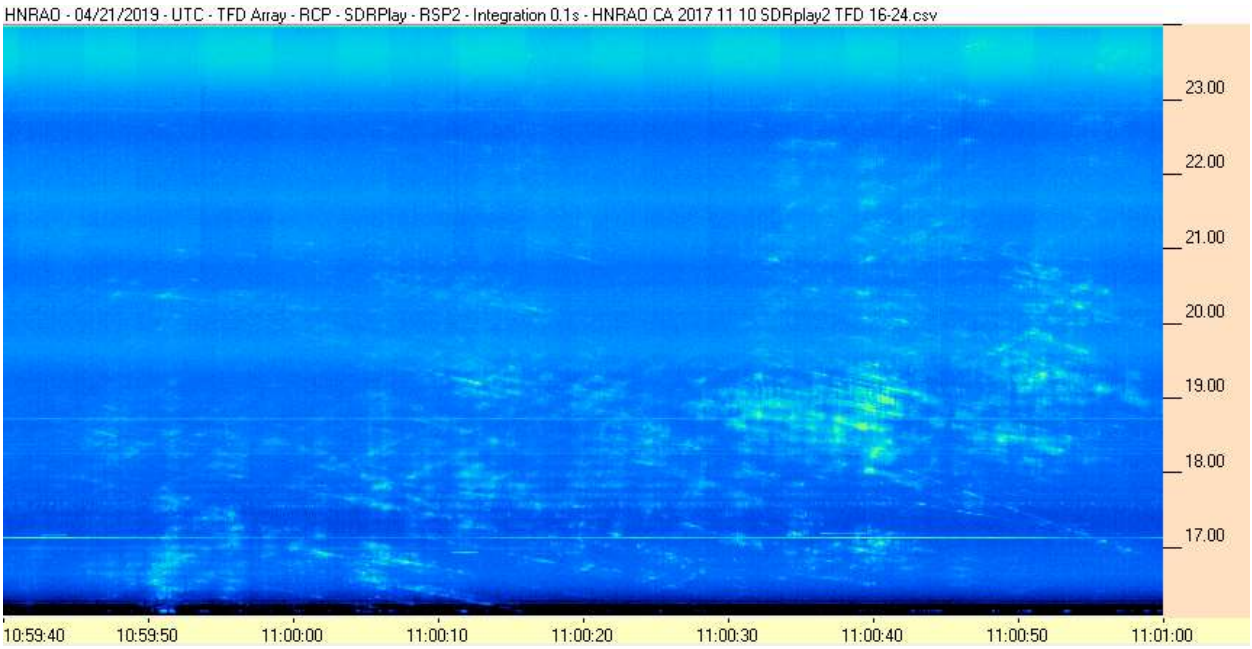
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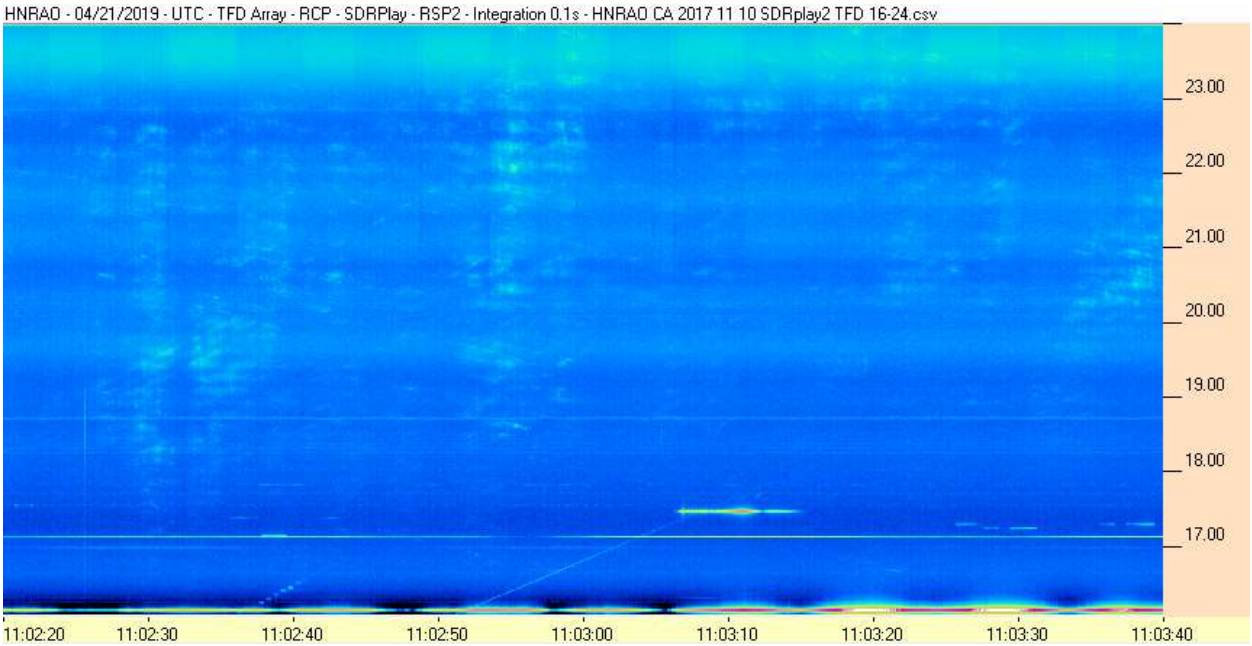
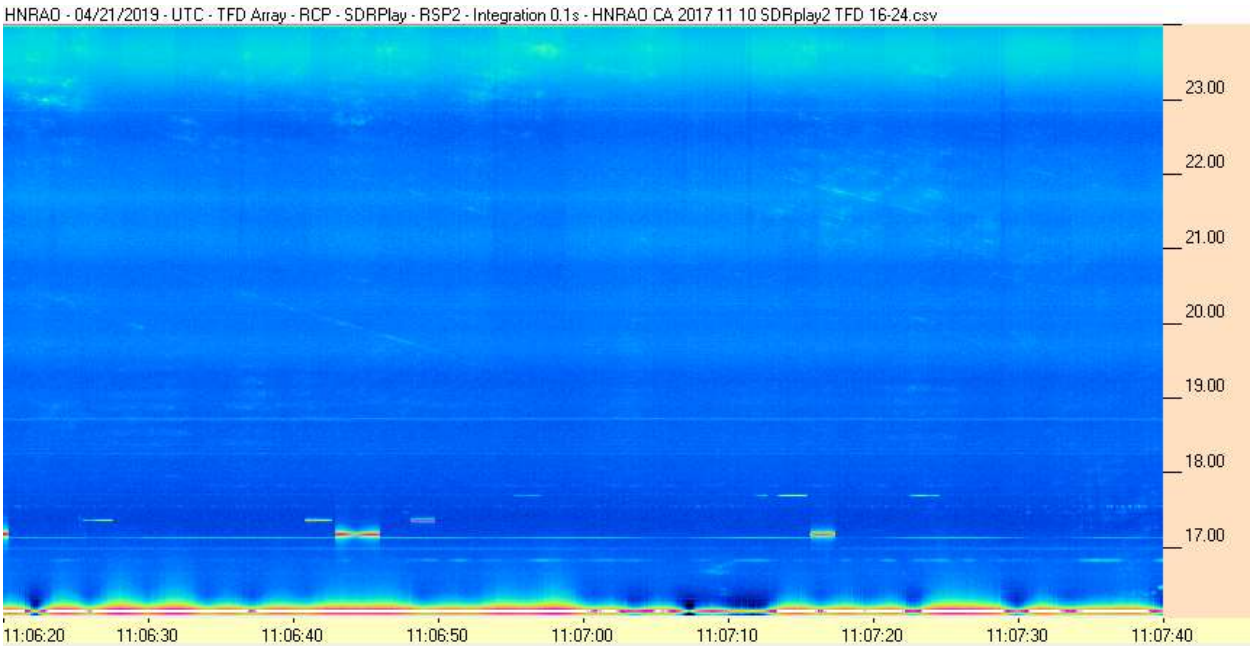
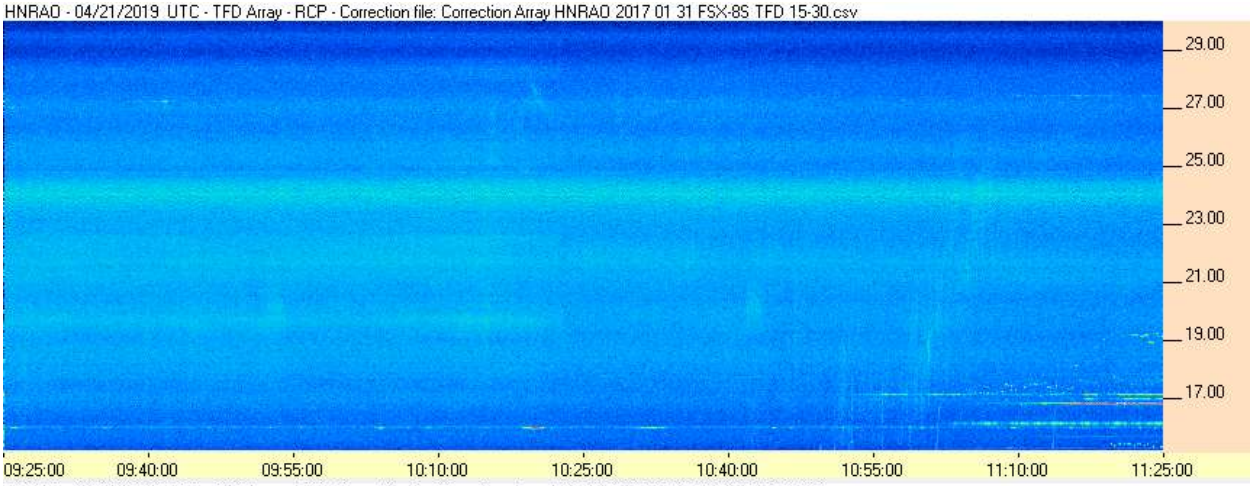




FSX-8S / TFD Array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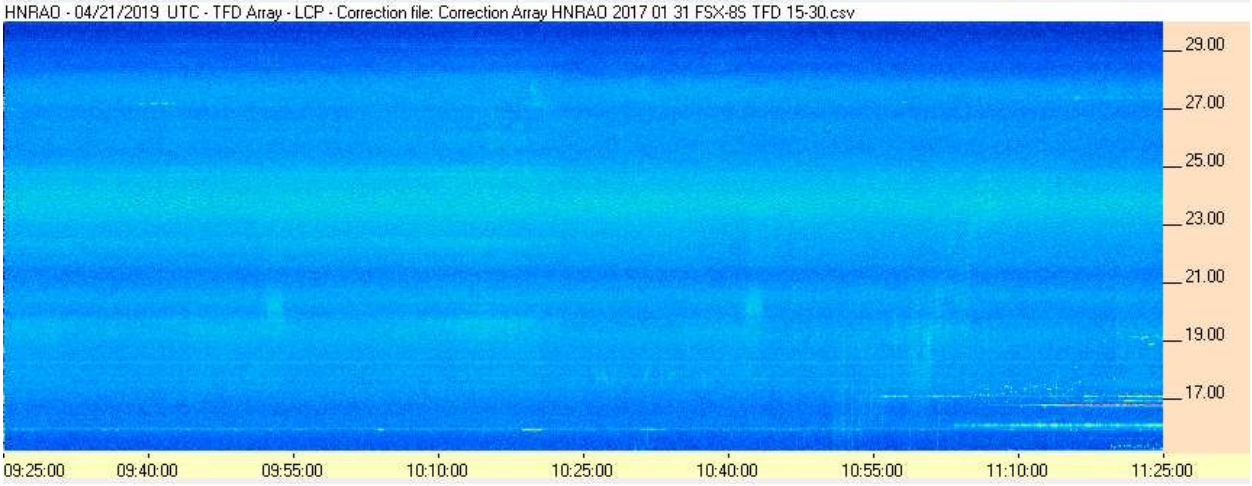
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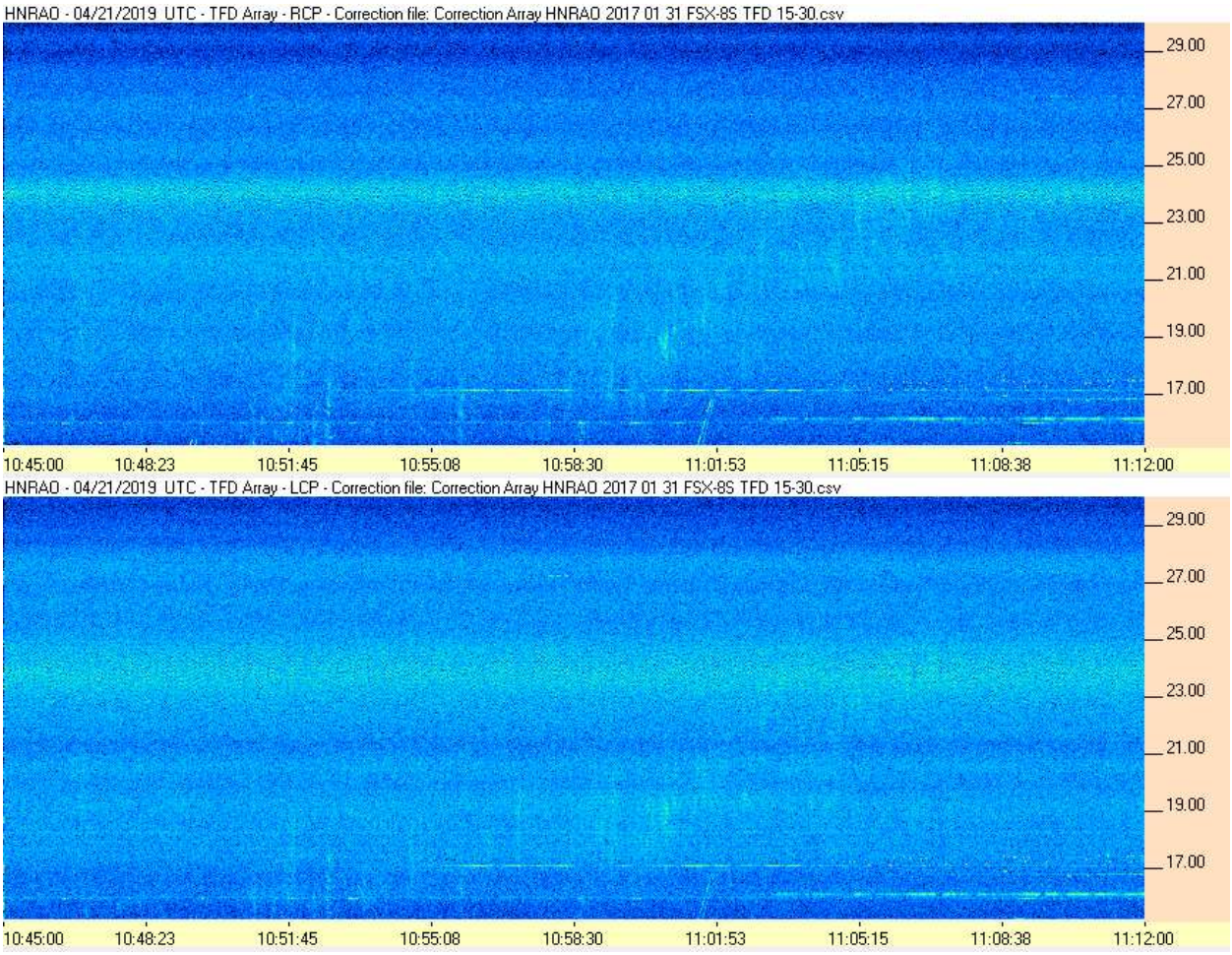
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11:05:15
11:08:38
11:12:00
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10:51:45
10:55:08
10:58:30
11:01:53
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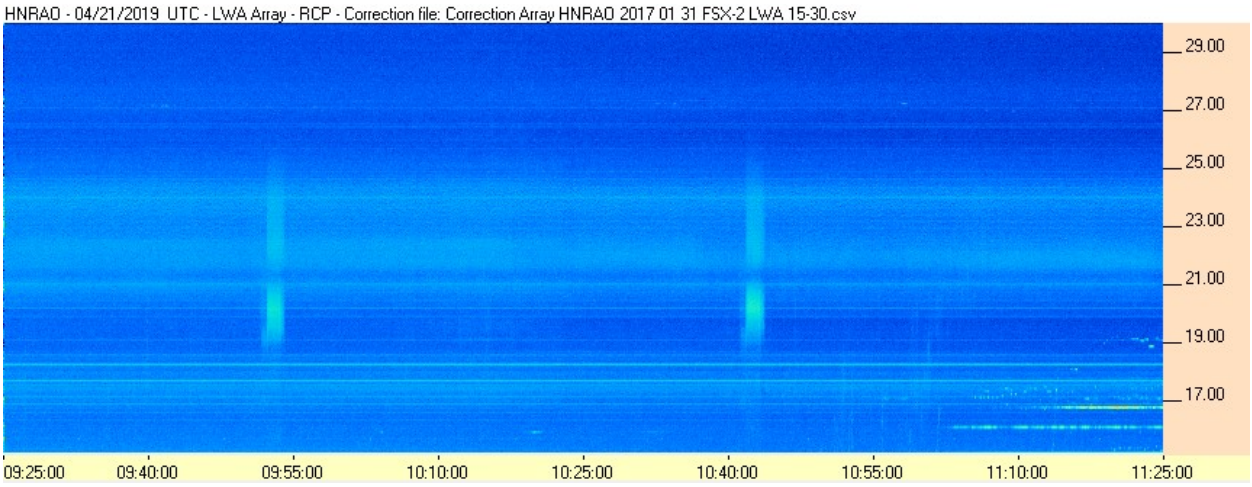
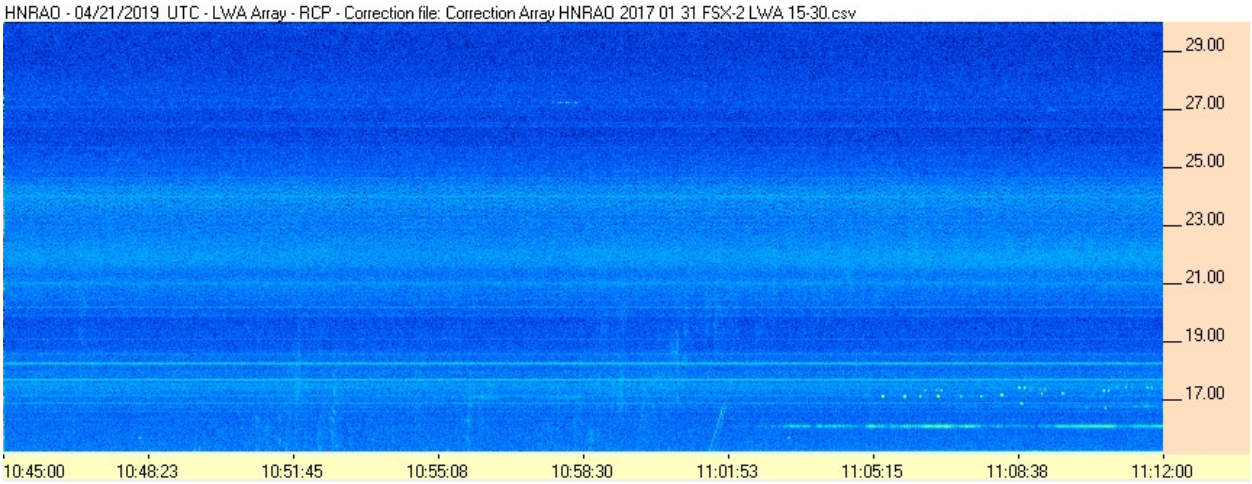
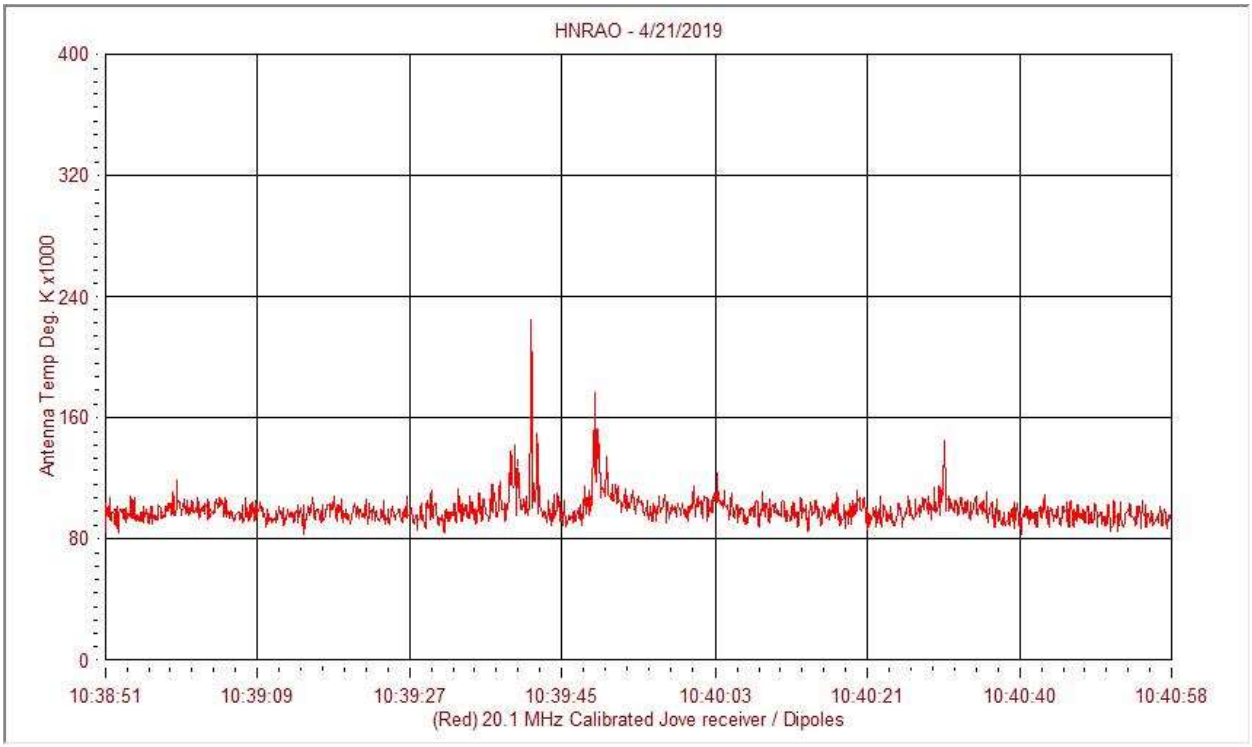
FSX-2 / LWA Array





Radio JOVE / JOVE Dipole Array



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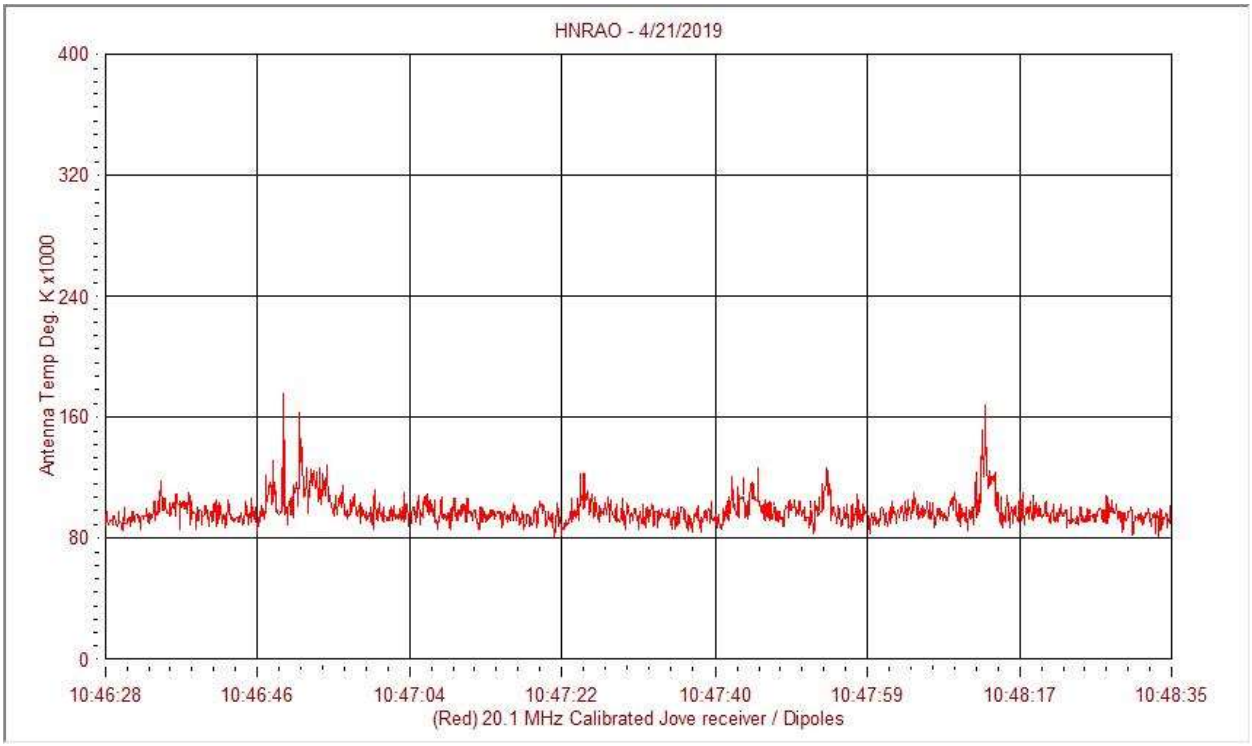

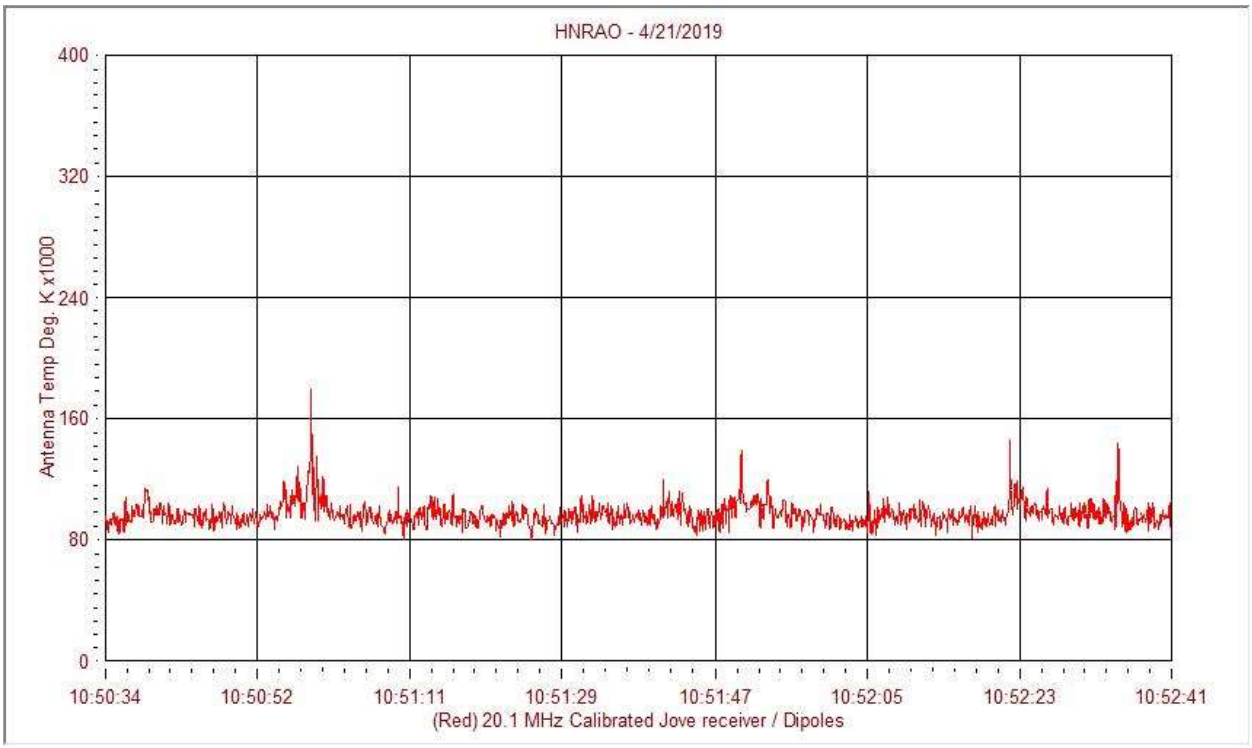

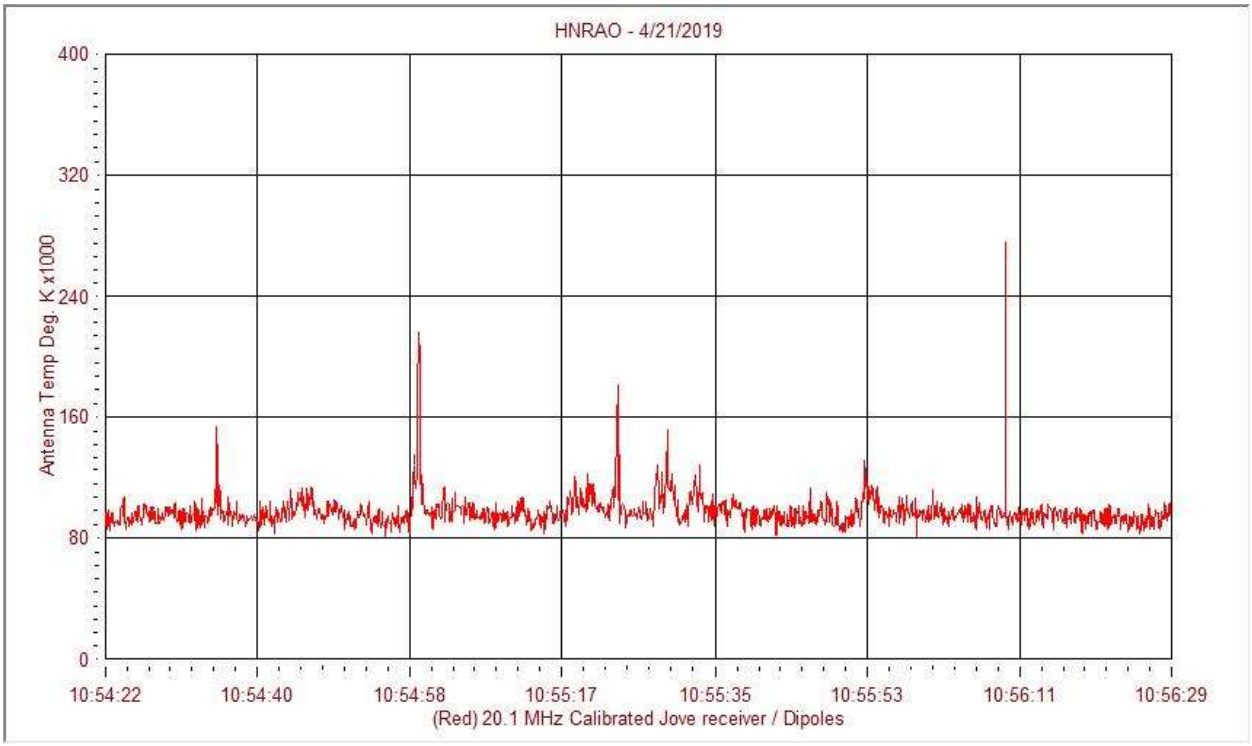
HNRAO - 4/21/2019
400
320
240
160
80
0
Antenna Temp Deg. K x1000
10:54:22
10:54:40
10:54:58
10:55:17
10:55:35
10:55:53
10:56:11
10:56:29
(Red) 20.1 MHz Calibrated Jove receiver / Dipoles