

HNRAO Observing Log
40.673181 N – 80.437885 W
EN90sq



Date: April 20, 2019

Object: Jupiter – Io-C

Observer: Unattended

Start - Time UT:	0903	Planetary K-index:	1
Jupiter Altitude (deg):	26.6	Jupiter Azimuth (deg):	180
Jupiter CML:	277	Jupiter Io Phase:	236.78
Jupiter RA (hr/min):	17:34	Jupiter Dec (hr/min):	-22:41
Hour Angle (hr/min):	00:00	Polarization	LCP
Sun Altitude (deg):	-16.2	Sun Azimuth (deg):	059.5
Sun RA (hr/min):	01:44	Sun Dec (hr/min):	10:48

End – Time UT:	1107	De:	-2.8
Jupiter Altitude (deg):	20.4	Jupiter Azimuth (deg):	210.5
Jupiter CML:	351.97	Jupiter Io Phase	254.32
Hour Angle (hr/min):	02:04	Duration (min):	204
Sun Altitude (deg):	05.8	Sun Azimuth (deg):	080.7
Max Frequency MHz	25	Min Frequency MHz	16

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 I	TFD	RCP	-8.35 dB	#2 RCP	Port 3 +3 dB	04/20/2018
JOVE I	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

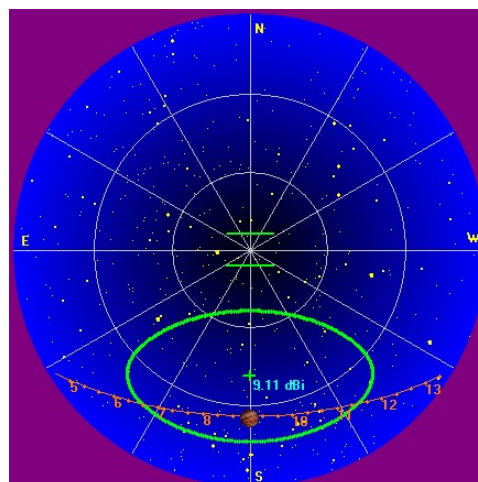
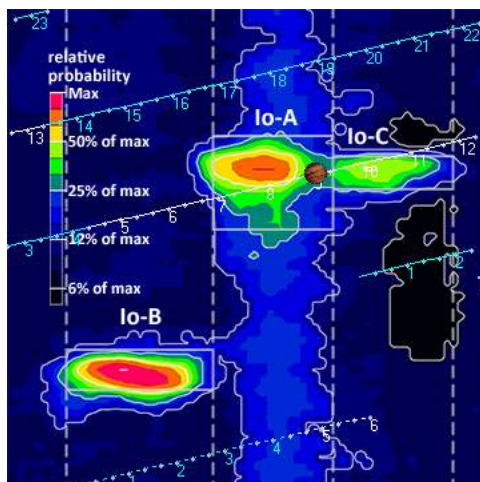
* Used for testing and evaluating antenna systems

Software Radio Sky Spectrograph 2.8.50

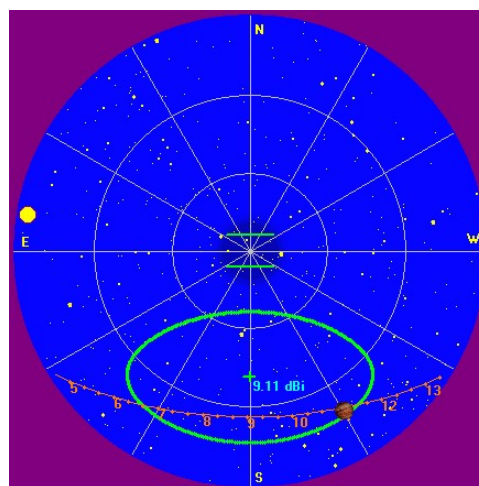
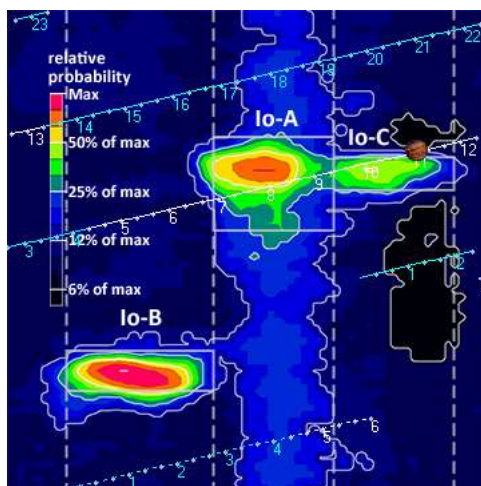
Red = Offline

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

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Beginning of Pass



End of Pass



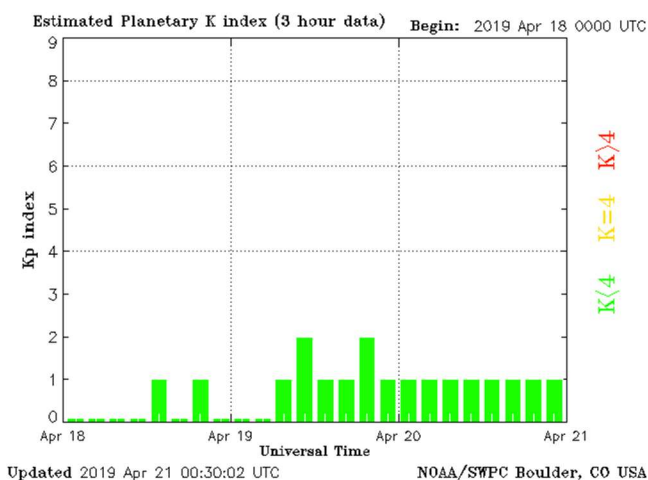
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MODE	CML RANGE	Io RANGE	MAX F	POLAR	ARC	NOTES
Io-D	0-200	95-130	18	LH	Early	Also called "fourth source"
Io-B	(105 - 185)	(80-110)	39.5	RH	Early	Also called "early source"
non Io-B	80-200	0-360	38	RH	Early	Voyager info
Io-A	(200-270)	(205-260)	38	RH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

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An Io-C storm beginning at transit with Jupiter at 180 degrees azimuth. Negative drift L-bursts and S-bursts with L4 modulation lanes. An N-events was also present.

All spectrographs and Radio JOVE array were operating and recording data. The FSX-8S / TFD array and the SDRPlay RSP2 / TFD array recorded the LCP emissions. The FSX-2 was in RCP mode.

Weather at the observatory was cloudy with intermittent rain showers. Rain showers present themselves in the spectra as bright vertical lines (precipitation static). Despite the precipitation static, there were some good emissions observed. Emissions strength, as observed here, ranged from slightly above GB to several dB above GB. The strongest emissions were S-bursts from 1041 UT through the end of the storm at 1107 UT. These strongest bursts were confined between 16 MHz and 19 MHz.

The storm started out with L-bursts with S-bursts starting about 20 minutes into the pass. S-bursts, for the most part, were confined below 20 MHz, while the L-bursts spanned 16 – 25 MHz. There were periods of S-bursts with a parallel grouping of S-bursts; 1025 UT through 1030 UT. One N-event of note was observed from 1020 UT to 1025 UT between 23 MHz and 24 MHz. L-bursts and S-bursts were mixed throughout the storm so that measurements of the S-burst modulation lanes could not be reliably made.

One curious feature were upswept lines when looking at the storm in a large time span. 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.

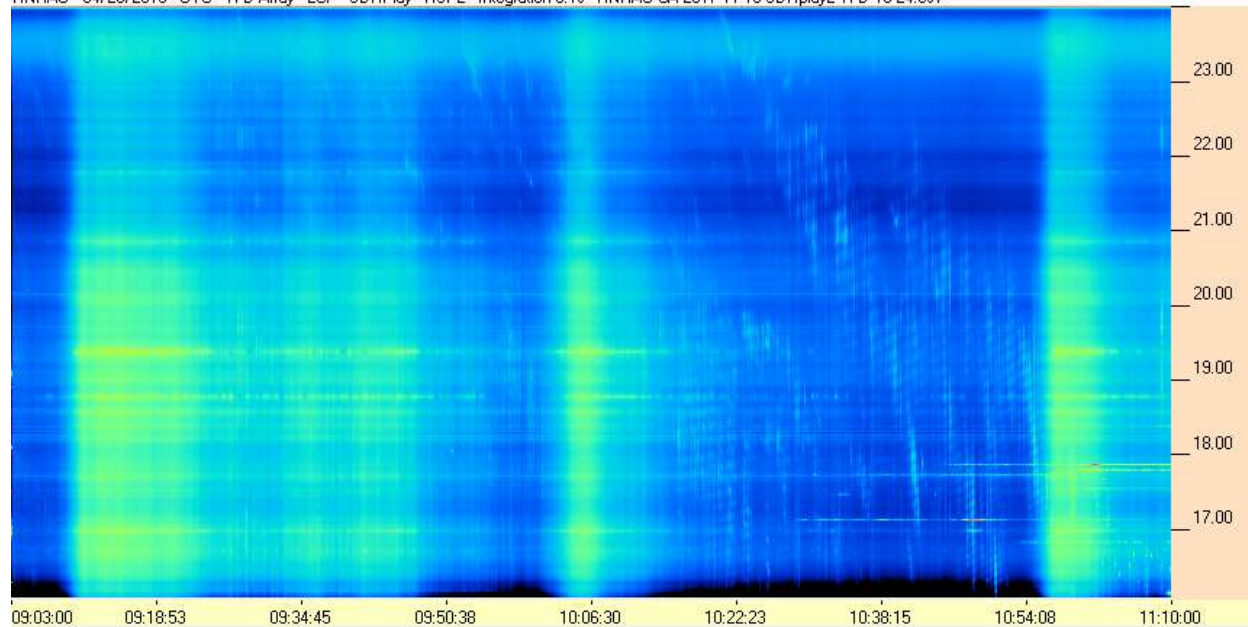
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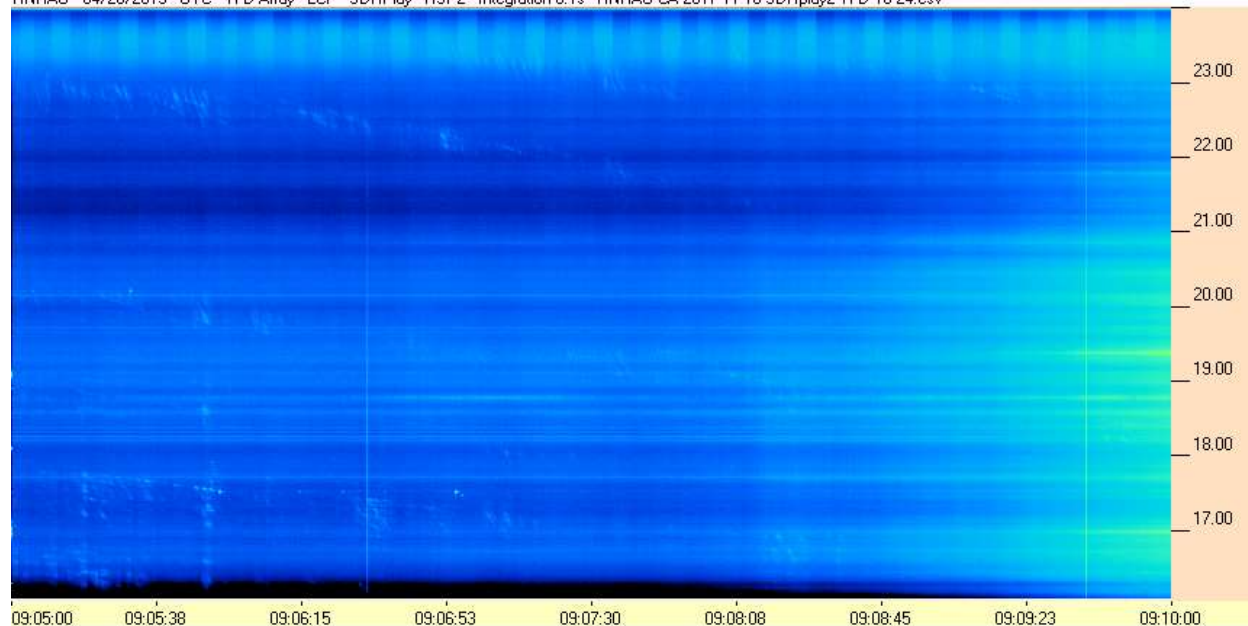


SDRPlay RSP2 / TFD Array

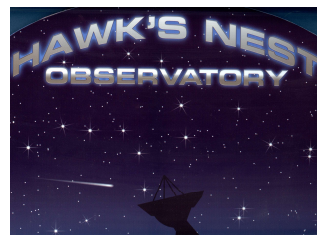
HNRAO - 04/20/2019 - UTC - TFD Array - LCP - SDRPlay - RSP2 - Integration 0.1s - HNRAO CA 2017 11 10 SDRplay2 TFD 16-24.csv



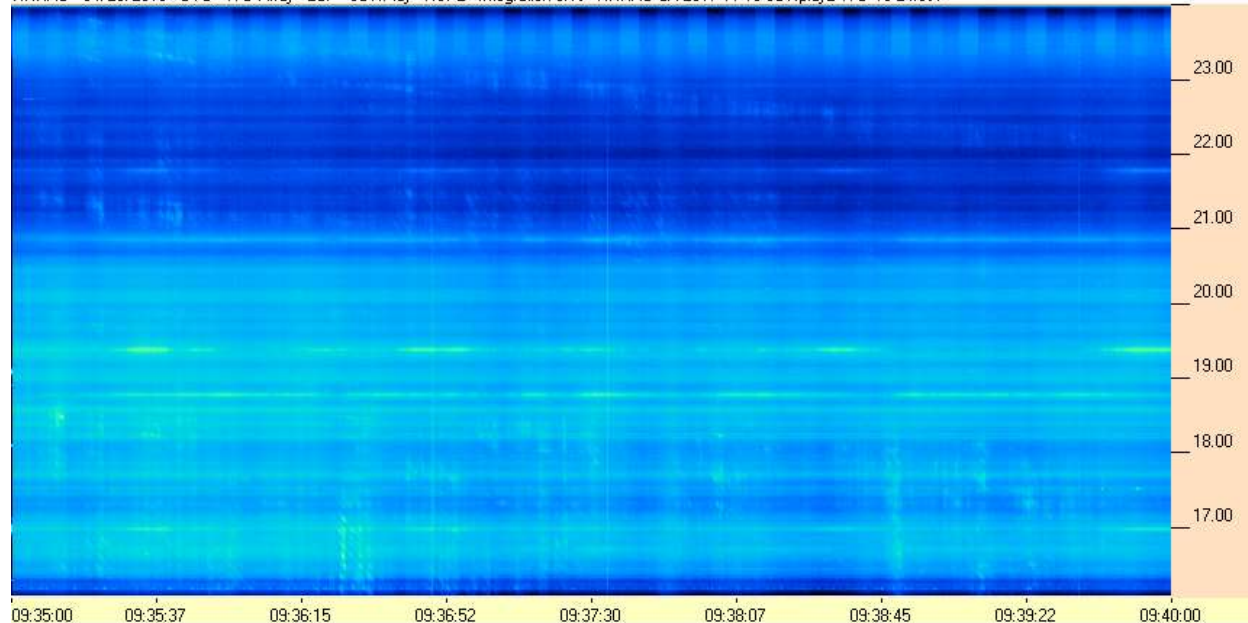
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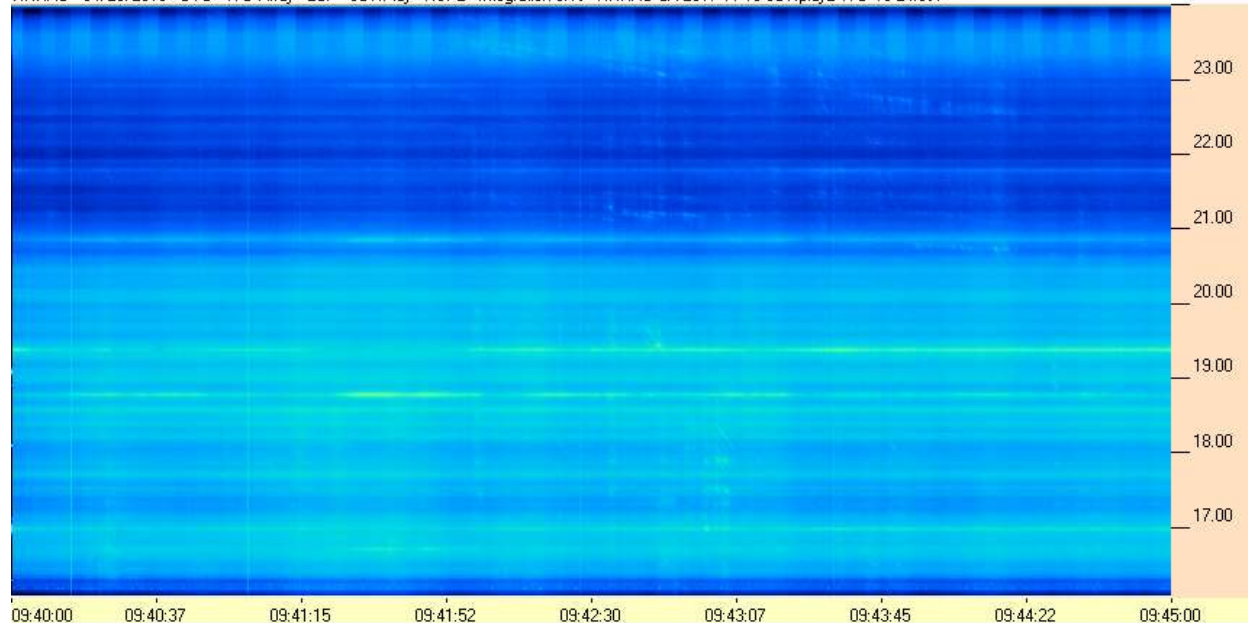
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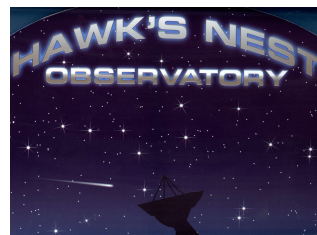
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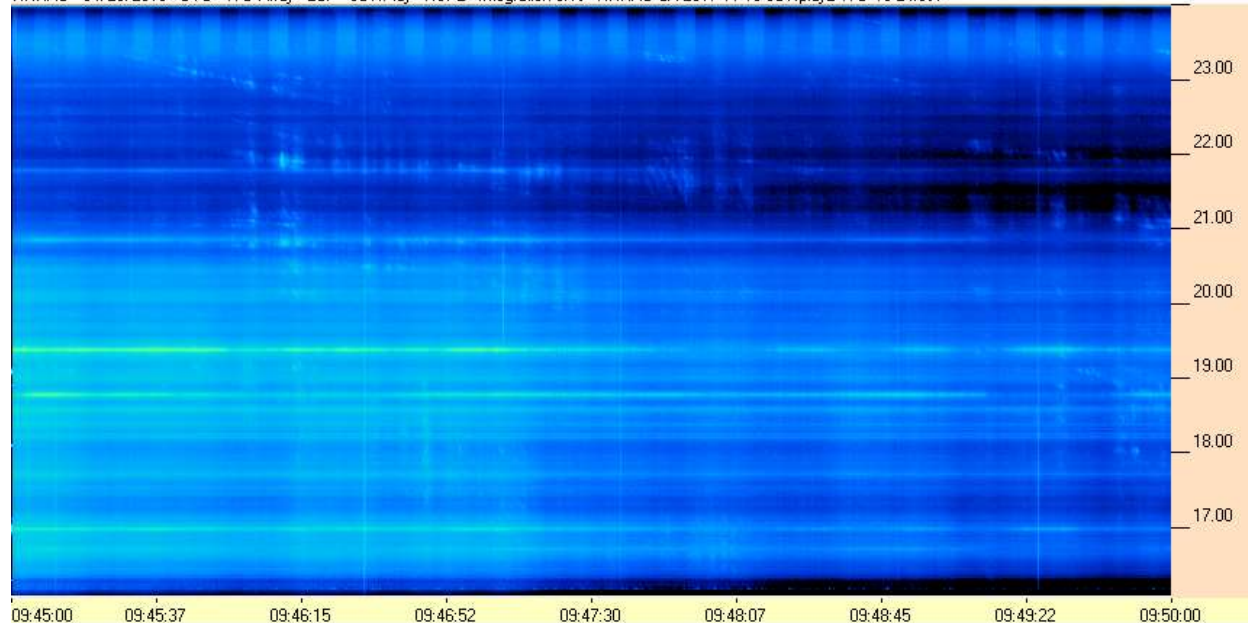
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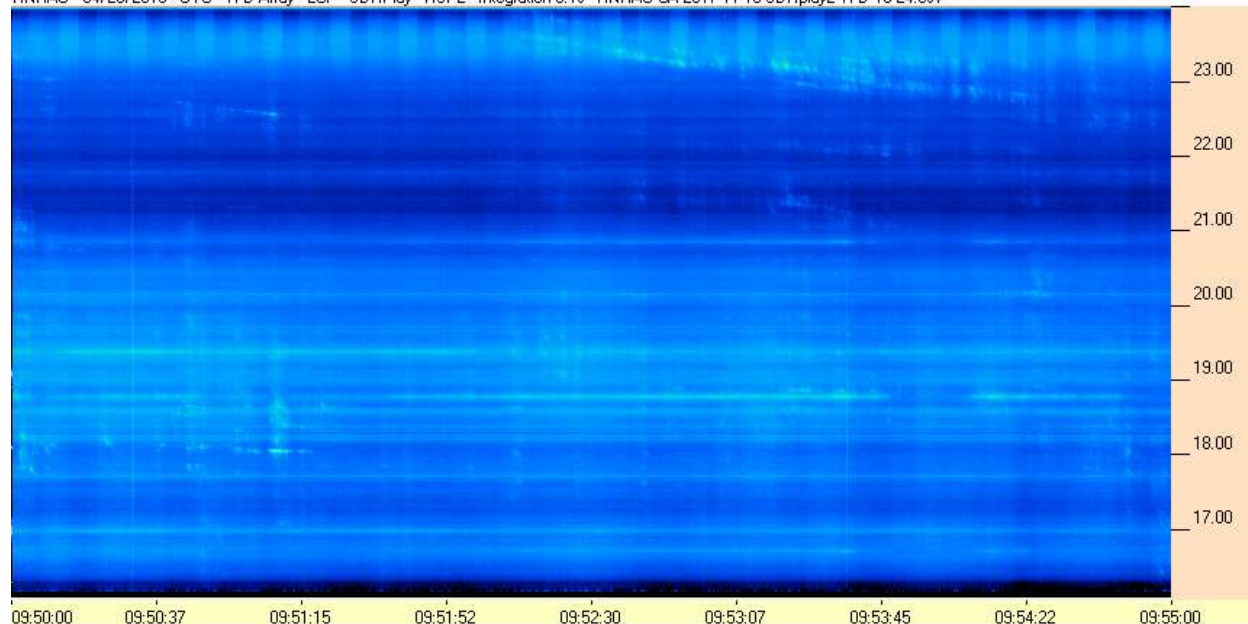
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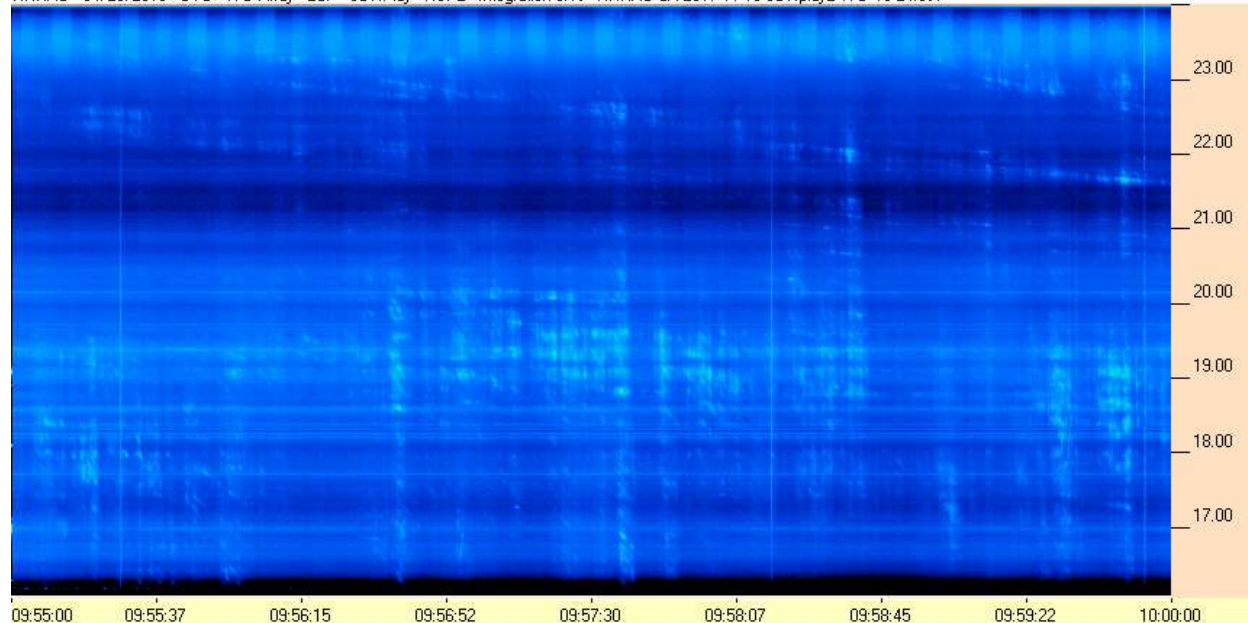
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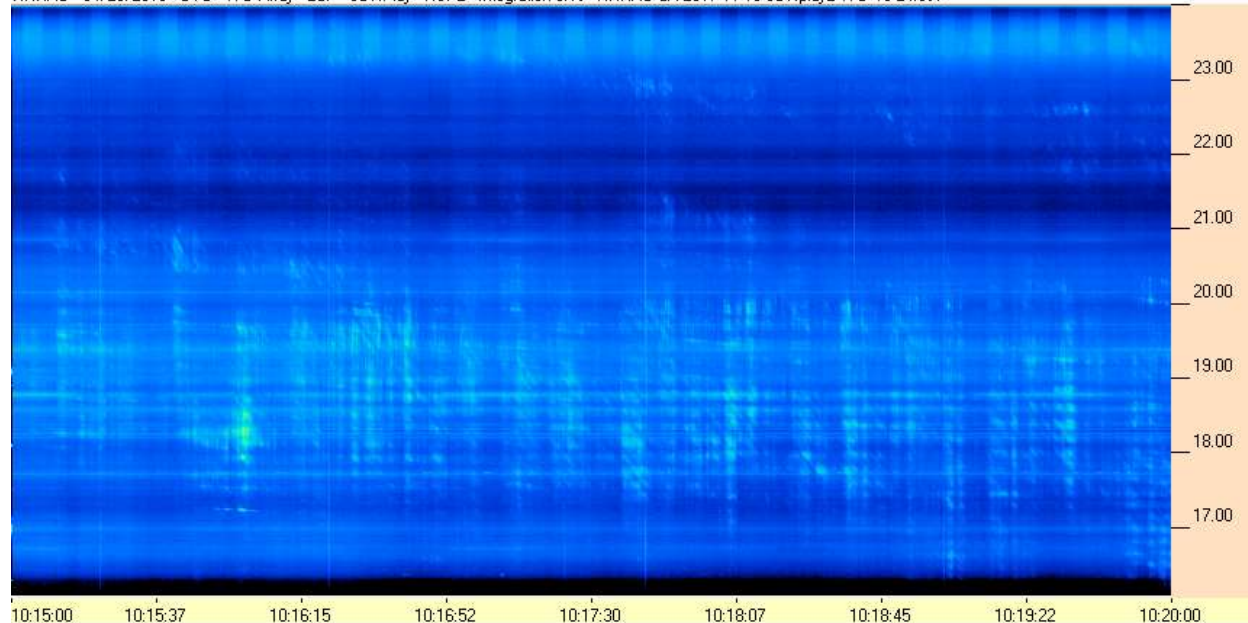
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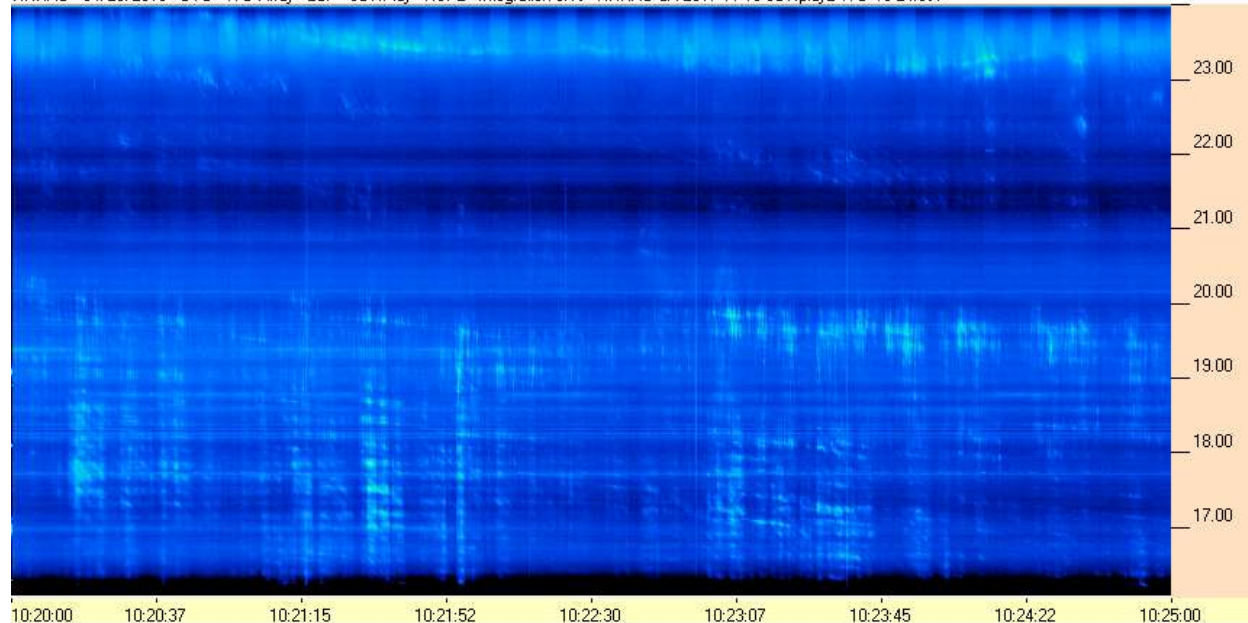
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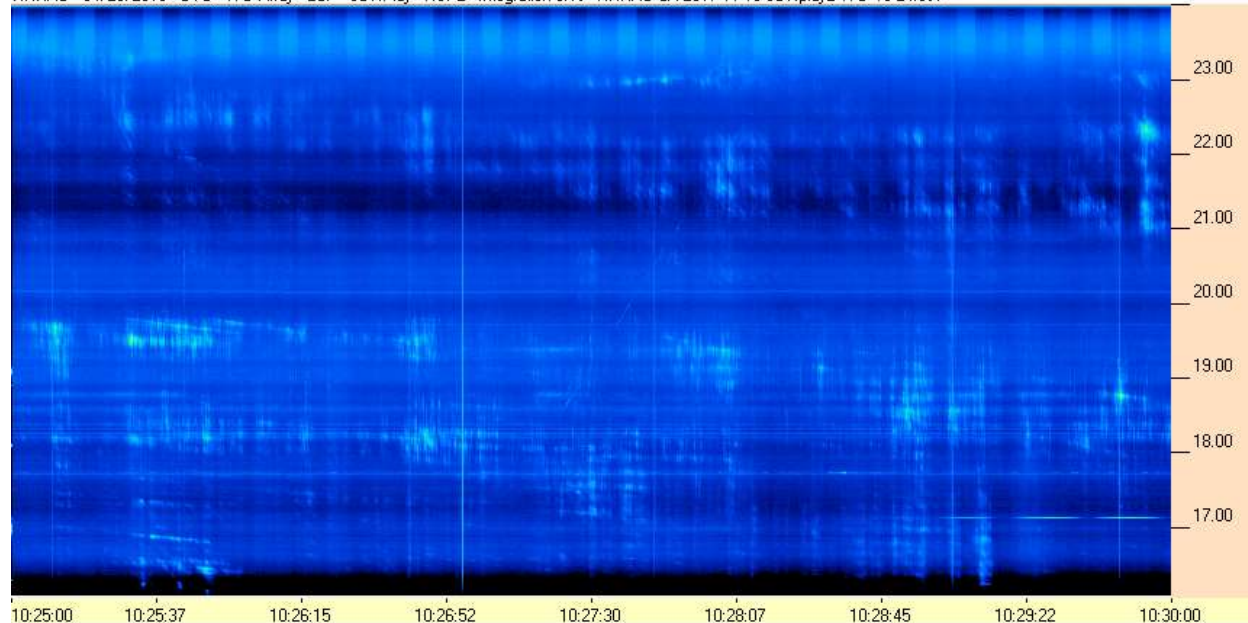
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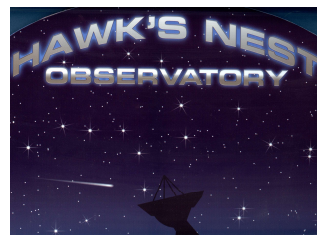
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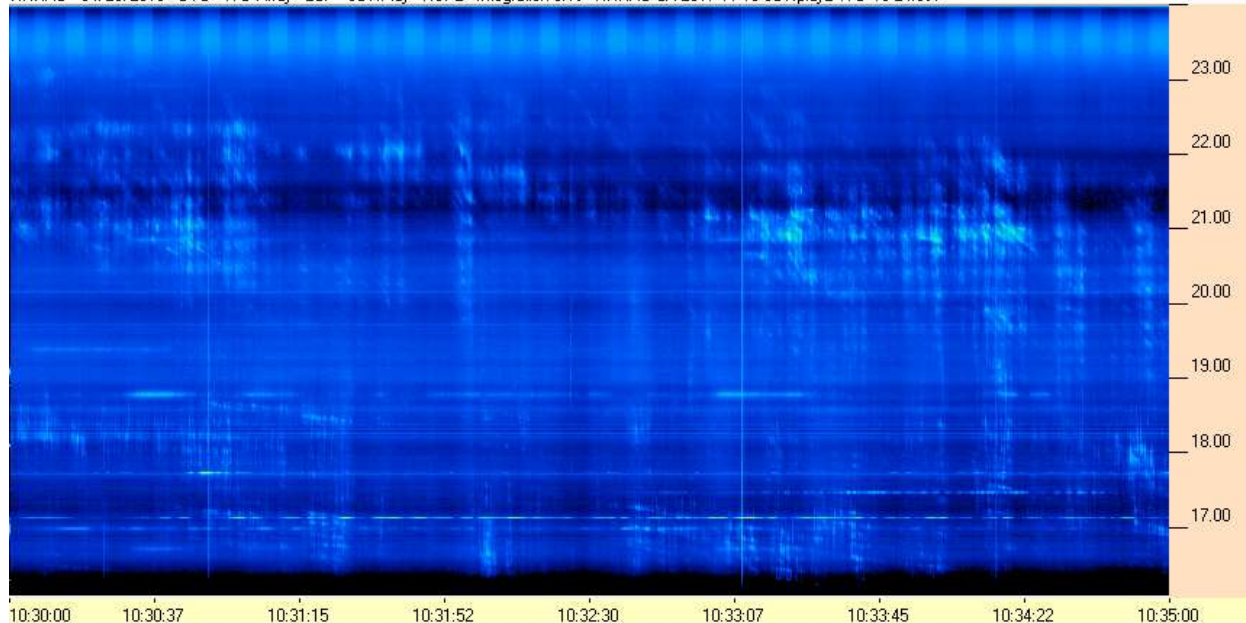
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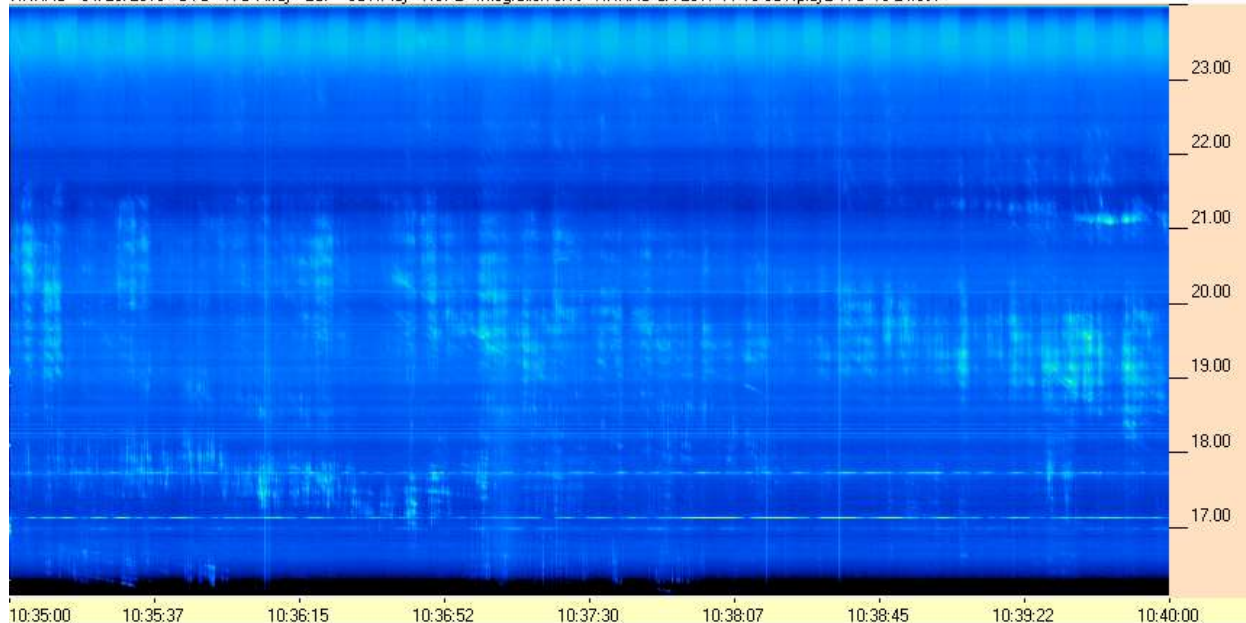
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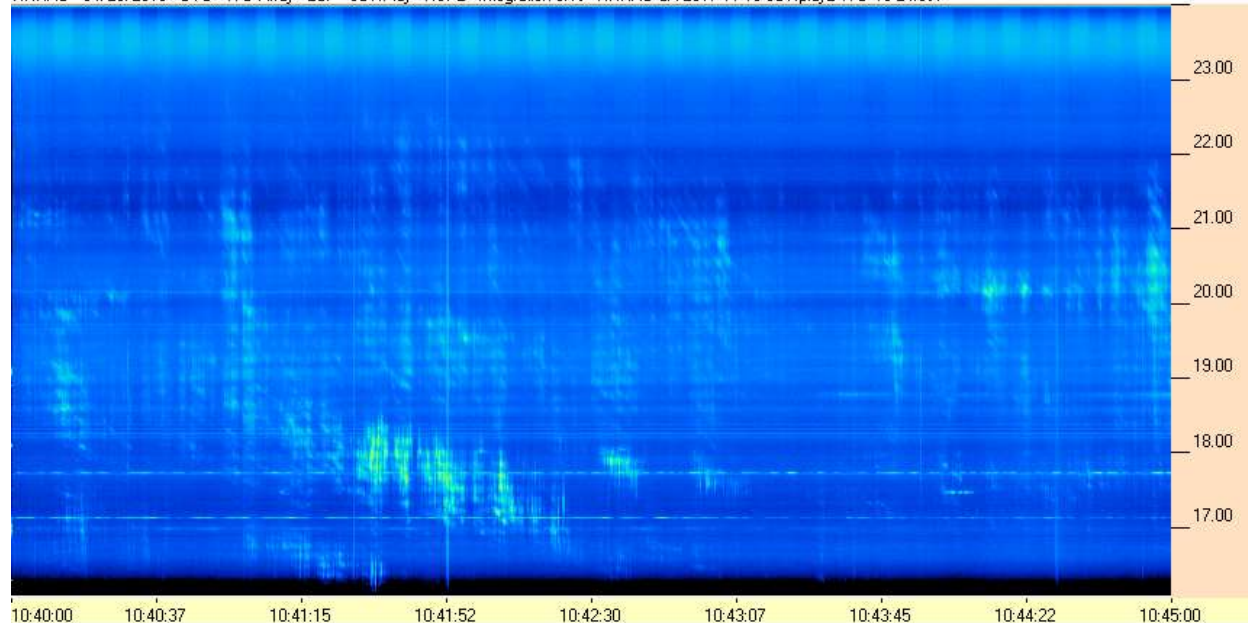
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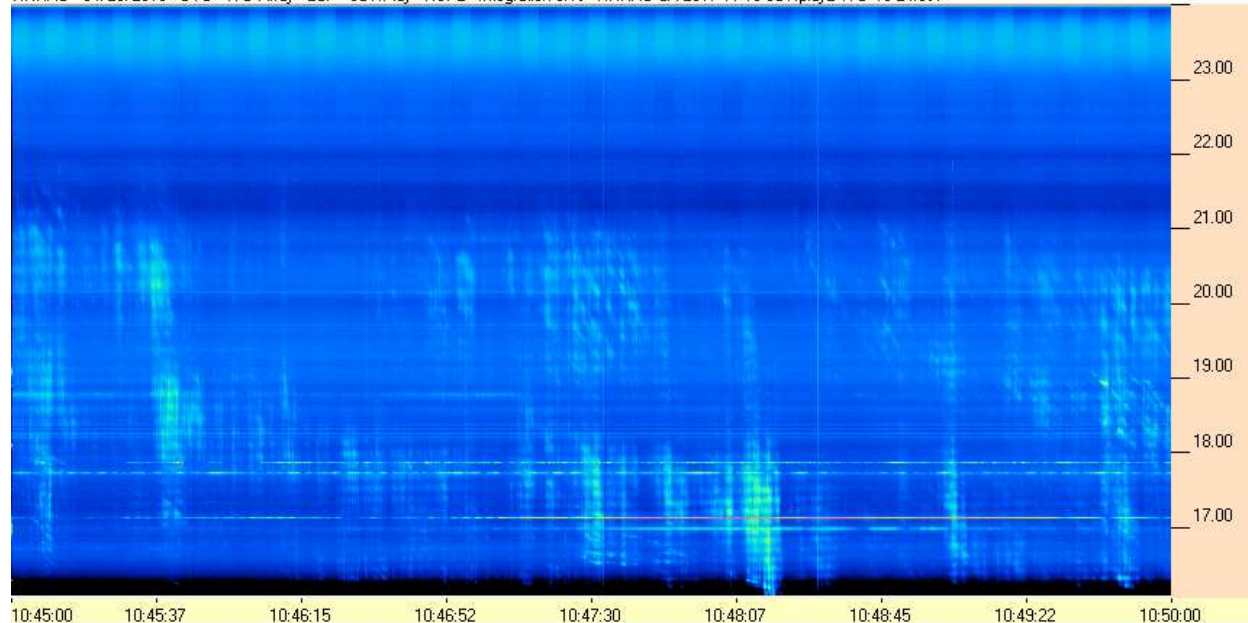
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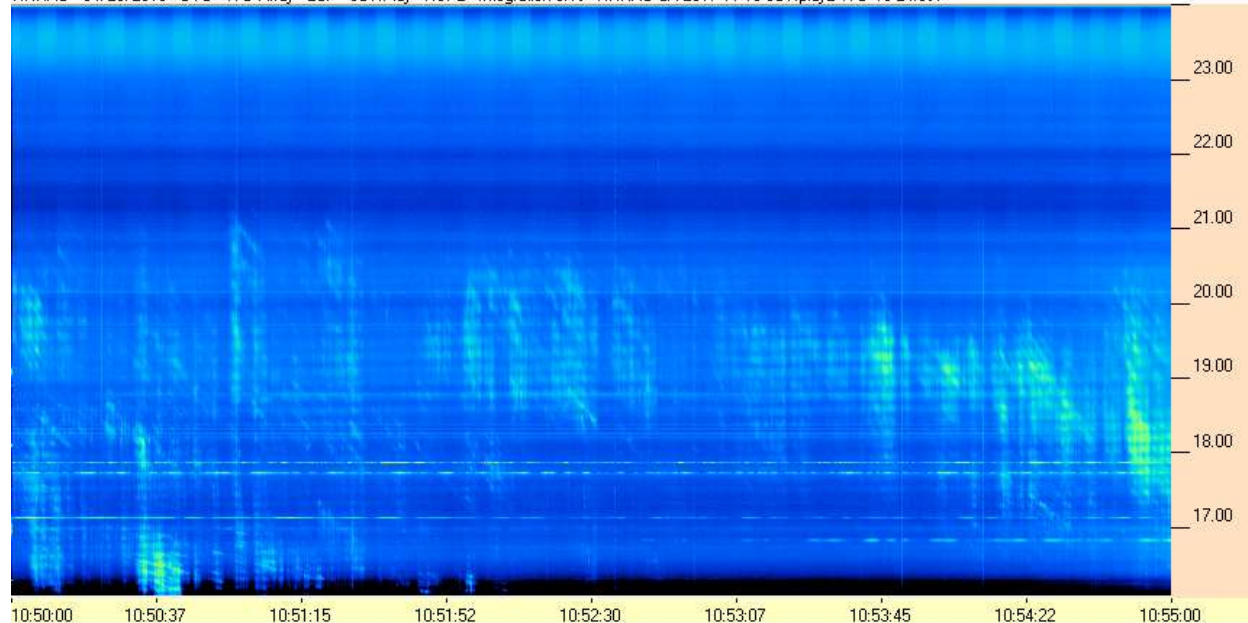
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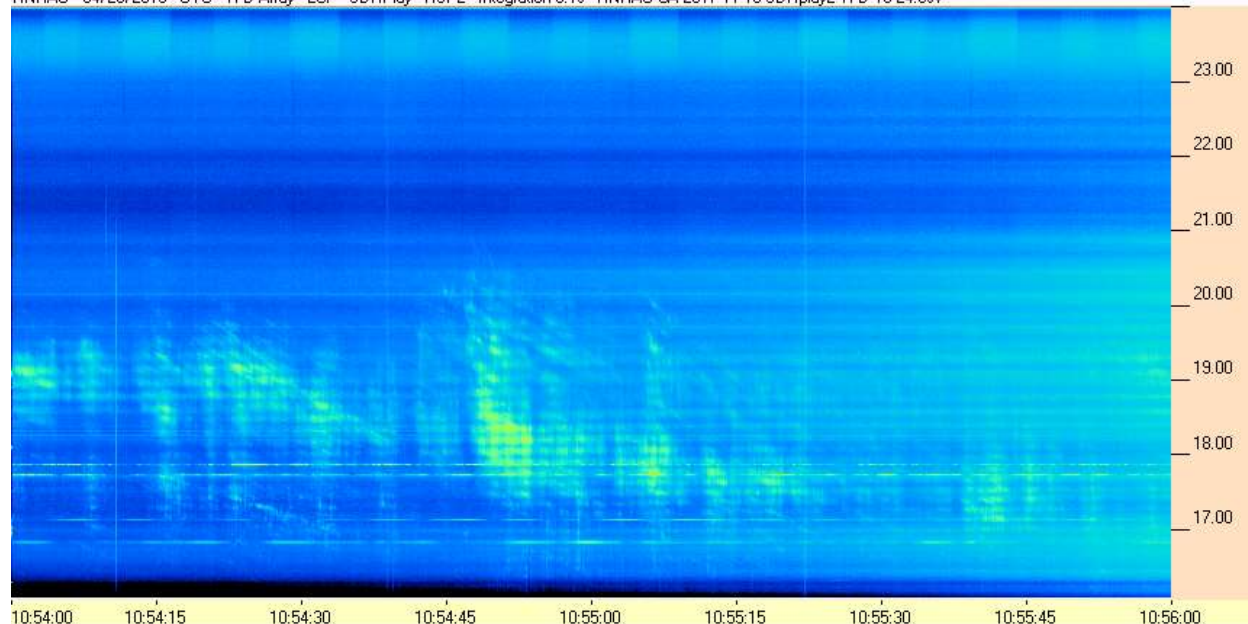
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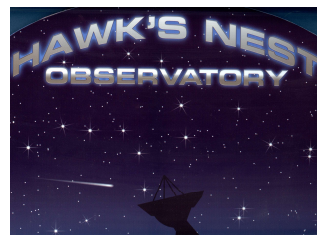
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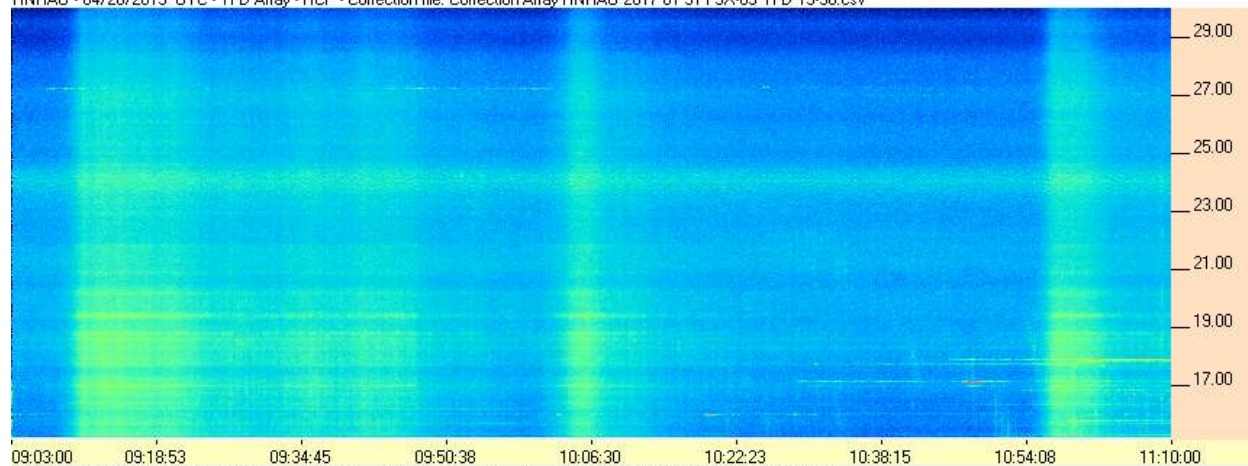


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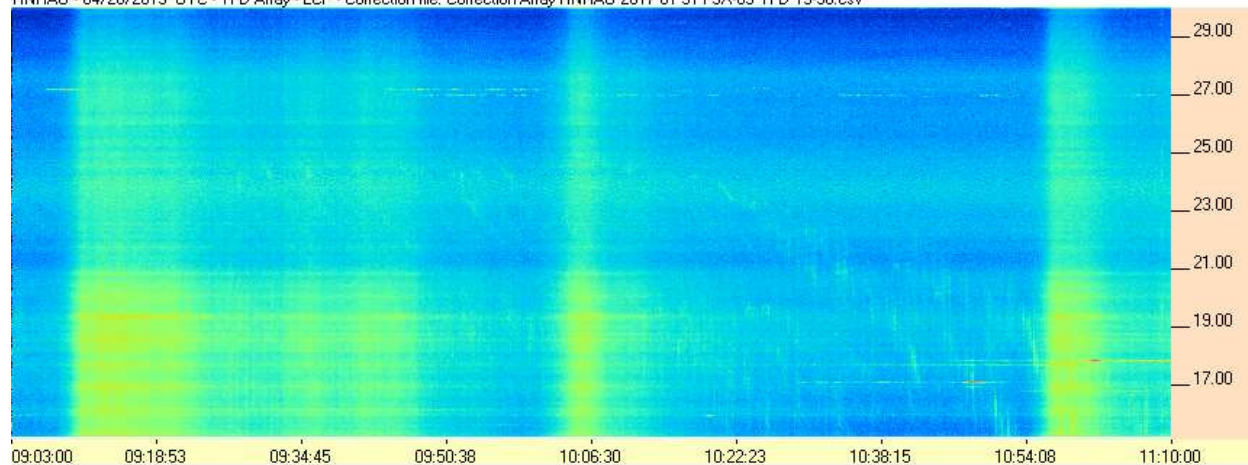


FSX-8S / TFD Array

HNRAO - 04/20/2019 UTC - TFD Array - RCP - Correction file: Correction Array HNRAO 2017 01 31 FSX-8S TFD 15-30.csv



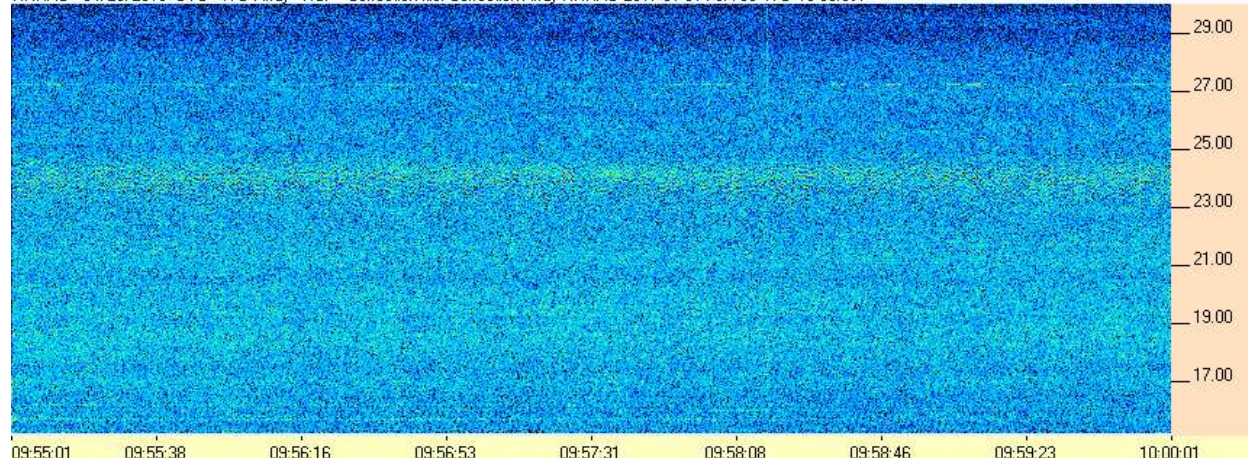
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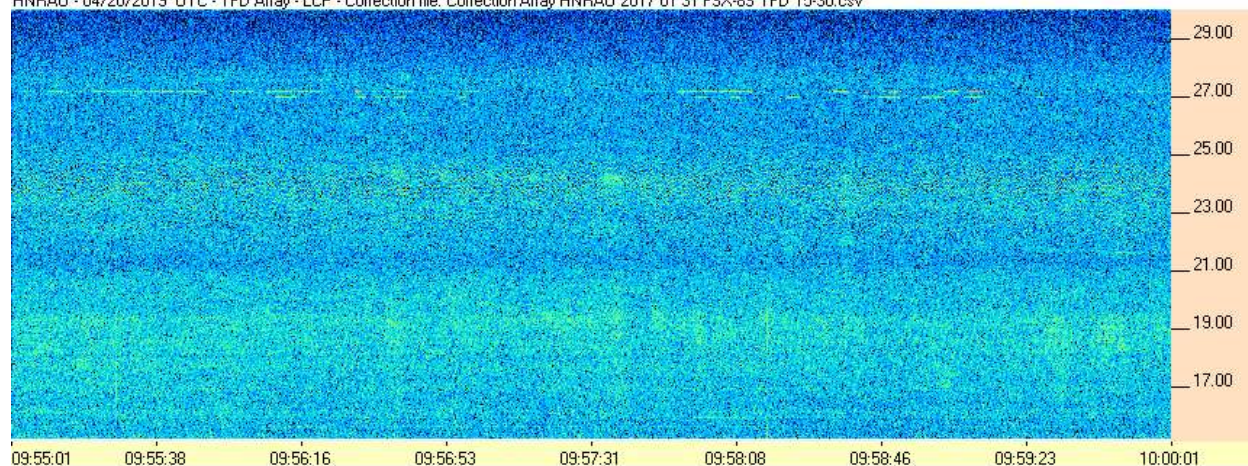
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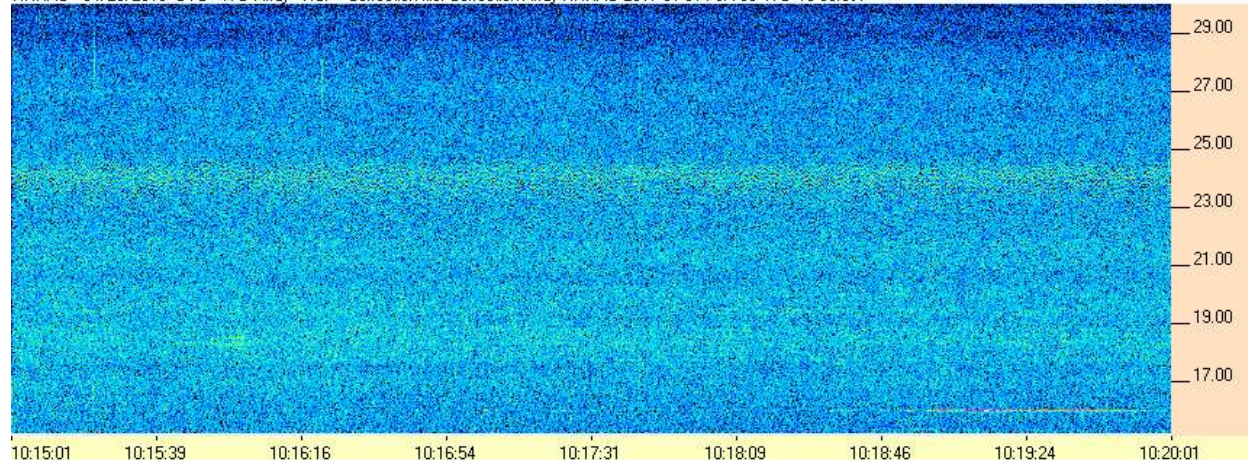
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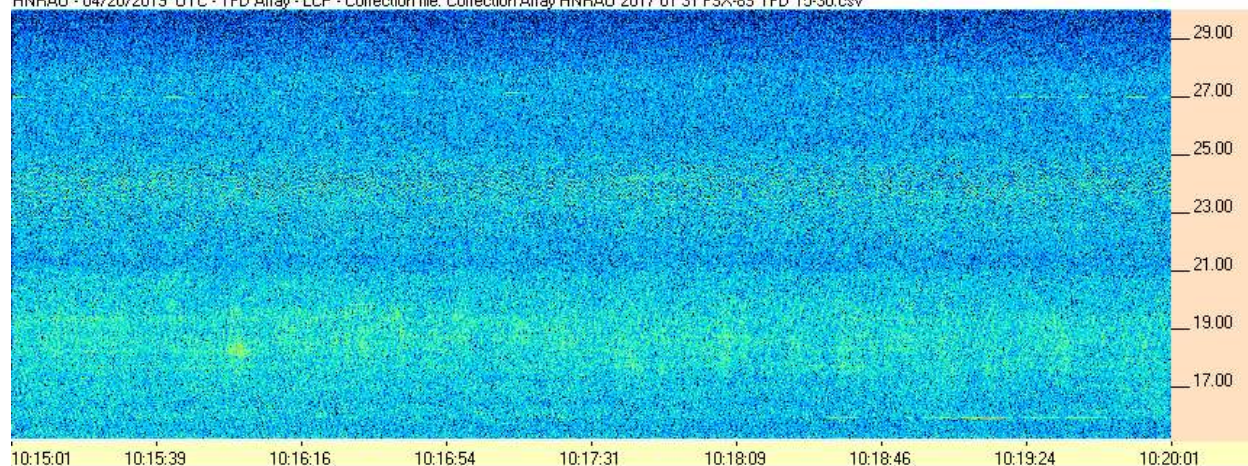
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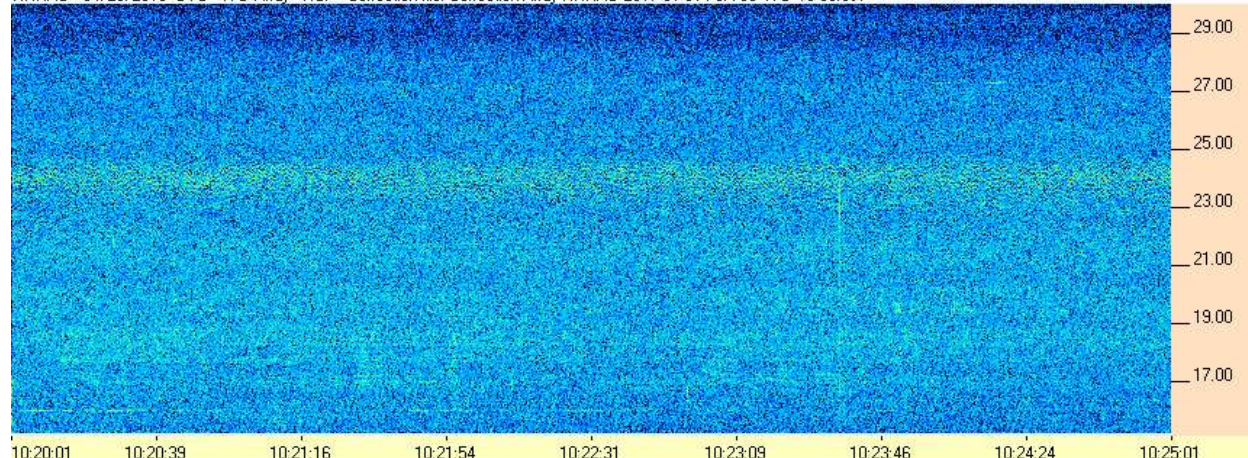
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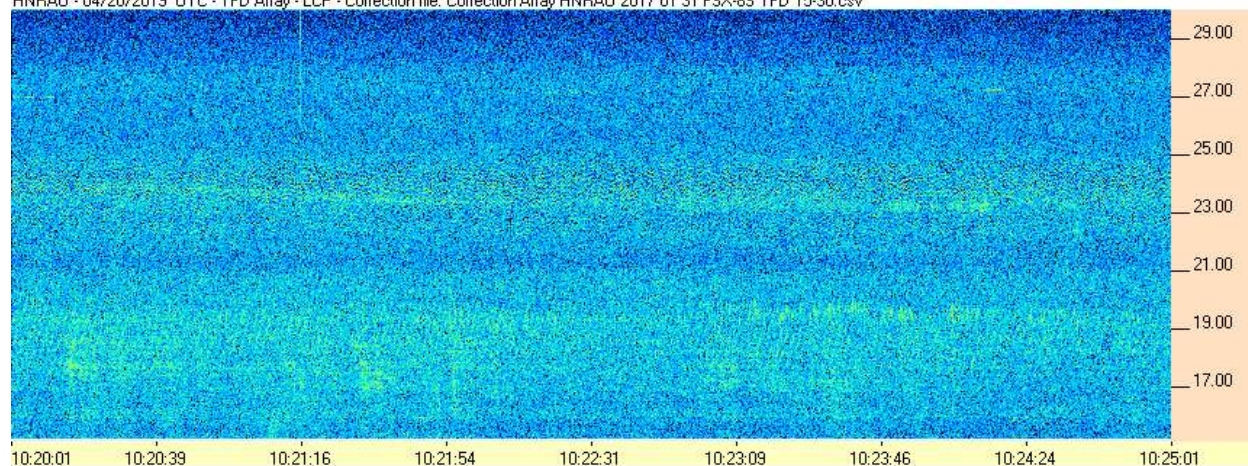
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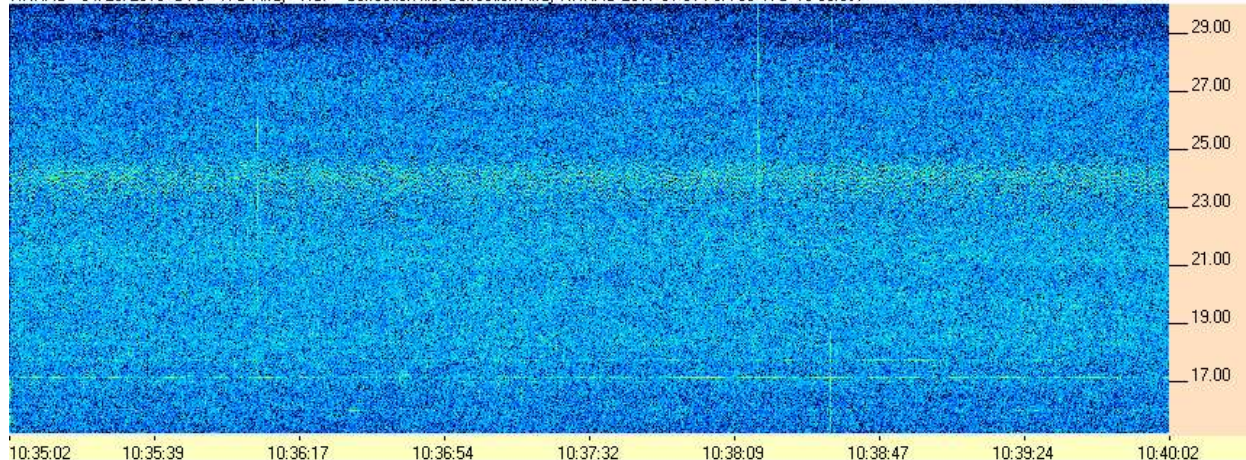
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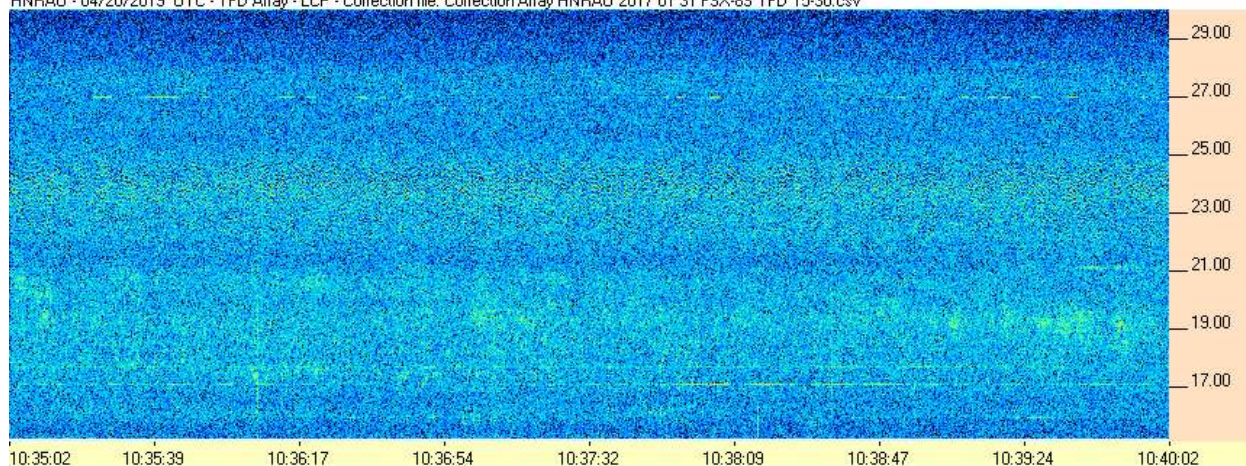
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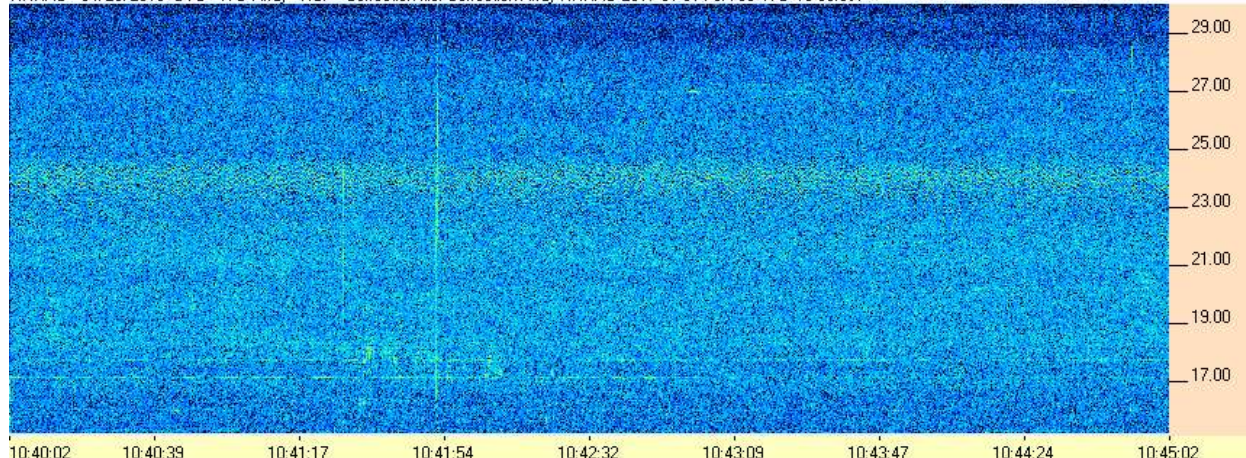
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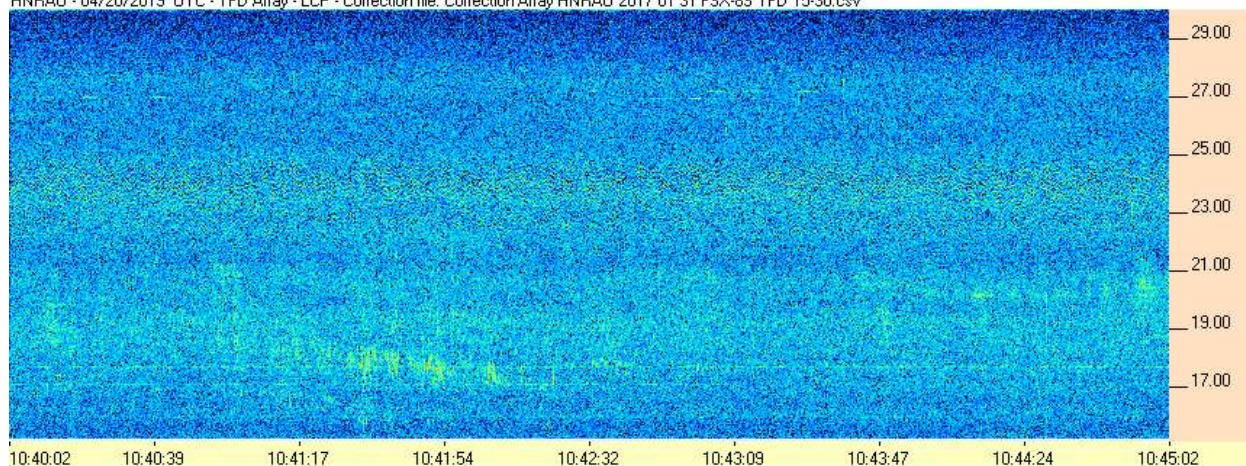
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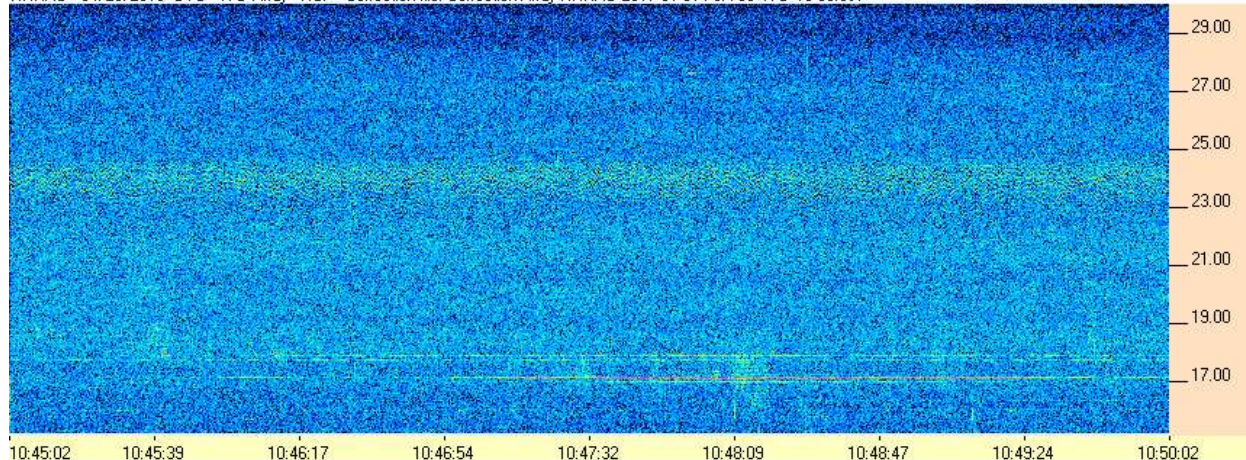
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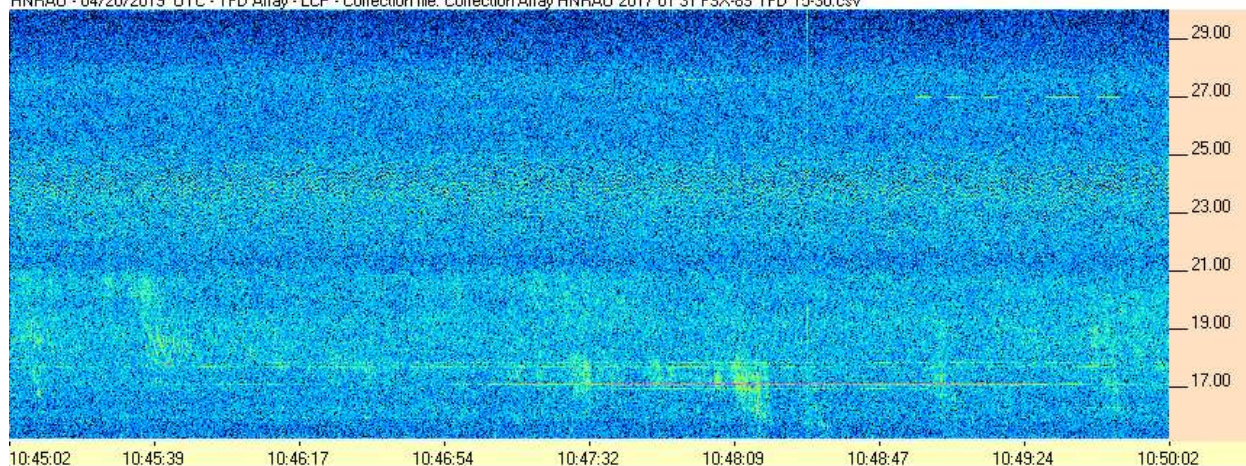
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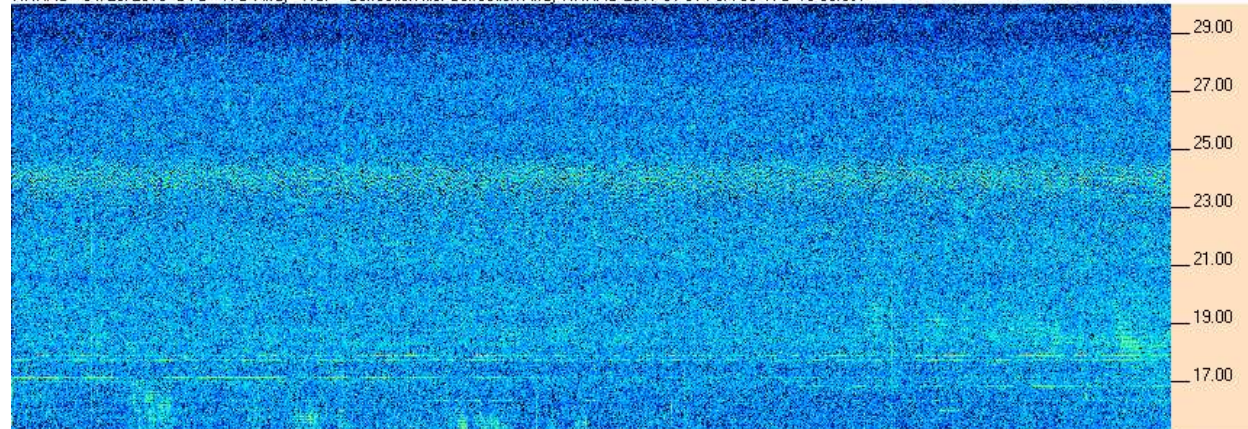
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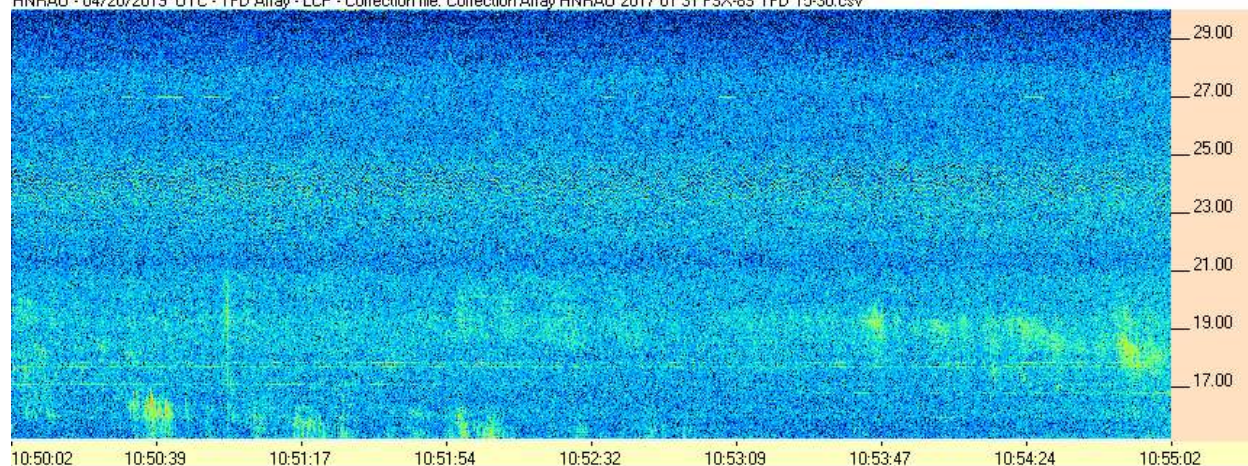
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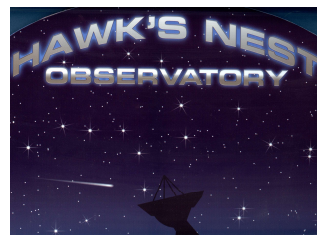
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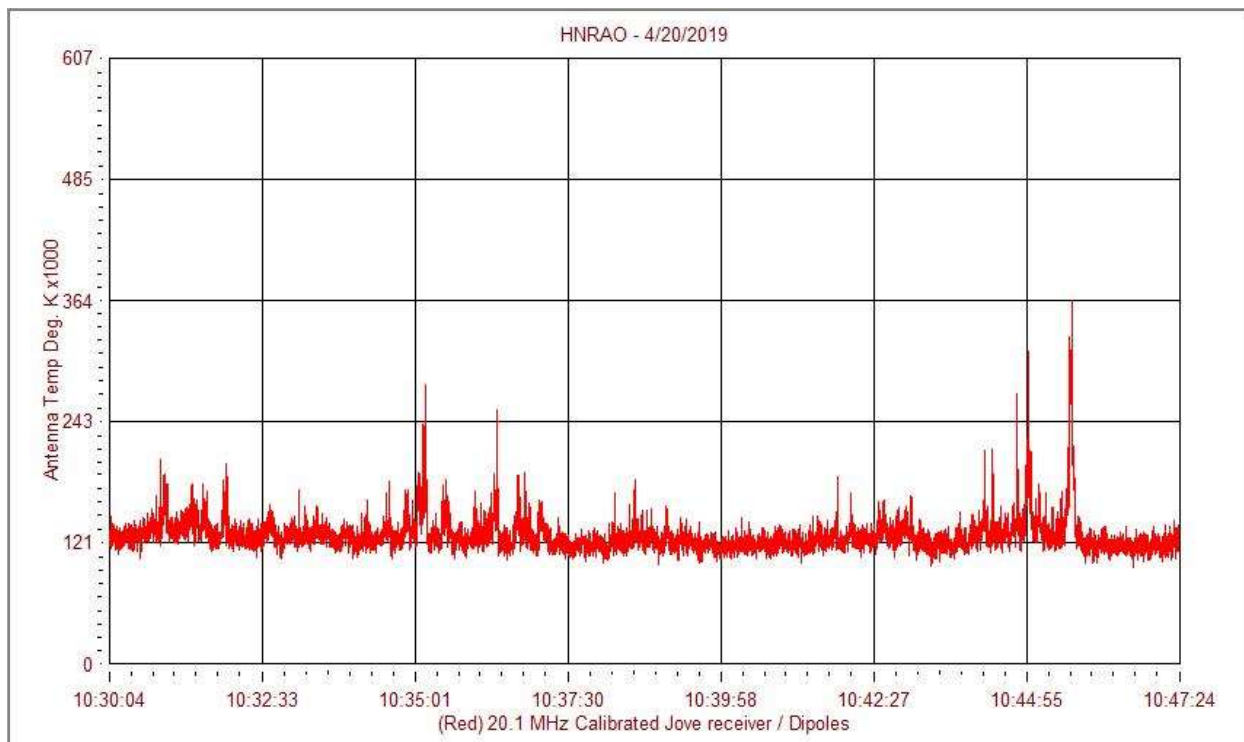
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Radio JOVE / JOVE Dipole Array



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