

HNRAO Observing Log
40.673181 N – 80.437885 W
EN90sq



Date: August 1-2, 2019

Object: Jupiter – Io-B

Observer: J. Brown / Unattended

Start - Time UT:	2300 – 8/1/2019	Planetary K-index:	3/1
Jupiter Altitude (deg):	17.8	Jupiter Azimuth (deg):	142.8
Jupiter CML:	97.95	Jupiter Io Phase:	084.49
Jupiter RA (hr/min):	16:53	Jupiter Dec (hr/min):	-22:06
Hour Angle (hr/min):	-02:34	Polarization	RCP
Sun Altitude (deg):	15.7	Sun Azimuth (deg):	281.0
Sun RA (hr/min):	08:40	Sun Dec (hr/min):	18:23

End – Time UT:	0220 – 8/2/2019	De:	-2.6
Jupiter Altitude (deg):	26.3	Jupiter Azimuth (deg):	192.1
Jupiter CML:	218.85	Jupiter Io Phase	112.53
Hour Angle (hr/min):	00:47	Duration (min):	200
Sun Altitude (deg):	-17.6	Sun Azimuth (deg):	315.1
Max Frequency MHz	30	Min Frequency MHz	15

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	7/19/2019

Radio JOVE dipoles phased @ 32 degrees for 2018-2019 season

Typinski AN-TFD-24-4 array phased @ 35 degrees for 2018-2019 season

Four LWA antenna array phased @ 35 degrees and orientation for observation: 45 degrees

Radio Sky Spectrograph software version 2.9.26

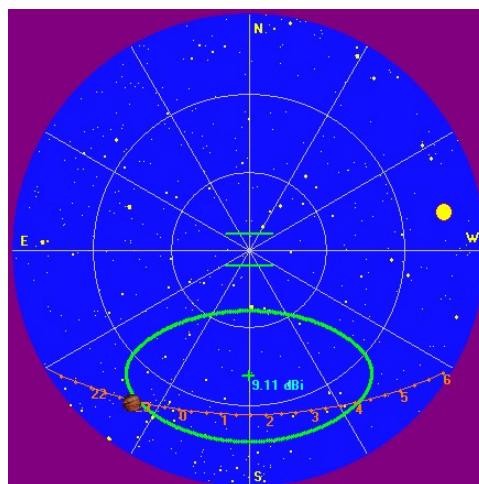
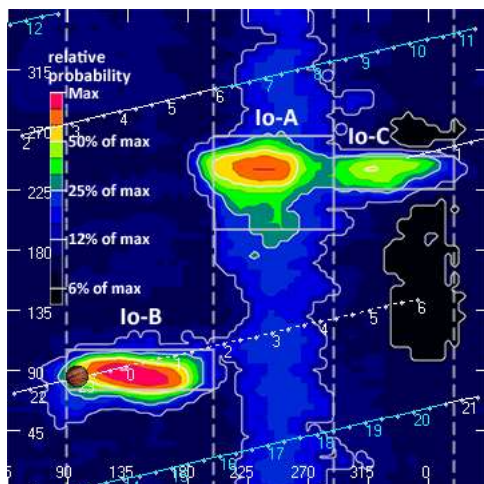
Radio-SkyPipe software version 2.7.33

Radio-Jupiter Pro software version 3.8.2

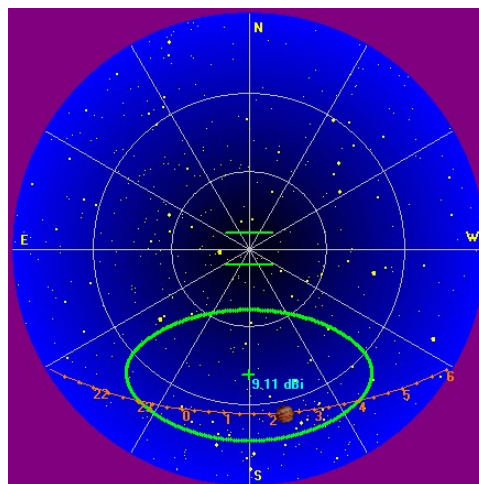
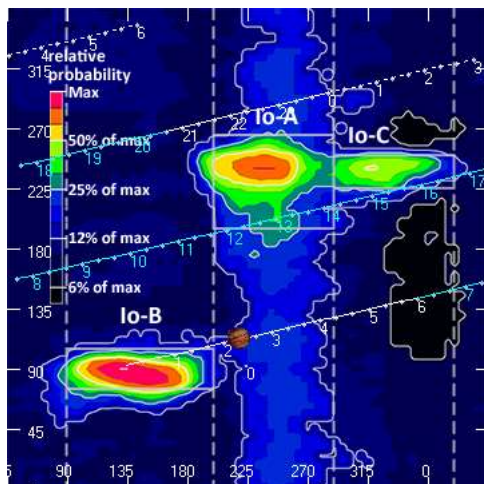
Network Time Server GpsNtp-Pi, Reeve Engineering

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

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Beginning of Pass



End of Pass



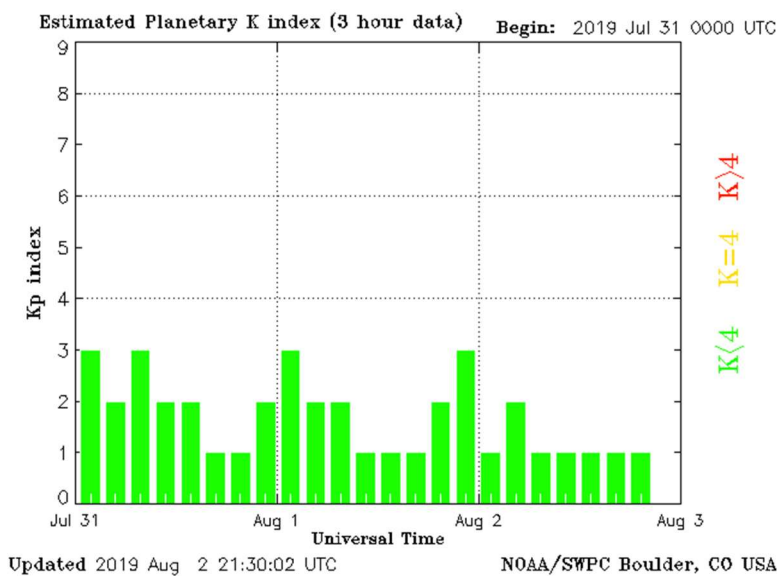
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MODE	CML RANGE	Io RANGE	MAX F	POLAR	ARC	NOTES
Io-D	0-200	95-130	18	LH	Early	Also called "fourth source"
Io-B	(105 - 185)	(80-110)	39.5	RH	Early	Also called "early source"
non Io-B	80-200	0-360	38	RH	Early	Voyager info
Io-A	(200-270)	(205-260)	38	RH	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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Jupiter / Sun angular separation = 126.9 degrees.

All spectrographs and receivers running and antennas functional. No known issues.

All RCP spectrographs and the JOVE II / JOVE dipole array recorded data. RFI was minimal on the spectrographs. Horizontal bright bands are from an unknown RFI source. Narrow vertical bright lines are from distant thunderstorms and brighter wider vertical bands are foreign broadcast station overloading the front end of the spectrograph. Ionospheric “sweepers” were present and are the bright diagonal lines. There was periodically bad RFI, from an unknown source, with the JOVE II / JOVE dipole SkyPipe chart. There were several periods of no RFI in the SkyPipe record so that several bursts were recorded.

A remarkable Io-B storm composed of L-bursts and S-bursts dominated by L3 modulation lanes and a several brief S3 modulation lanes. There were no observed N-events. The storm began on 8/1/2019 UTC and ended 8/2/2019 UTC. There were L2 modulation lanes during the storm, but the entire storm was dominated by L3 lanes. The emissions arc began at 15 MHz and reached 27 MHz before dropping to 15 MHz at the end of the storm. There was a negative drift group of S-bursts that began above 30 MHz at 2337:28 UT and ended at 27 MHz at 2341 UT.

Emissions were from, perhaps at or 1 dB above GB to on the order of several dB above GB as observed here, with many singular bursts, most likely S-bursts, reaching saturation of the receiver.

Scintillation was present throughout the storm. As has been the case during this iteration, there were long periods of no activity punctuated by clusters of bursts. Some of these bursts were the strongest seen this observing season. For example, at 0029:10 UT, a very strong cluster of S-bursts dominate the spectrograph chart. Another cluster is seen at 0030:06 UT. These strong clusters occurred throughout the storm.

There were several things that made this a noteworthy storm. The first being the domination of the type L3 modulation lanes. The second, there were S3 modulation lanes as well. Given the time of day the storm began, and Jupiter being so low (De -2.6 degrees), this was a remarkably strong storm.

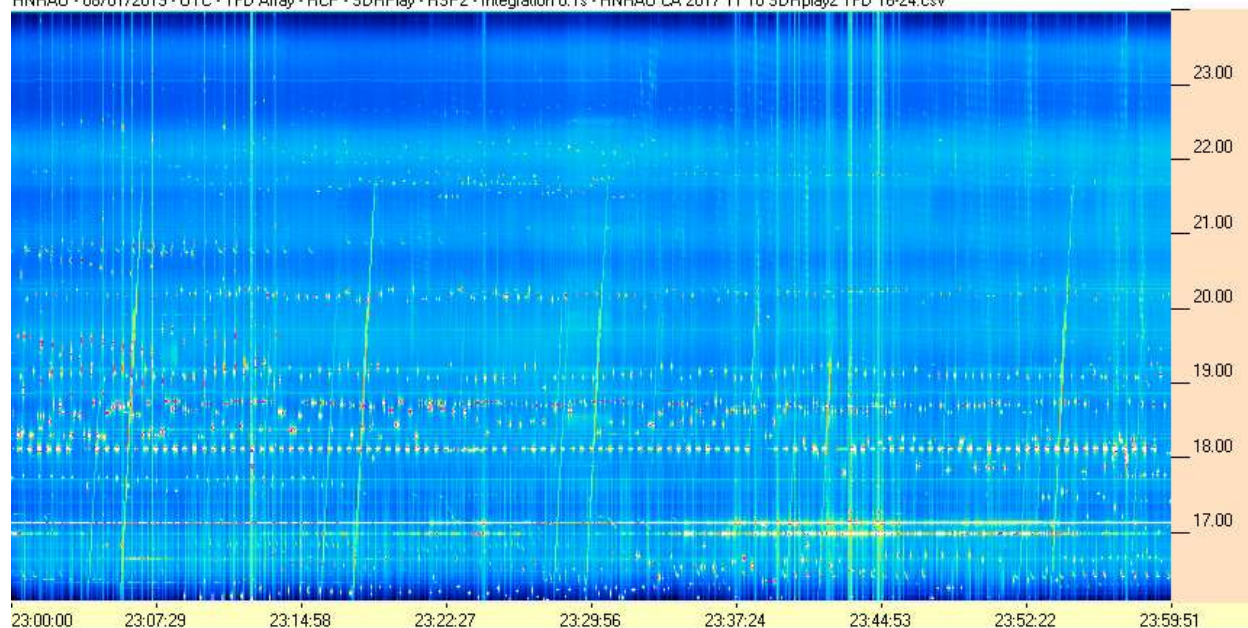
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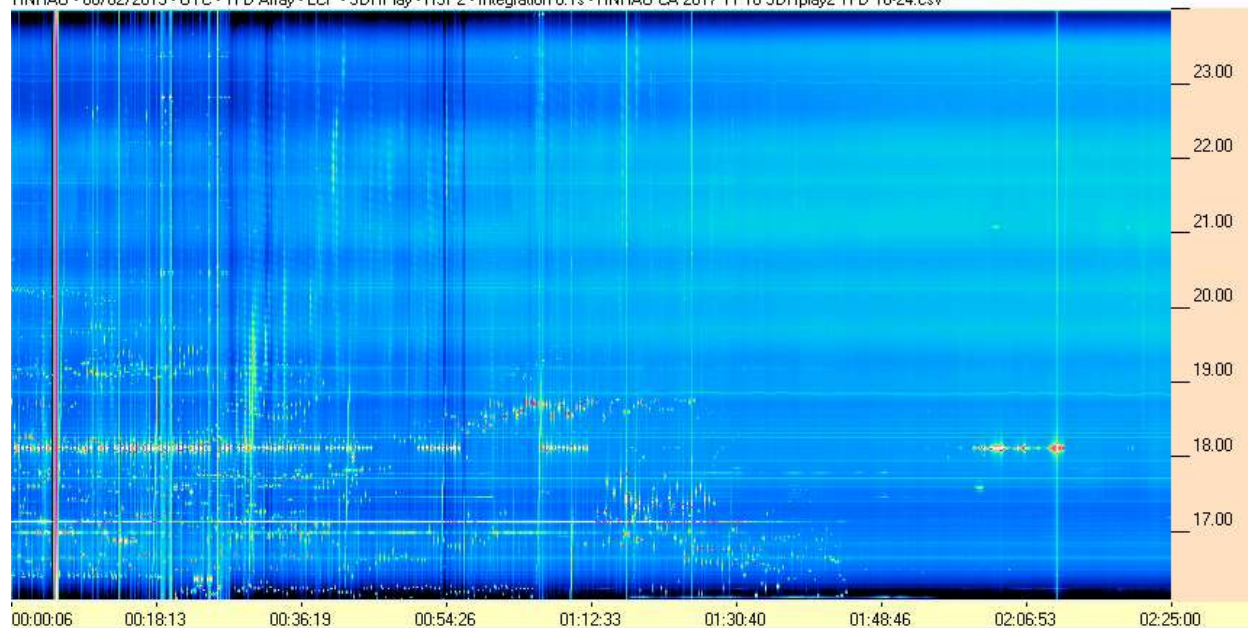


SDRPlay RSP2 / TFD Array

HNRAO - 08/01/2019 - UTC - TFD Array - RCP - SDRPlay - RSP2 - Integration 0.1s - HNRAO CA 2017 11 10 SDRplay2 TFD 16-24.csv



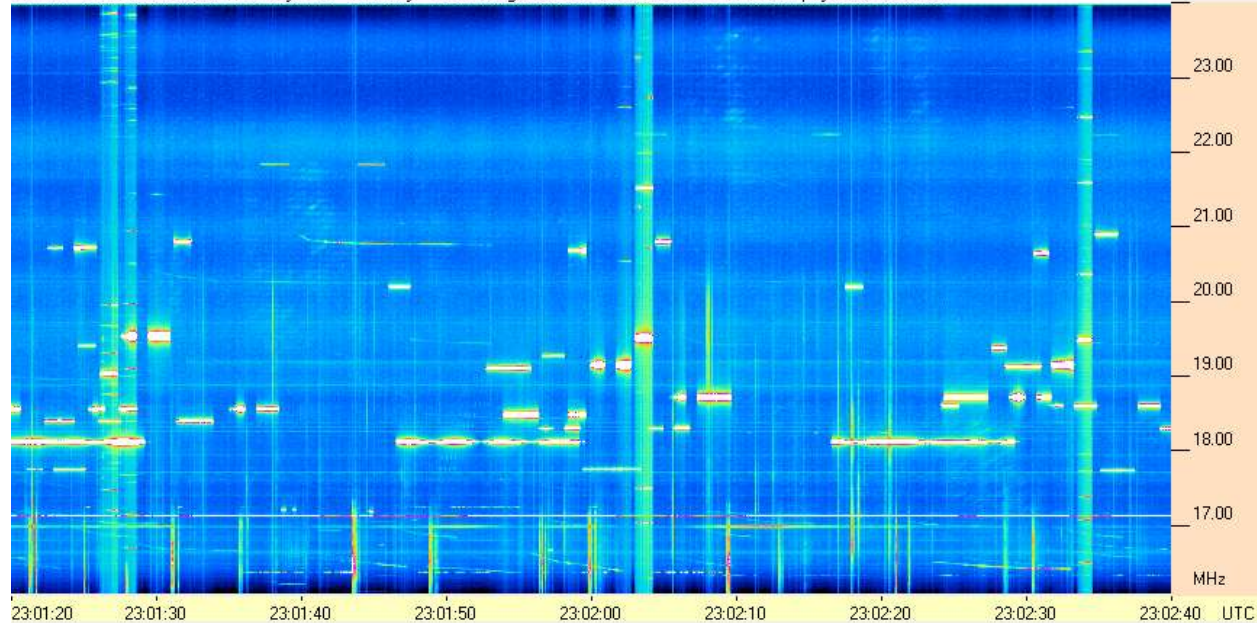
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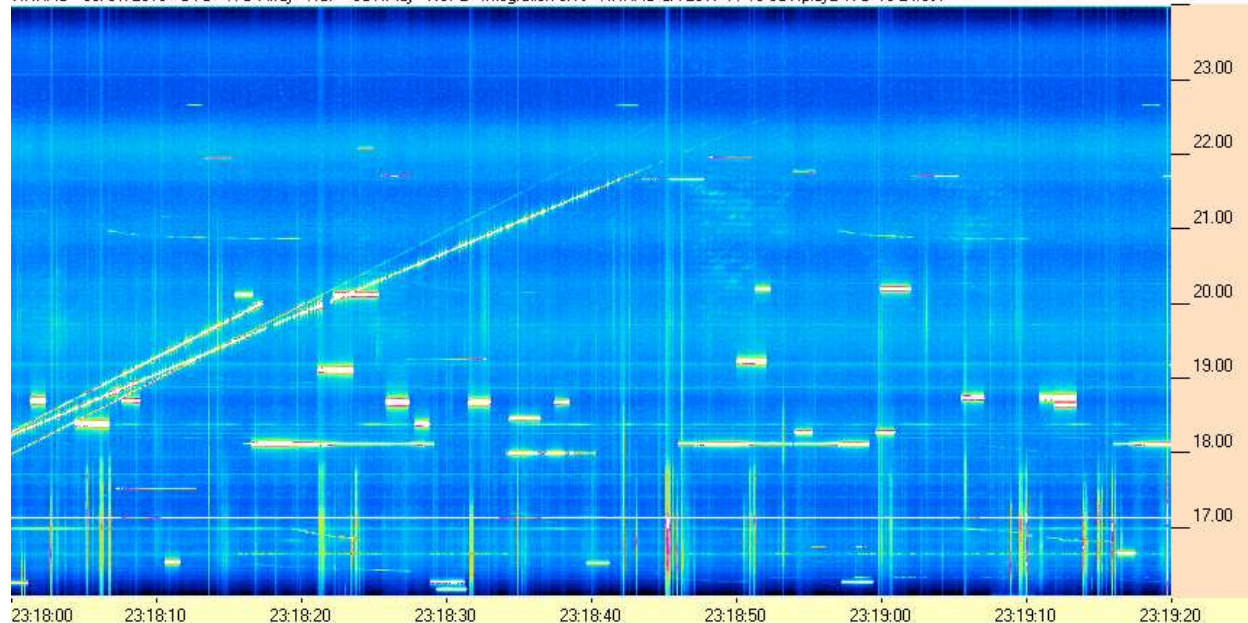
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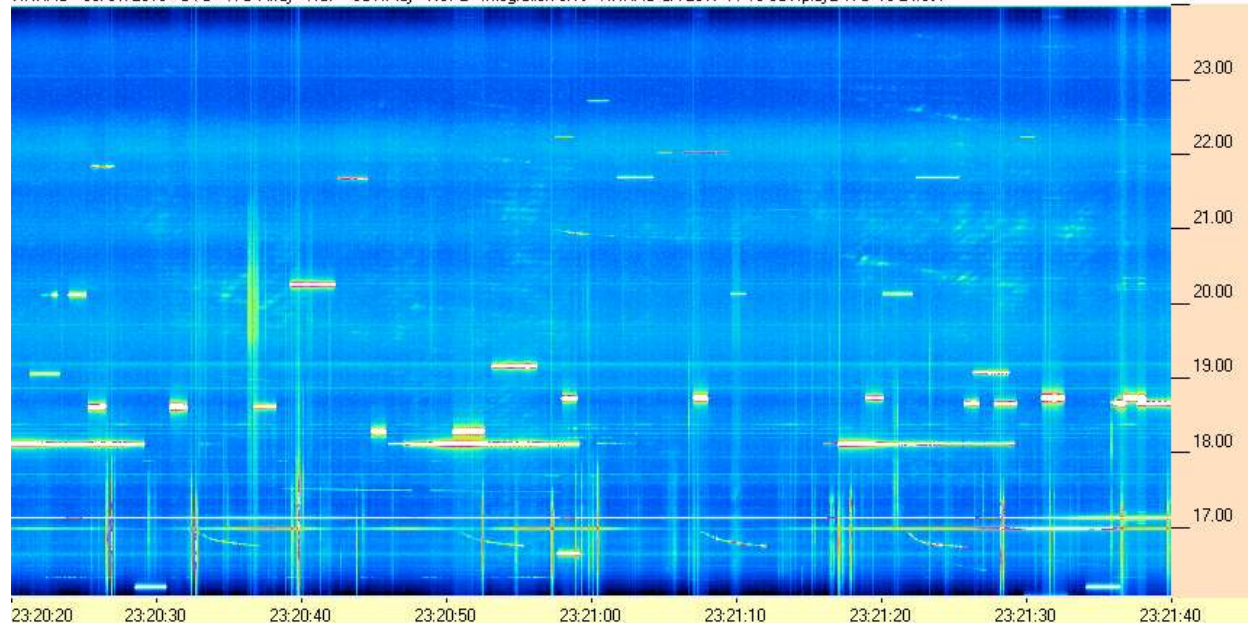
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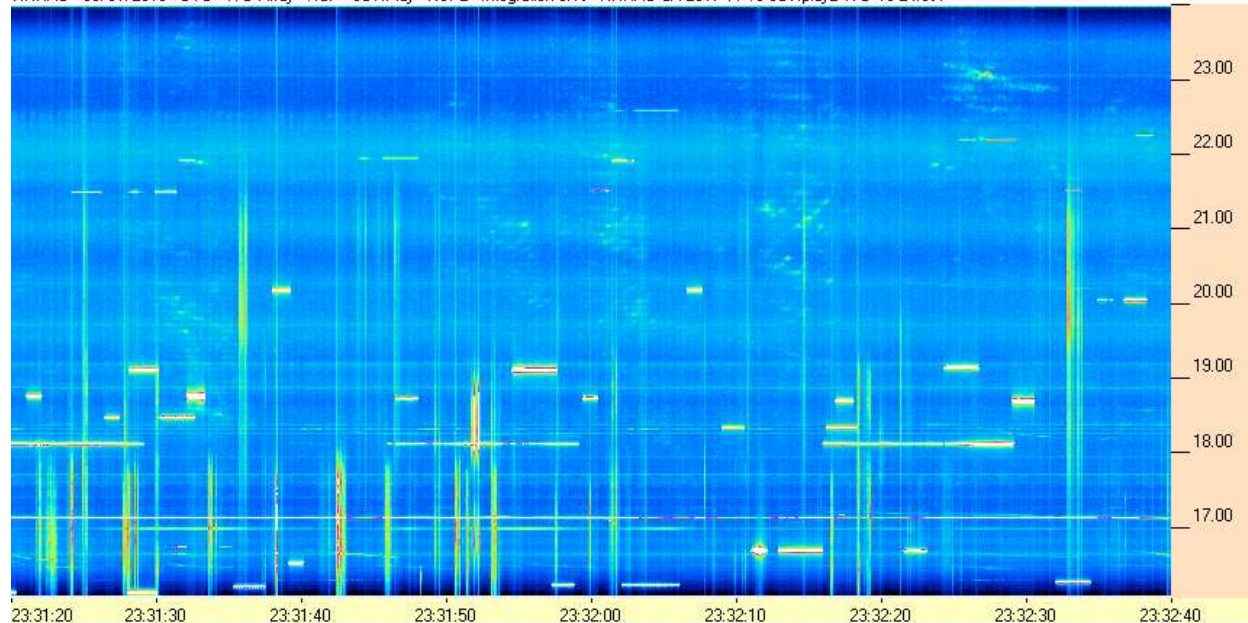
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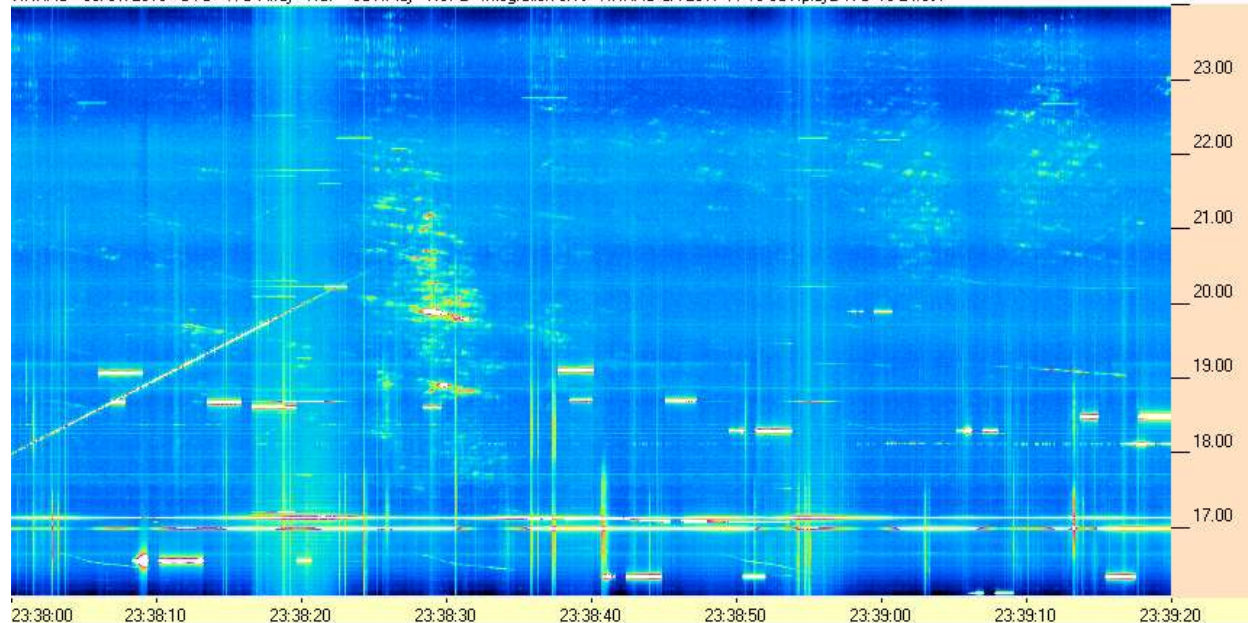
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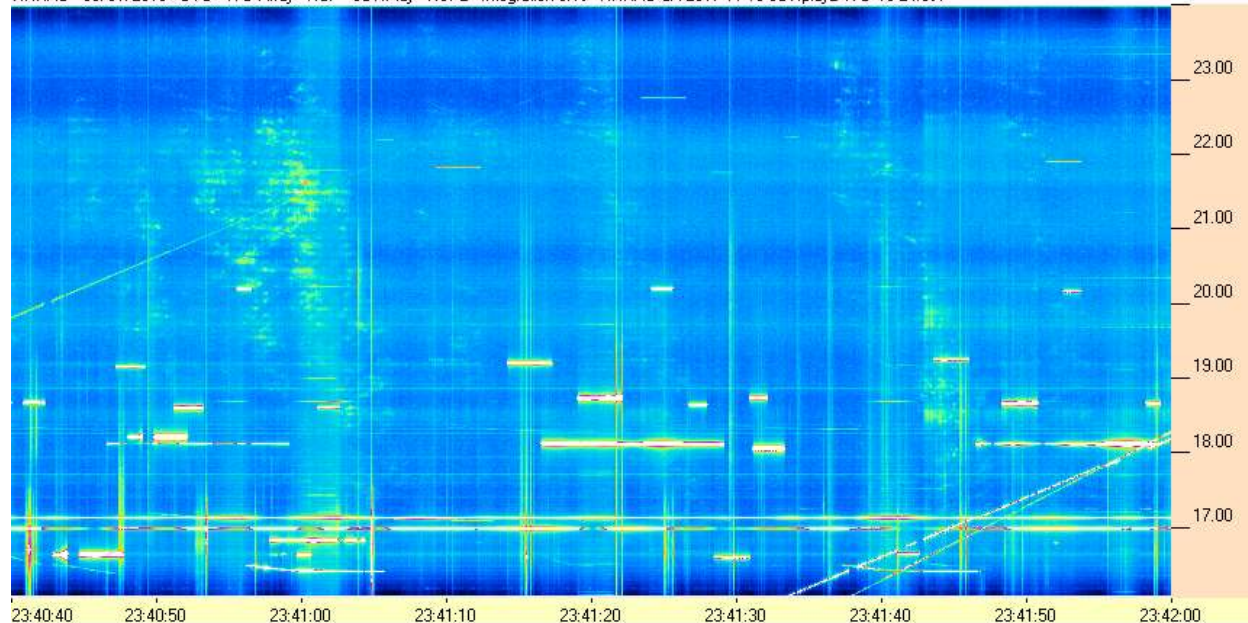
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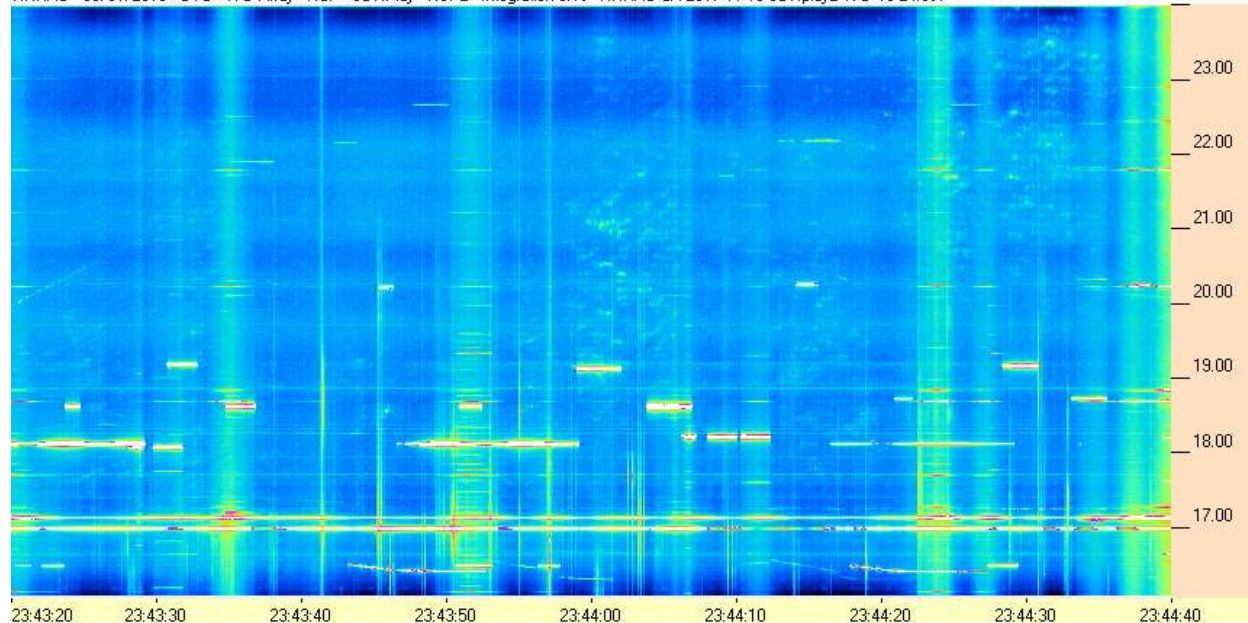
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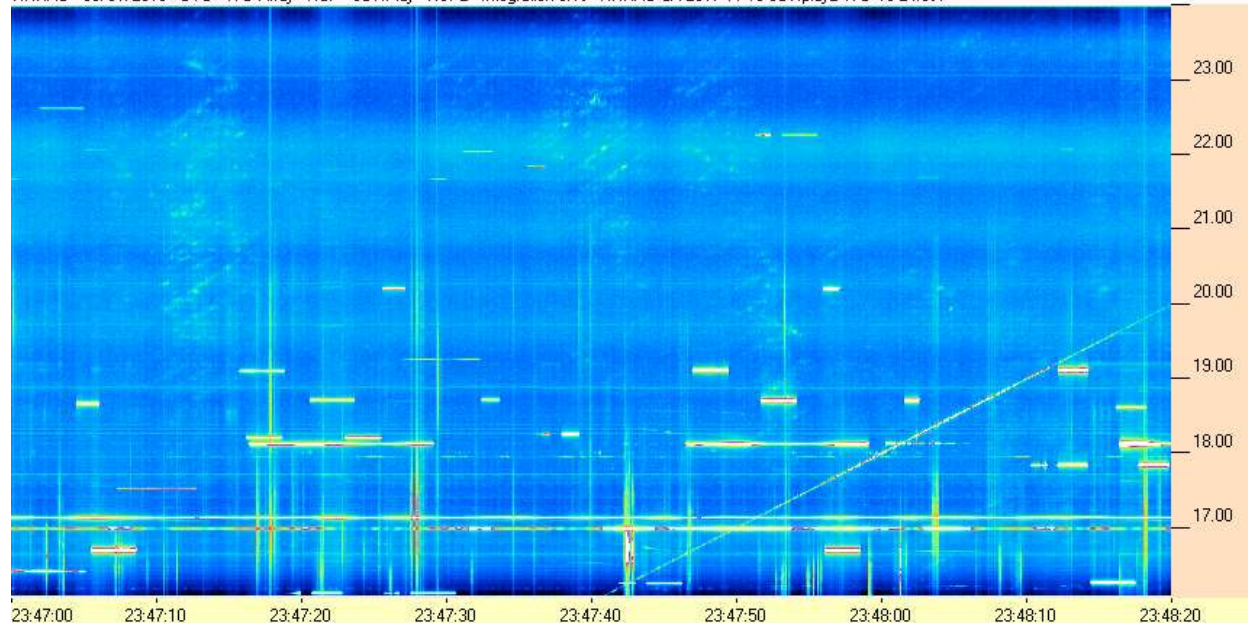
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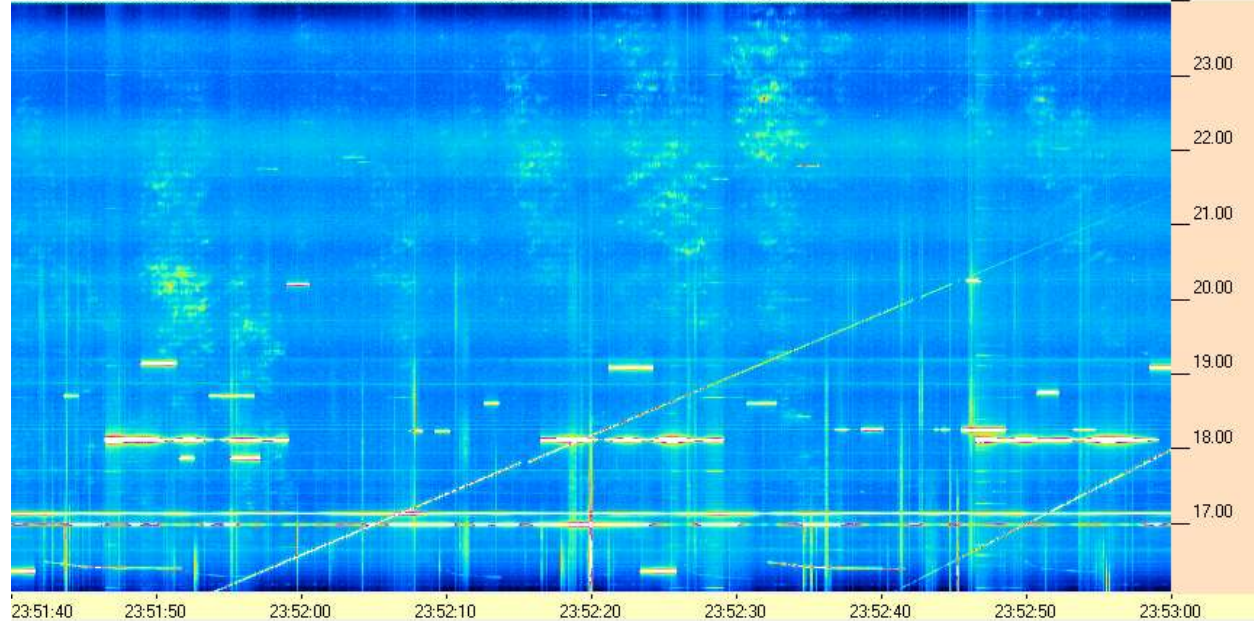
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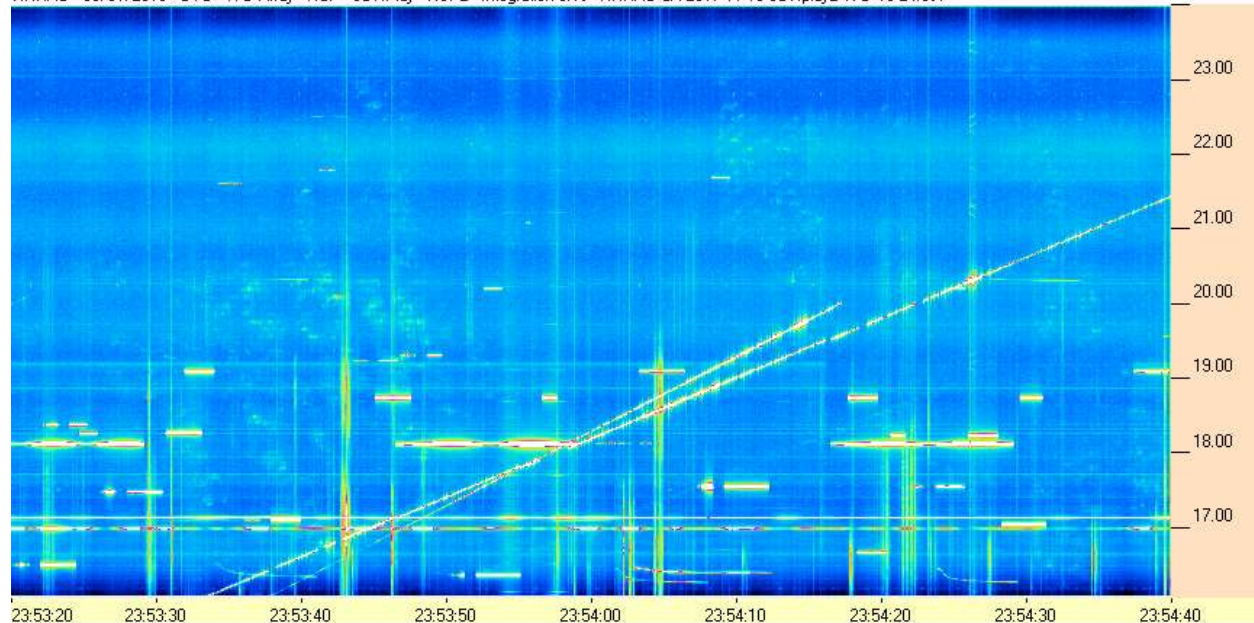
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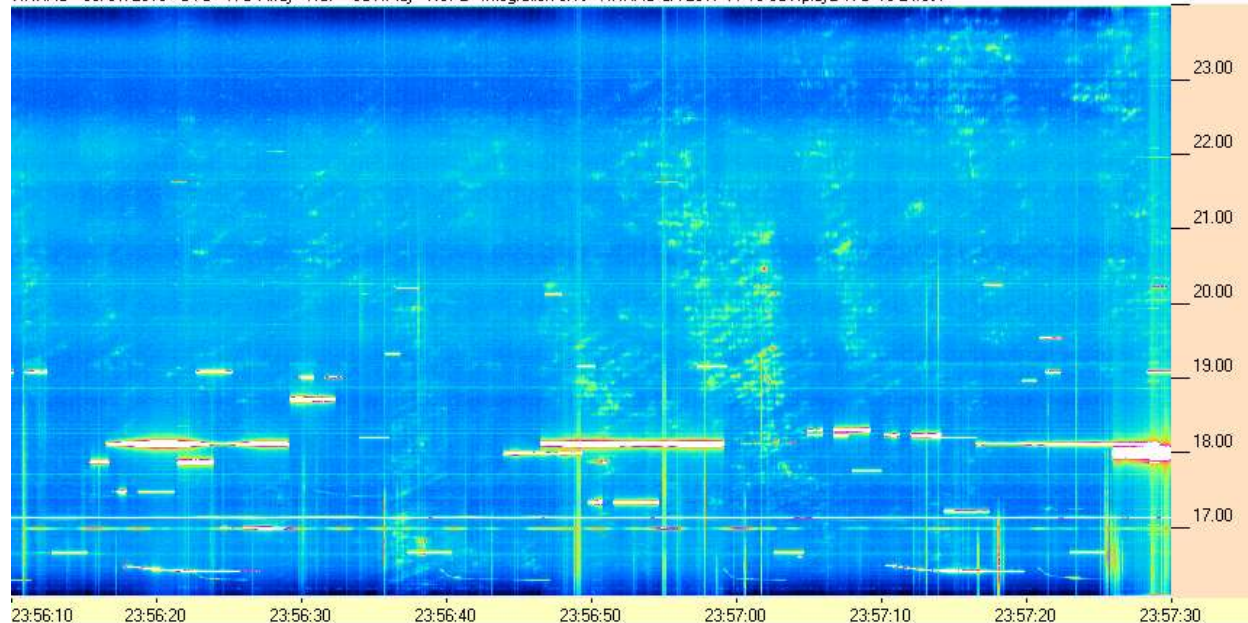
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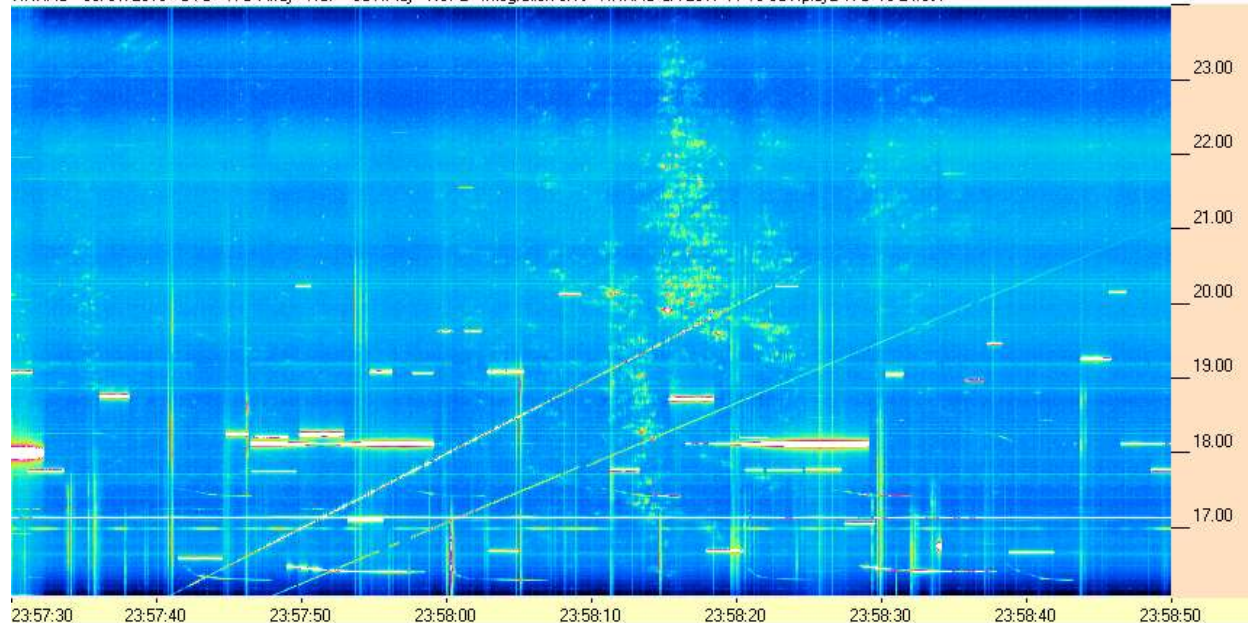
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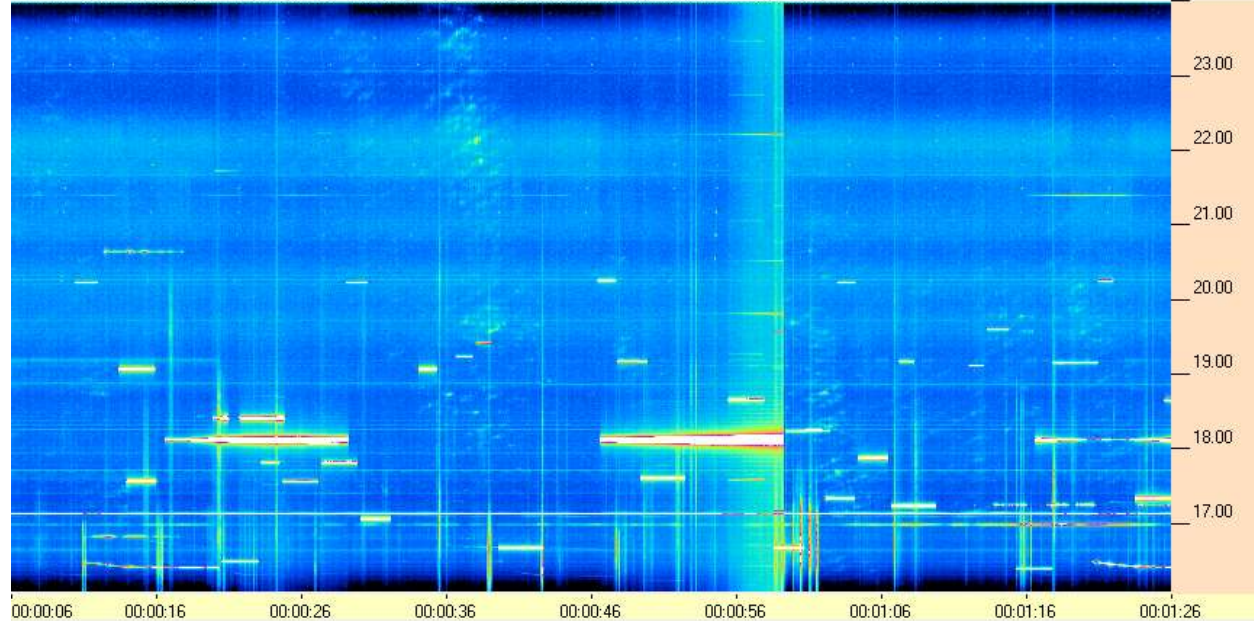
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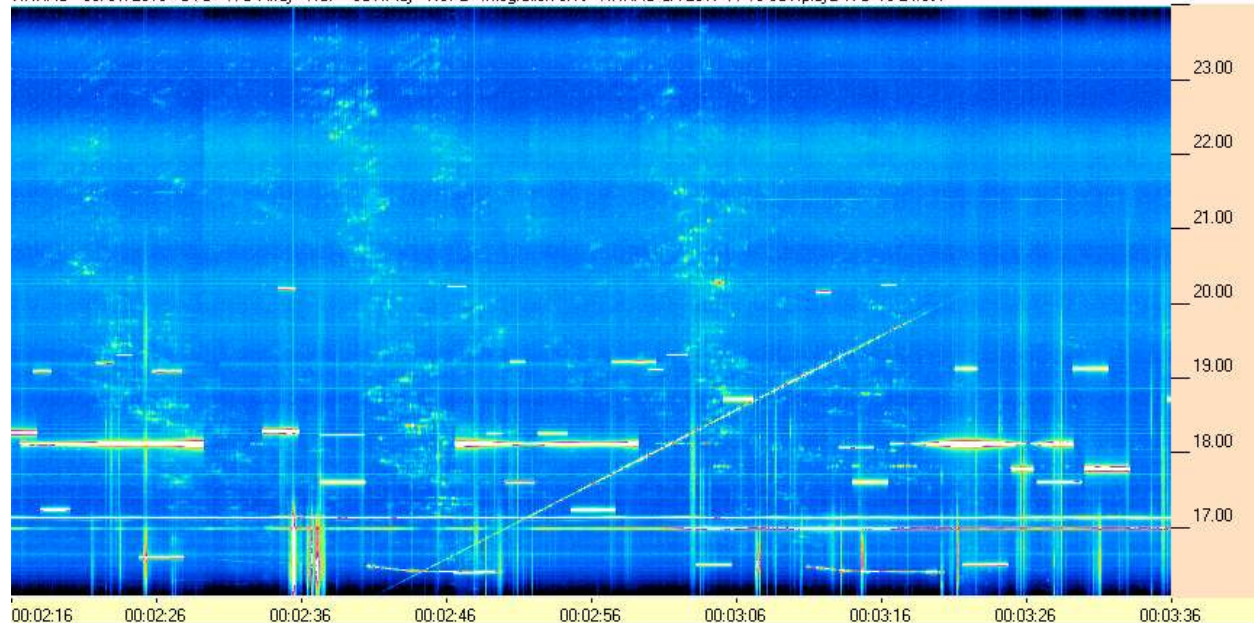
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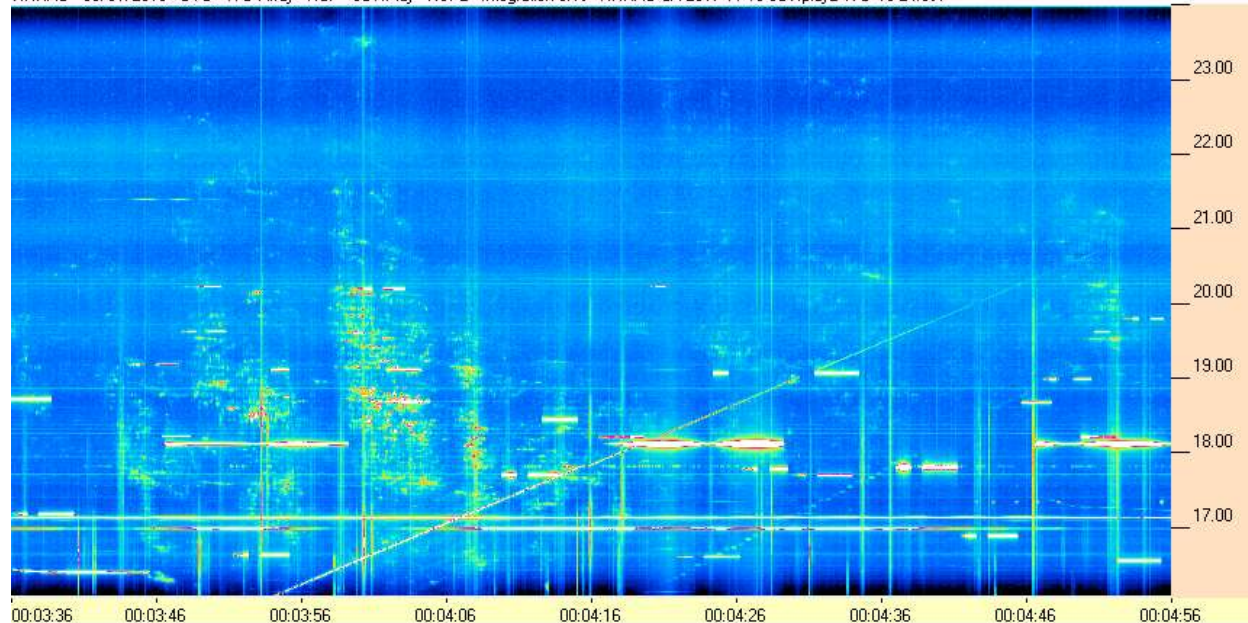
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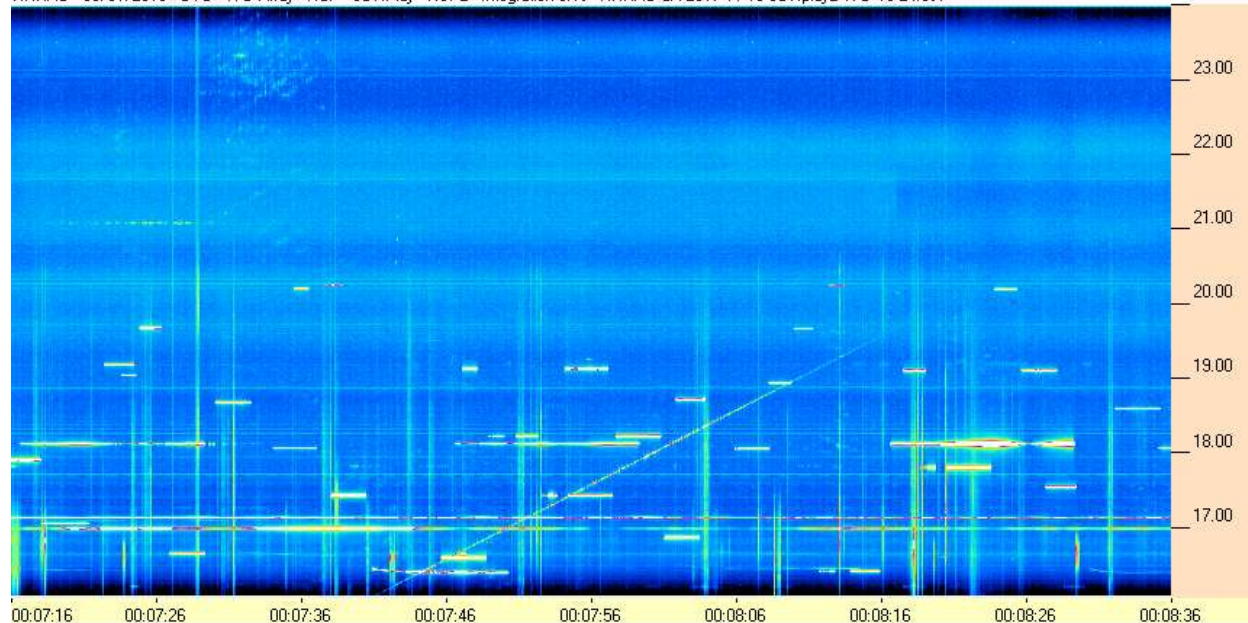
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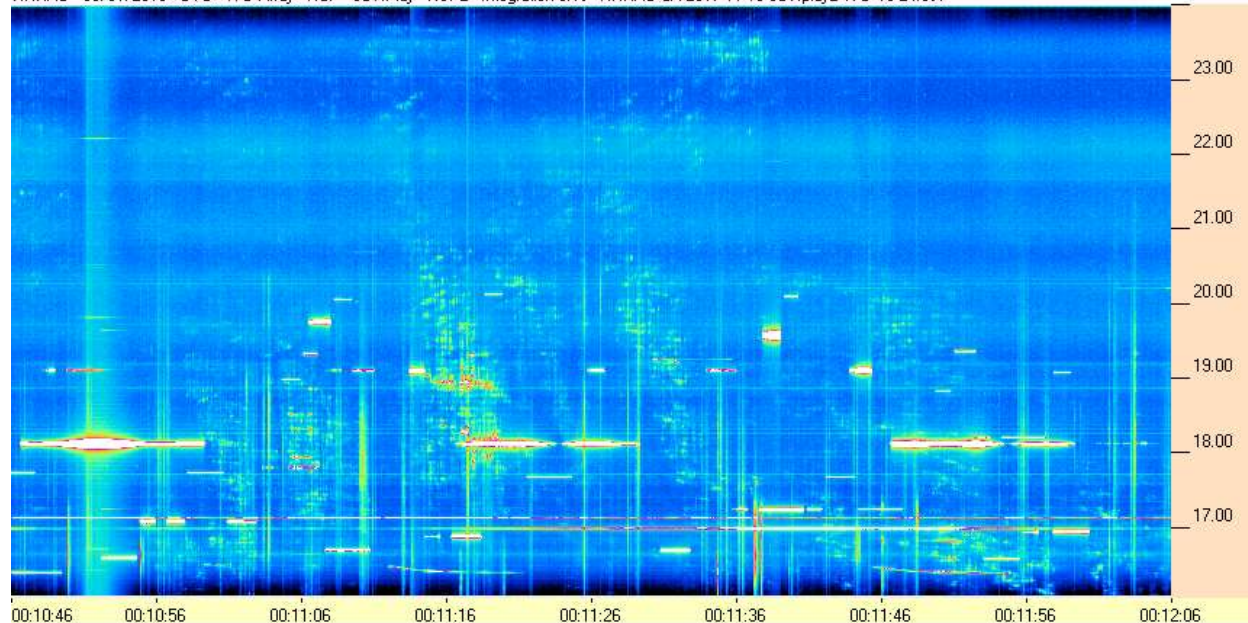
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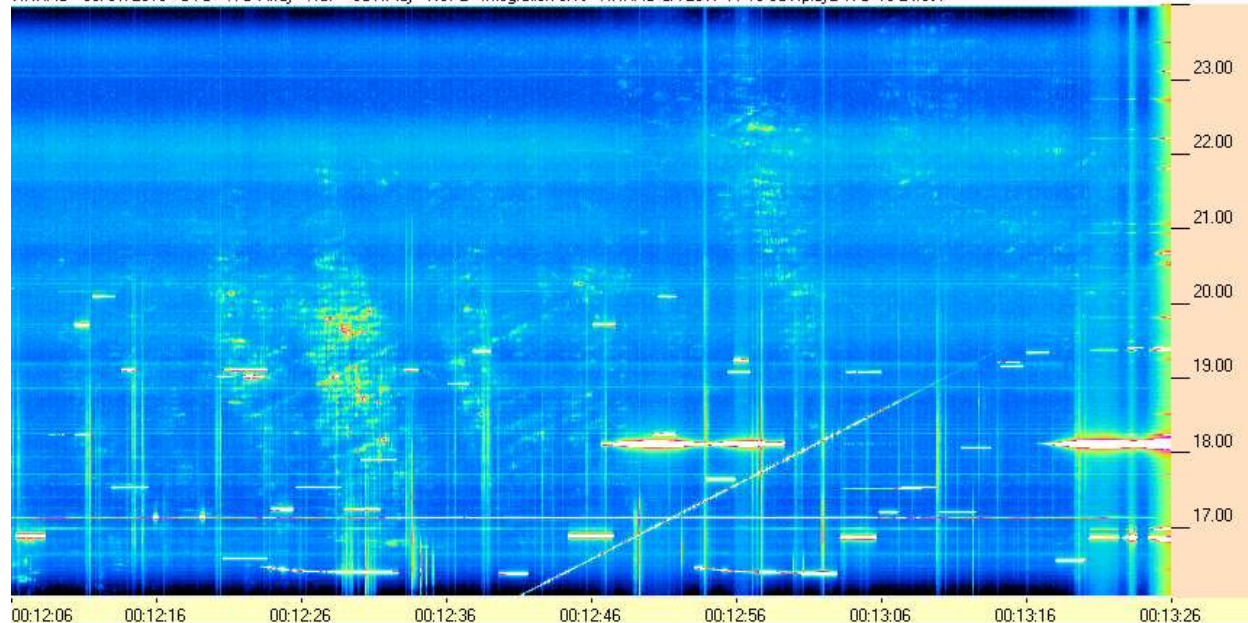
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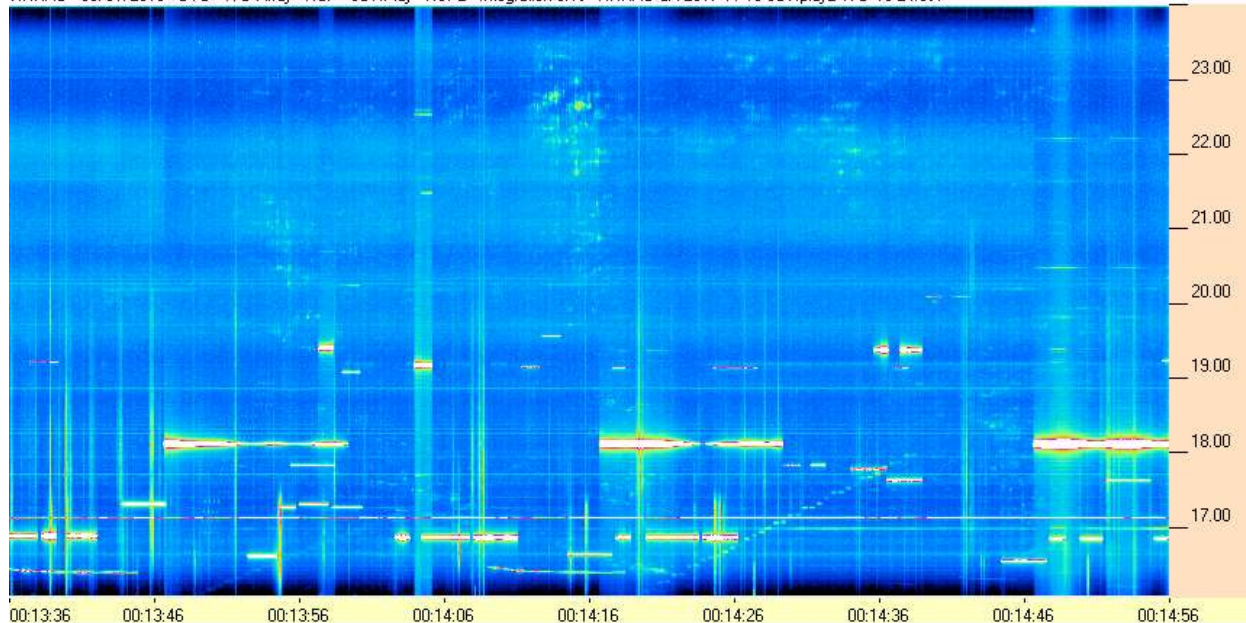
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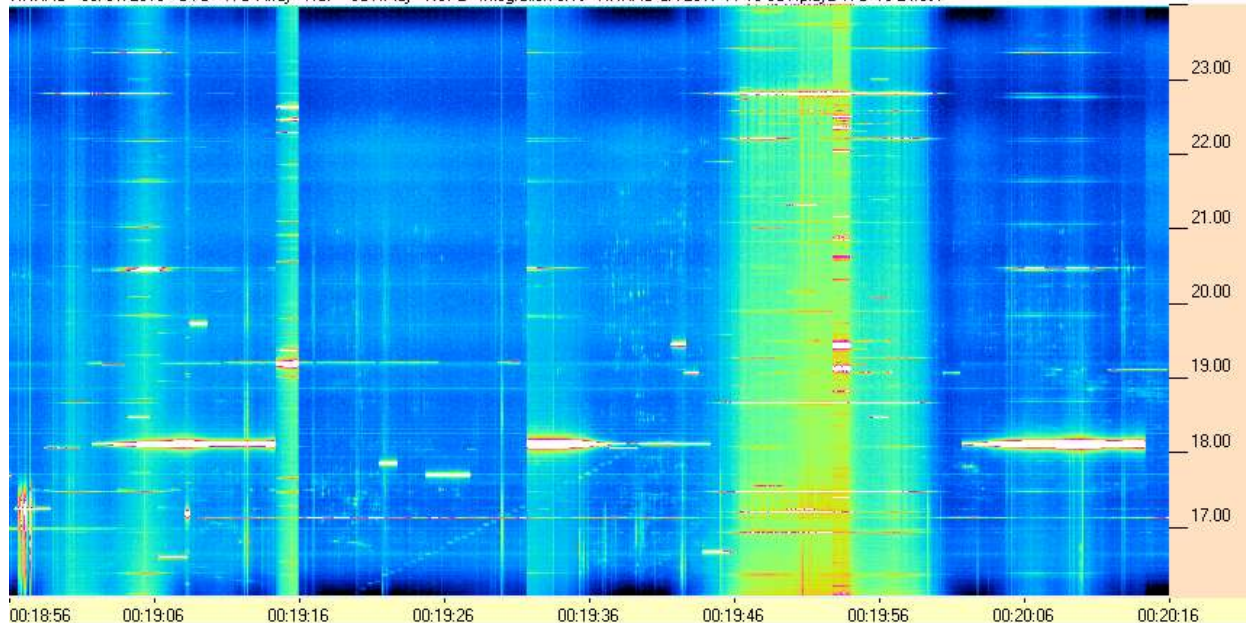
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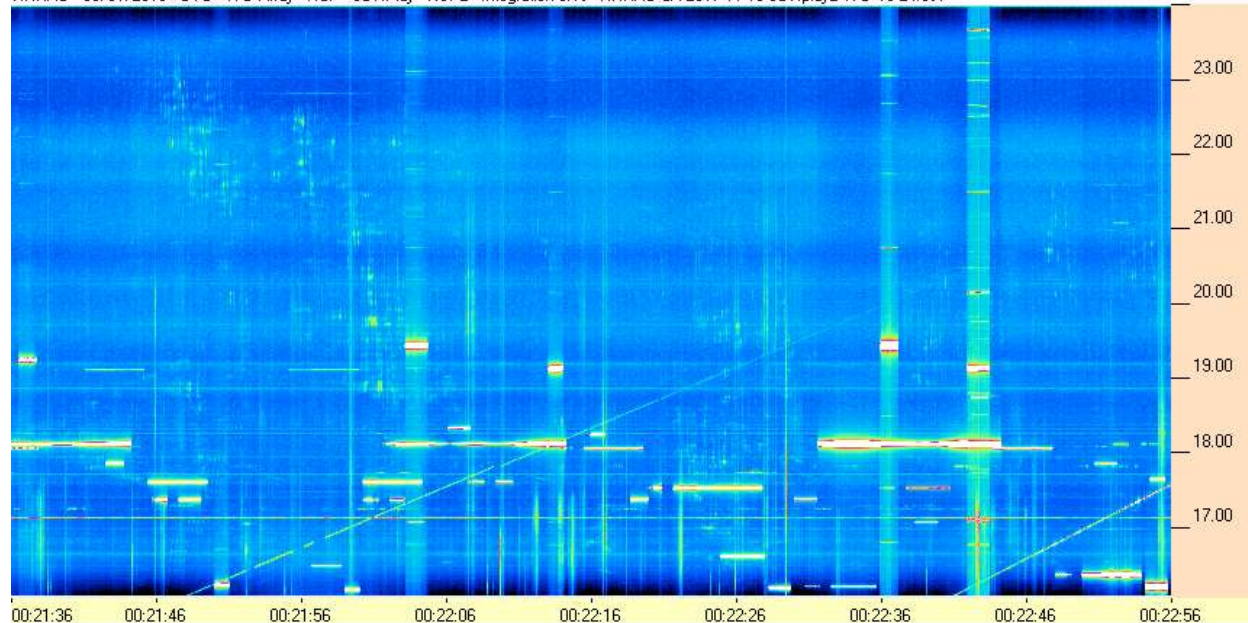
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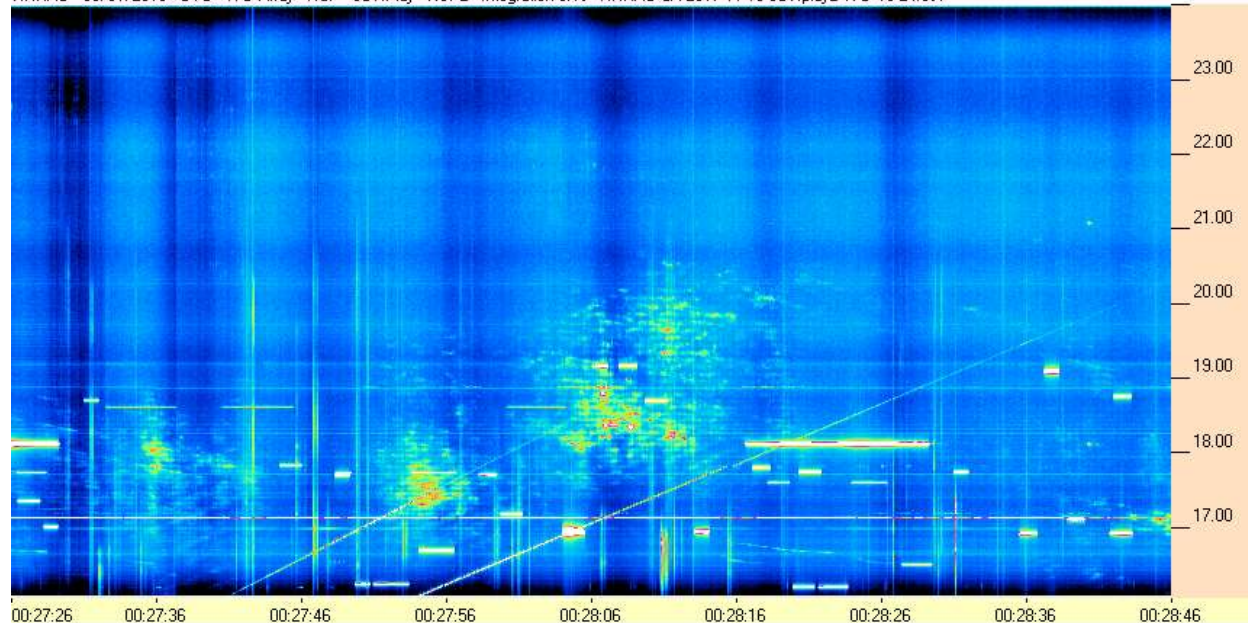
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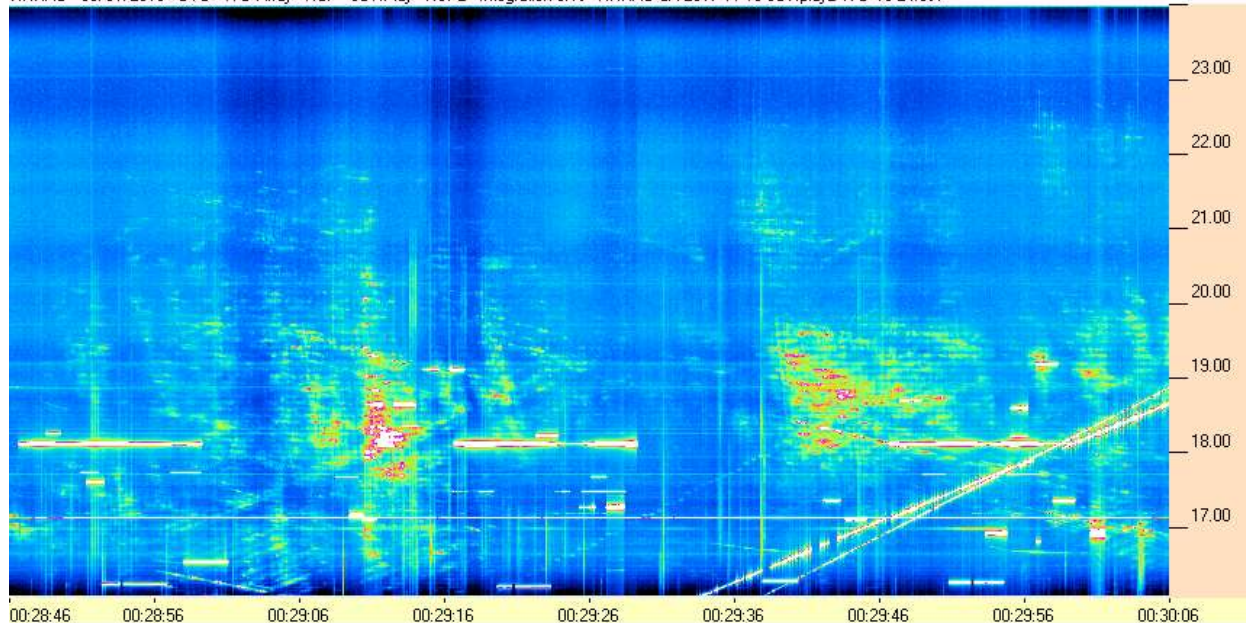
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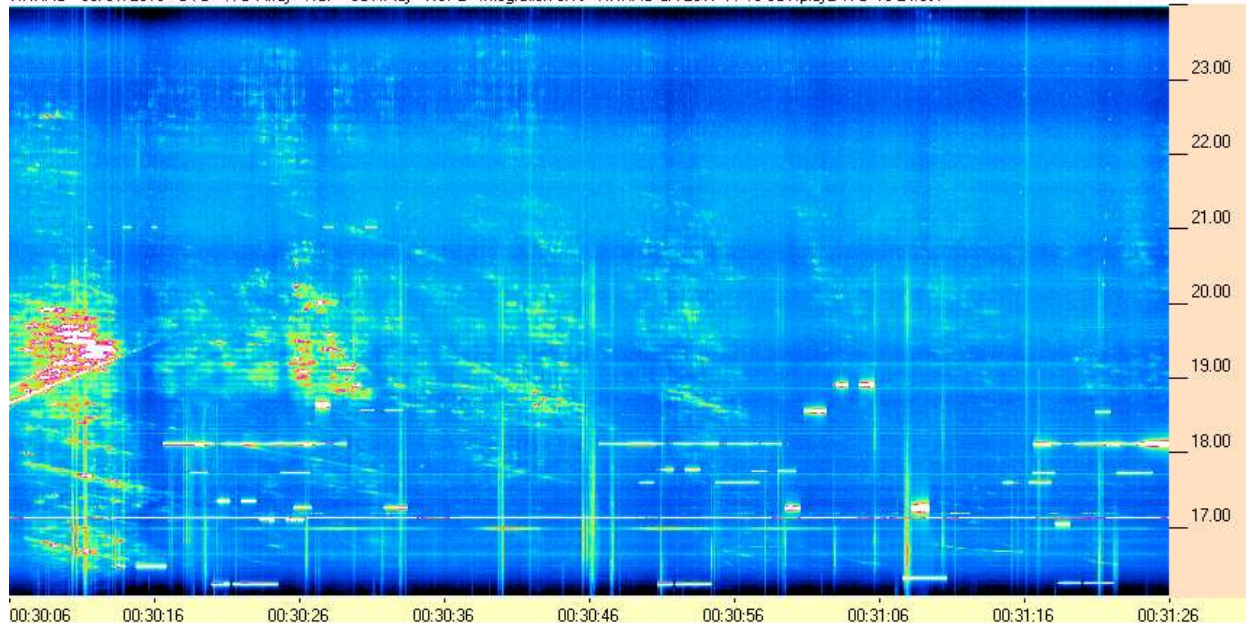
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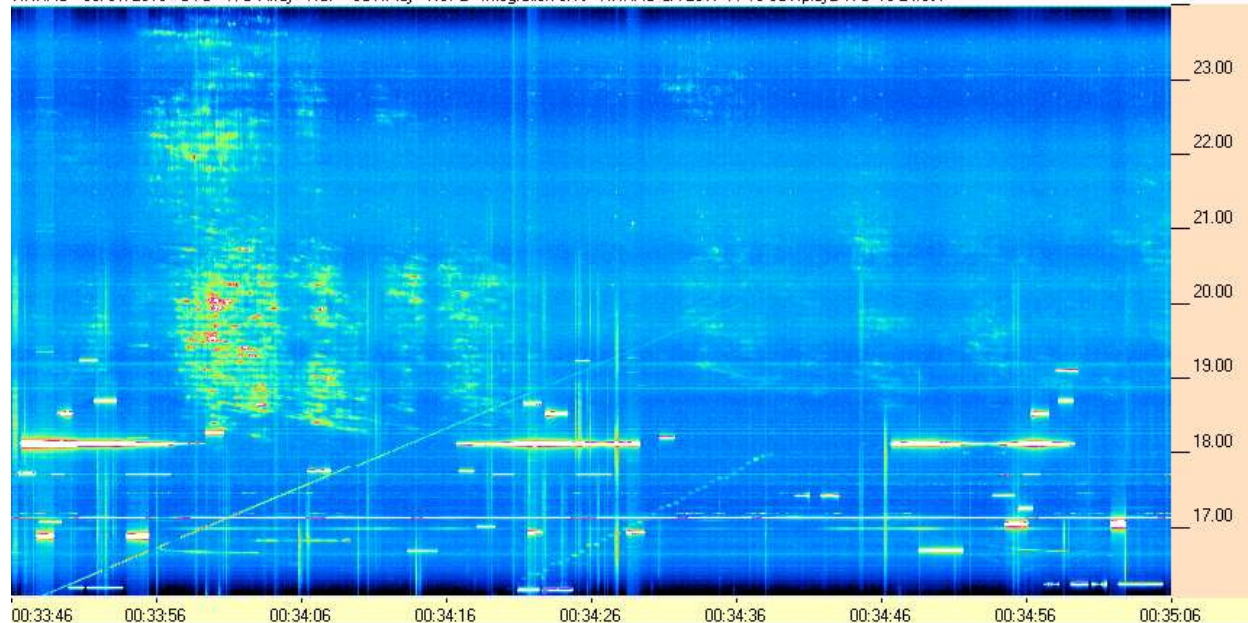
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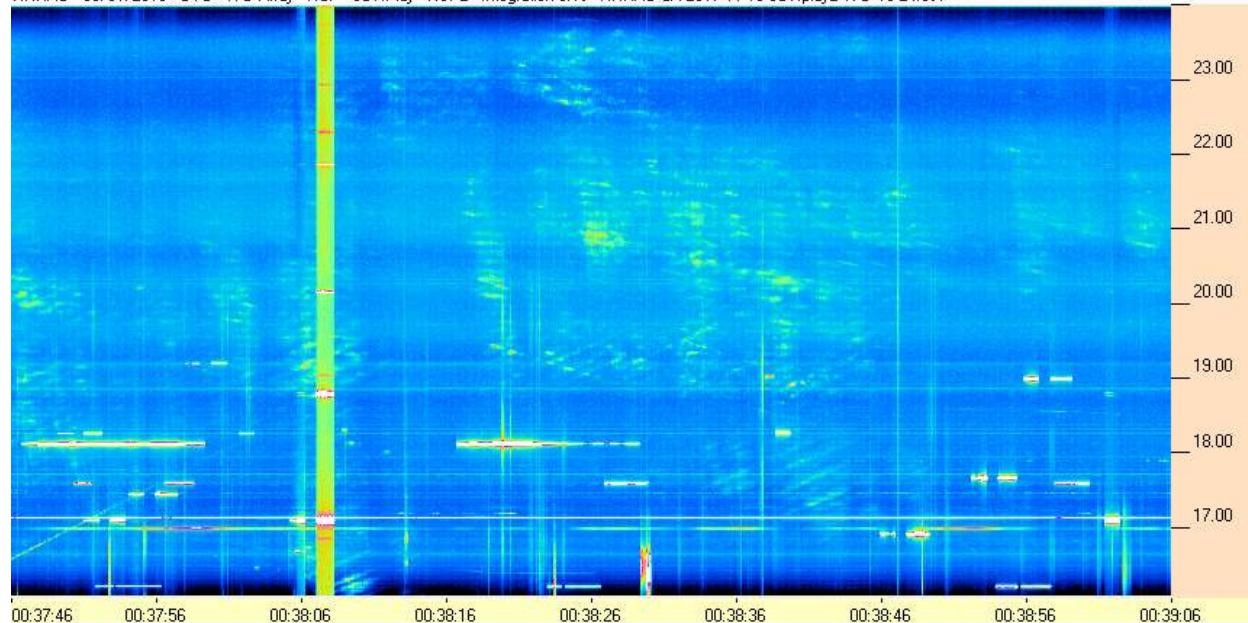
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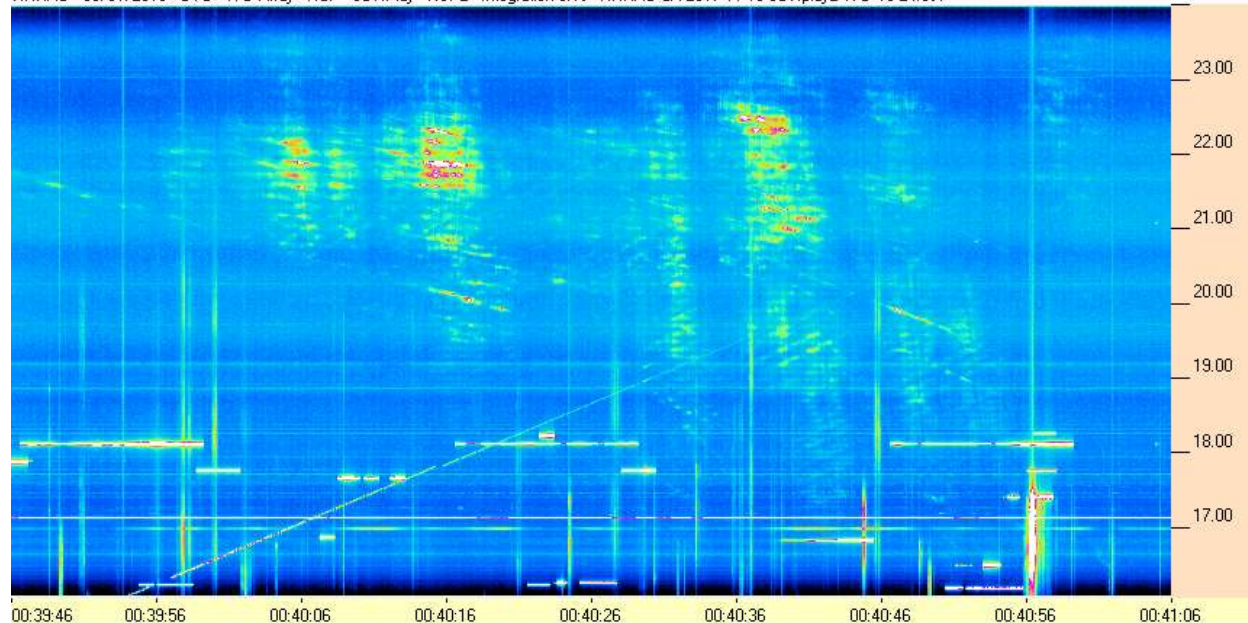
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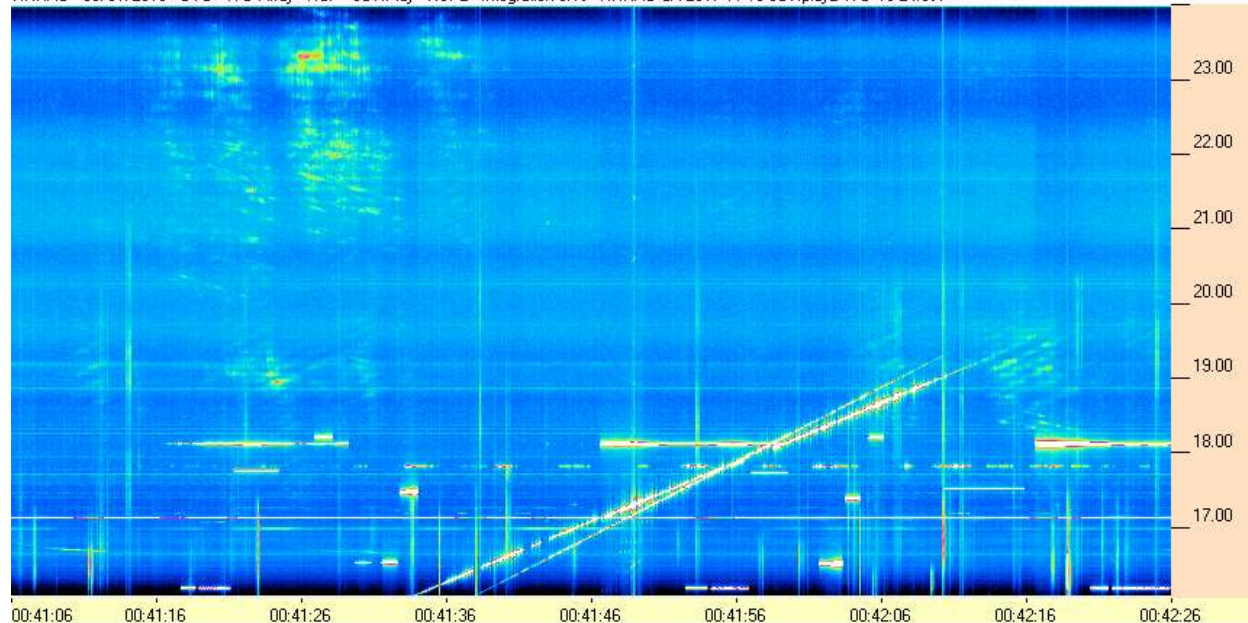
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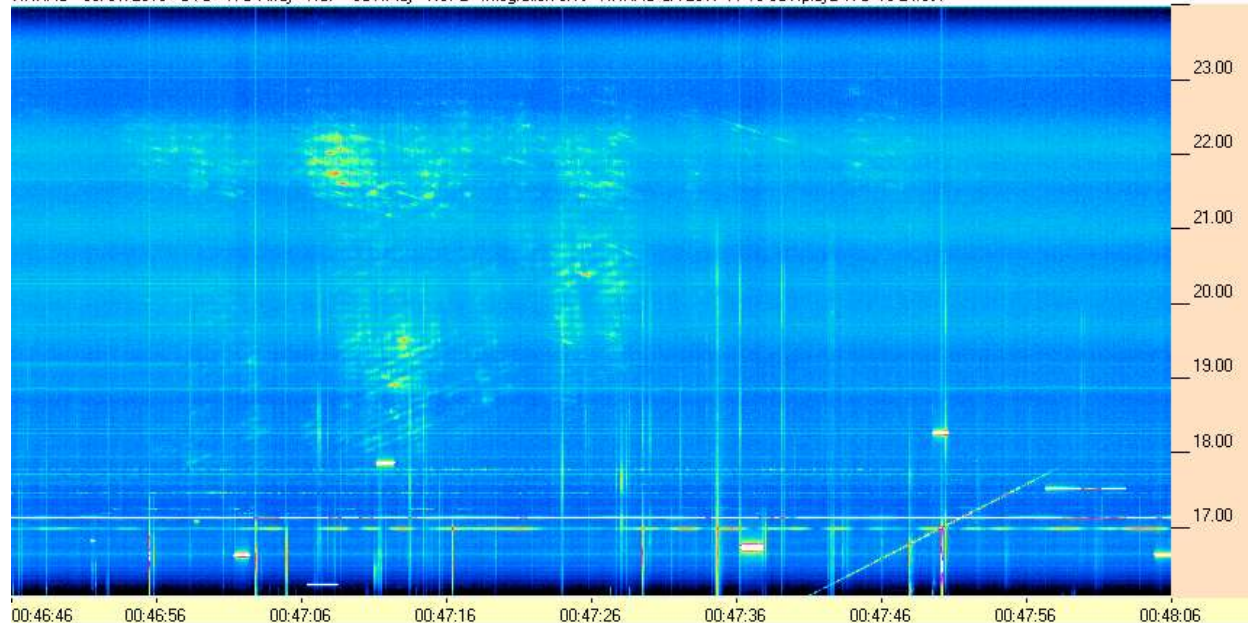
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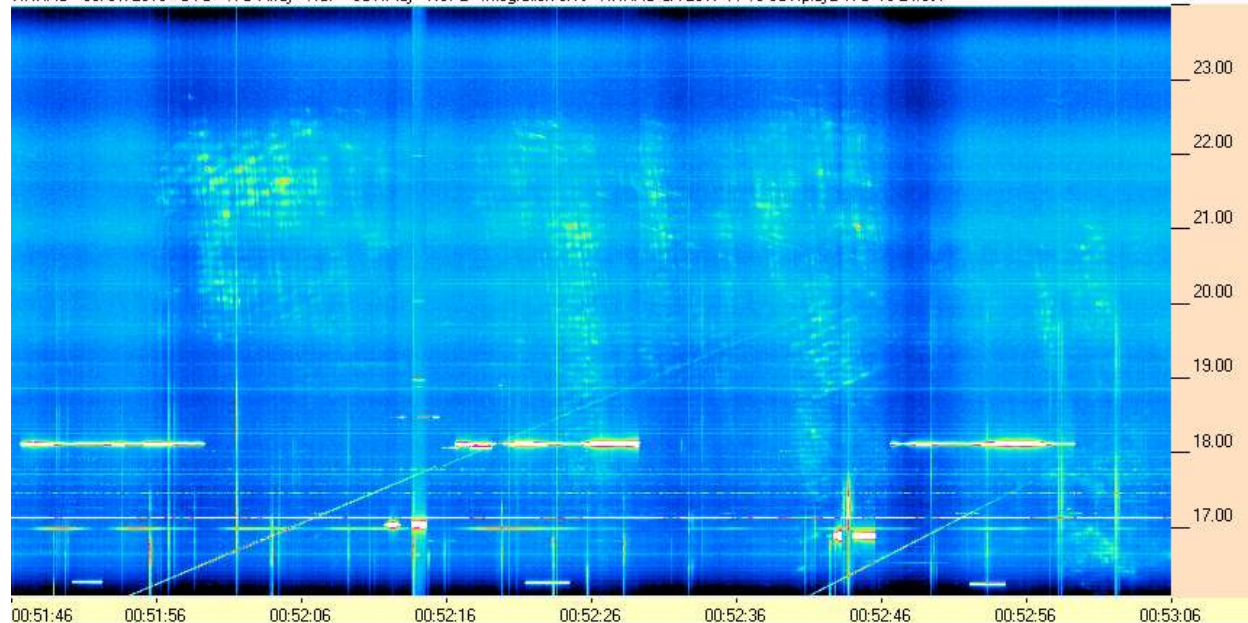
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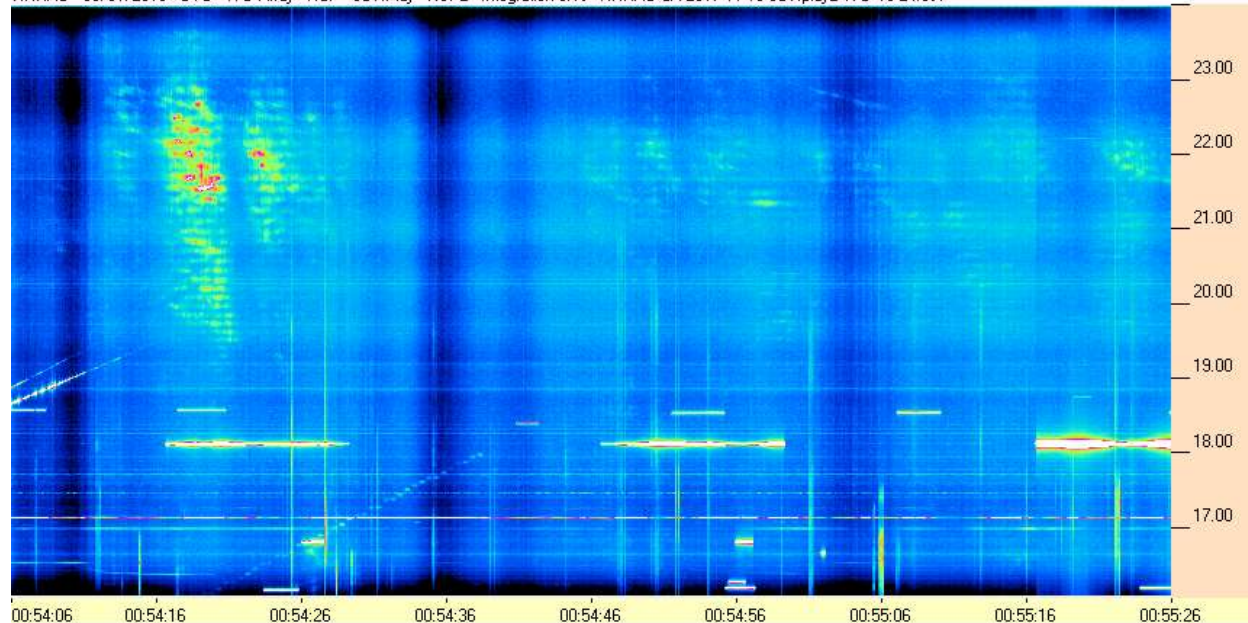


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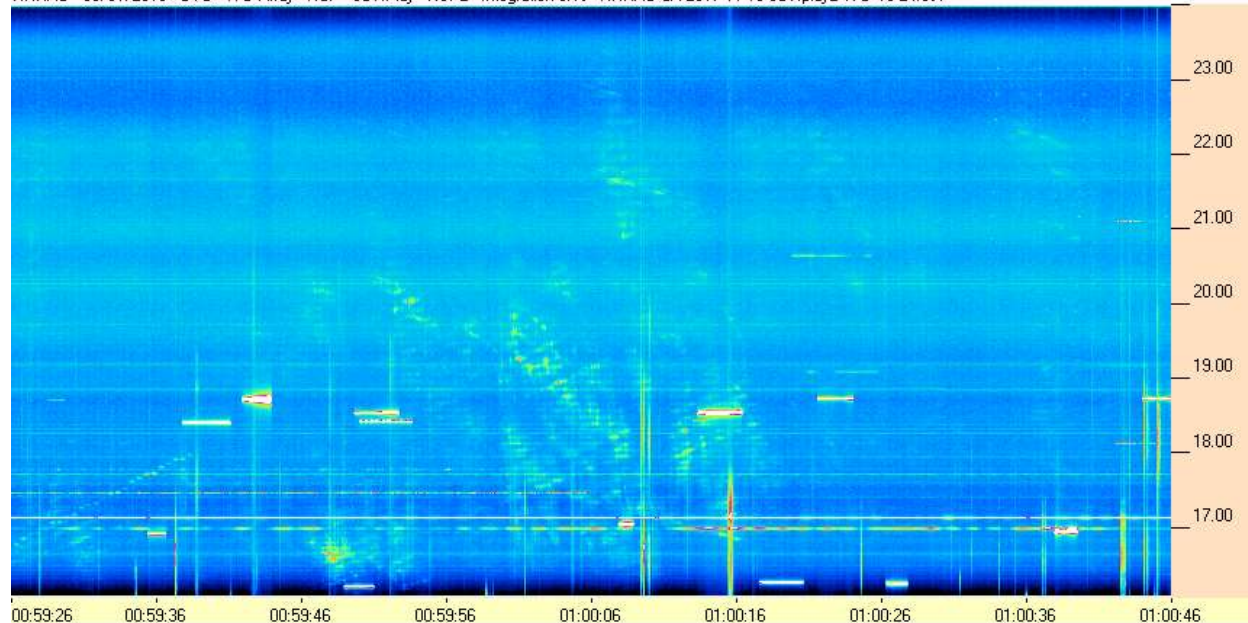
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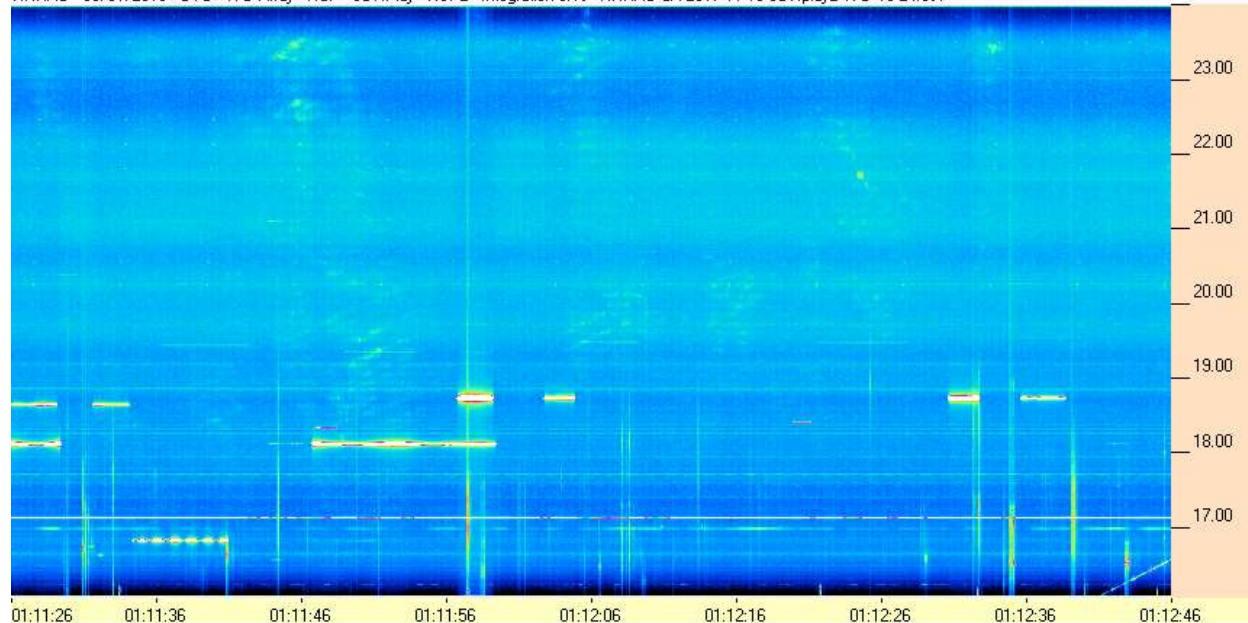
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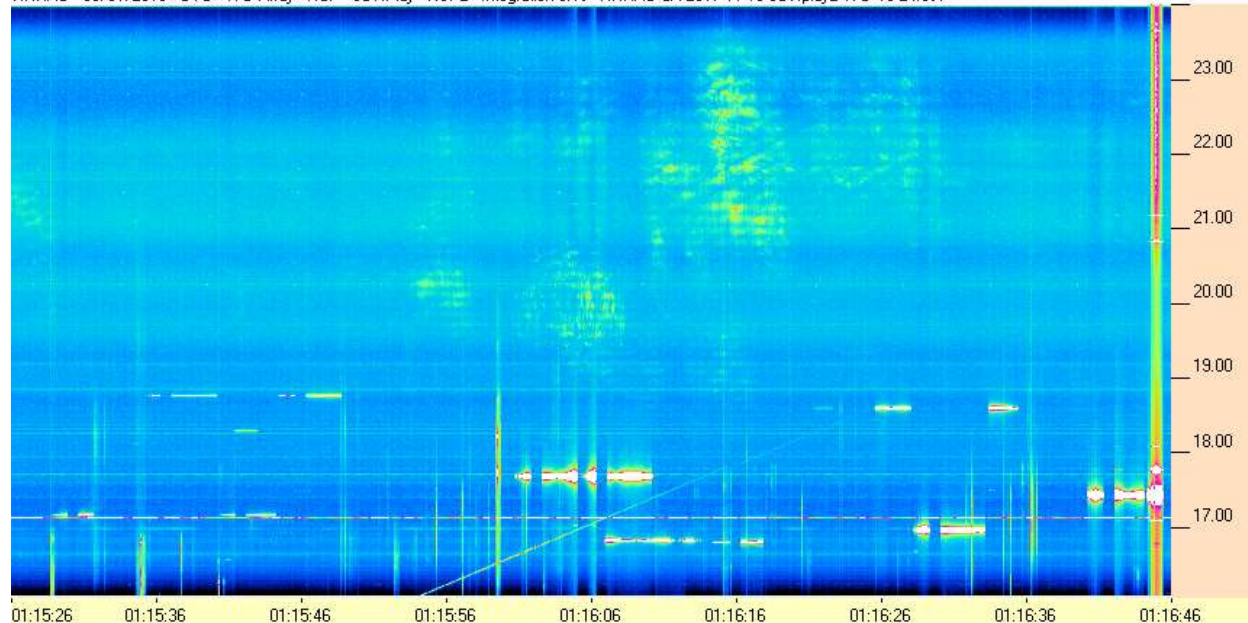
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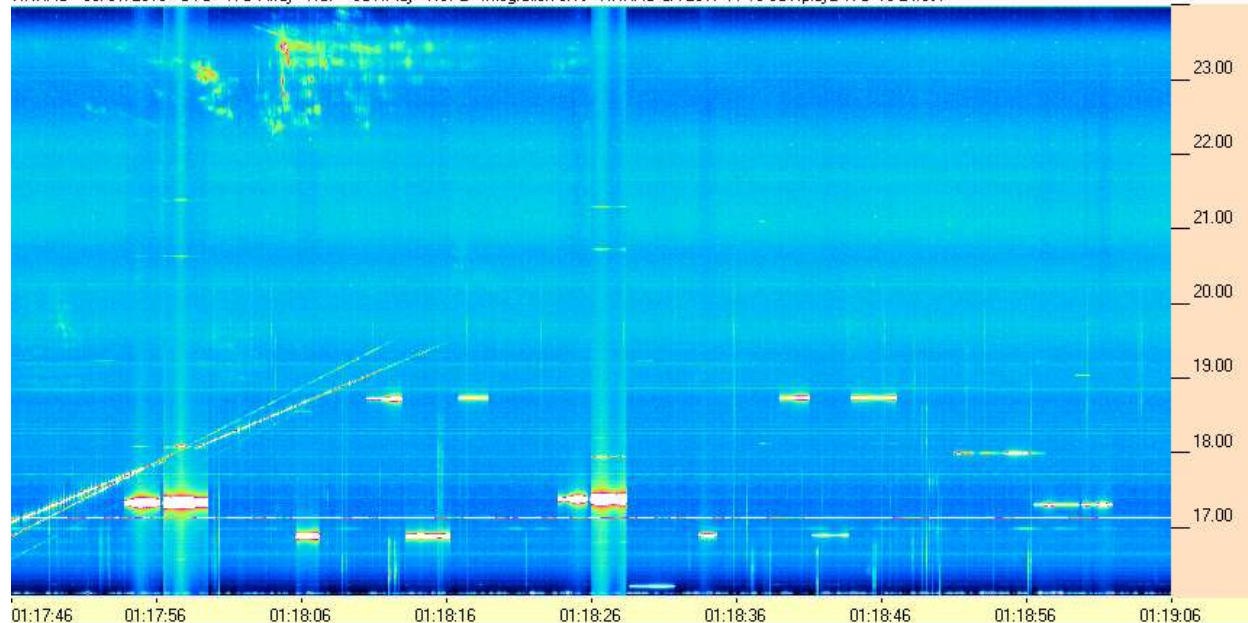
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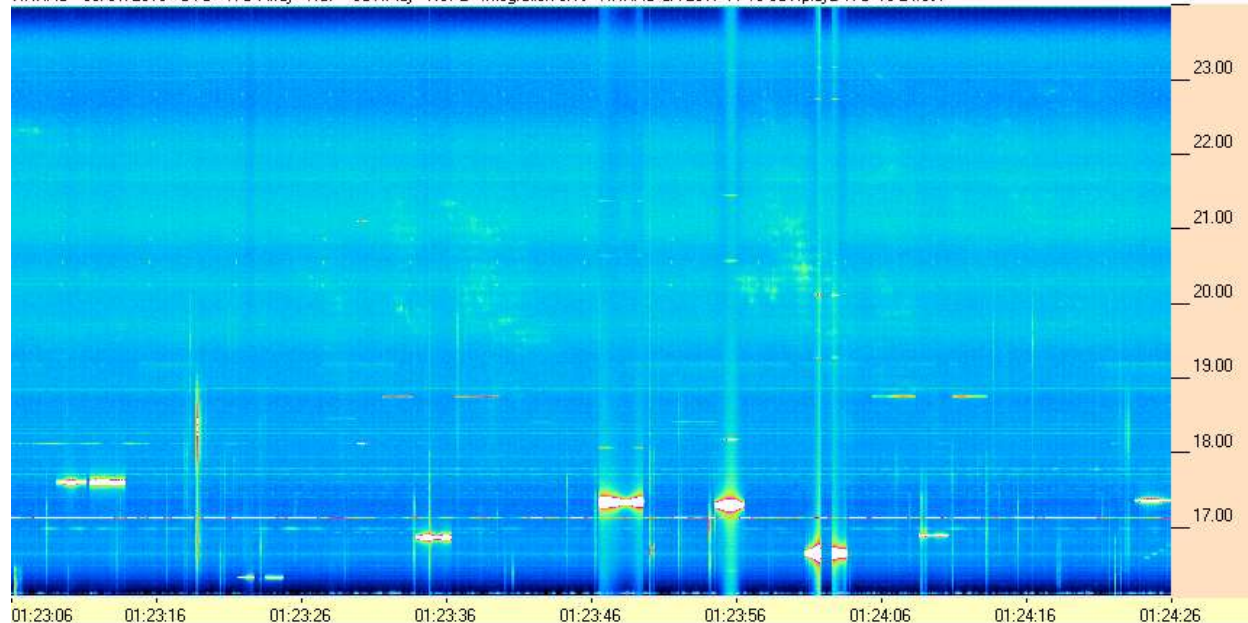
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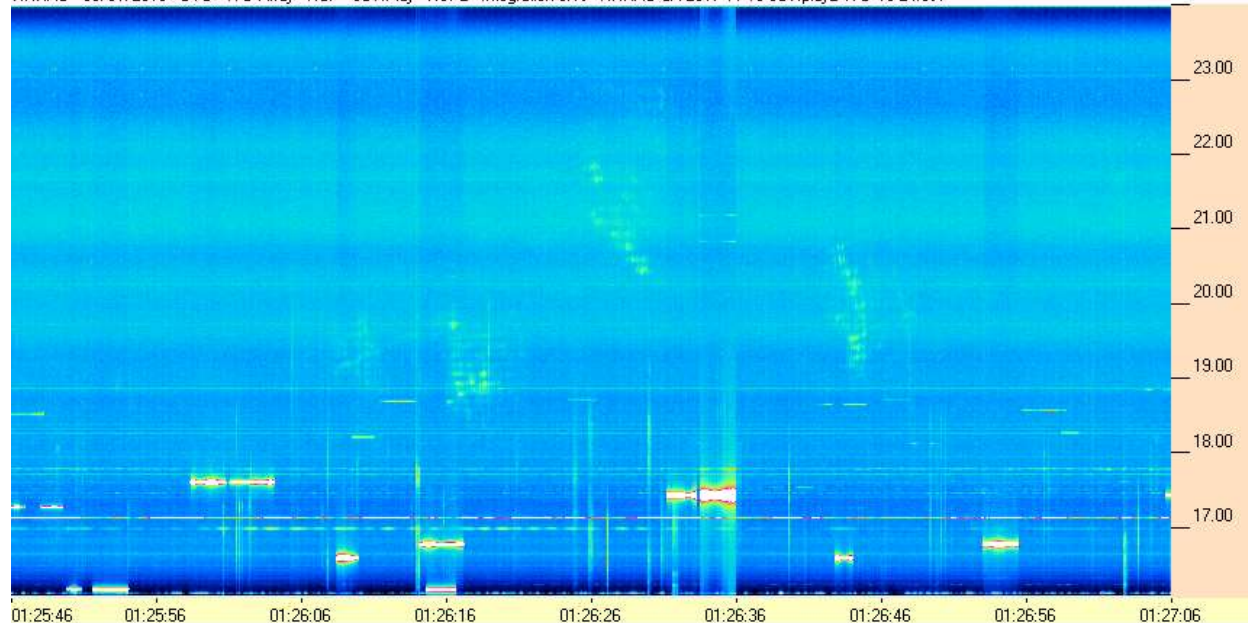
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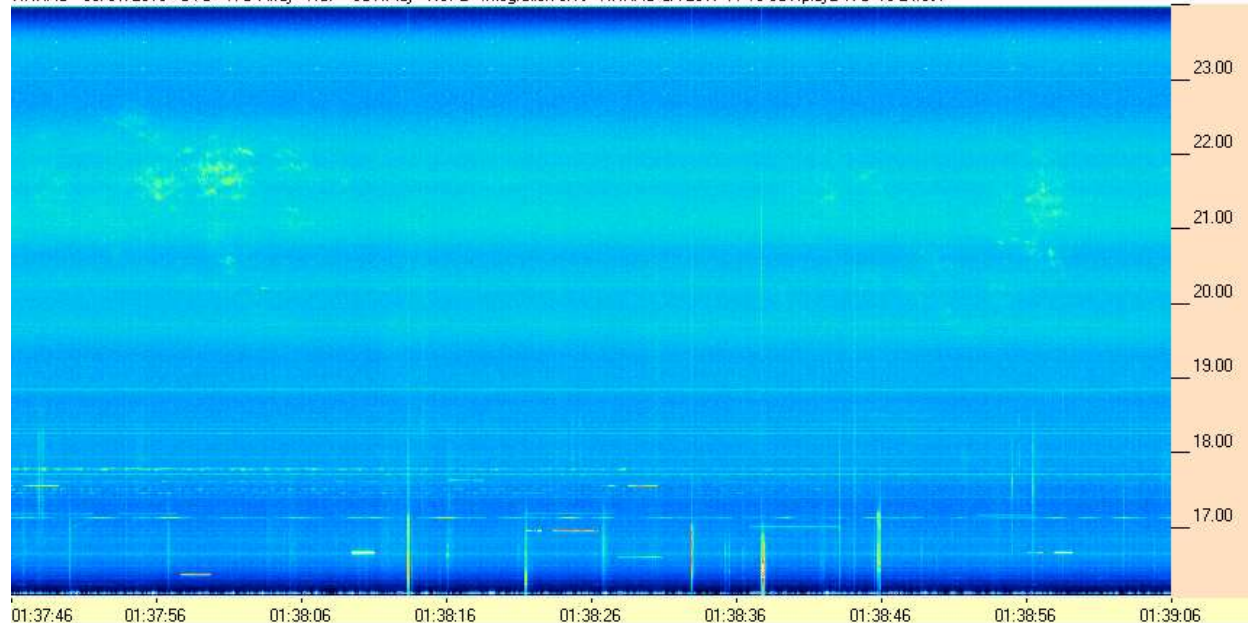
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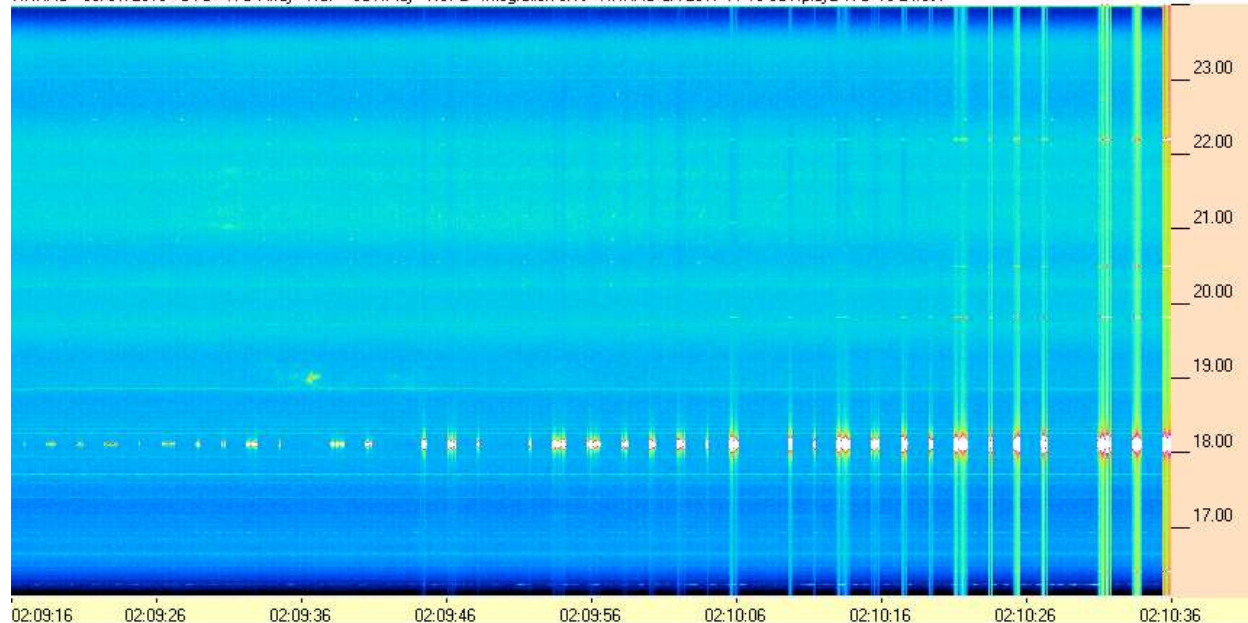
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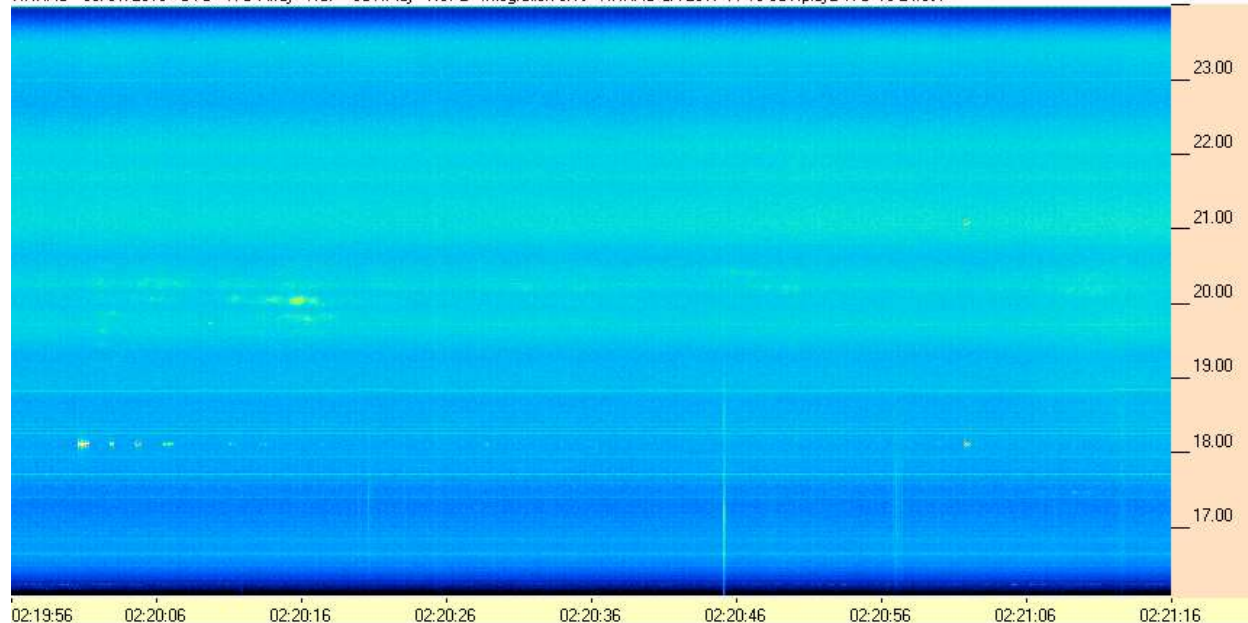
HNRAO Observing Log
40.673181 N – 80.437885 W
EN90sq



HNRAO - 08/01/2019 - UTC - TFD Array - RCP - SDRPlay - RSP2 - Integration 0.1s - HNRAO CA 2017 11 10 SDRplay2 TFD 16-24.csv



HNRAO - 08/01/2019 - UTC - TFD Array - RCP - SDRPlay - RSP2 - Integration 0.1s - HNRAO CA 2017 11 10 SDRplay2 TFD 16-24.csv

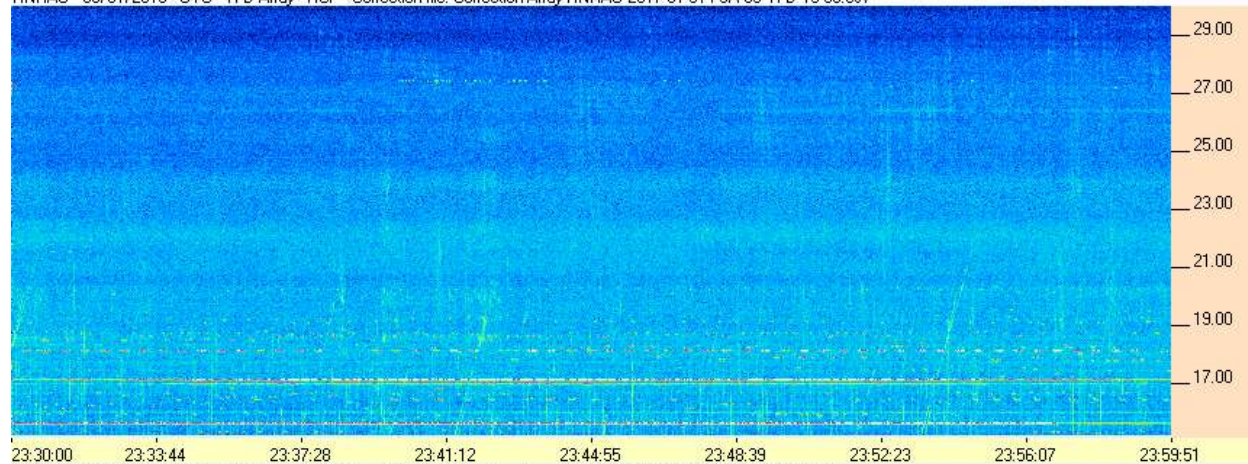


HNRAO Observing Log
40.673181 N – 80.437885 W
EN90sq

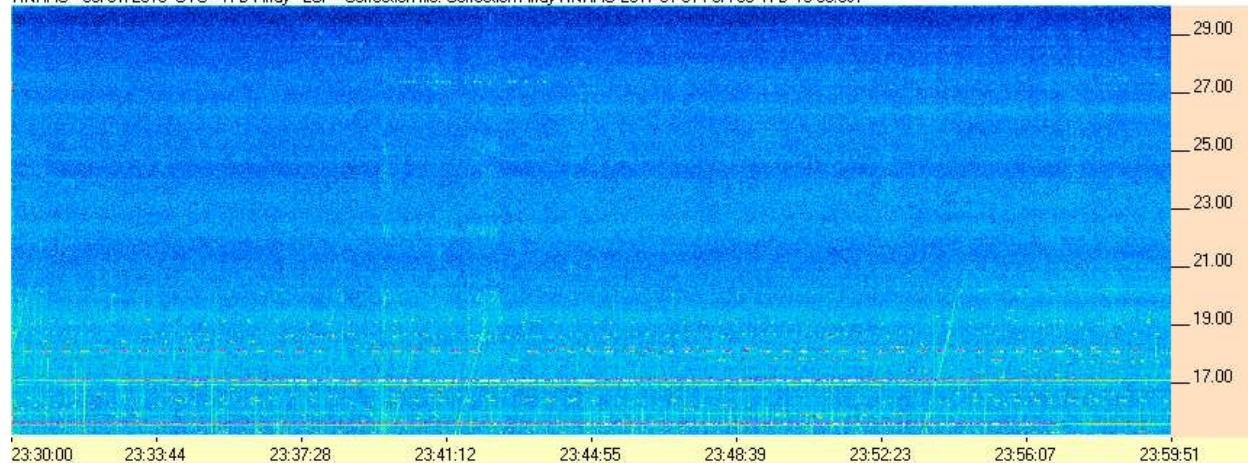


FSX-8S / TFD Array

HNRAO - 08/01/2019 - UTC - TFD Array - RCP - Correction file: Correction Array HNRAO 2017 01 31 FSX-8S TFD 15-30.csv



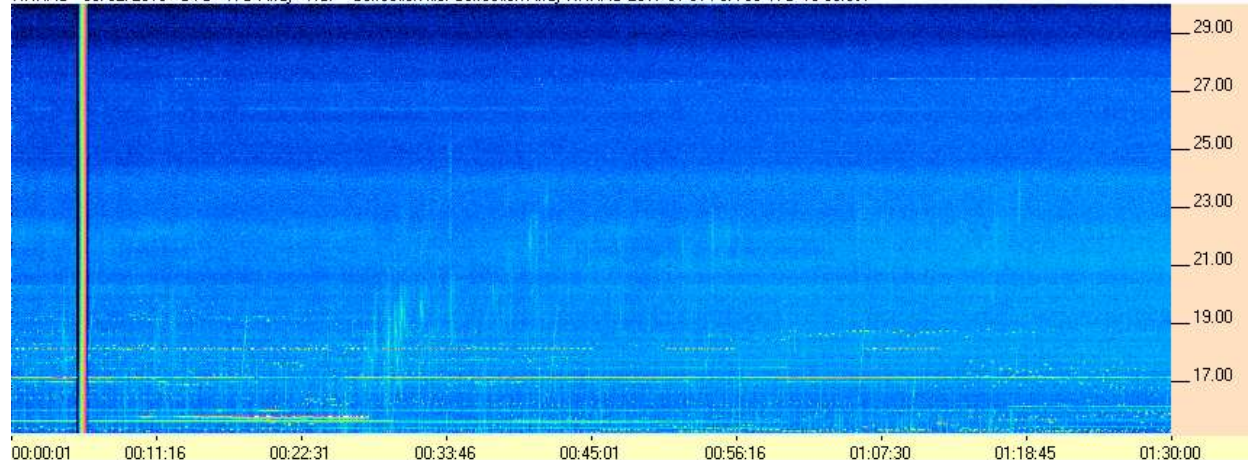
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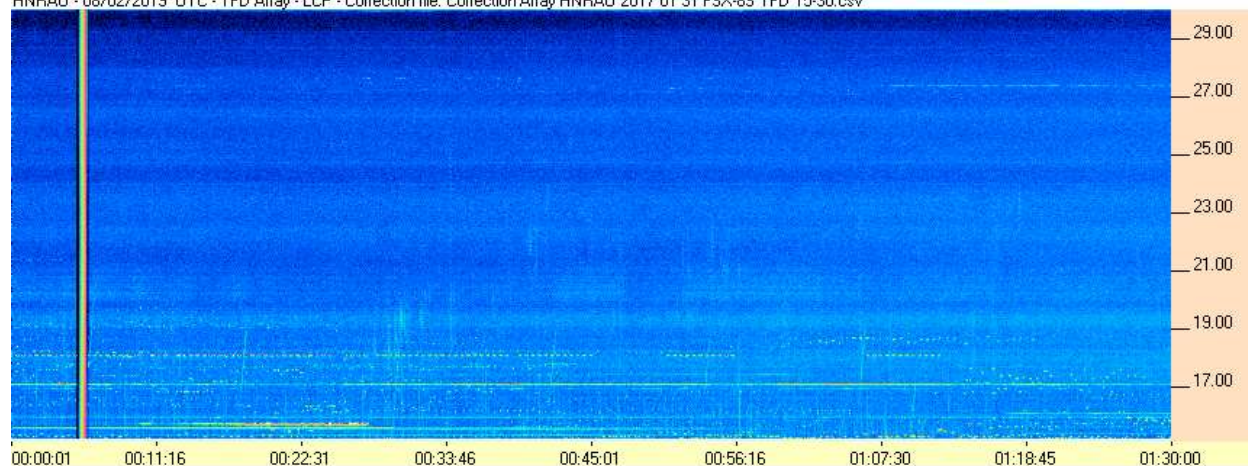
HNRAO Observing Log
40.673181 N – 80.437885 W
EN90sq



HNRAO - 08/02/2019 - UTC - TFD Array - RCP - Correction file: Correction Array HNRAO 2017 01 31 FSX-8S TFD 15-30.csv



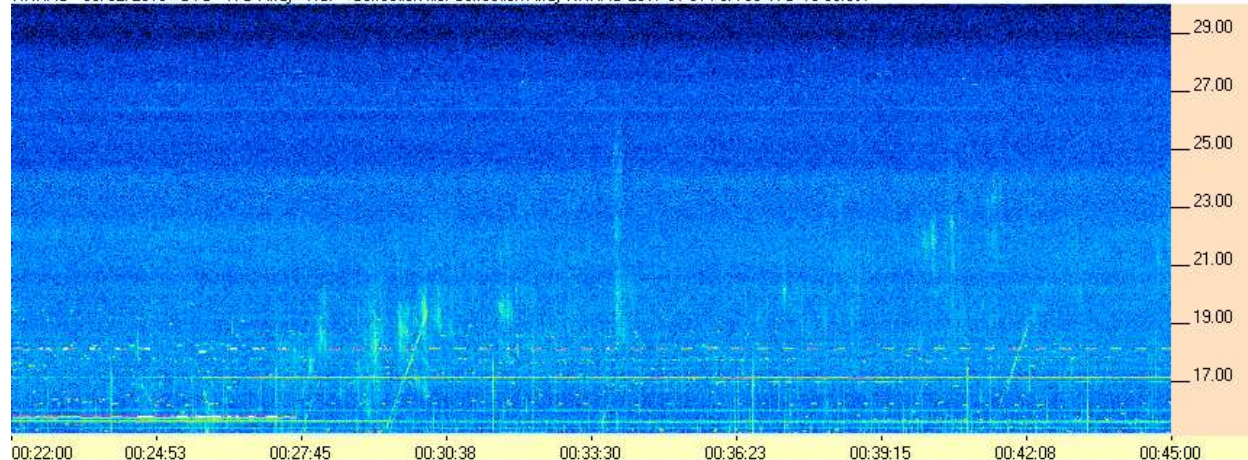
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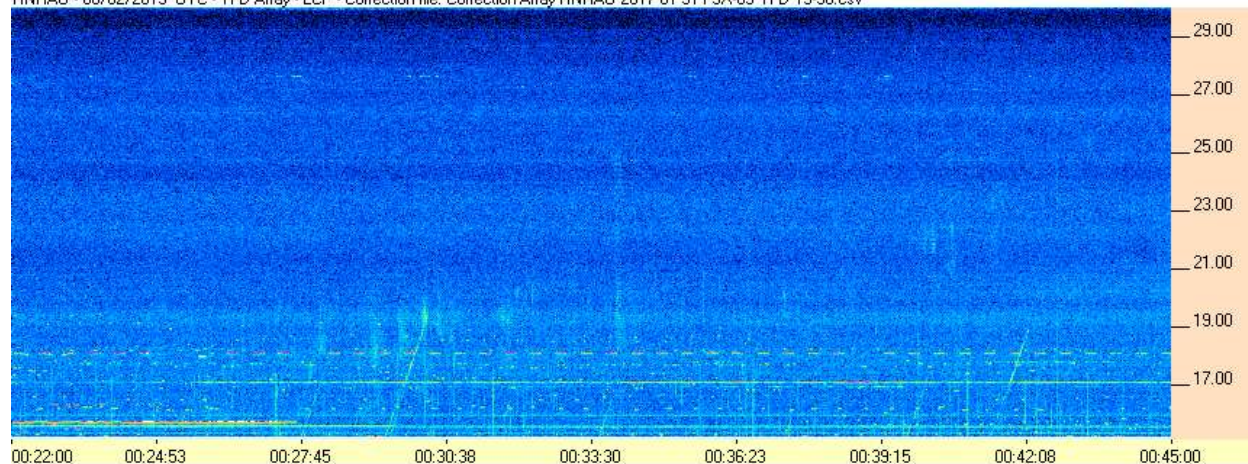
HNRAO Observing Log
40.673181 N – 80.437885 W
EN90sq



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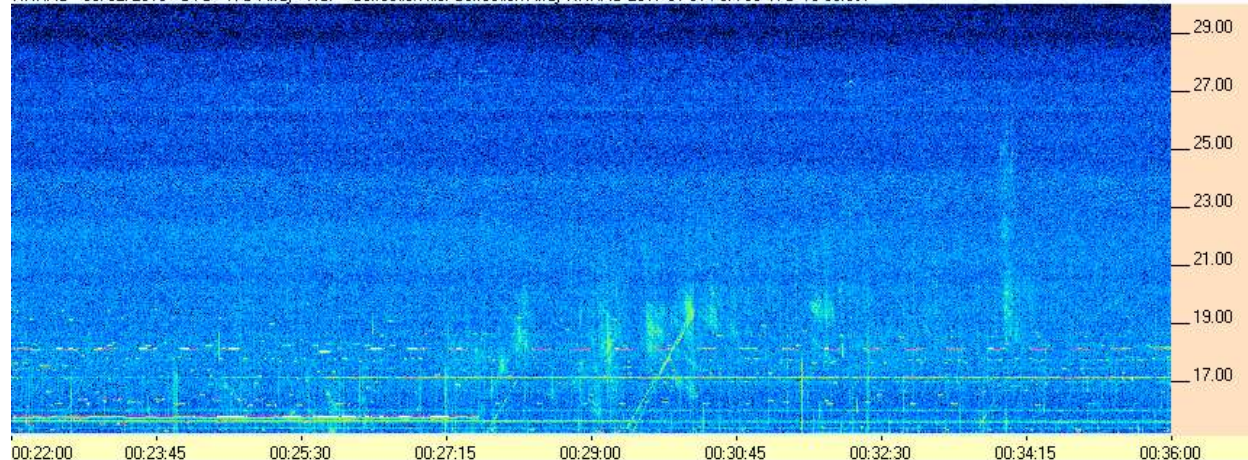
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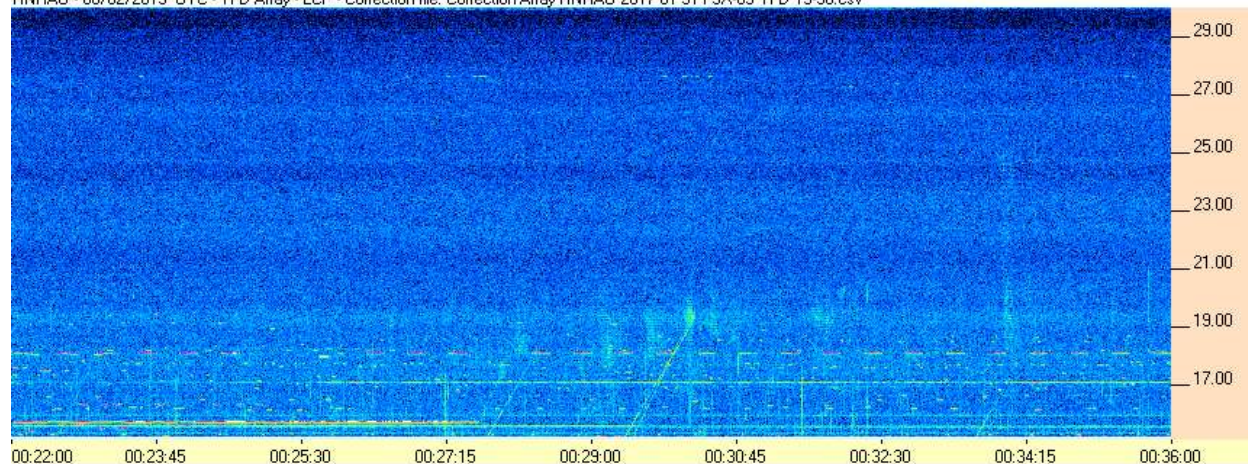
HNRAO Observing Log
40.673181 N – 80.437885 W
EN90sq



HNRAO - 08/02/2019 - UTC - TFD Array - RCP - Correction file: Correction Array HNRAO 2017 01 31 FSX-8S TFD 15-30.csv



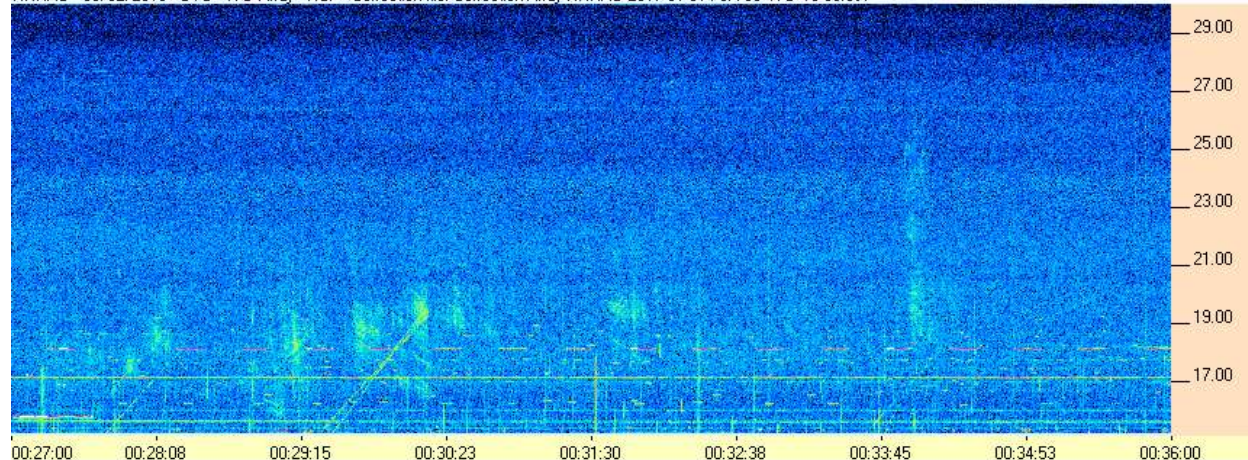
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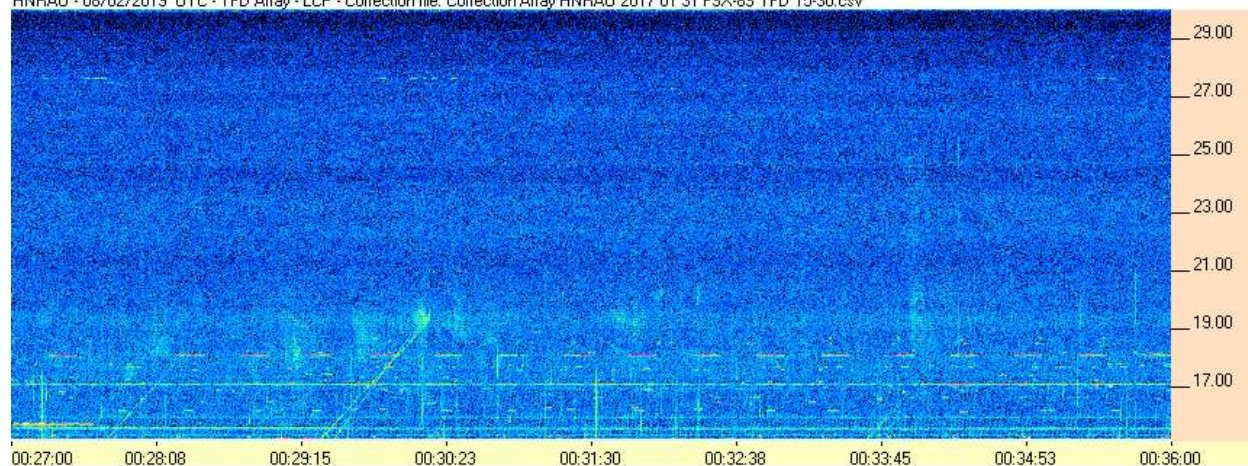
HNRAO Observing Log
40.673181 N – 80.437885 W
EN90sq



HNRAO - 08/02/2019 - UTC - TFD Array - RCP - Correction file: Correction Array HNRAO 2017 01 31 FSX-8S TFD 15-30.csv



HNRAO - 08/02/2019 - UTC - TFD Array - LCP - Correction file: Correction Array HNRAO 2017 01 31 FSX-8S TFD 15-30.csv

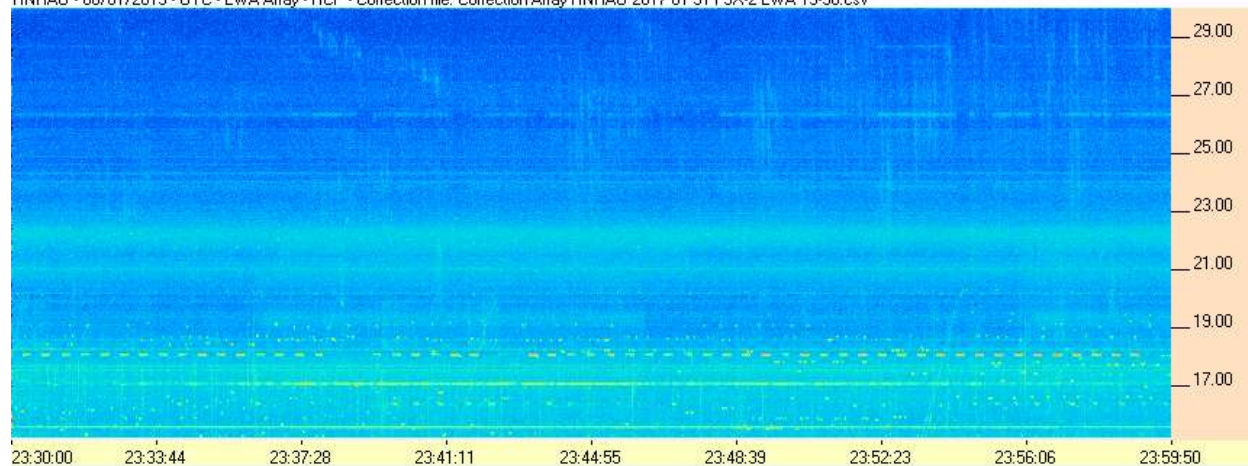


HNRAO Observing Log
40.673181 N – 80.437885 W
EN90sq

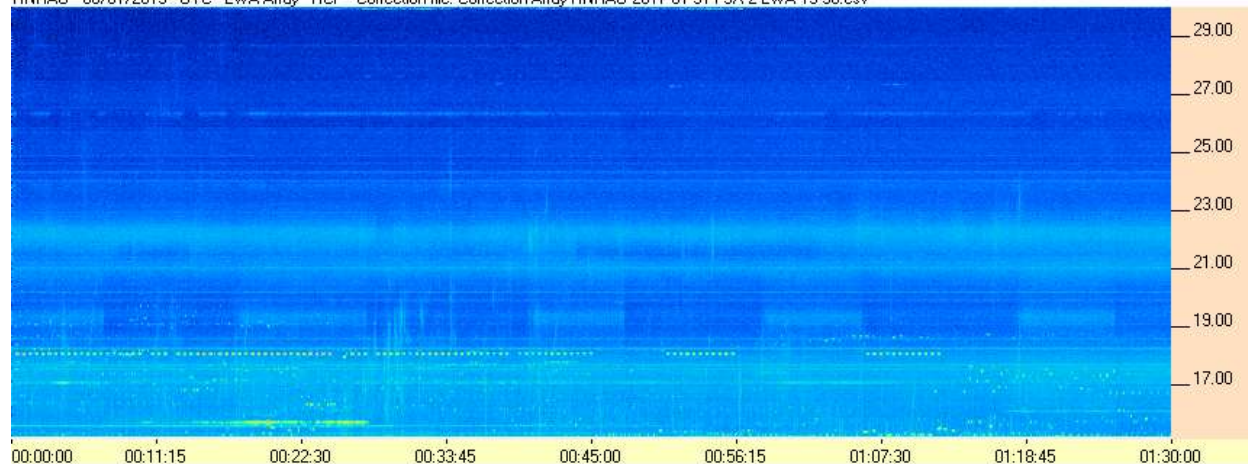


FSX-2 / LWA Array

HNRAO - 08/01/2019 - UTC - LWA Array - RCP - Correction file: CorrectionArray HNRAO 2017 01 31 FSX-2 LWA 15-30.csv



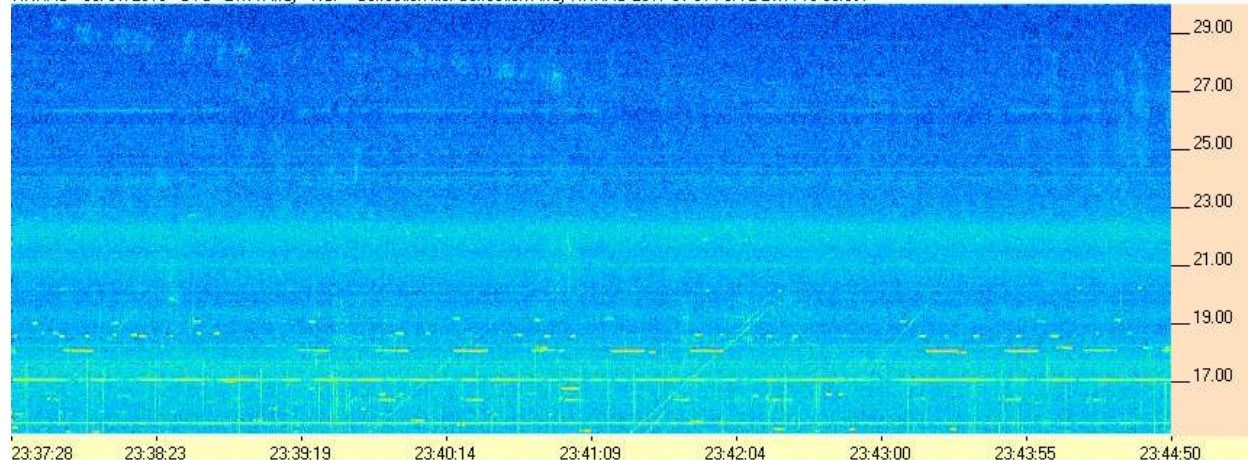
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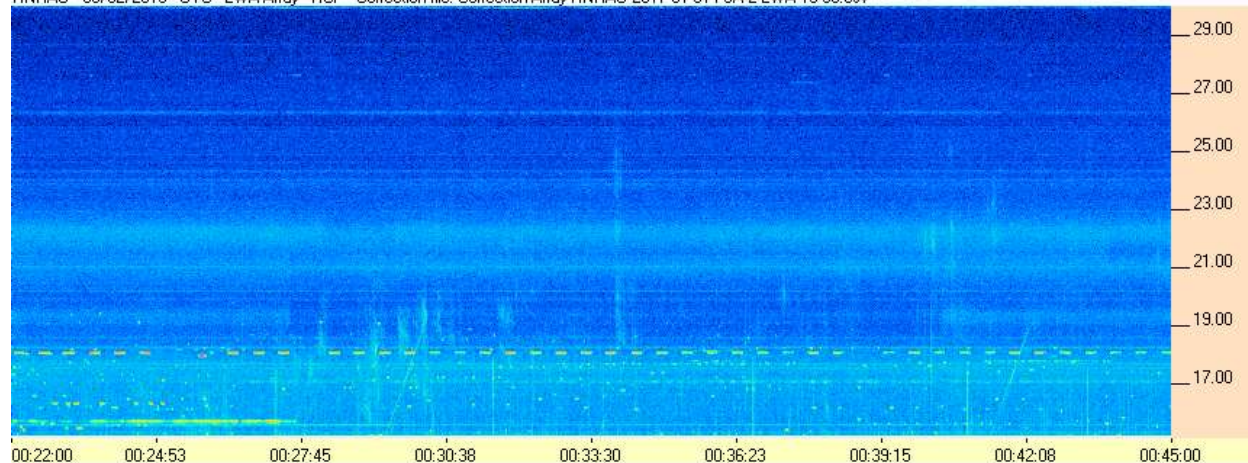
HNRAO Observing Log
40.673181 N – 80.437885 W
EN90sq



HNRAO - 08/01/2019 - UTC - LWA Array - RCP - Correction file: Correction Array HNRAO 2017 01 31 FSX-2 LWA 15-30.csv



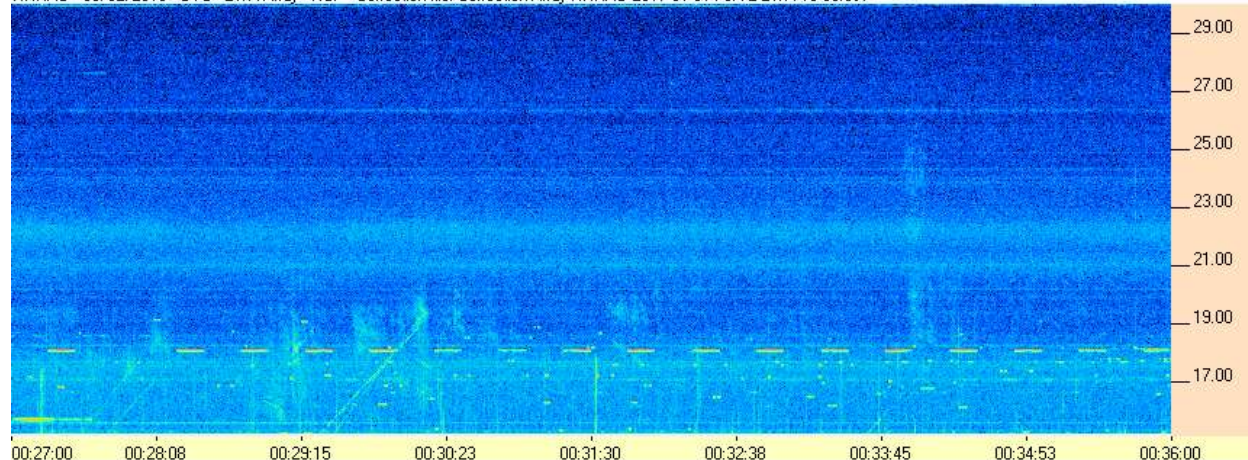
HNRAO - 08/02/2019 - UTC - LWA Array - RCP - Correction file: Correction Array HNRAO 2017 01 31 FSX-2 LWA 15-30.csv



HNRAO Observing Log
40.673181 N – 80.437885 W
EN90sq



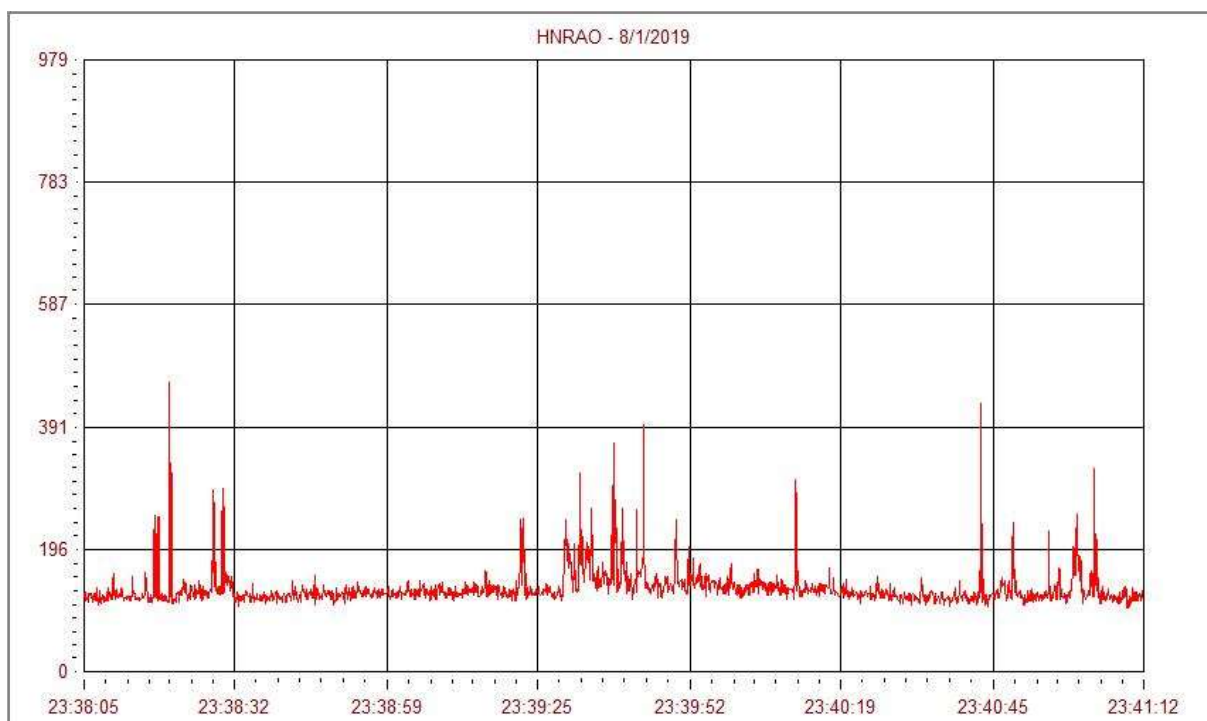
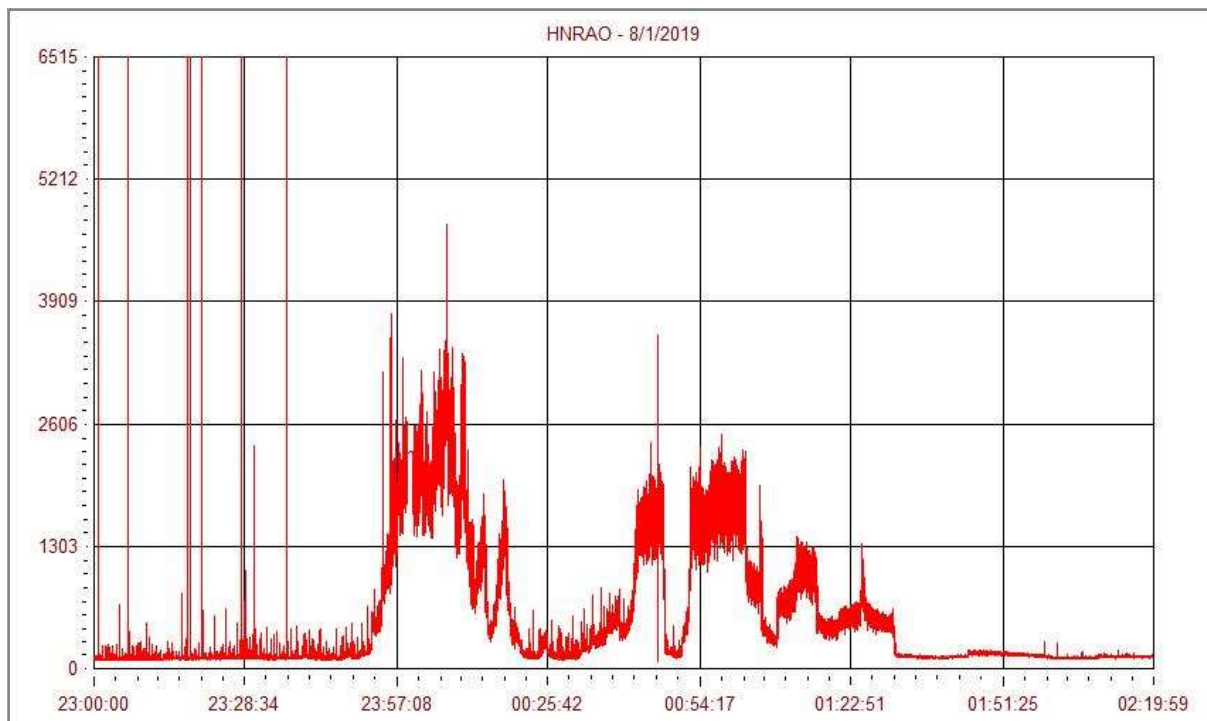
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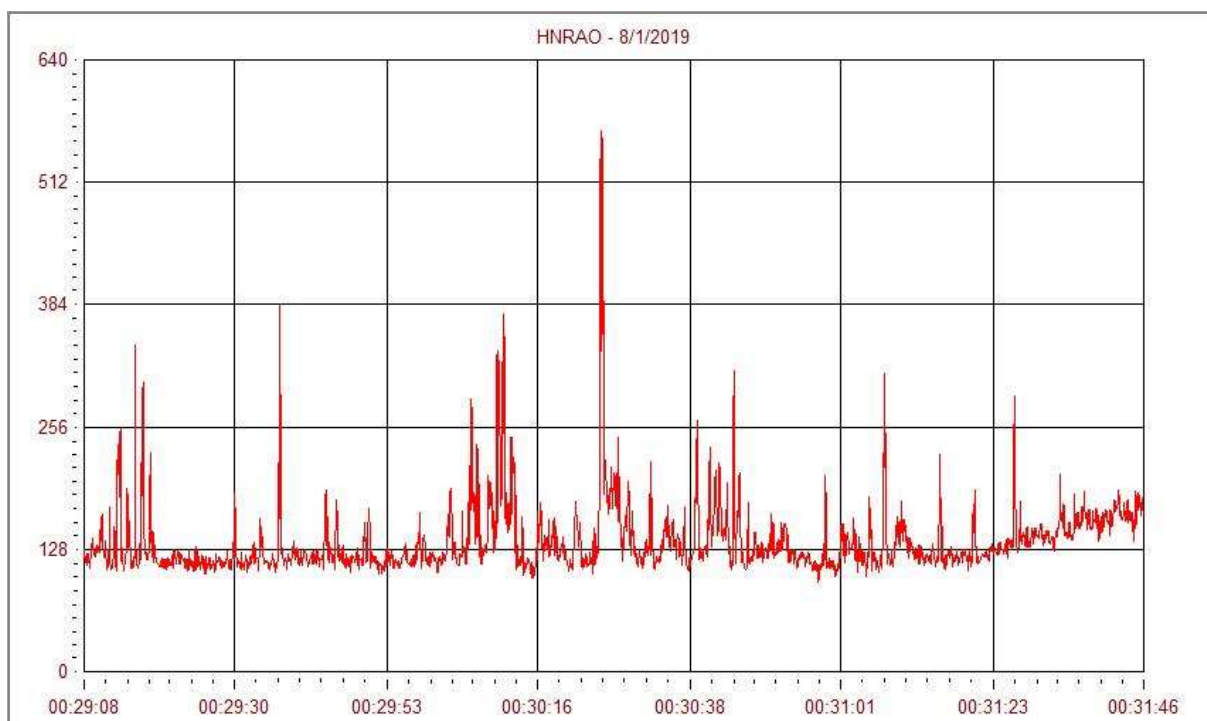
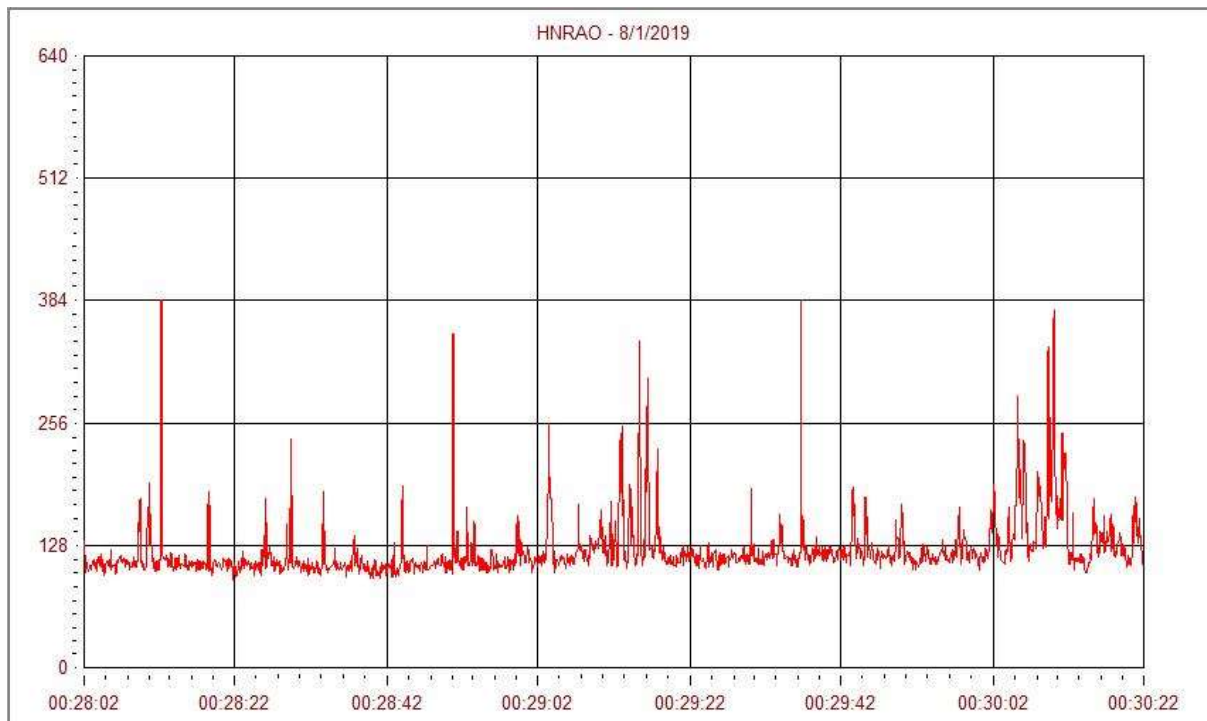
HNRAO Observing Log
40.673181 N – 80.437885 W
EN90sq



JOVE II / JOVE Dipole Array



HNRAO Observing Log
40.673181 N – 80.437885 W
EN90sq



HNRAO Observing Log
40.673181 N – 80.437885 W
EN90sq

