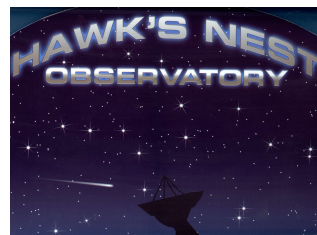


HNRAO Observing Log
40.673181 N – 80.437885 W
EN90sq



Date: May 16, 2019

Object: Jupiter – Io-B

Observer: Unattended

Start - Time UT:	0457:50	Planetary K-index:	
Jupiter Altitude (deg):	19.2	Jupiter Azimuth (deg):	146.7
Jupiter CML:	85.84	Jupiter Io Phase:	095.68
Jupiter RA (hr/min):	17:27	Jupiter Dec (hr/min):	-22:36
Hour Angle (hr/min):	-02:17	Polarization	RCP
Sun Altitude (deg):	-30.7	Sun Azimuth (deg):	356.5
Sun RA (hr/min):	03:23	Sun Dec (hr/min):	18:34

End – Time UT:	0613:48	De:	-2.8
Jupiter Altitude (deg):	25.2	Jupiter Azimuth (deg):	164.6
Jupiter CML:	131.77	Jupiter Io Phase	106.34
Hour Angle (hr/min):	-01:00	Duration (min):	116
Sun Altitude (deg):	-28.9	Sun Azimuth (deg):	017.2
Max Frequency MHz	30	Min Frequency MHz	18

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

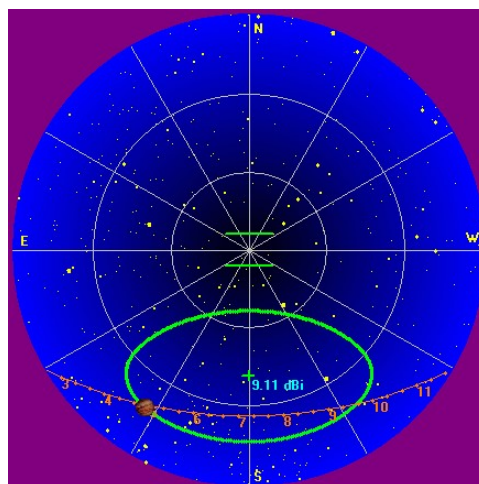
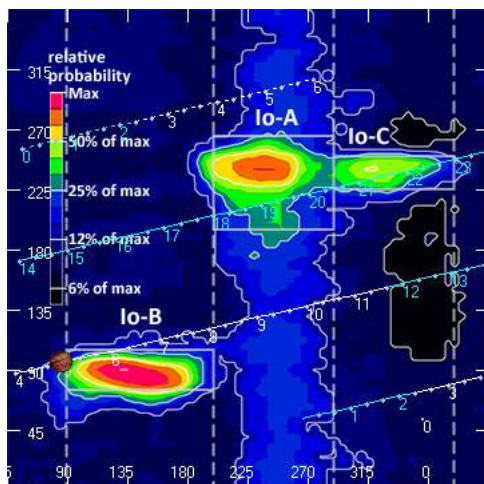
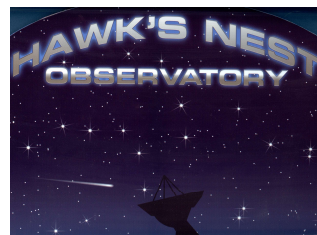
Radio-SkyPipe software version 2.7.33

Radio-Jupiter Pro software version 3.8.2

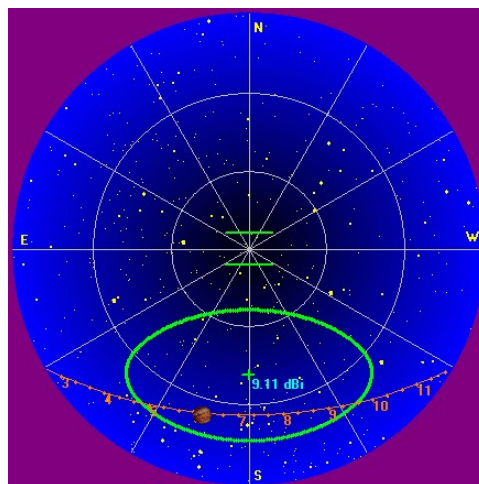
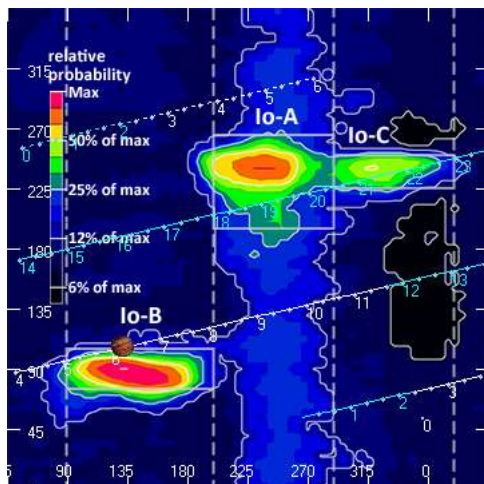
Network Time Server GpsNtp-Pi, Reeve Engineering

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

HNRAO Observing Log
40.673181 N – 80.437885 W
EN90sq



Beginning of Pass



End of Pass



HNRAO Observing Log
40.673181 N – 80.437885 W
EN90sq



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	

HNRAO Observing Log
40.673181 N – 80.437885 W
EN90sq



Jupiter / Sun angular separation 150.5 degrees

All spectrographs and receivers operating. All antennas functioning normally. No known issues.

Several brief periods of rain. Precipitation static was heavy at 0616 UT. There were several other periods of drizzle but none of the rain effected the data. The spectrograph charts show unknown RFI as horizontal bright bands and lines. Unknown RFI in the SkyPipe record rendered that data unusable. Cass A was not apparent in the data set.

All RCP spectrographs, FSX-8S, FSX-2 and SDRPLay RSP2, recorded this Io-B storm. All three spectrographs recorded data.

Given De and the position on the CML/IO plane, this was a weak Io-B storm with scintillation present. Long periods of inactivity between bursts. The storm was composed of positive drift L-bursts and S-bursts with L2 modulation lanes.

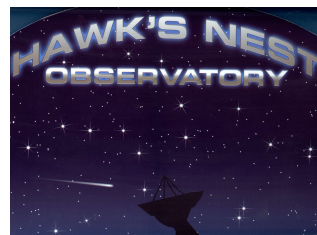
Emissions began at 18 MHz and reached about 30 MHz at the end with emission intensity ranged from near GB to 1 or 2 dB above GB as seen from this observatory.

Nothing else of note. Concurrent Io-D storm report attached to this report.

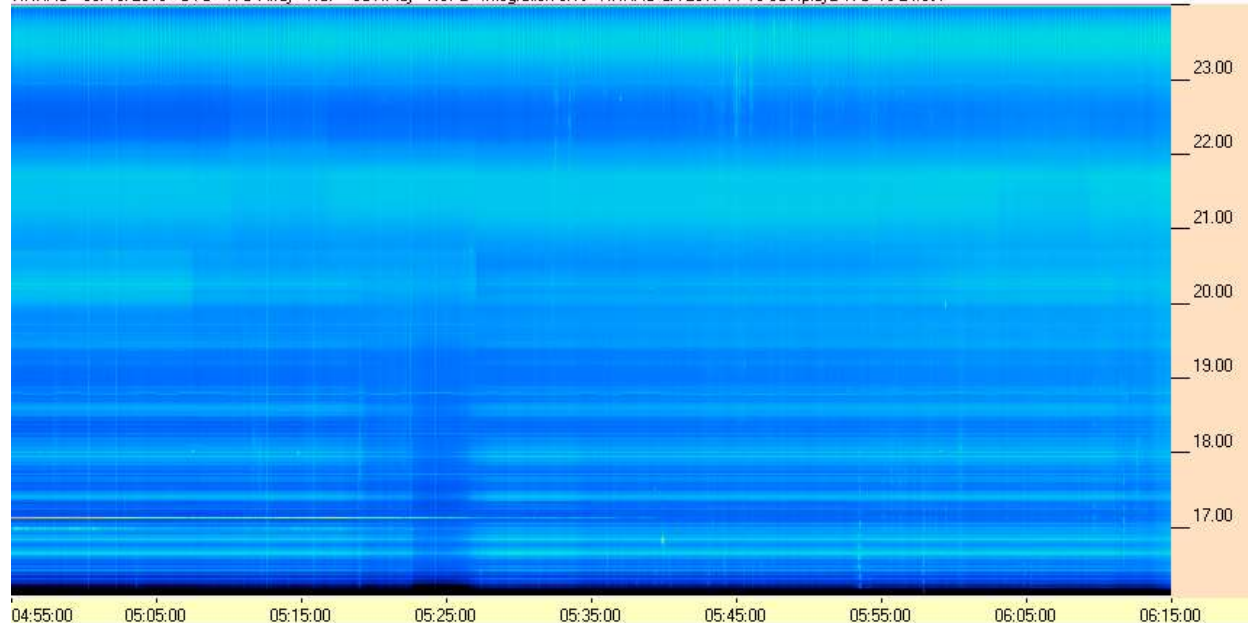
EOR

SDRPlay RSP2 / TFD Array

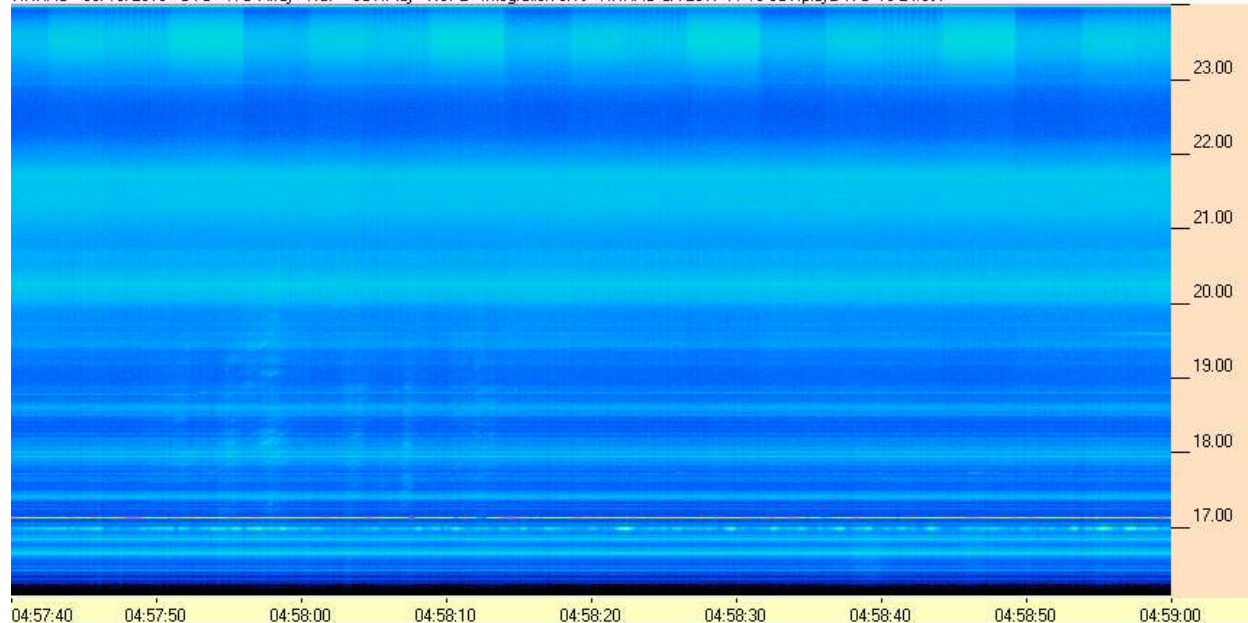
HNRAO Observing Log
40.673181 N – 80.437885 W
EN90sq



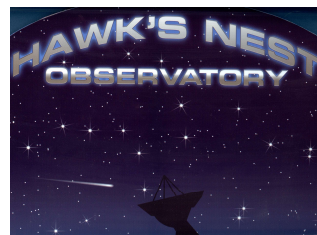
HNRAO - 05/16/2019 - UTC - TFD Array - RCP - SDRPlay - RSP2 - Integration 0.1s - HNRAO CA 2017 11 10 SDRplay2 TFD 16-24.csv



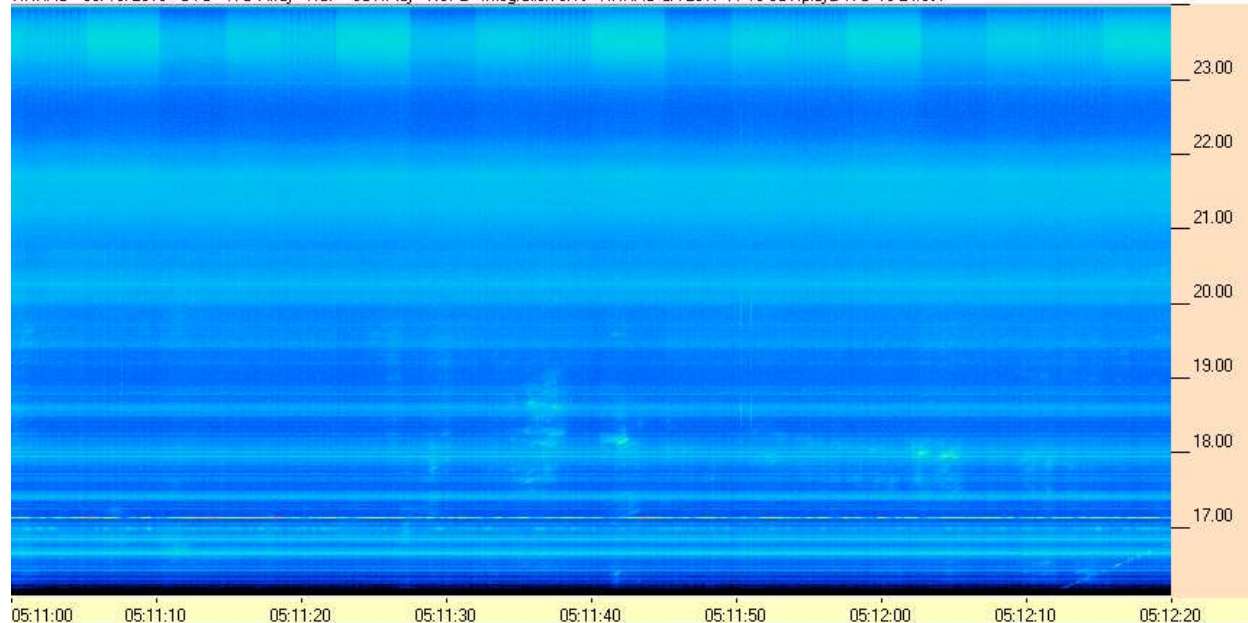
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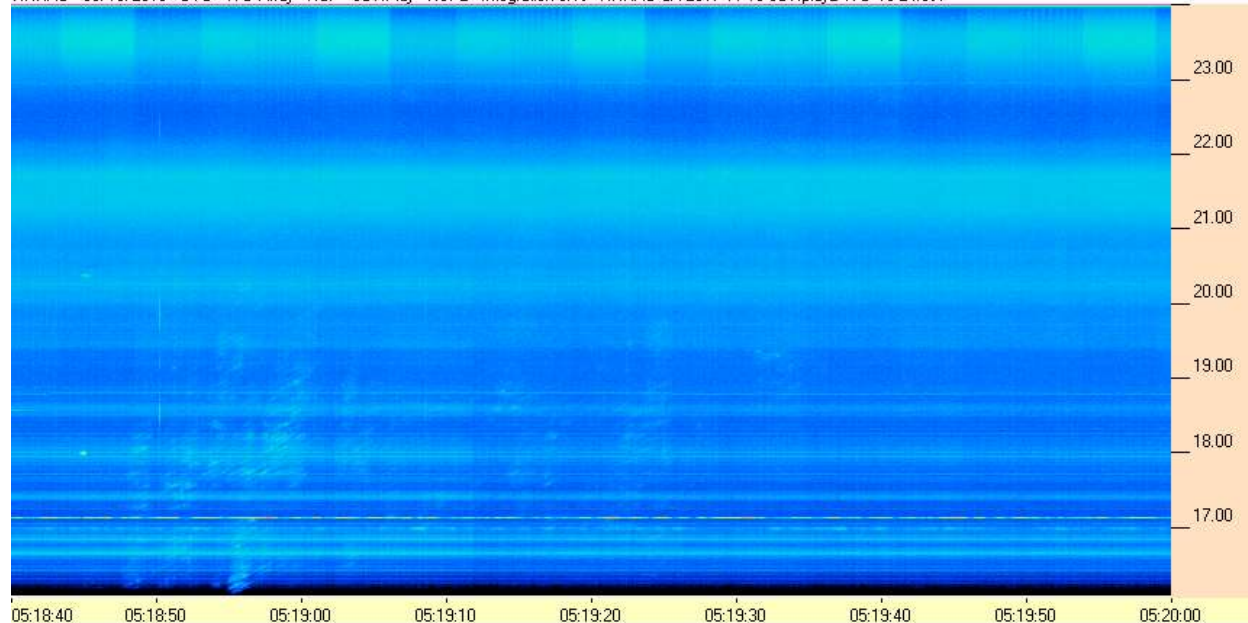
HNRAO Observing Log
40.673181 N – 80.437885 W
EN90sq



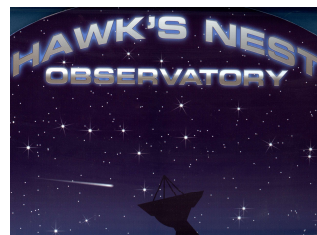
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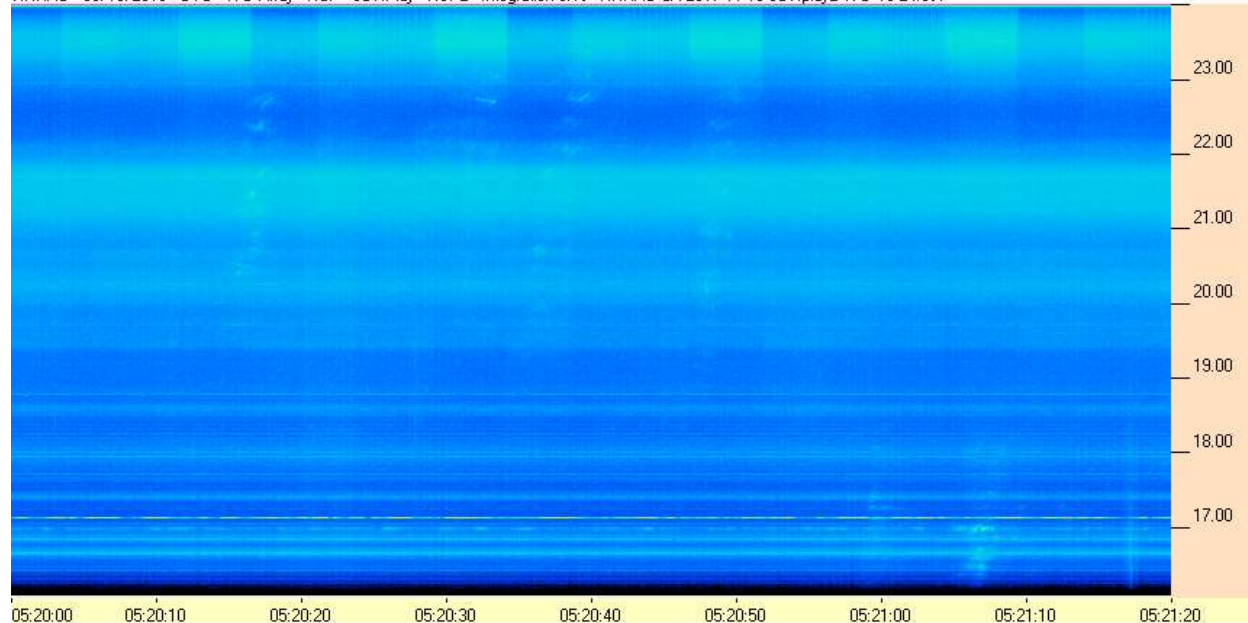
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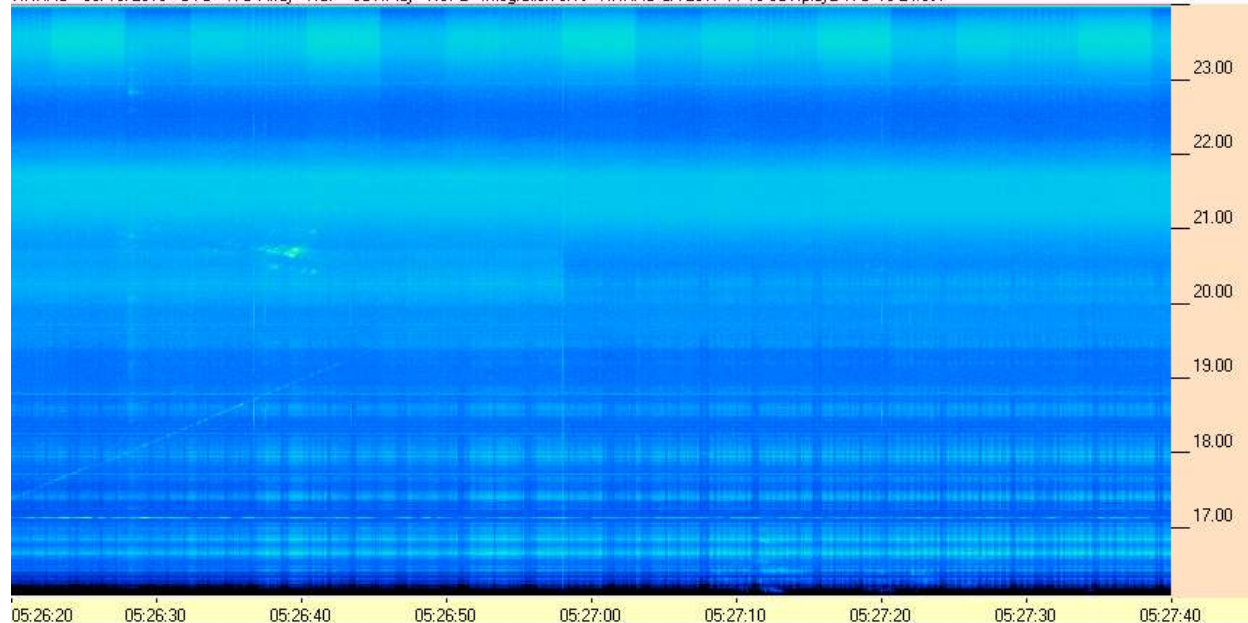
HNRAO Observing Log
40.673181 N – 80.437885 W
EN90sq



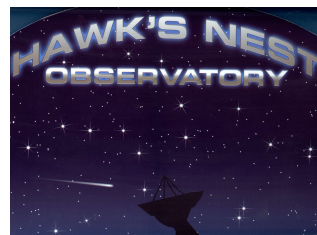
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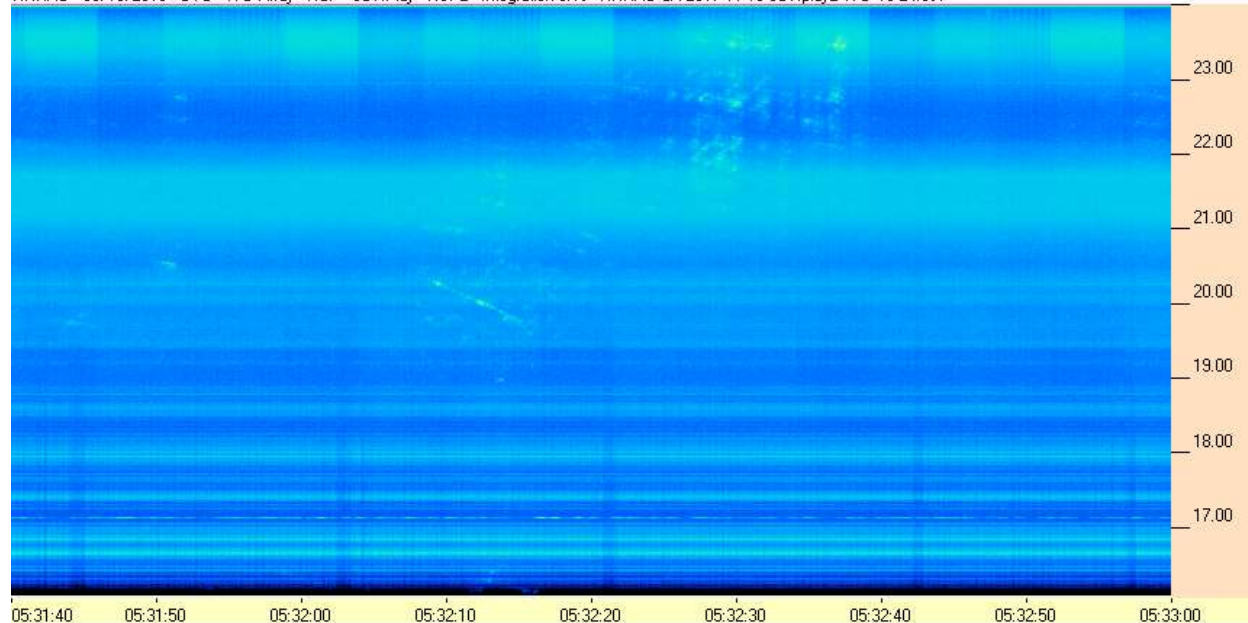
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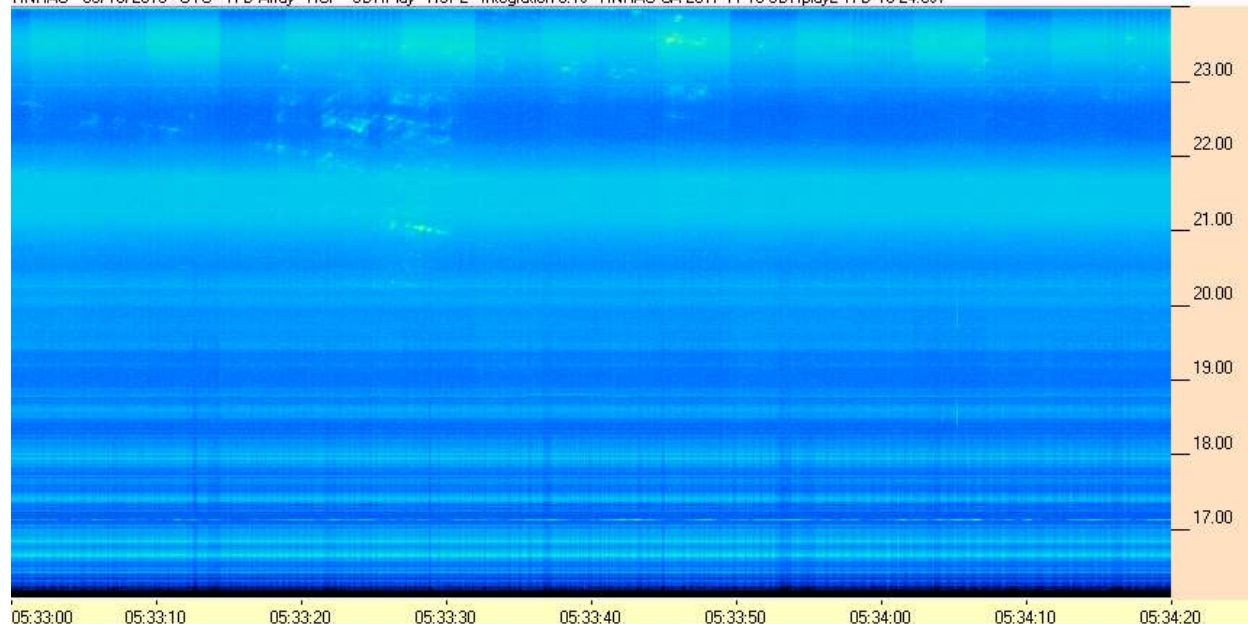
HNRAO Observing Log
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EN90sq



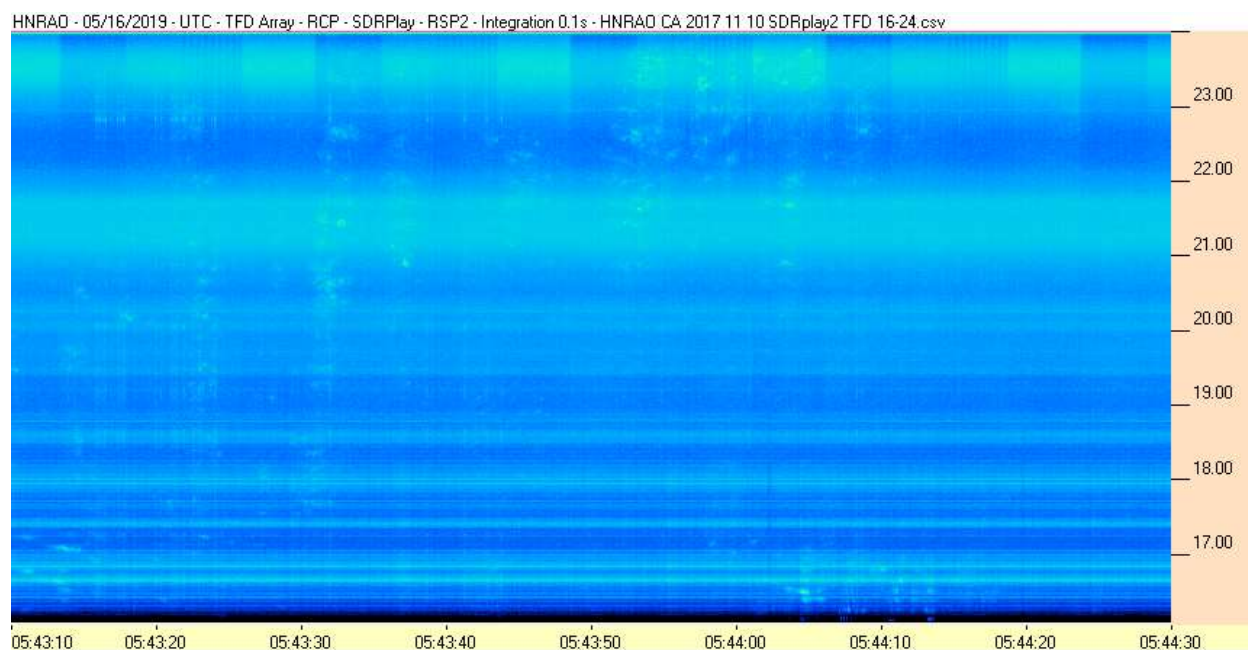
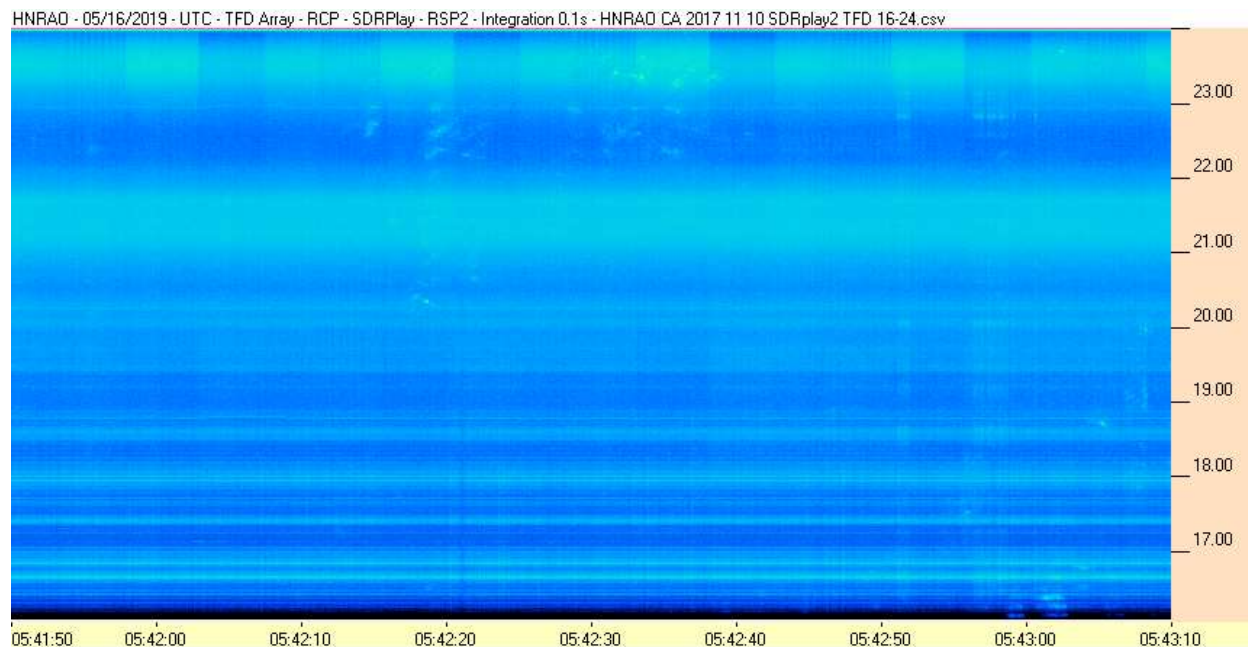
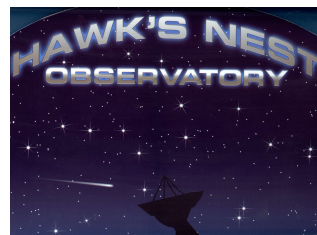
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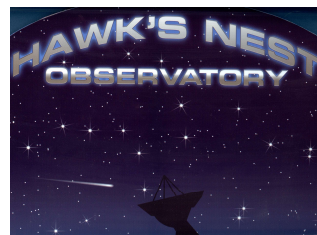
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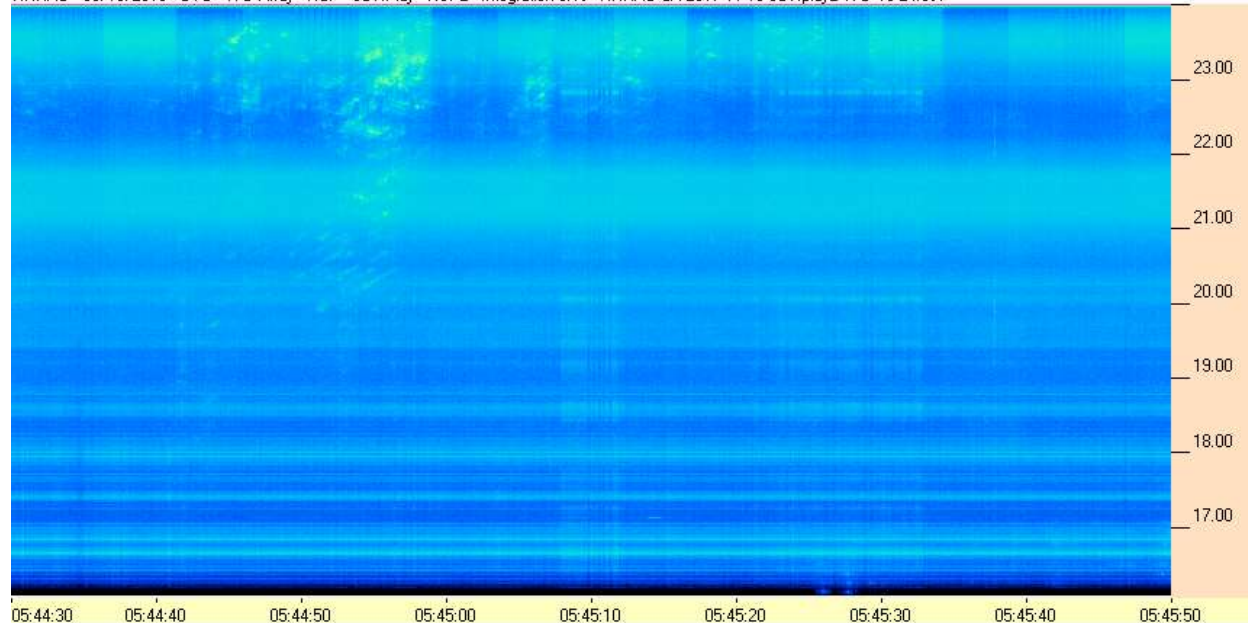
HNRAO Observing Log
40.673181 N – 80.437885 W
EN90sq



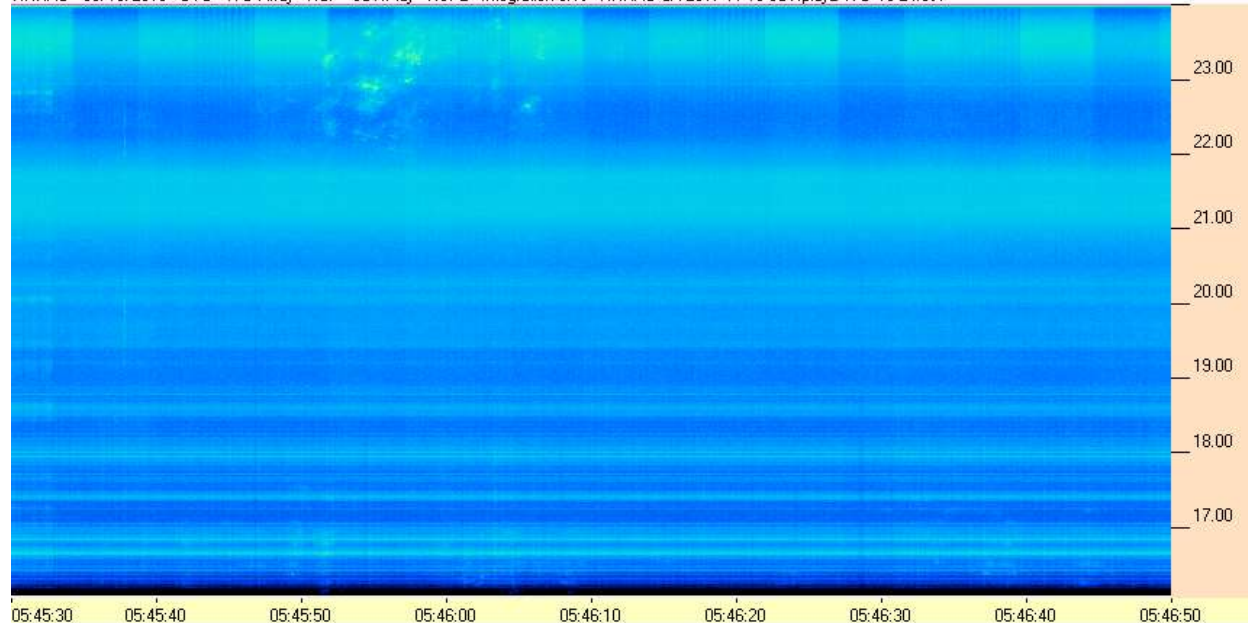
HNRAO Observing Log
40.673181 N – 80.437885 W
EN90sq



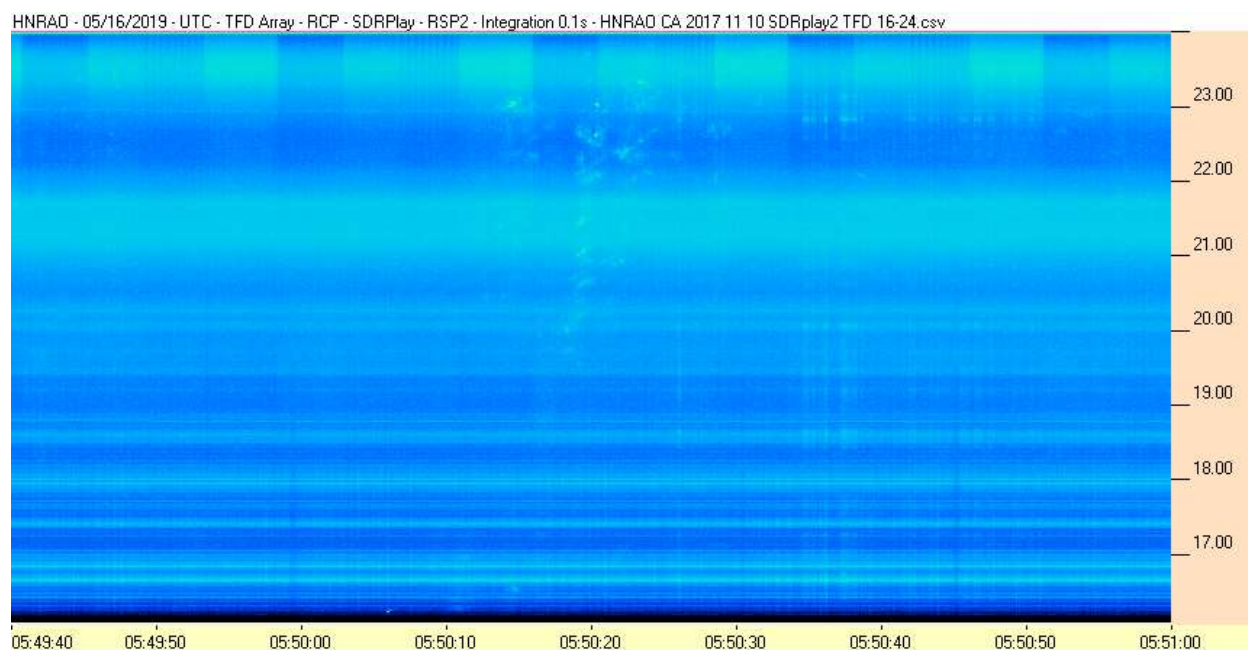
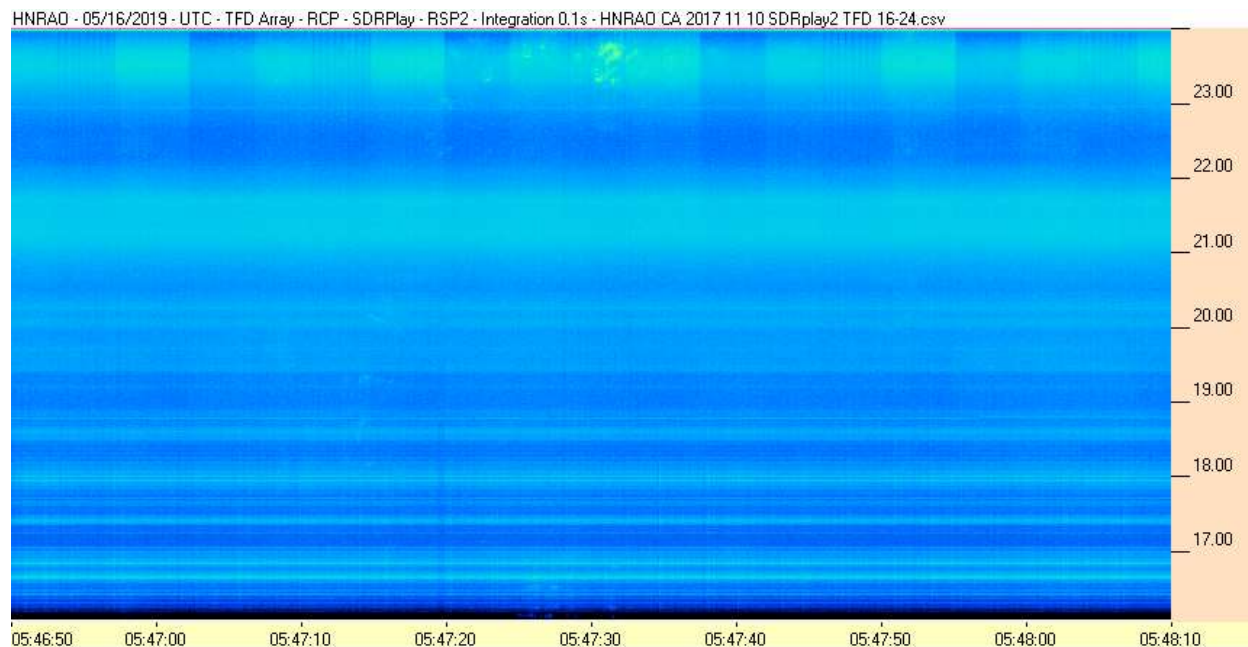
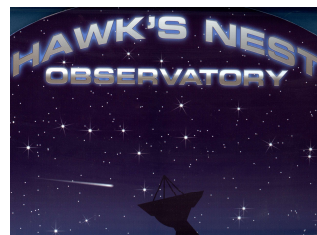
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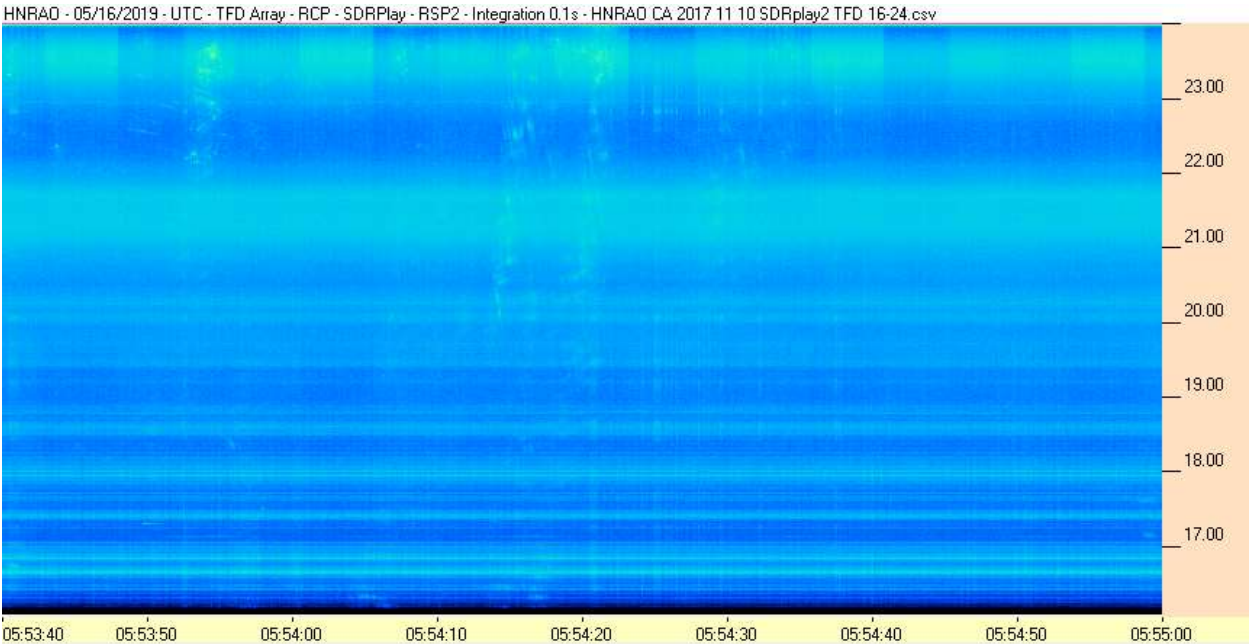
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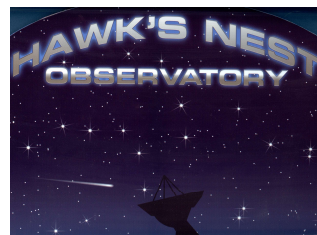
HNRAO Observing Log
40.673181 N – 80.437885 W
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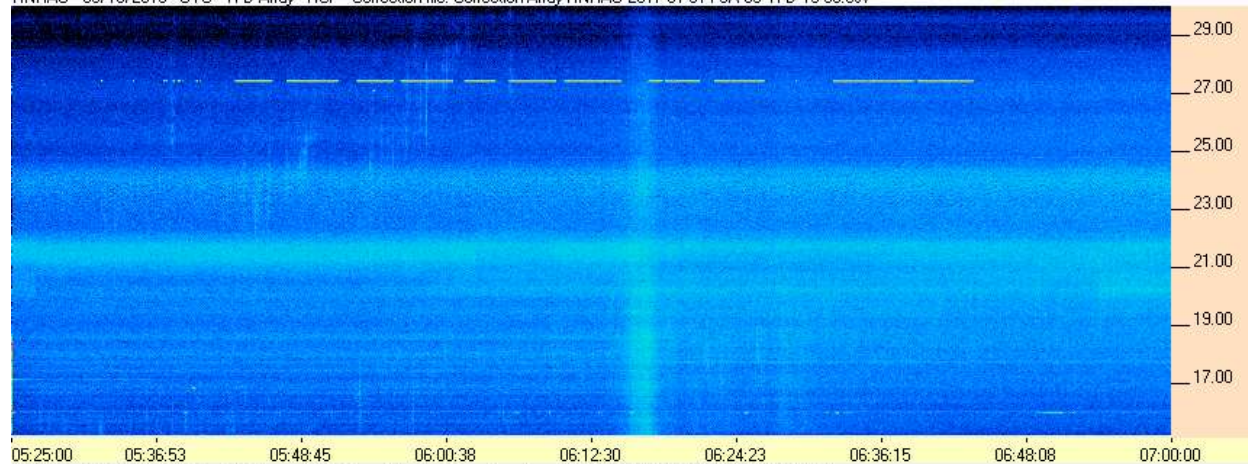


HNRAO Observing Log
40.673181 N – 80.437885 W
EN90sq

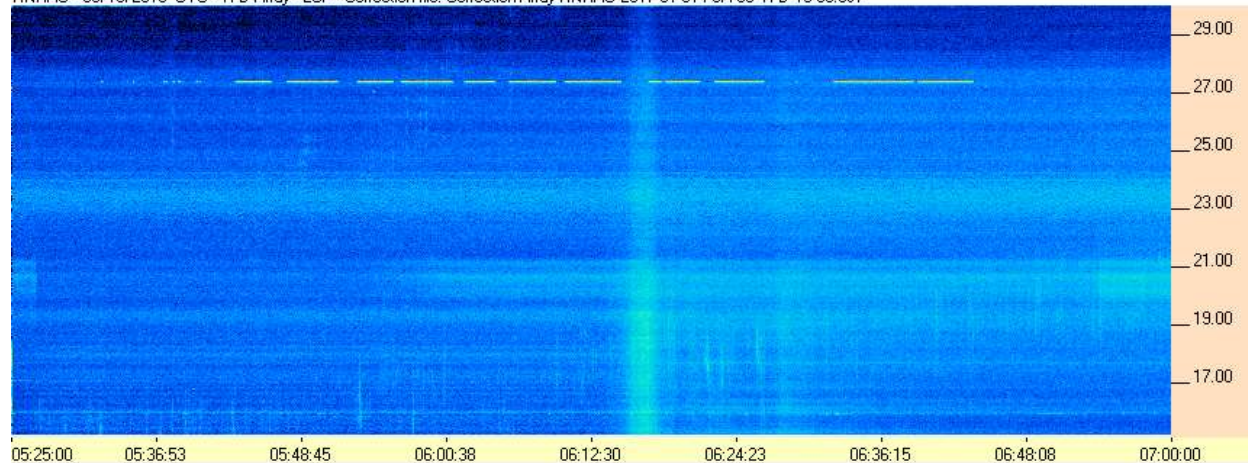


FSX-8S / TFD Array

HNRAO - 05/16/2019 - UTC - TFD Array - RCP - Correction file: Correction Array HNRAO 2017 01 31 FSX-8S TFD 15-30.csv

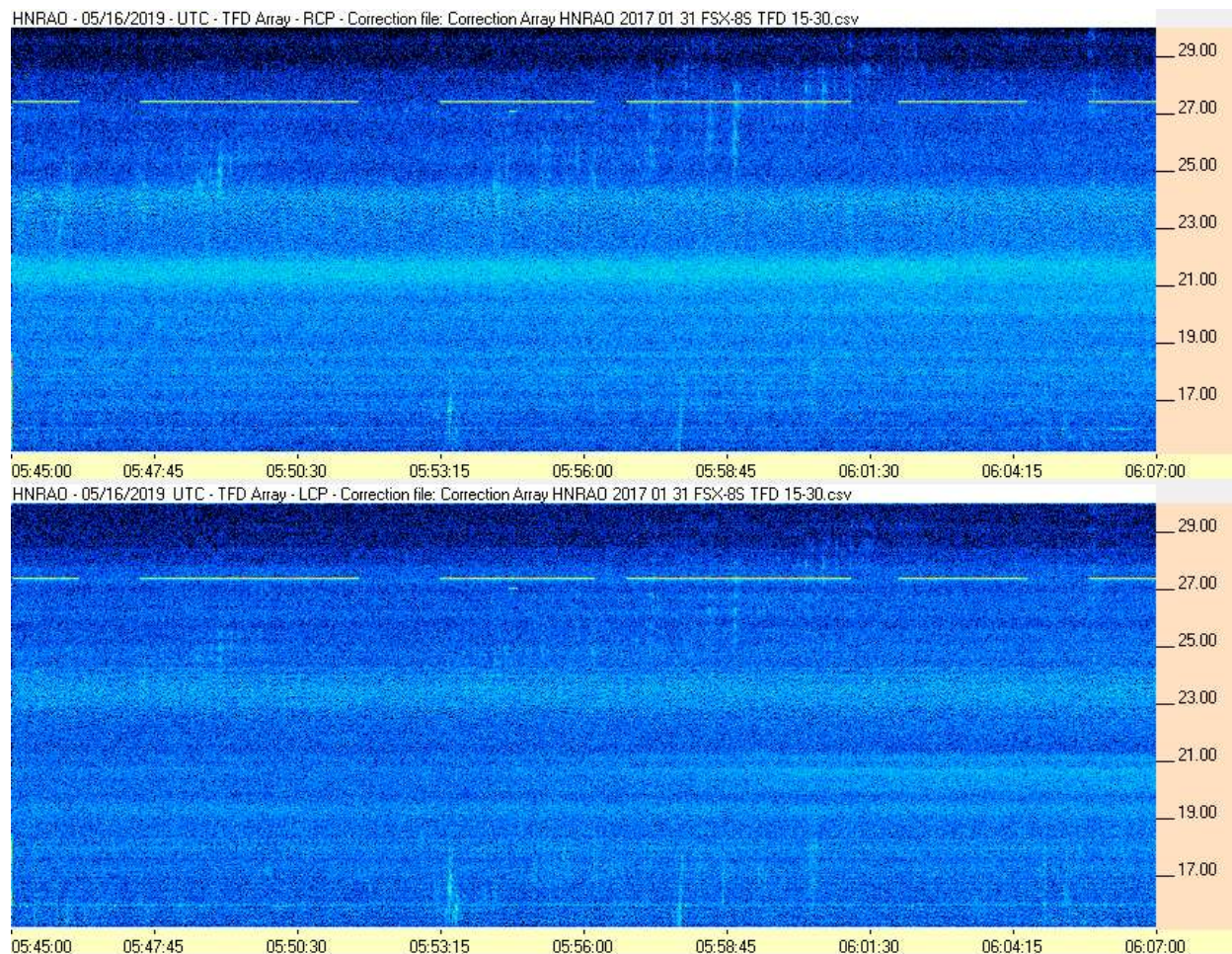
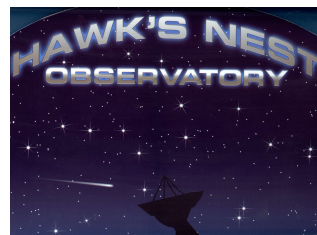


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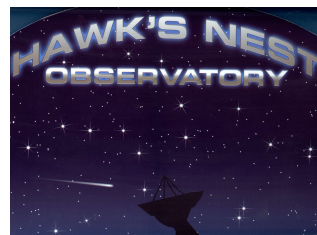


HNRAO Observing Log

40.673181 N – 80.437885 W
EN90sq

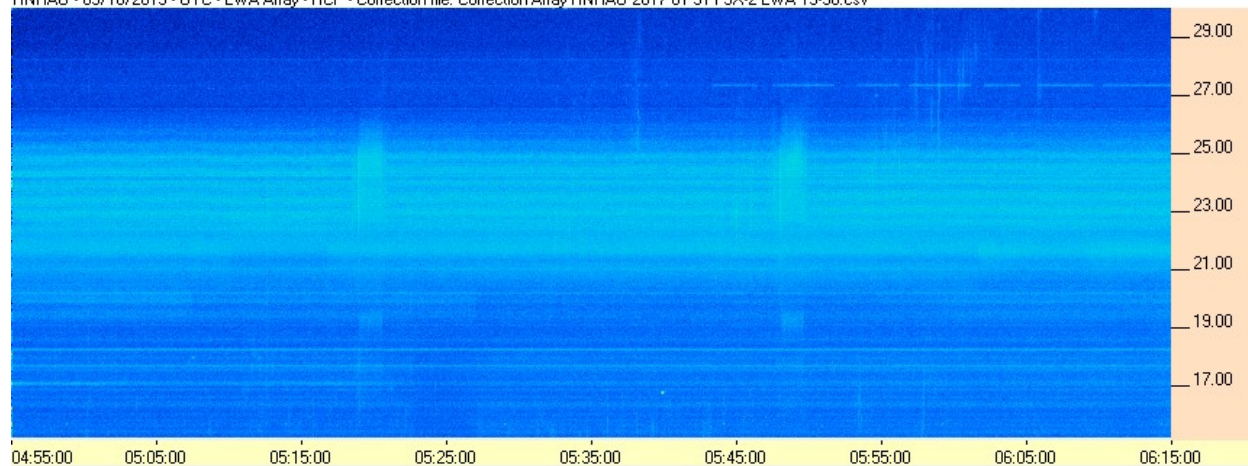


HNRAO Observing Log
40.673181 N – 80.437885 W
EN90sq

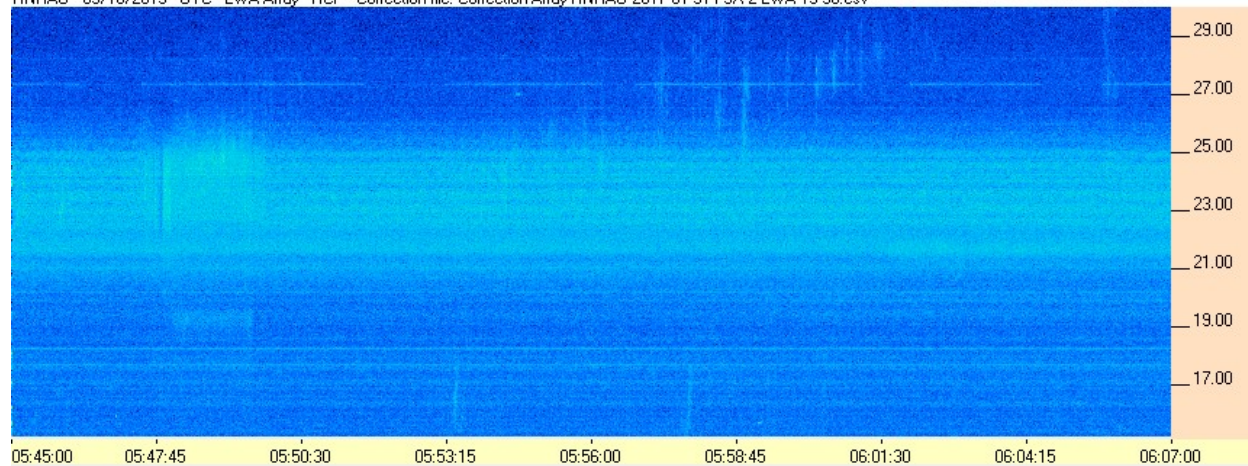


FSX-2 / LWA Array

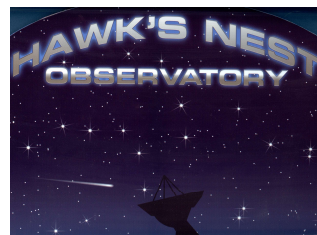
HNRAO - 05/16/2019 - UTC - LWA Array - RCP - Correction file: Correction Array HNRAO 2017 01 31 FSX-2 LWA 15-30.csv



HNRAO - 05/16/2019 - 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



Date: May 16, 2019

Object: Jupiter – Io-D

Observer: Unattended

Start - Time UT:	0527:10	Planetary K-index:	
Jupiter Altitude (deg):	22.0	Jupiter Azimuth (deg):	153.4
Jupiter CML:	103.58	Jupiter Io Phase:	099.80
Jupiter RA (hr/min):	17:27	Jupiter Dec (hr/min):	-22:36
Hour Angle (hr/min):	-01:47	Polarization	LCP
Sun Altitude (deg):	-30.6	Sun Azimuth (deg):	004.6
Sun RA (hr/min):	03:23	Sun Dec (hr/min):	18:34

End – Time UT:	0750:19	De:	-2.8
Jupiter Altitude (deg):	26.1	Jupiter Azimuth (deg):	189.4
Jupiter CML:	190.13	Jupiter Io Phase	119.88
Hour Angle (hr/min):	00:36	Duration (min):	197
Sun Altitude (deg):	-20.0	Sun Azimuth (deg):	040.4
Max Frequency MHz	24	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

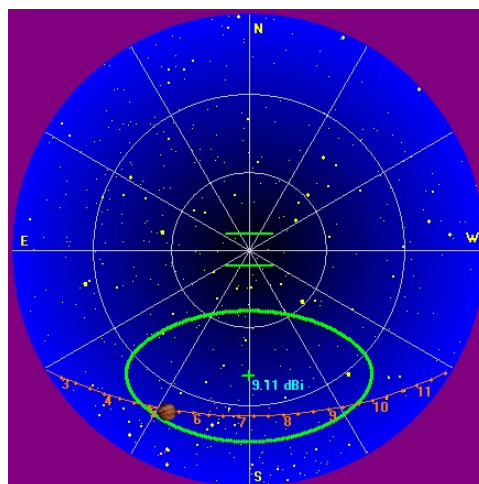
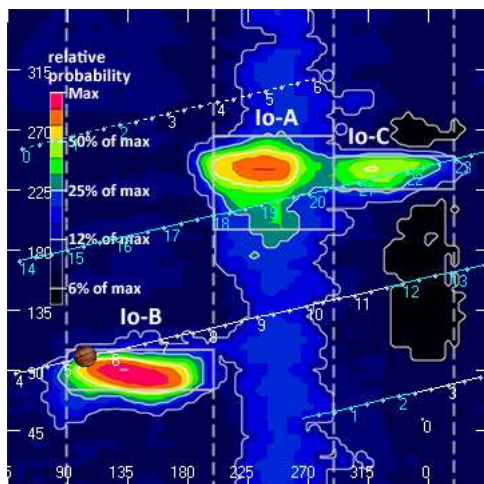
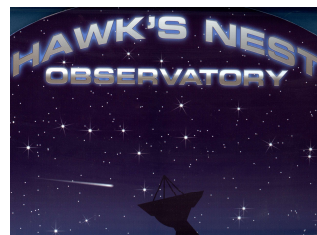
Radio-SkyPipe software version 2.7.33

Radio-Jupiter Pro software version 3.8.2

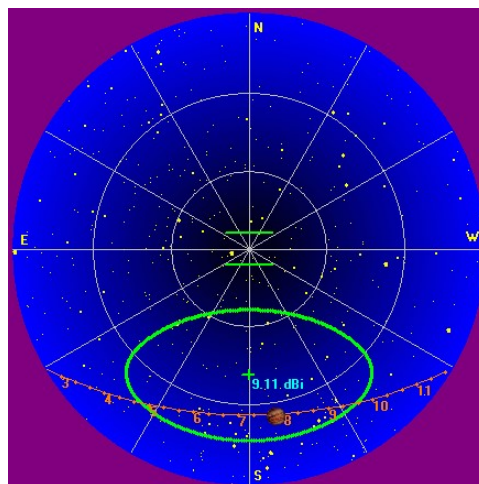
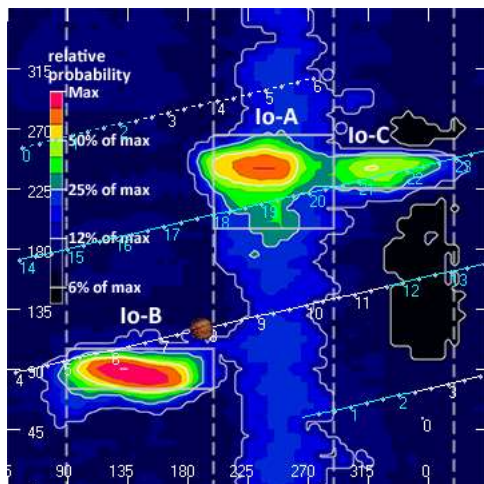
Network Time Server GpsNtp-Pi, Reeve Engineering

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

HNRAO Observing Log
40.673181 N – 80.437885 W
EN90sq



Beginning of Pass



End of Pass



HNRAO Observing Log
40.673181 N – 80.437885 W
EN90sq



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
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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	

HNRAO Observing Log
40.673181 N – 80.437885 W
EN90sq



Jupiter / Sun angular separation 150.5 degrees

All spectrographs and receivers operating. All antennas functioning normally. No known issues.

Several brief periods of rain. Precipitation static was heavy at 0616 UT. There were several other periods of drizzle but none of the rain effected the data. The spectrograph charts show unknown RFI as horizontal bright bands and lines. Unknown RFI in the SkyPipe record rendered that data unusable. Cass A was not apparent in the data set.

Both the LCP spectrographs, FSX-8S and SDRPlay RSP2, recorded this Io-D storm. The FSX-8S spectrograph data also recorded the Io-B storm that was occurring at the same time.

Given De, this was a relatively strong Io-D storm with scintillation present. Long periods of inactivity between bursts. The storm was composed of positive drift L-bursts and S-bursts with L2 modulation lanes.

Composed of L-bursts and S-bursts, this storm was positive drift with L4 modulation lanes. There was an Io-B storm concurrent this Io-D storm.

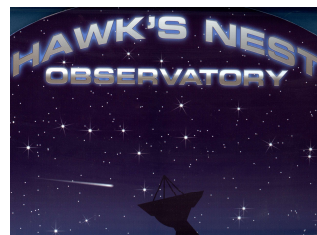
Emissions began at 15 MHz and most likely lower in frequency and reached about 24 MHz at the end of emissions.

Emission intensity ranged from near GB to several dB above GB as seen from this observatory. There were several groups of S-bursts that were the strongest in the storm, 0612:35 UT, 0621:55 UT, 0626:00 UT and 0724:15 UT.

Nothing else of note. Concurrent Io-B storm report attached to this report.

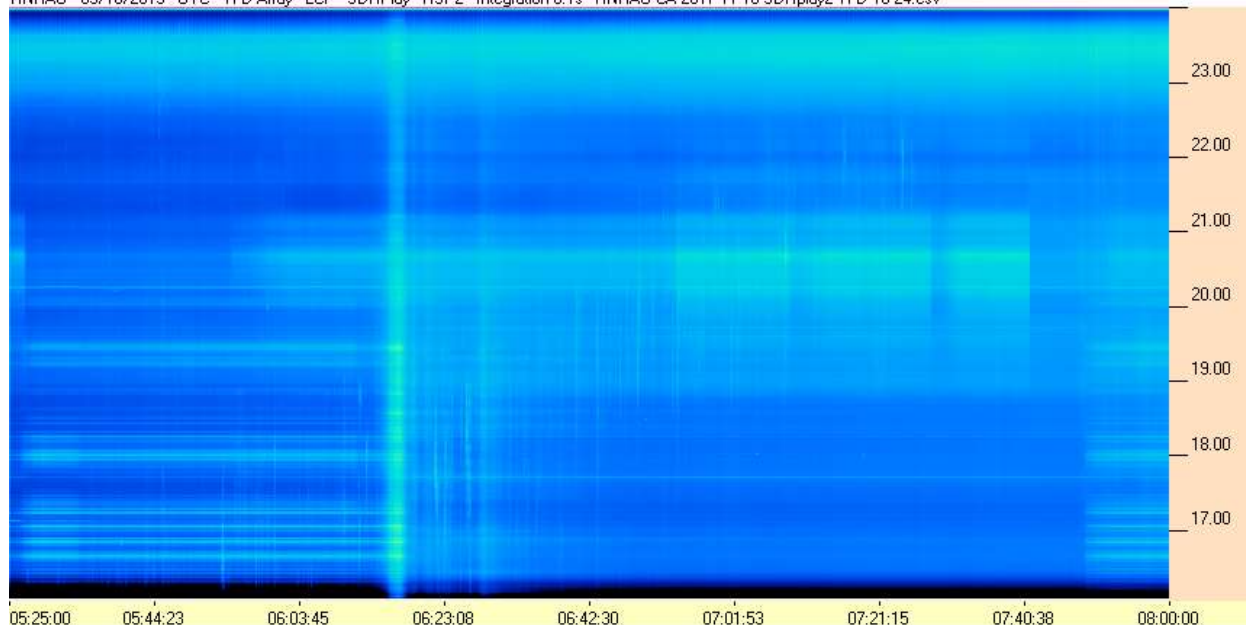
EOR

HNRAO Observing Log
40.673181 N – 80.437885 W
EN90sq

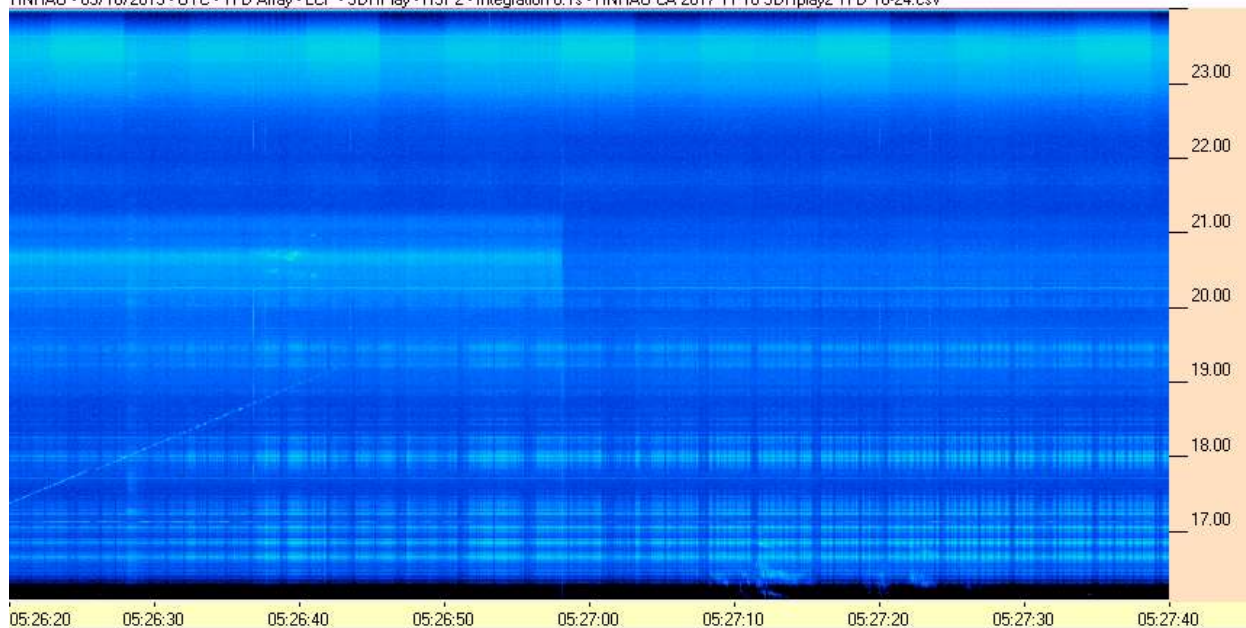


SDRPlay RSP2 / TFD Array

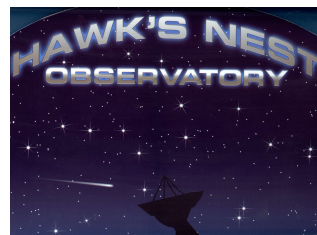
HNRAO - 05/16/2019 - UTC - TFD Array - LCP - SDRPlay - RSP2 - Integration 0.1s - HNRAO CA 2017 11 10 SDRplay2 TFD 16-24.csv



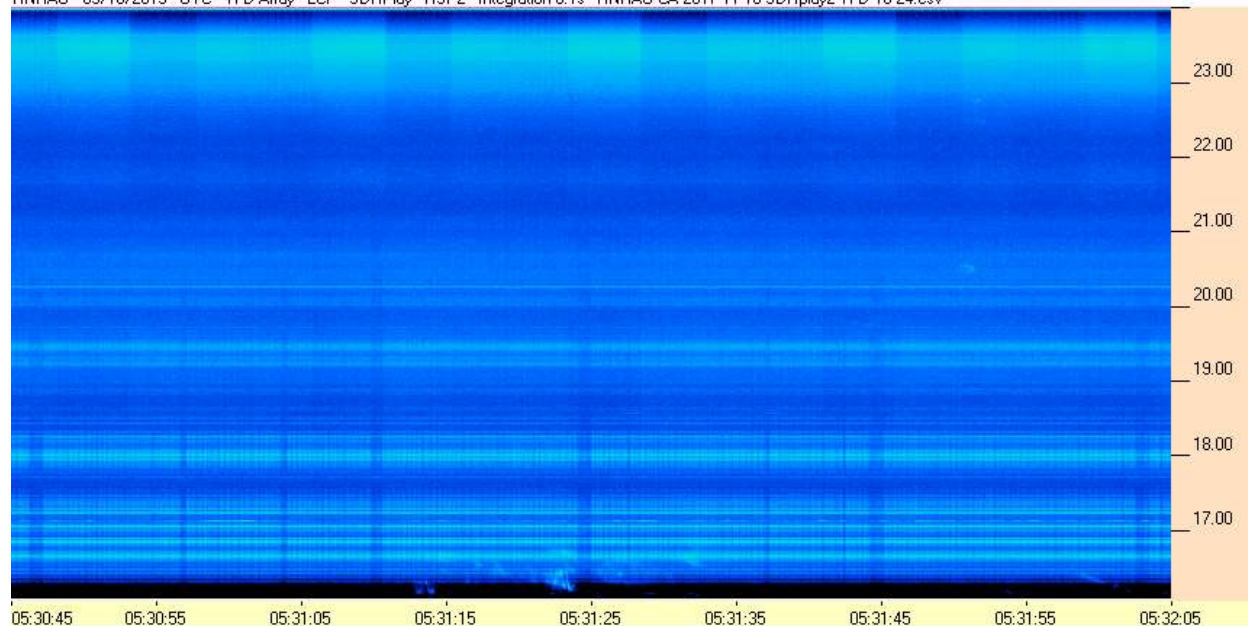
HNRAO - 05/16/2019 - UTC - TFD Array - LCP - SDRPlay - RSP2 - Integration 0.1s - HNRAO CA 2017 11 10 SDRplay2 TFD 16-24.csv



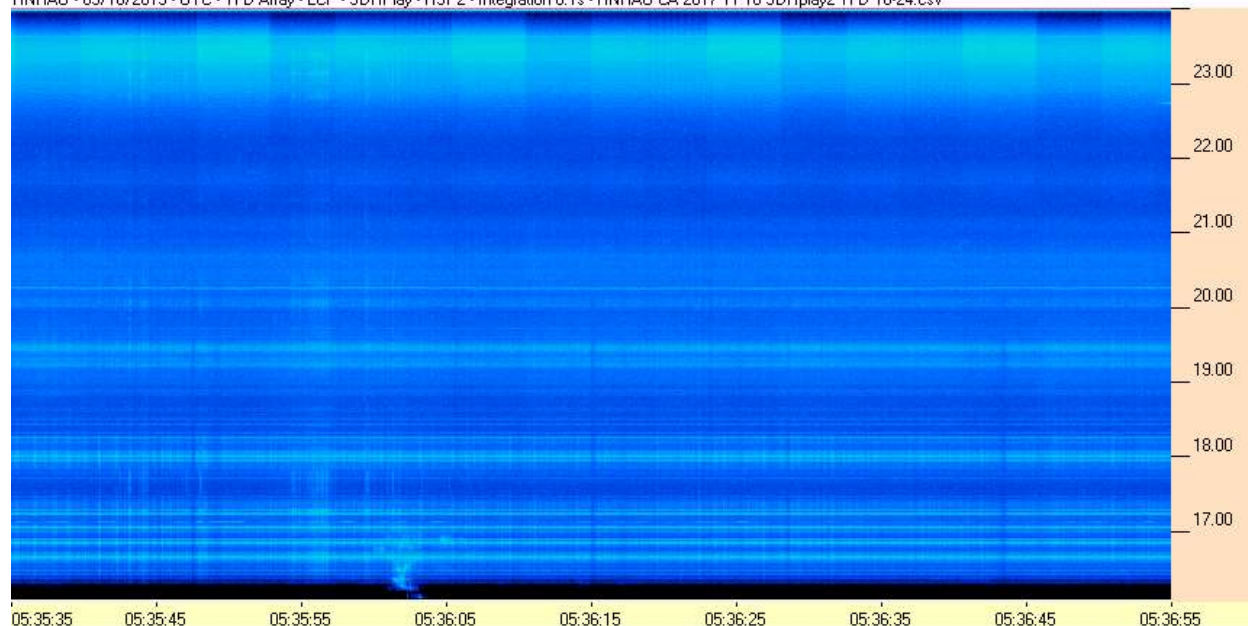
HNRAO Observing Log
40.673181 N – 80.437885 W
EN90sq



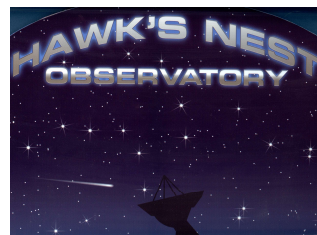
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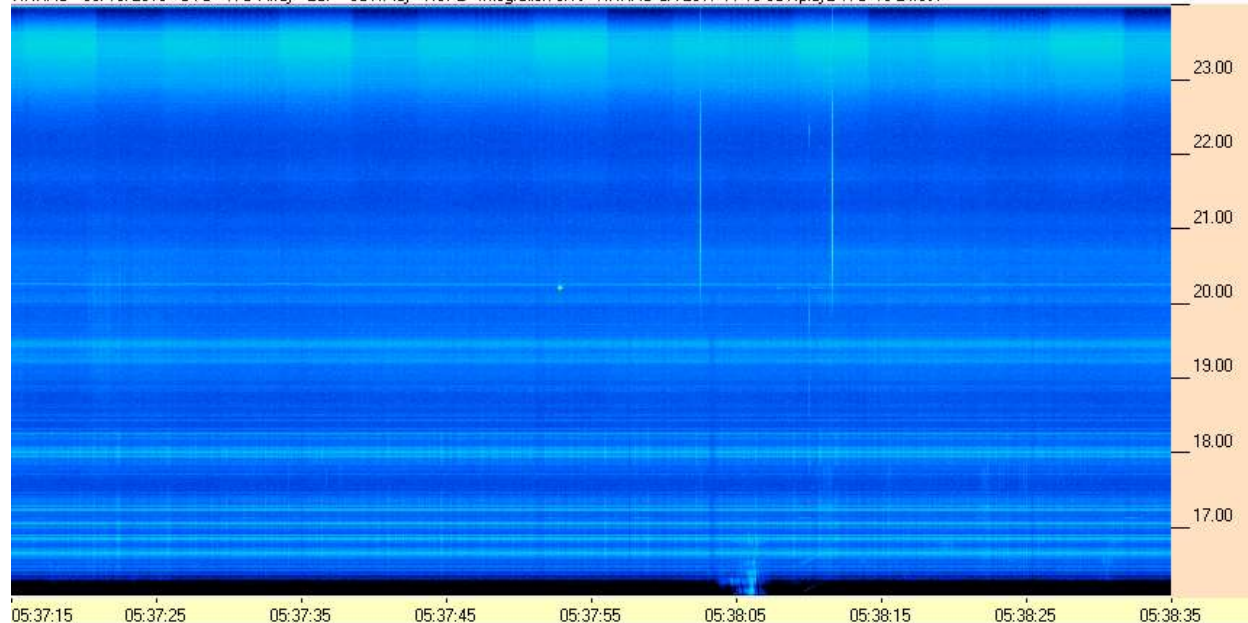
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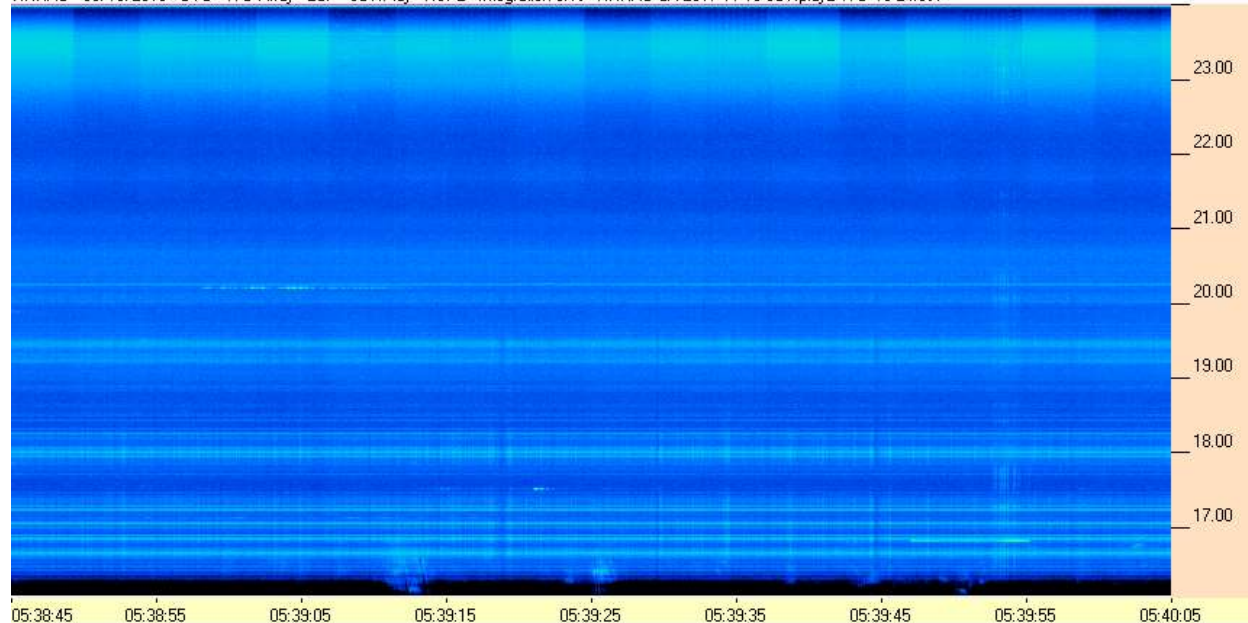
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40.673181 N – 80.437885 W
EN90sq



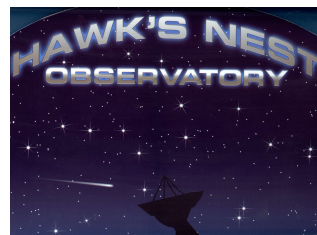
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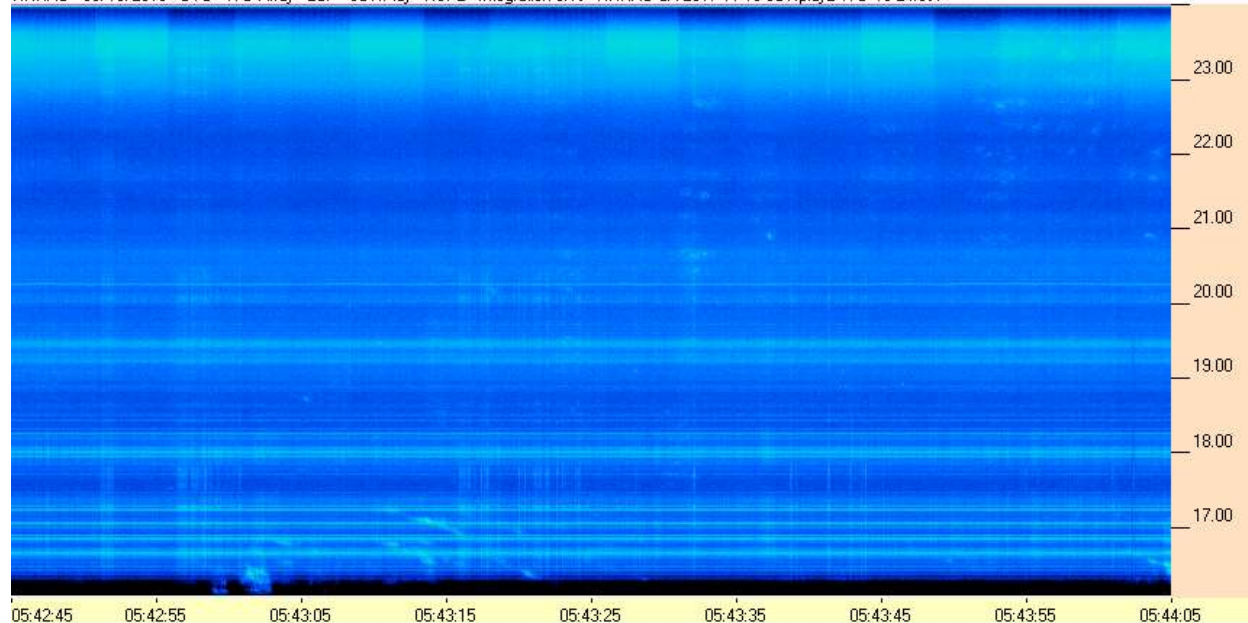
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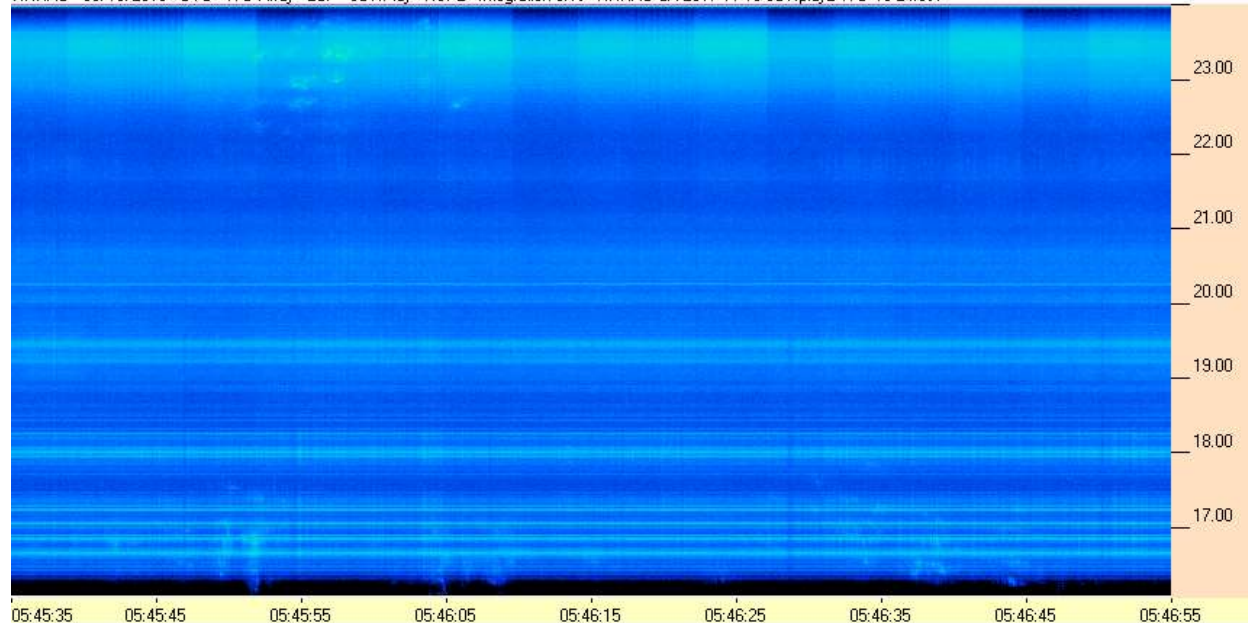
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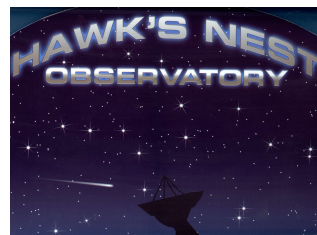
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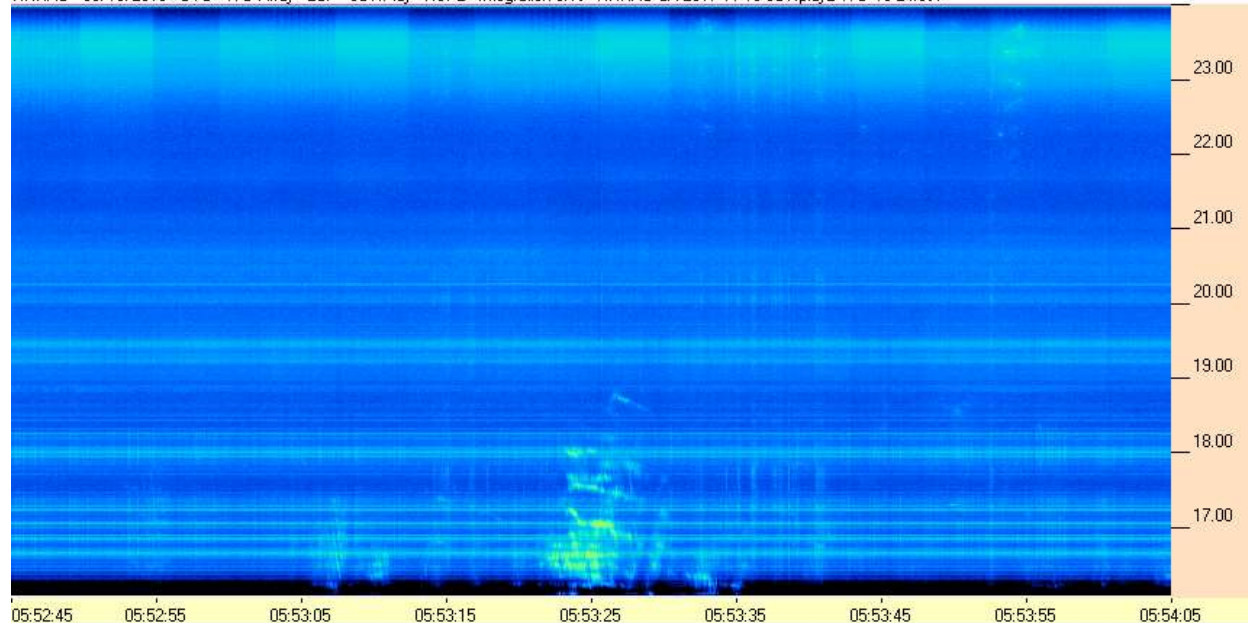
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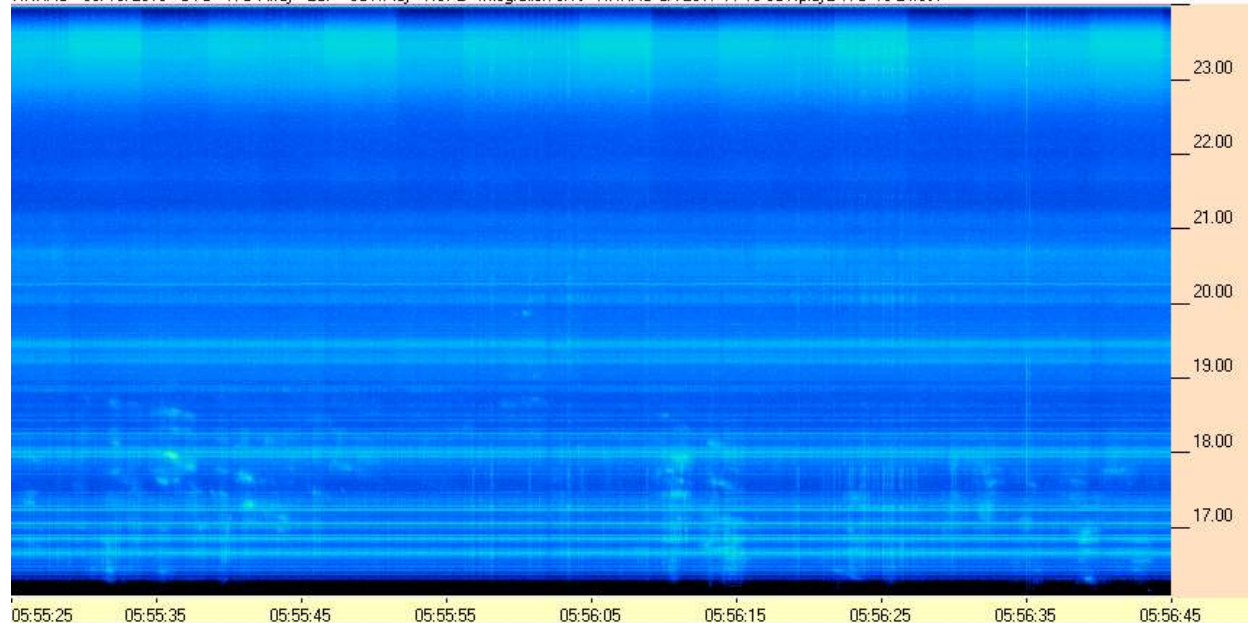
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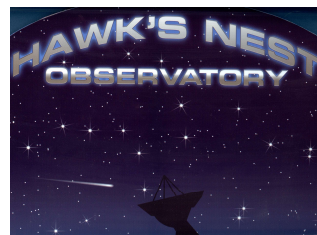
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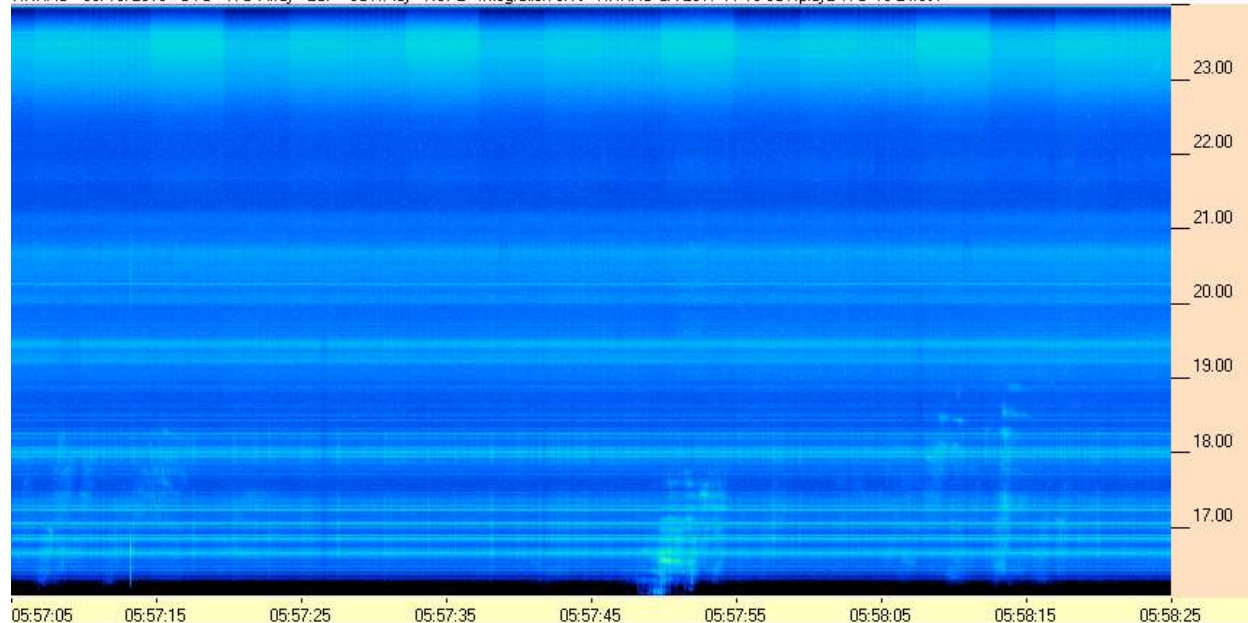
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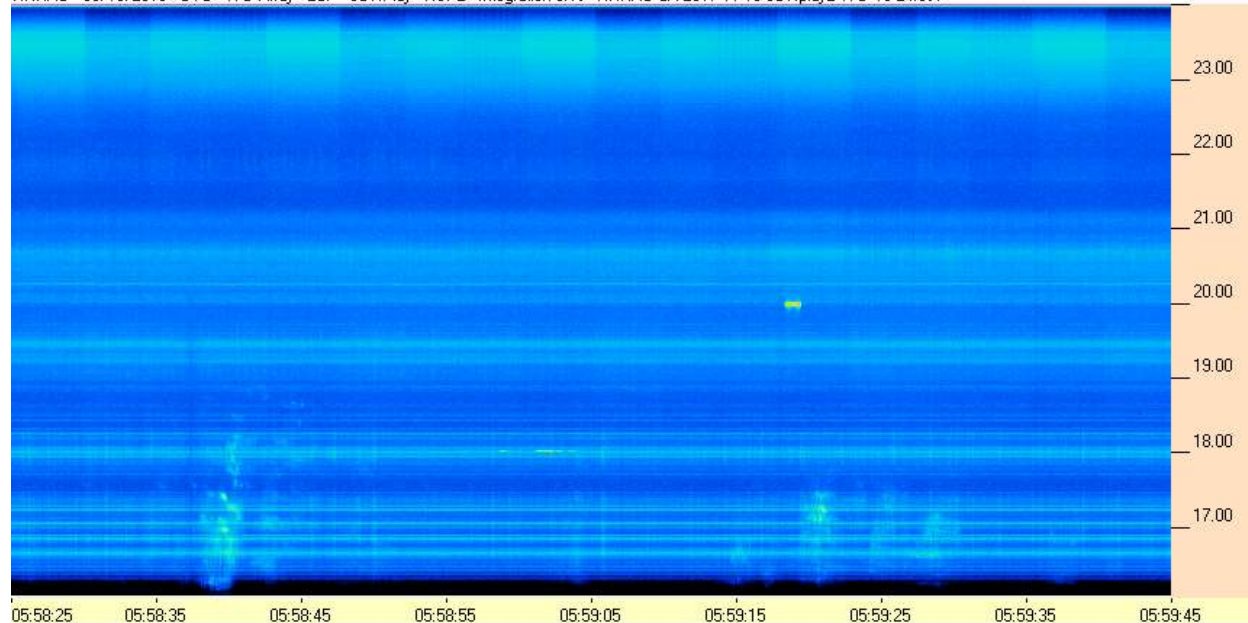
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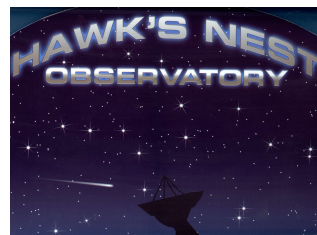
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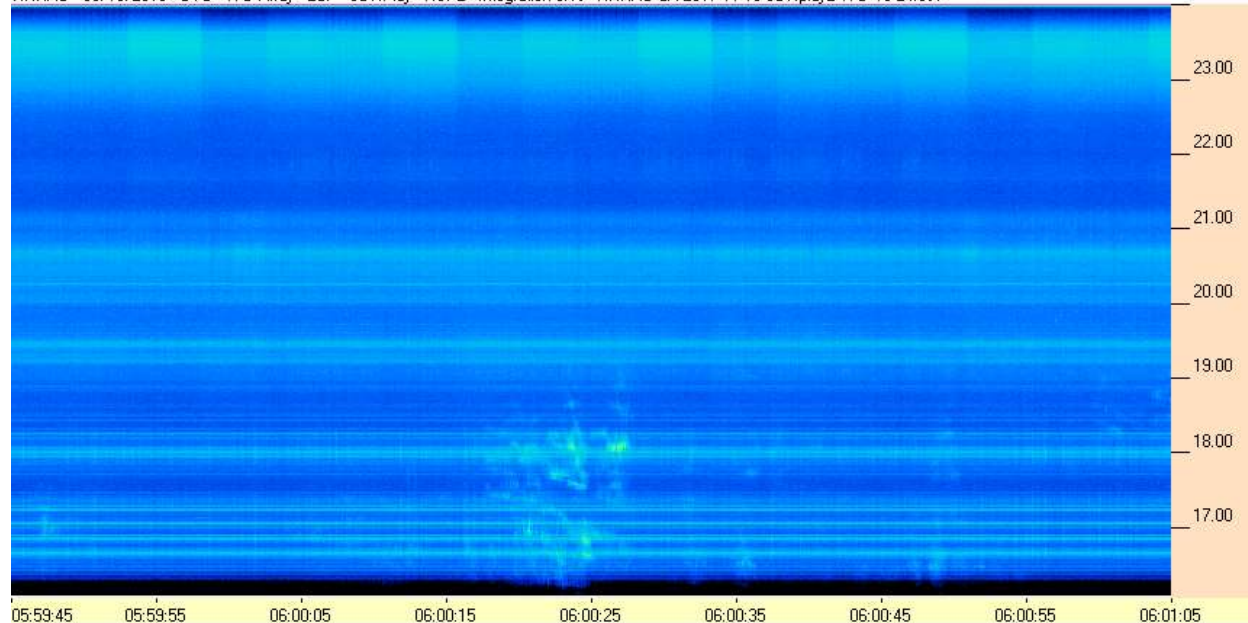
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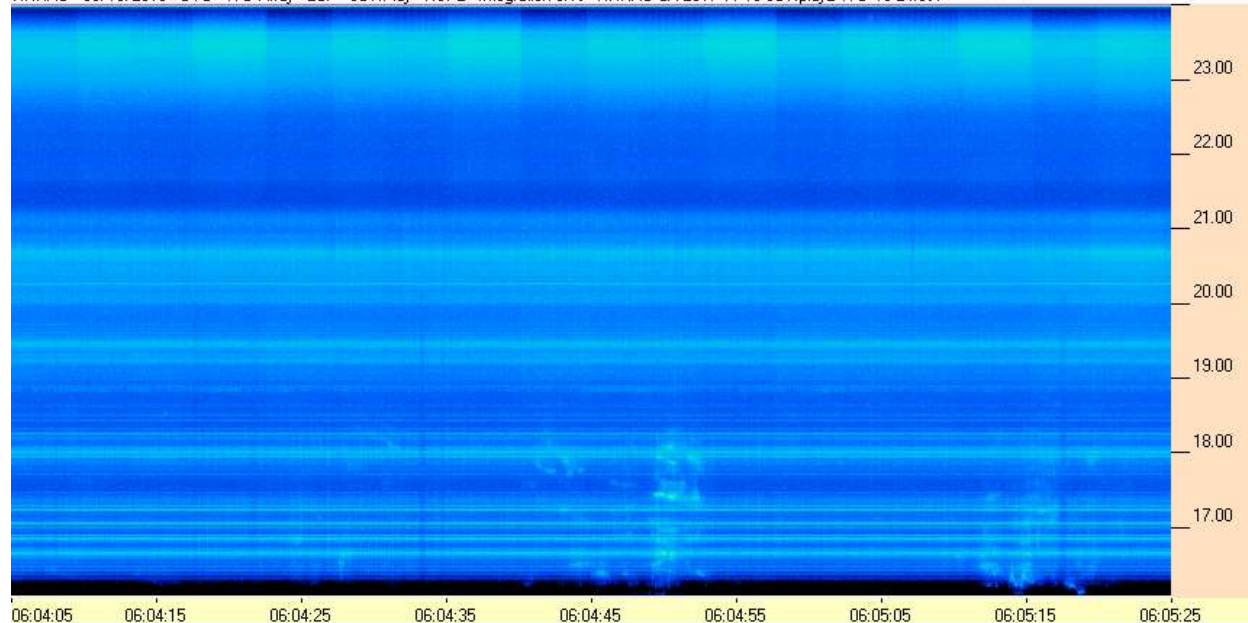
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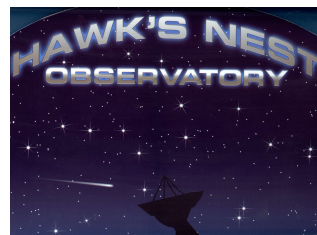
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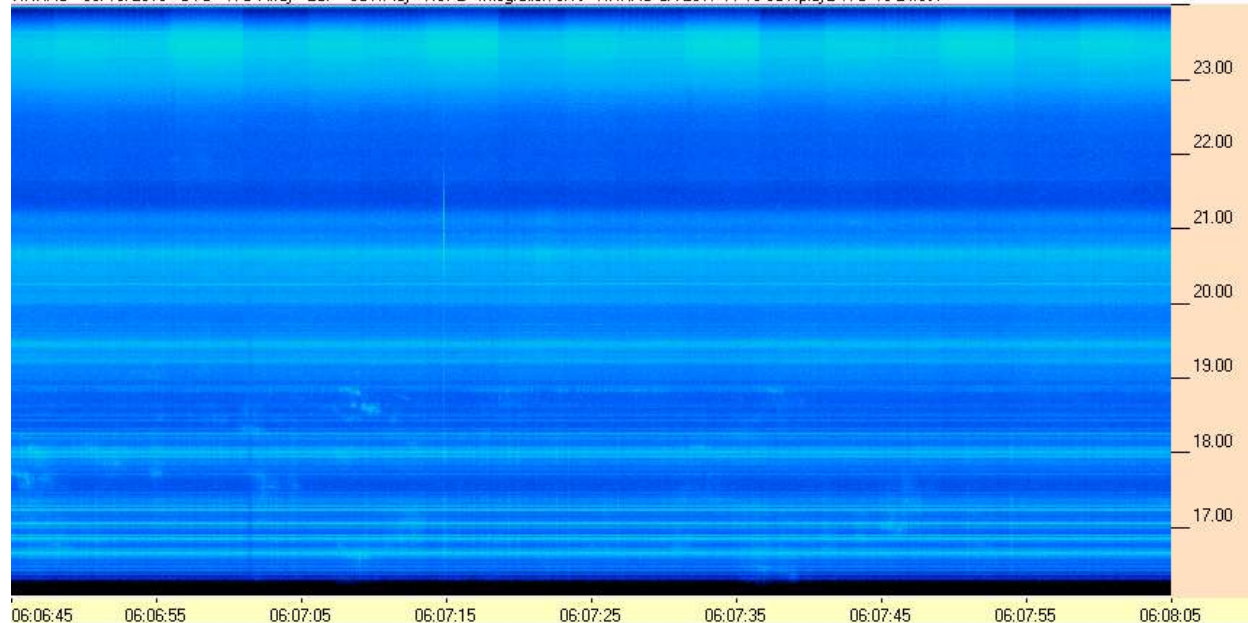
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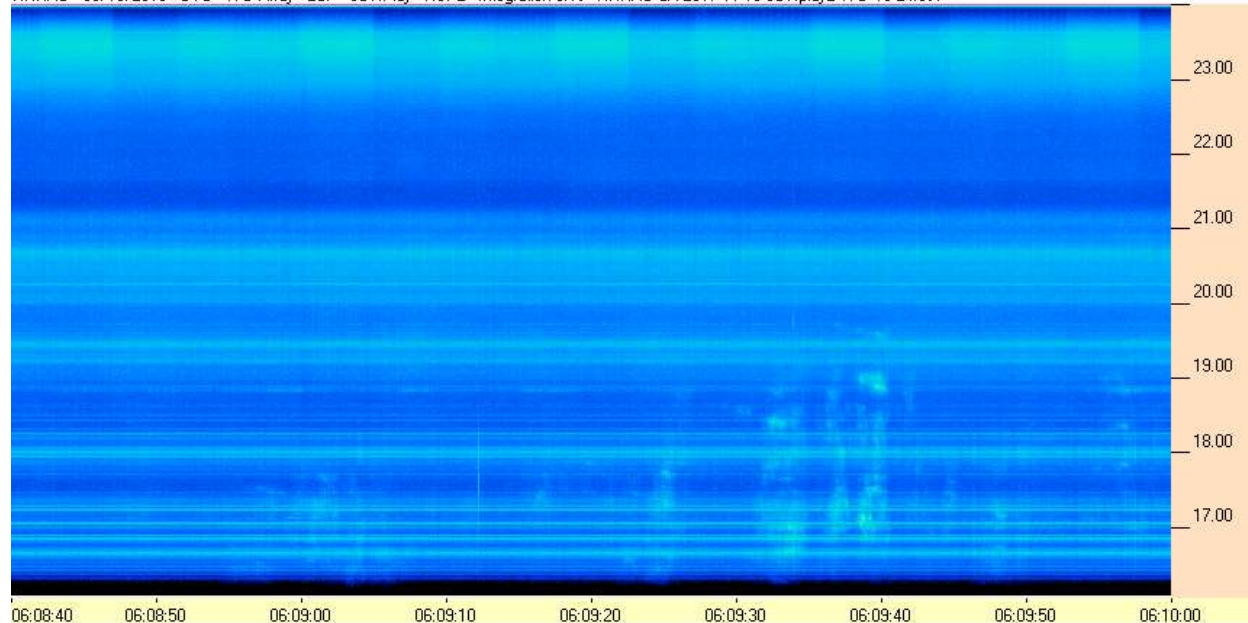
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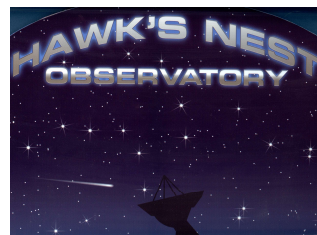
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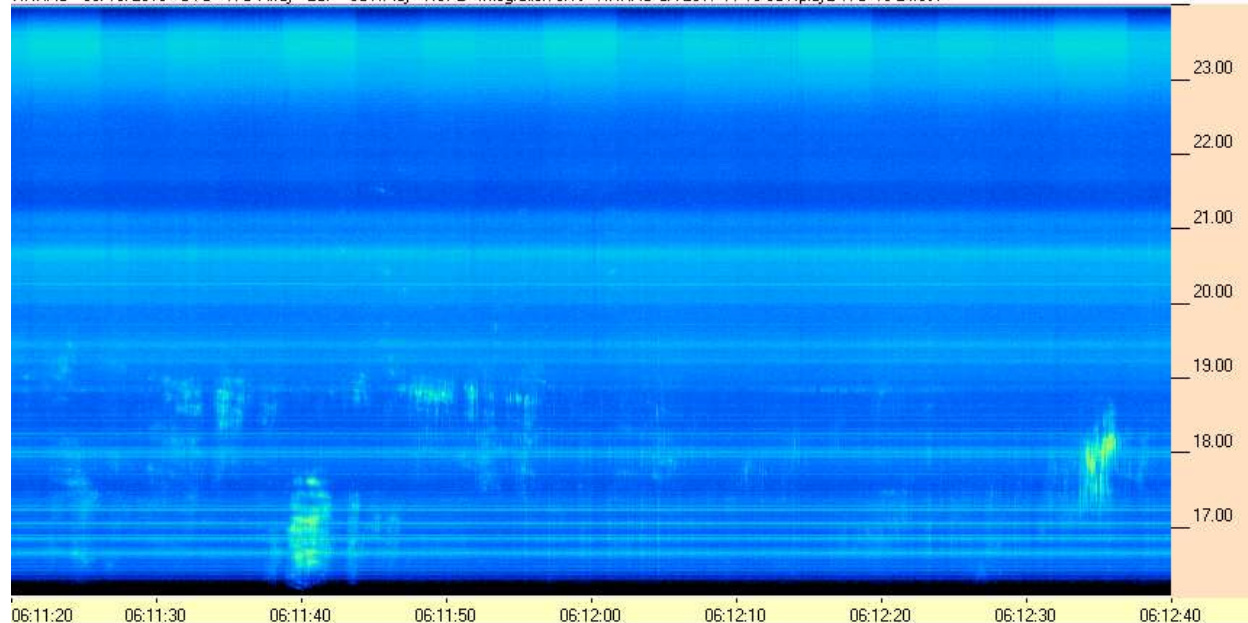
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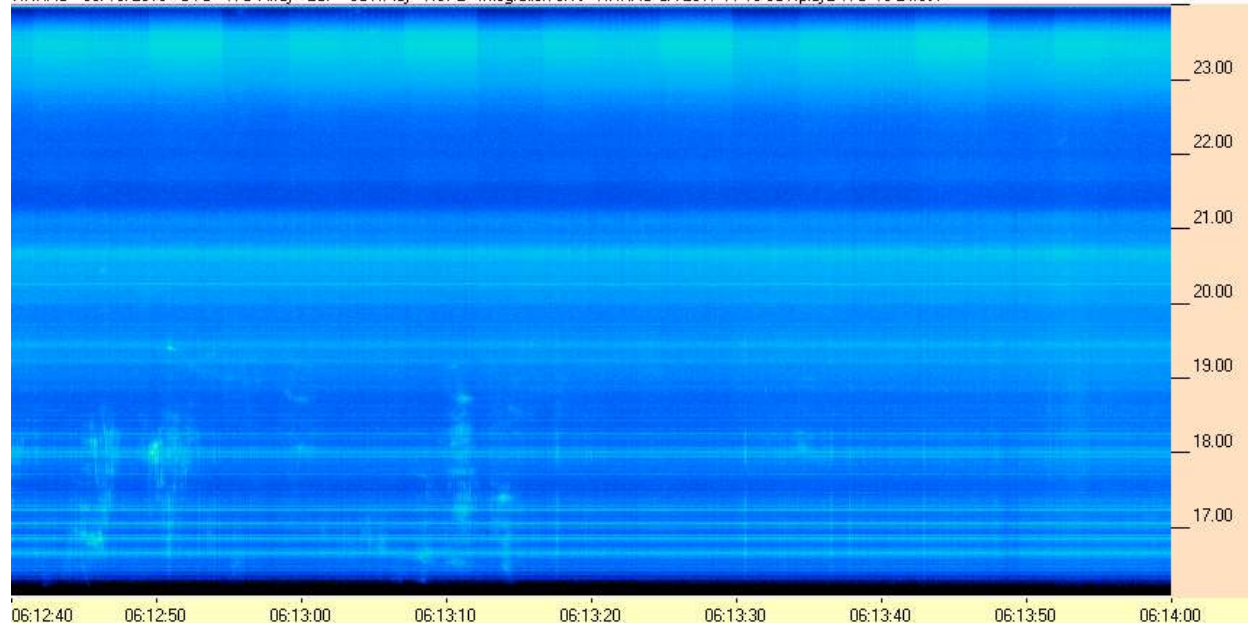
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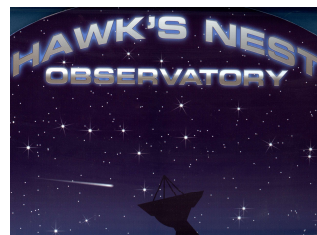
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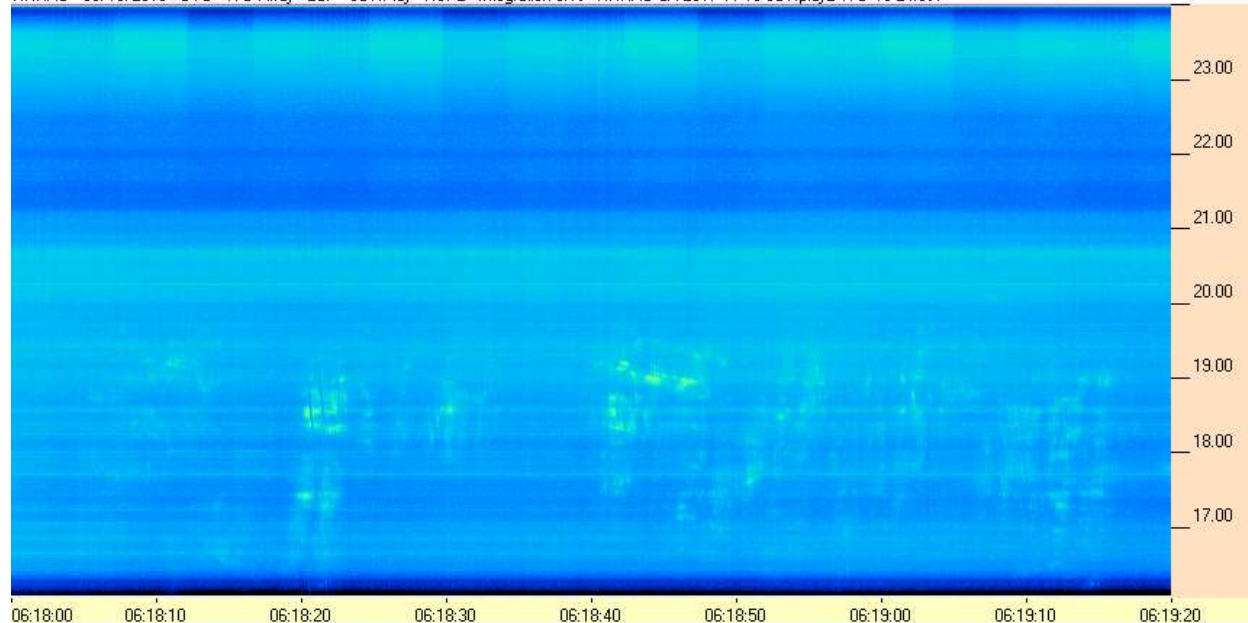
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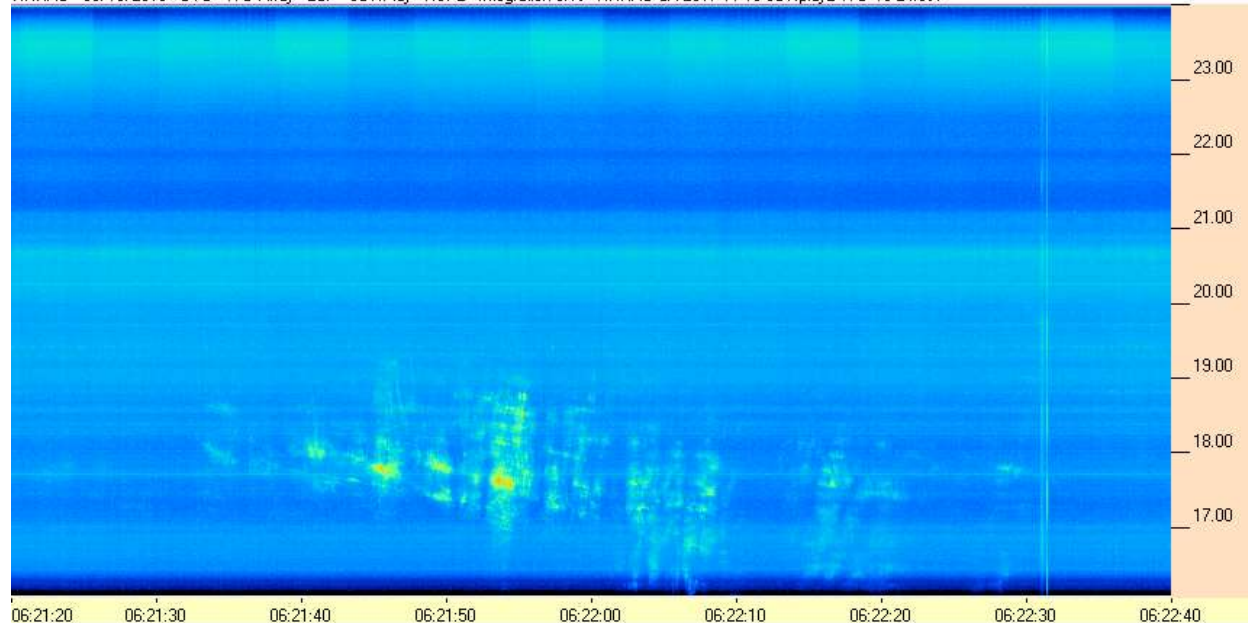
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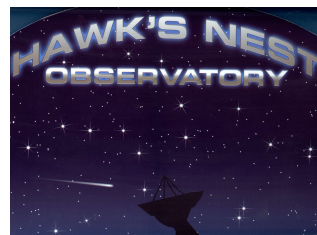
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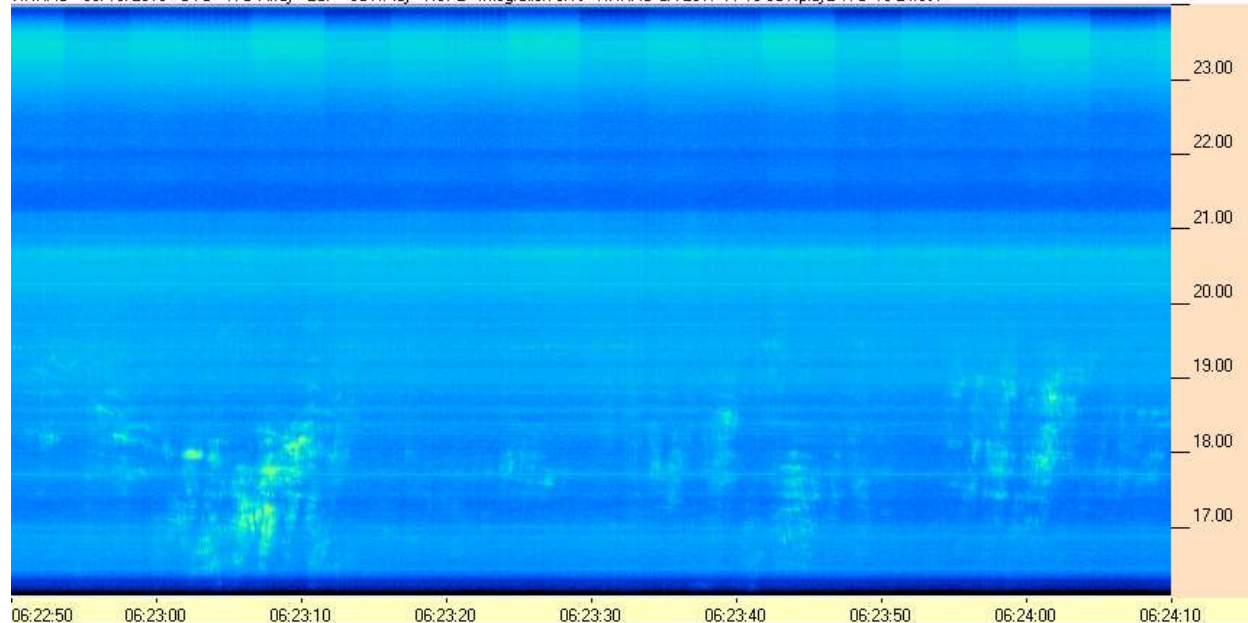
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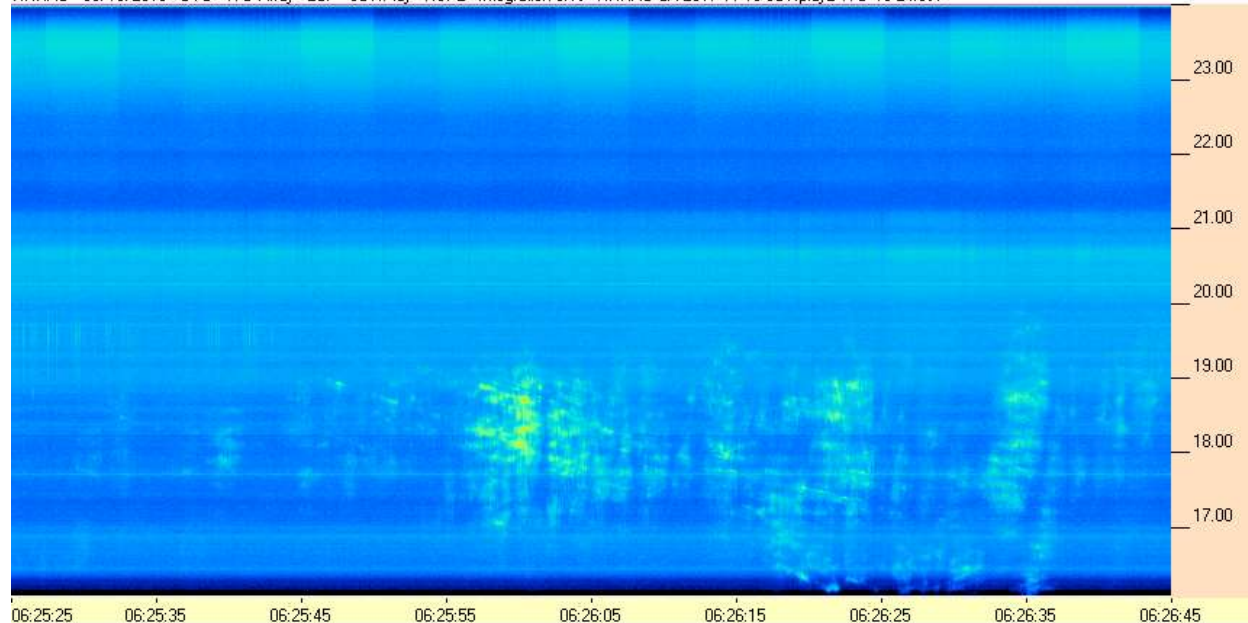
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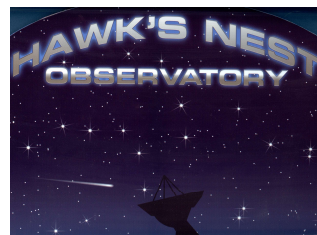
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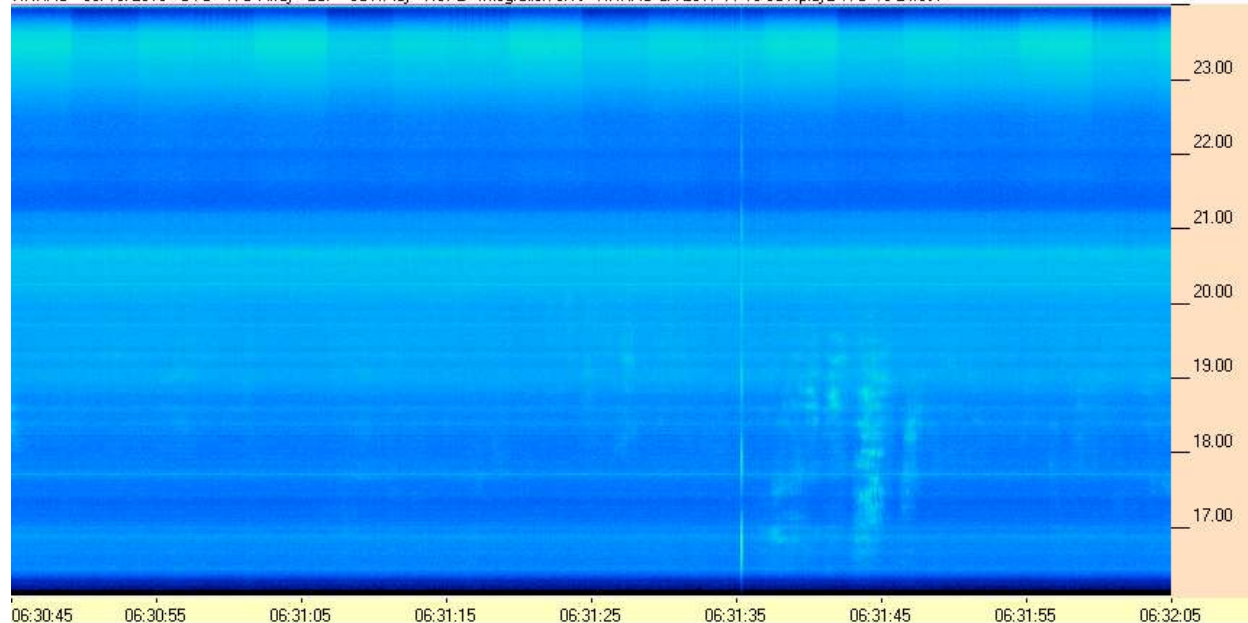
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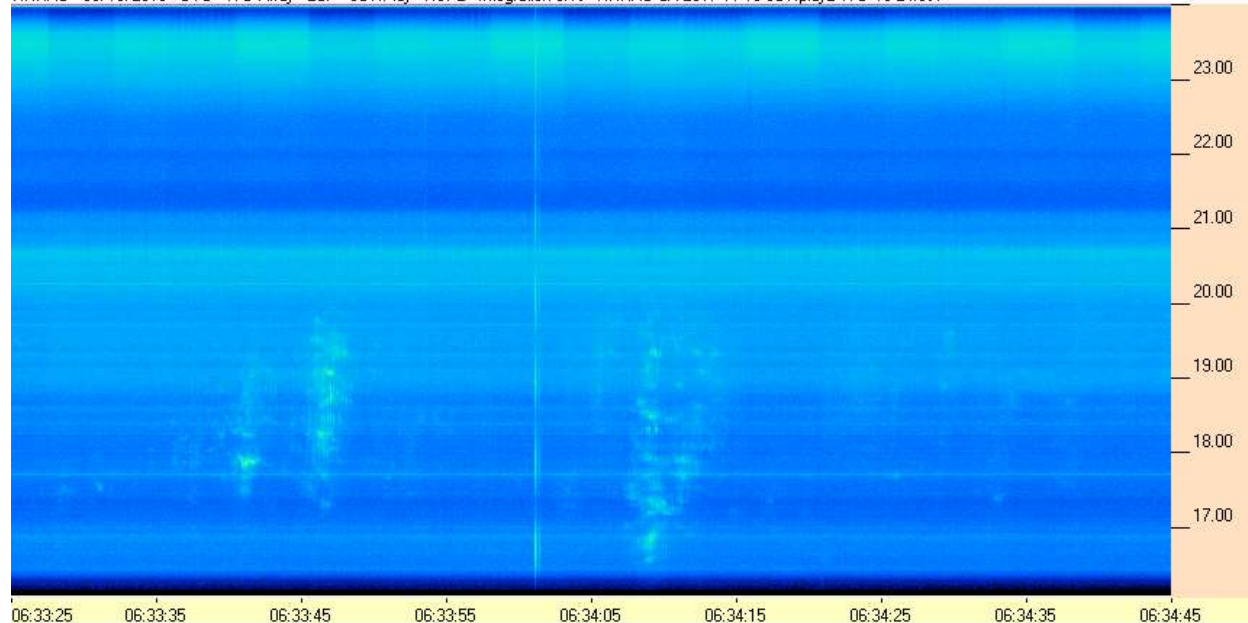
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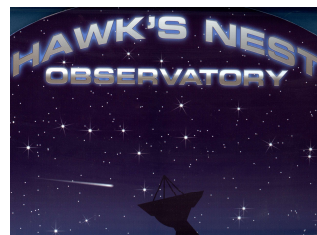
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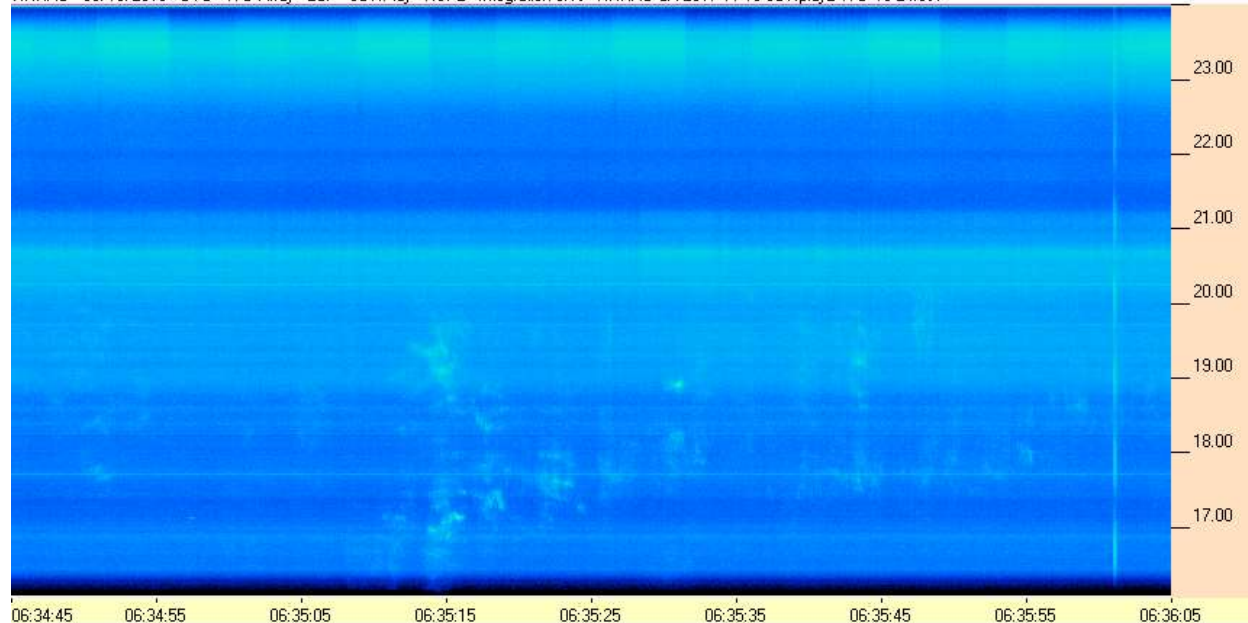
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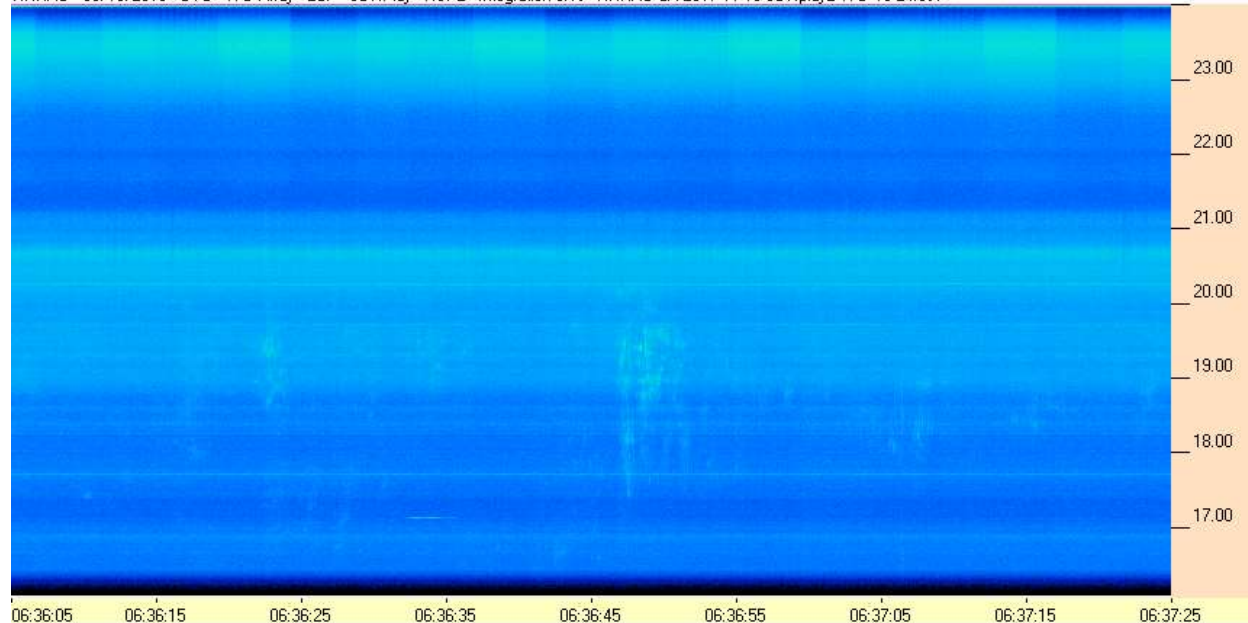
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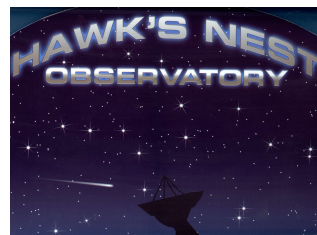


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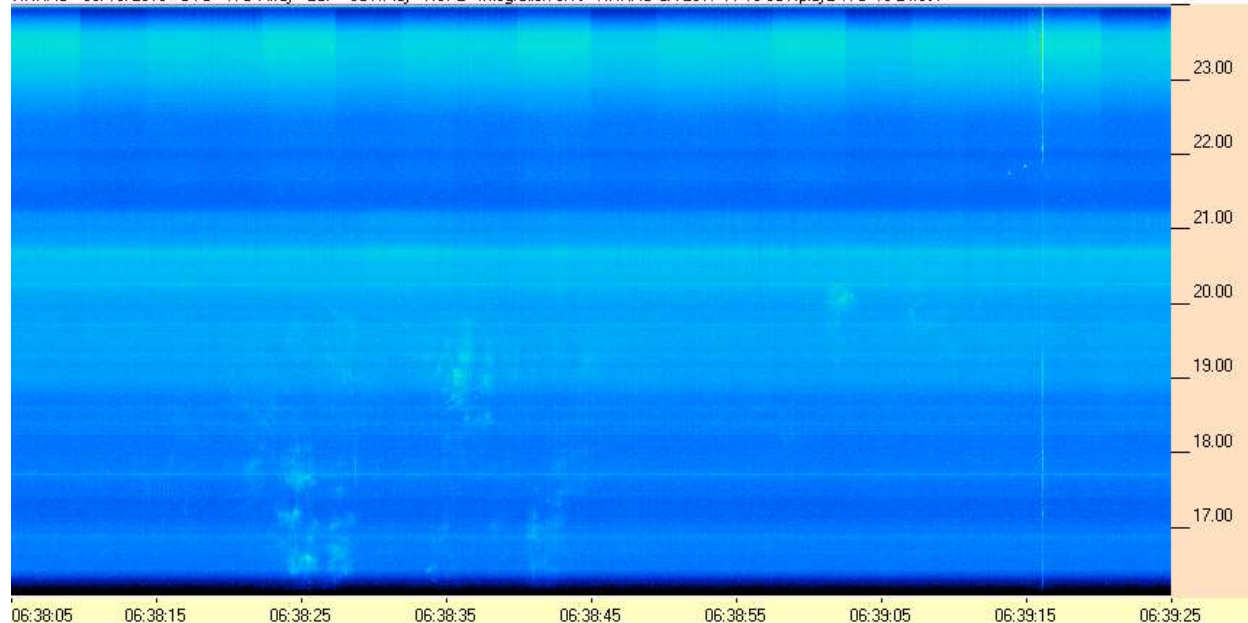


HNRAO Observing Log

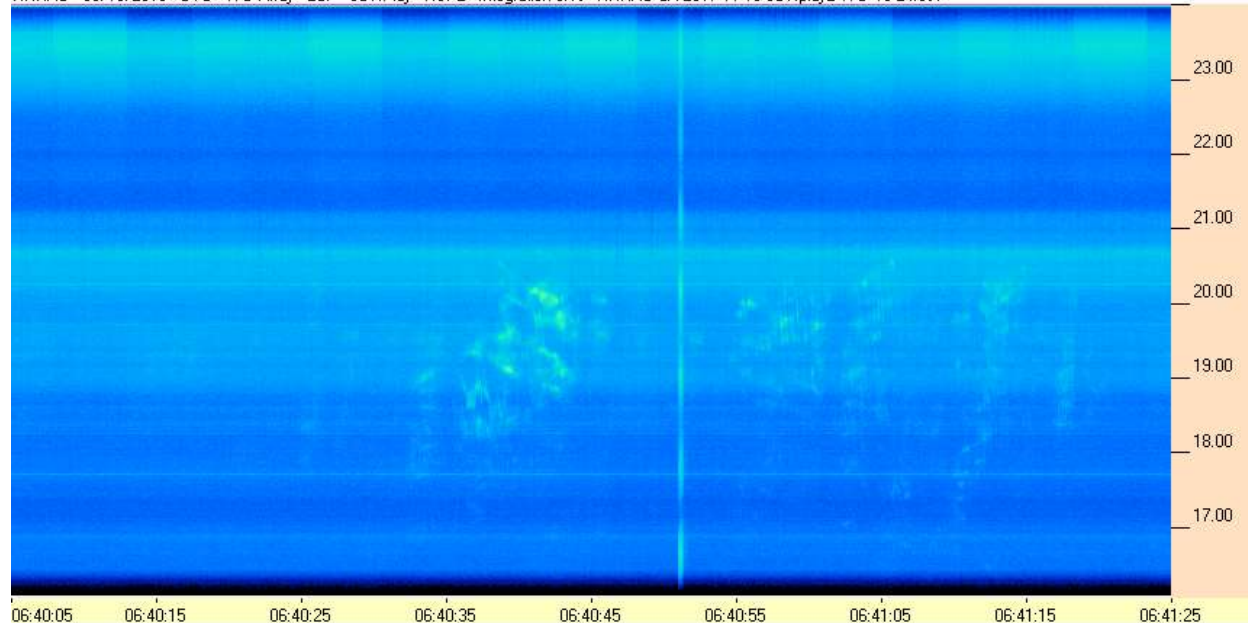
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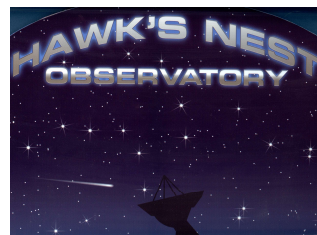
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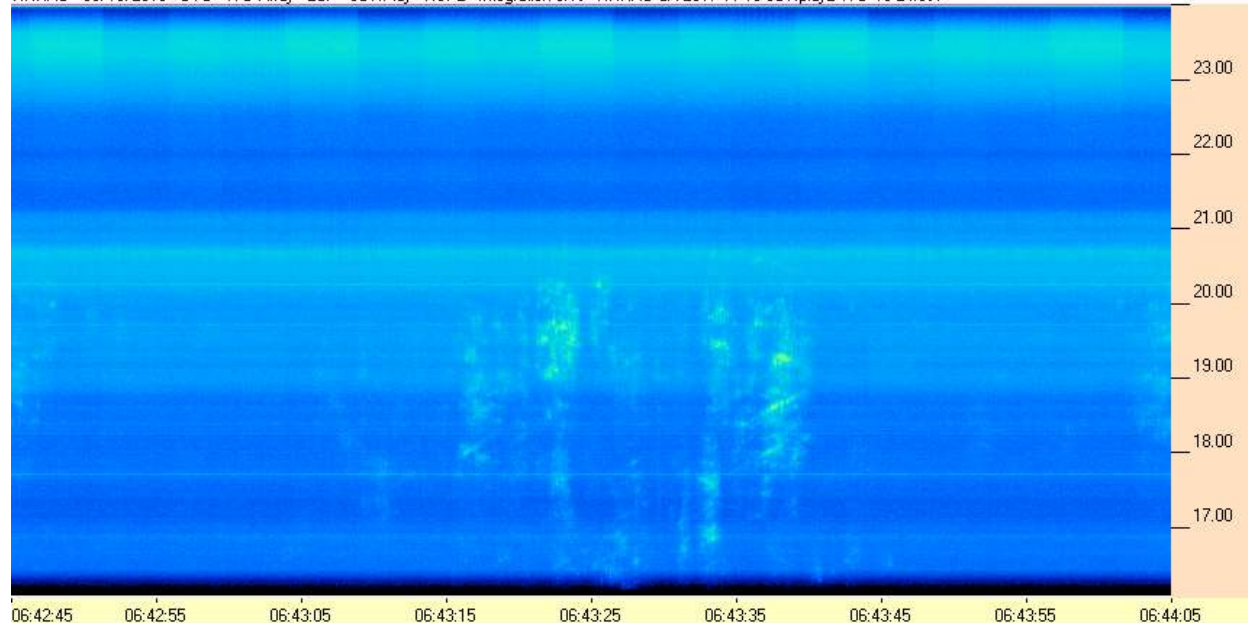
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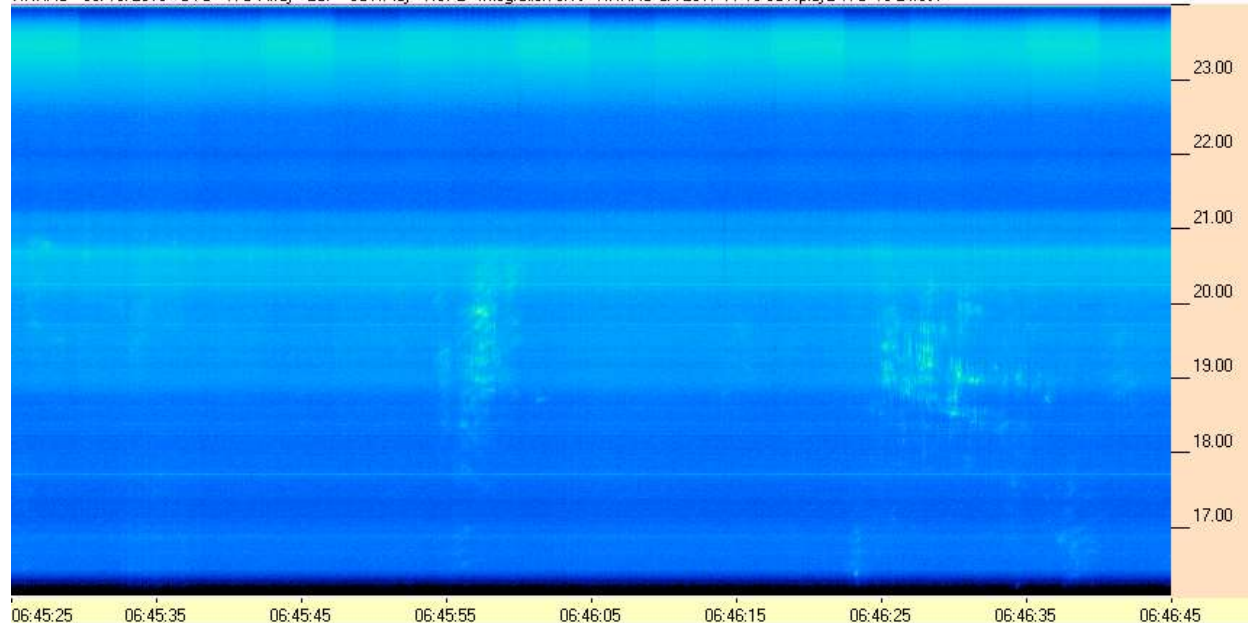
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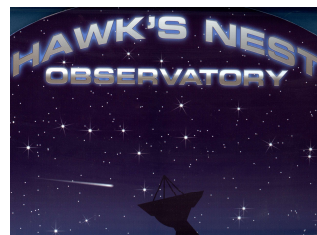
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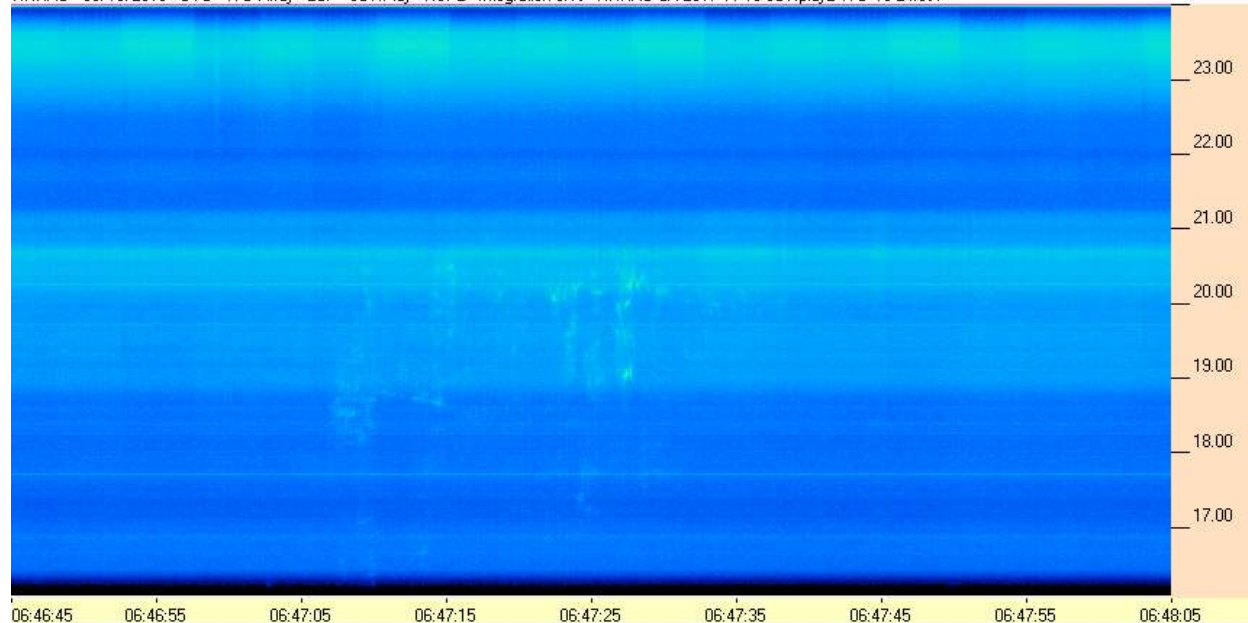
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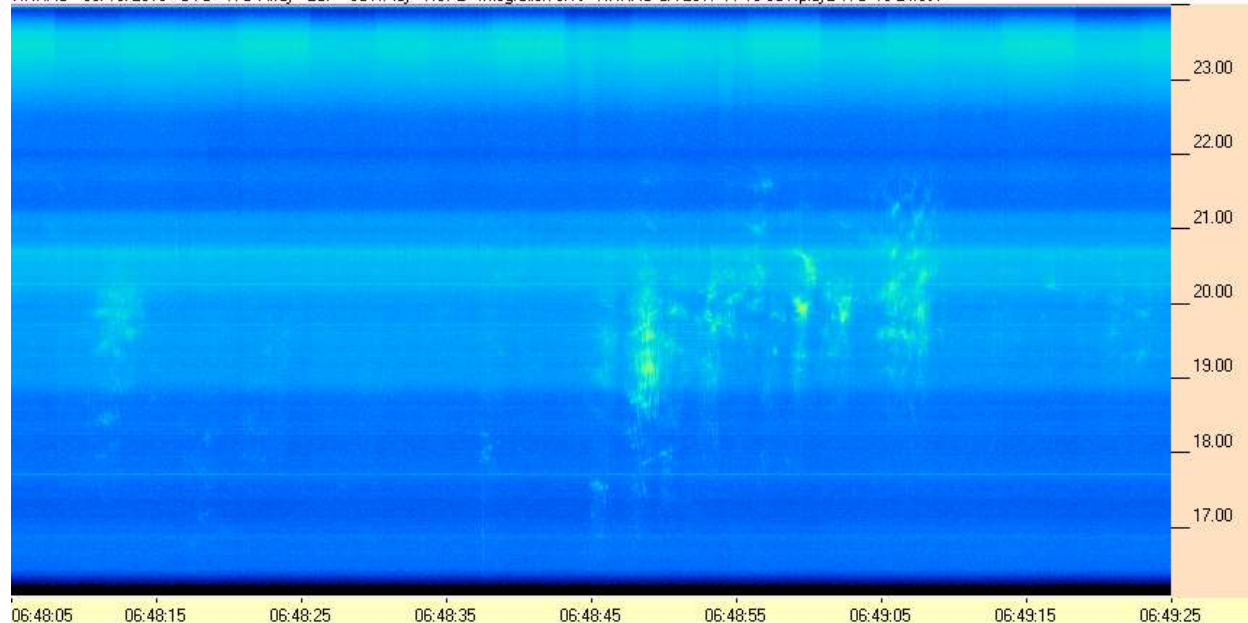
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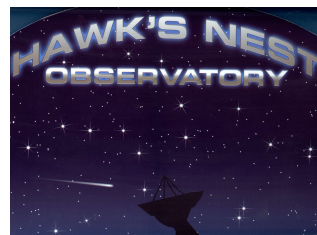
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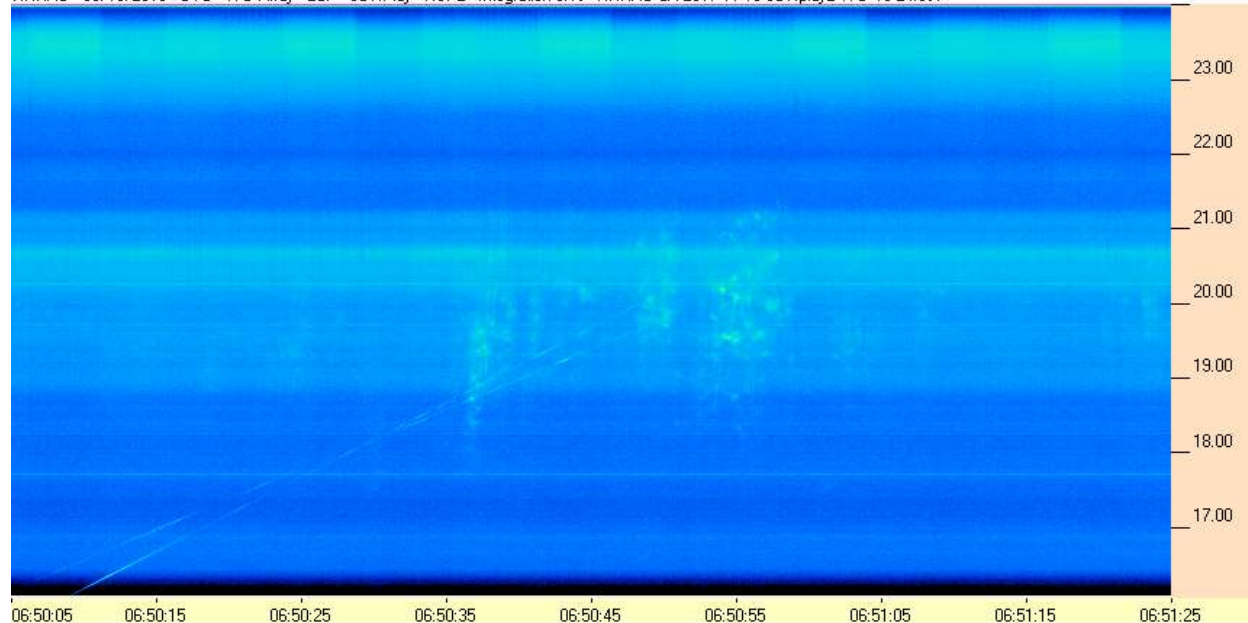
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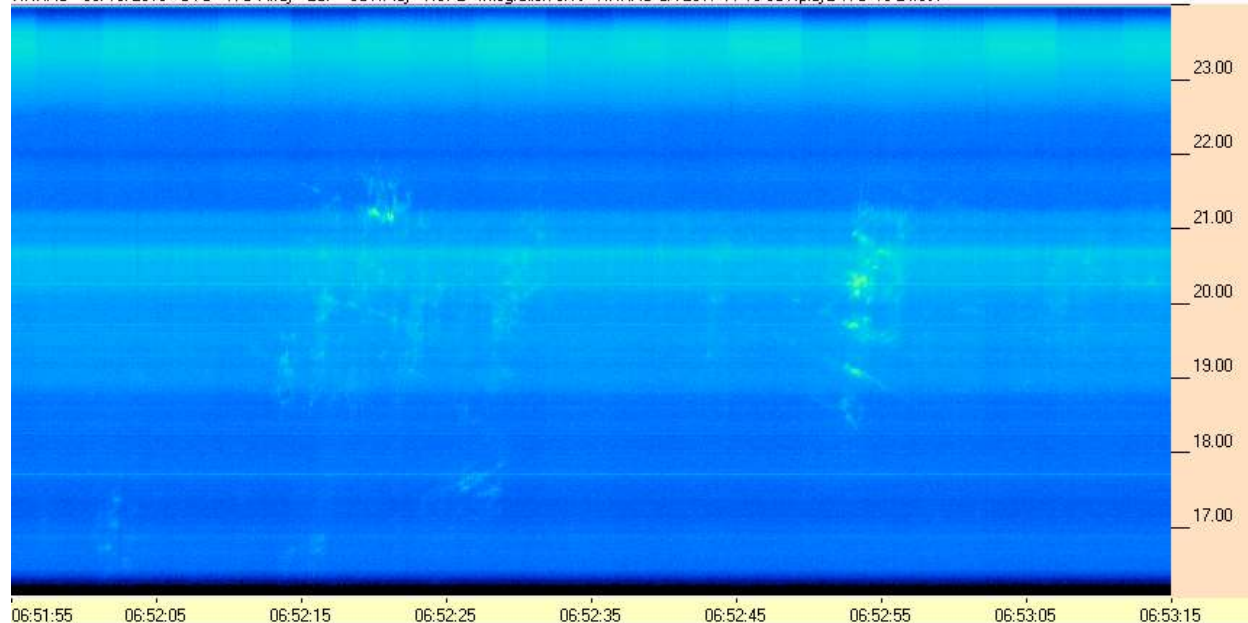
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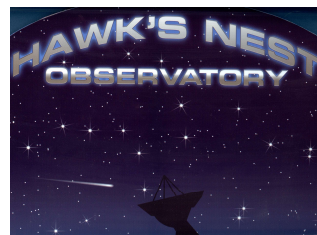
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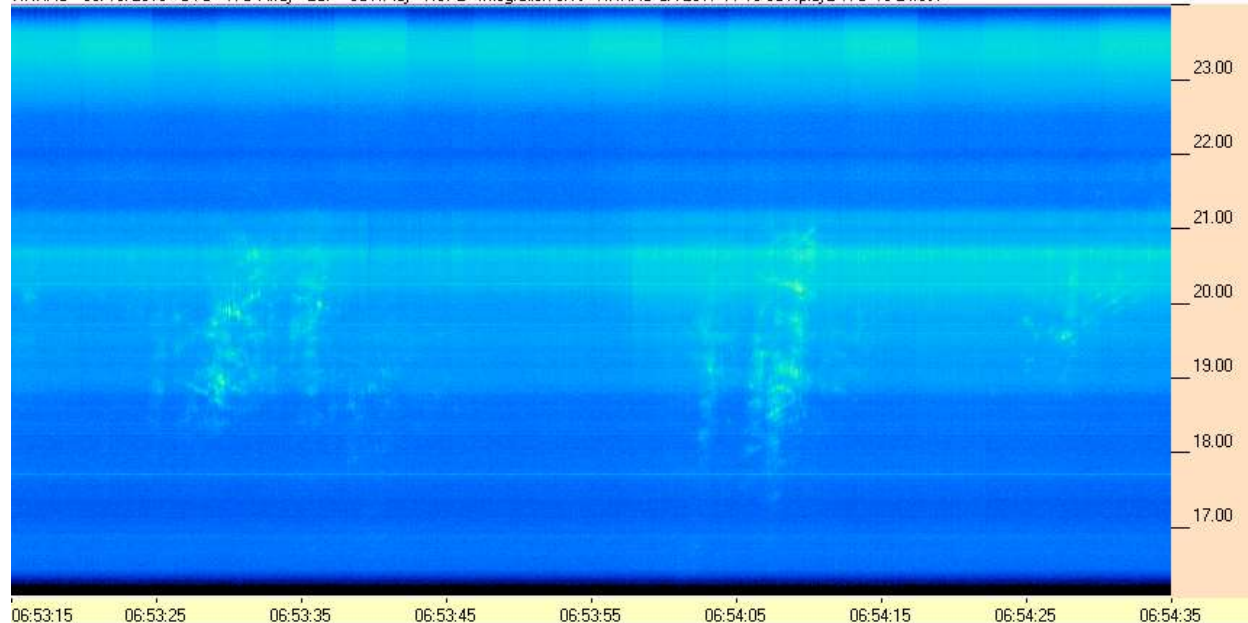
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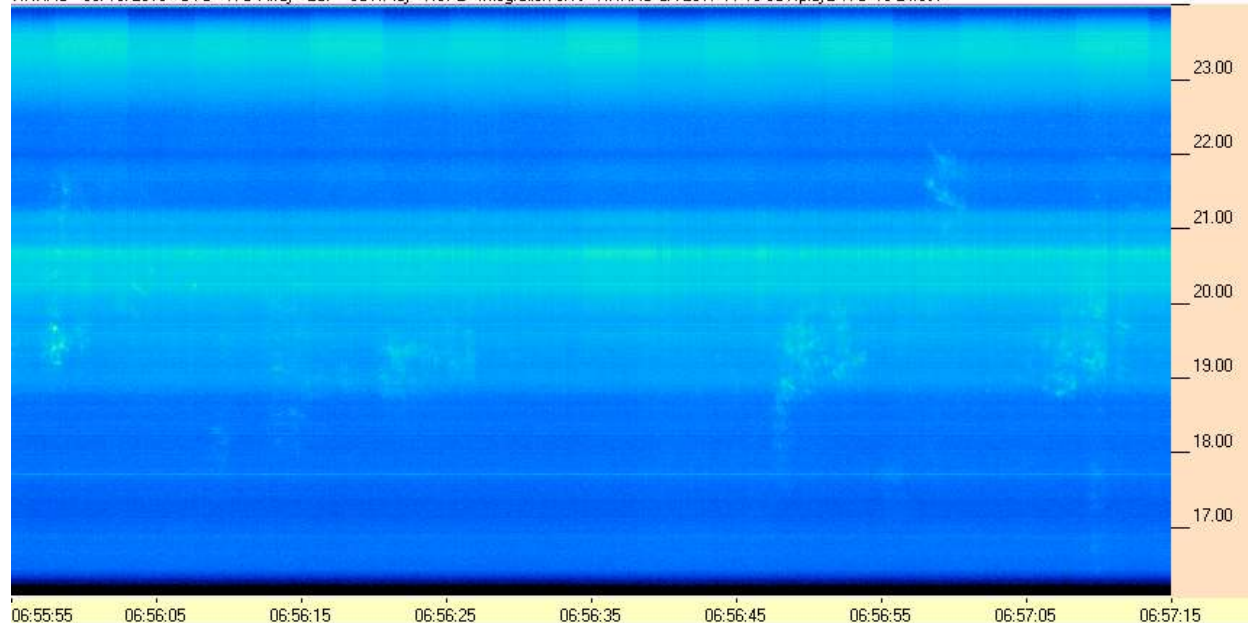
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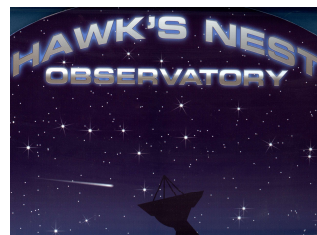
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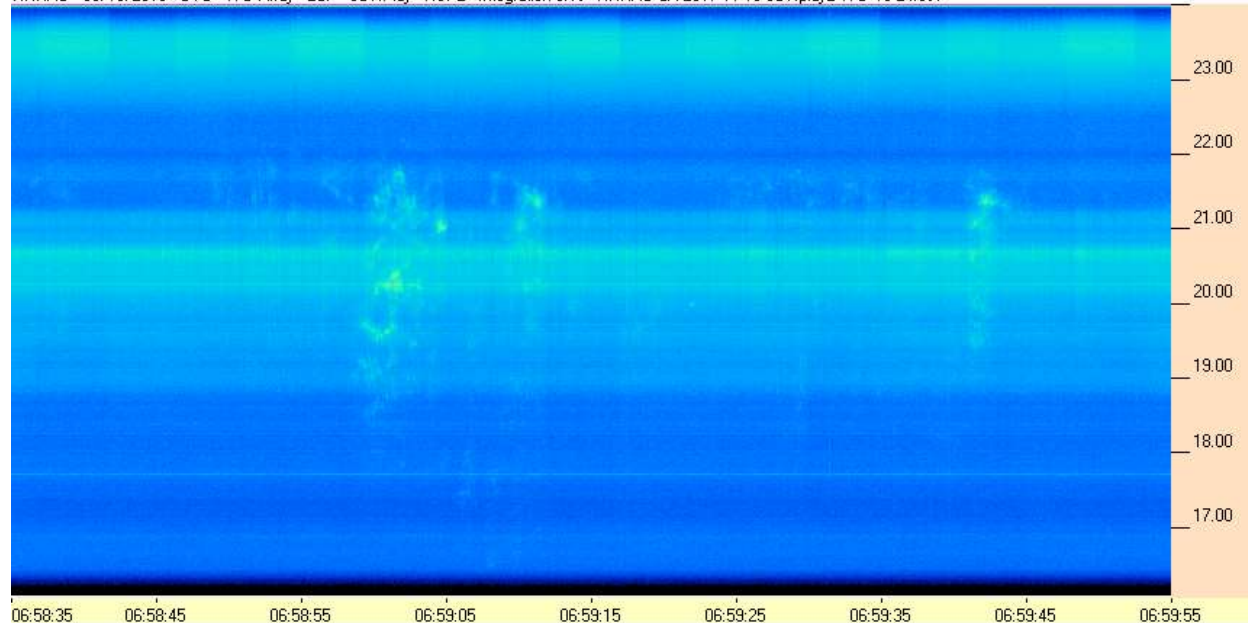
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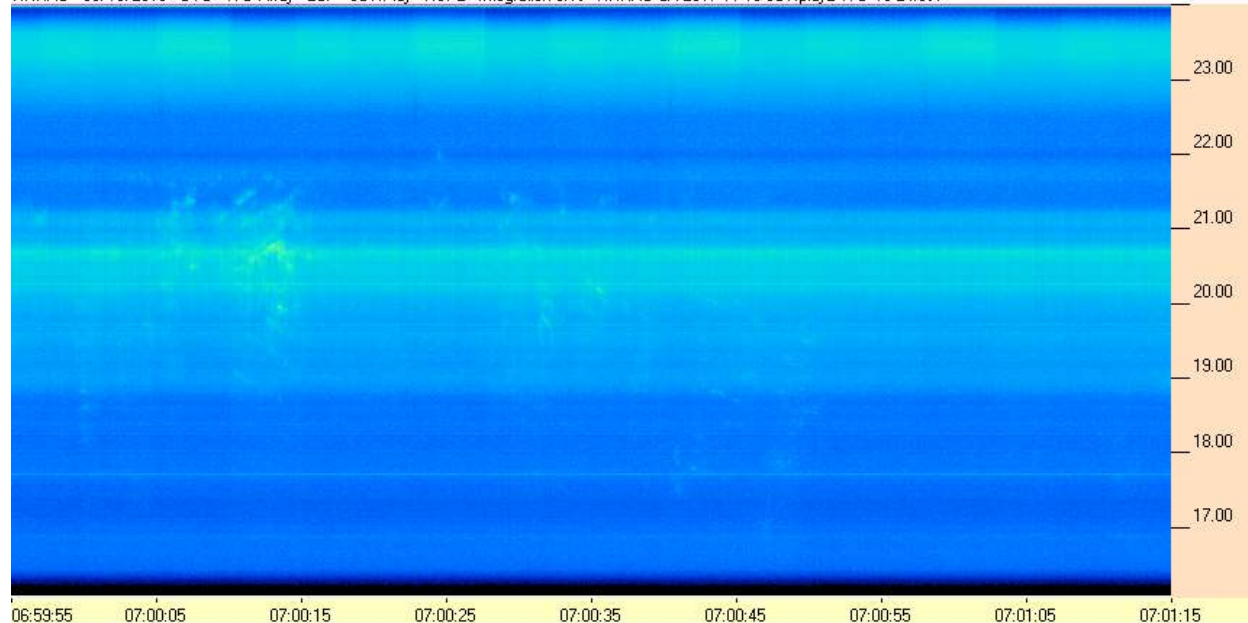
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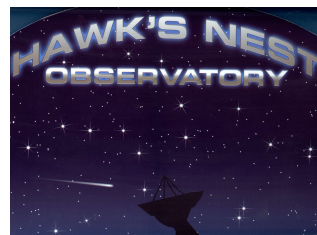


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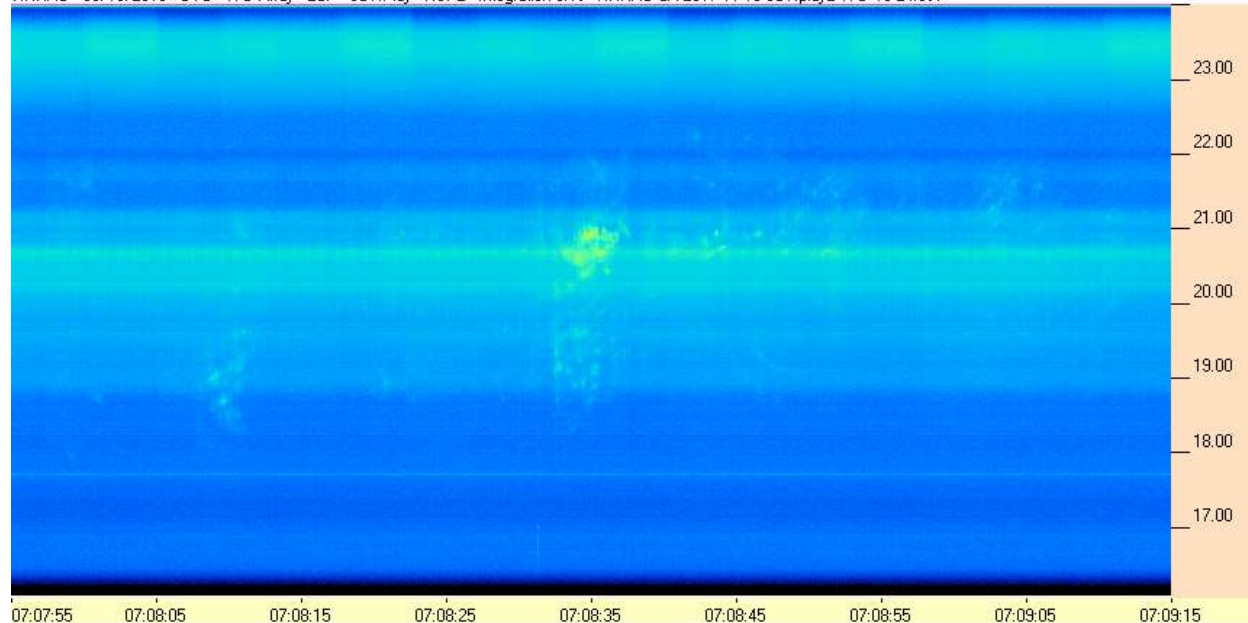


HNRAO Observing Log

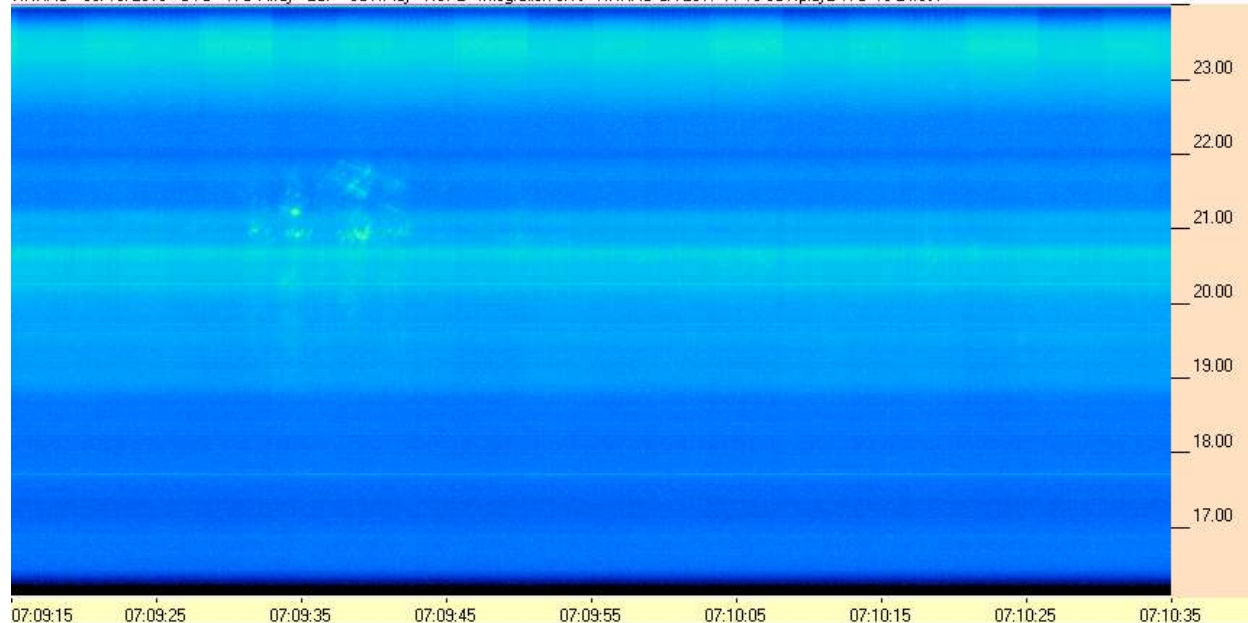
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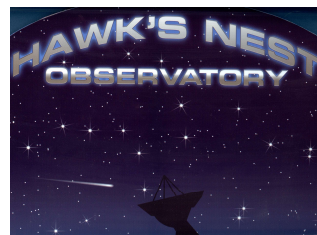
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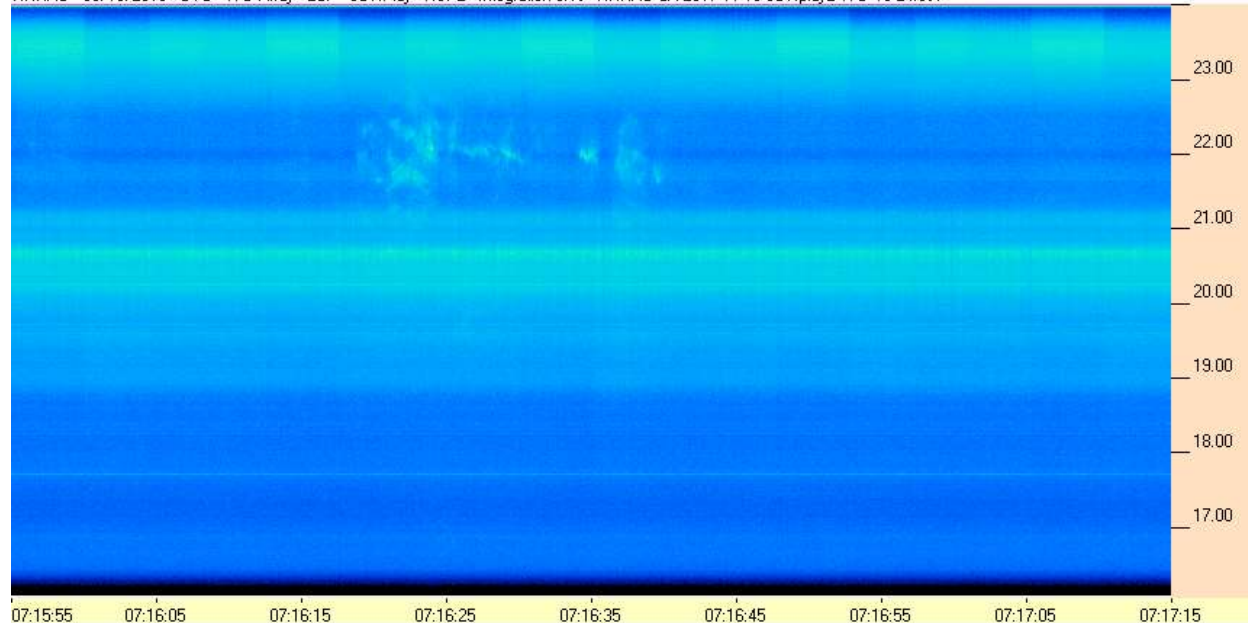
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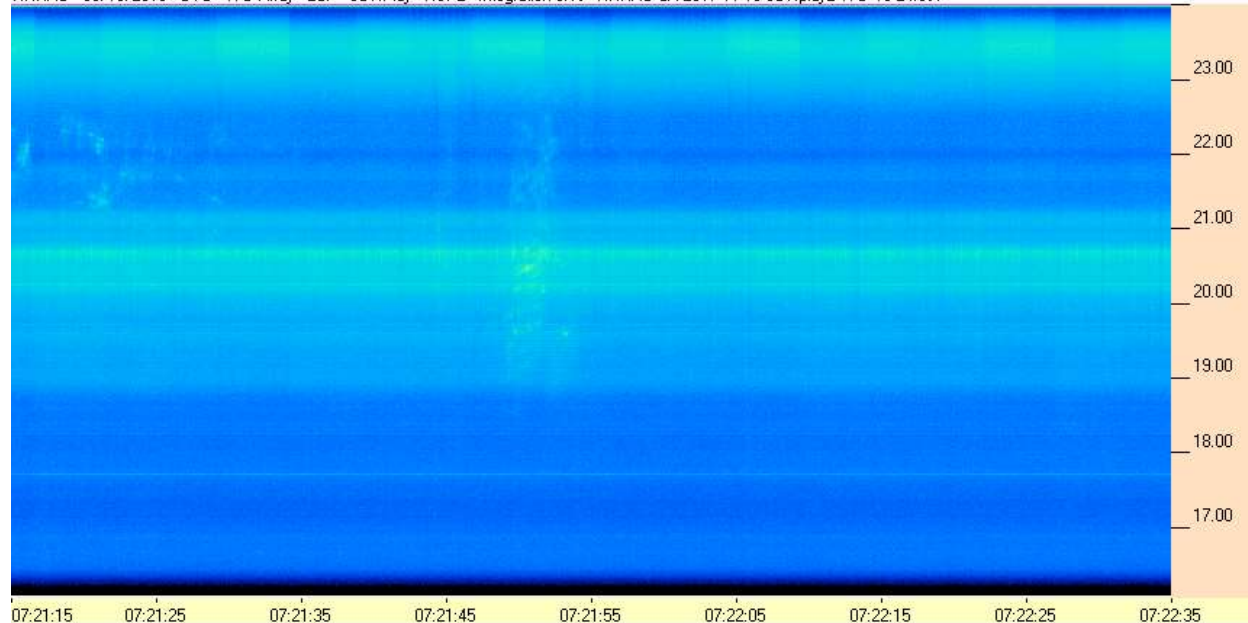
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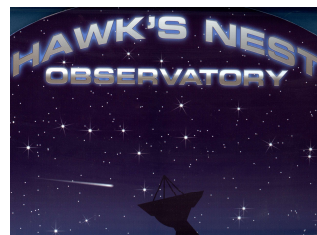
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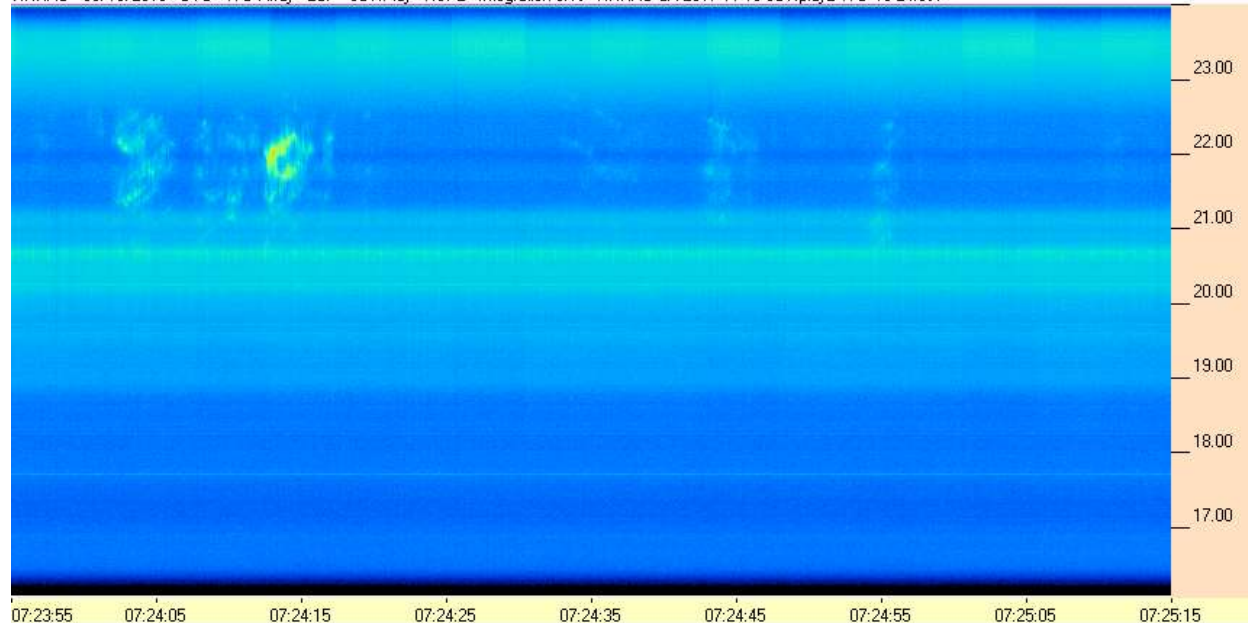
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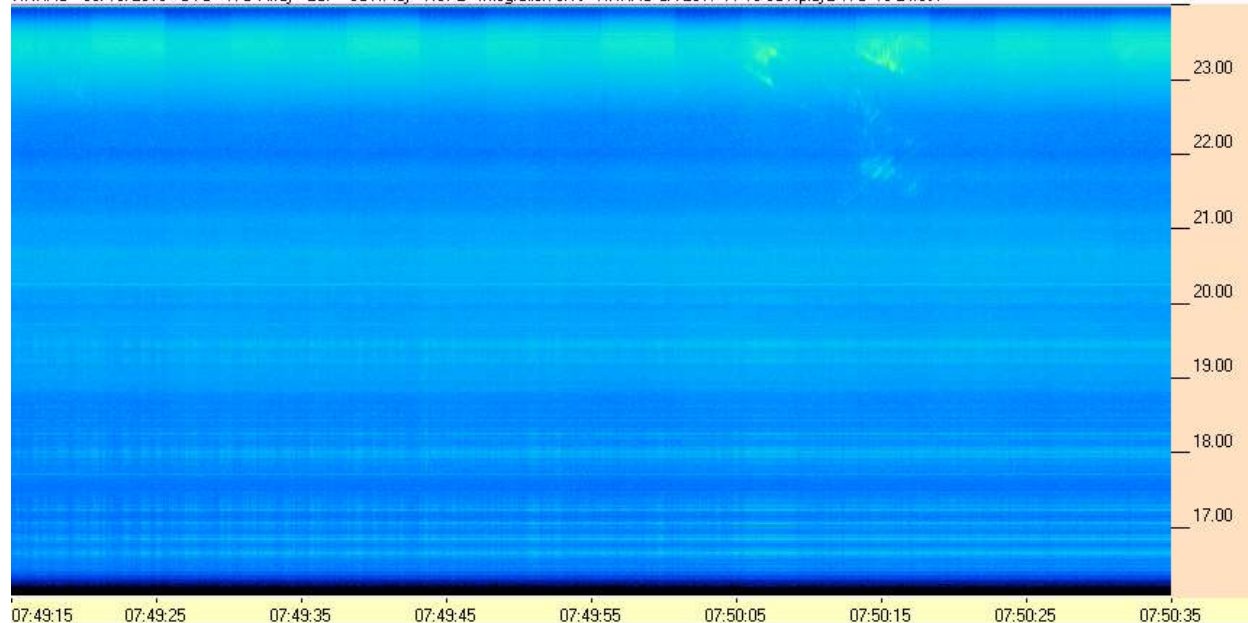
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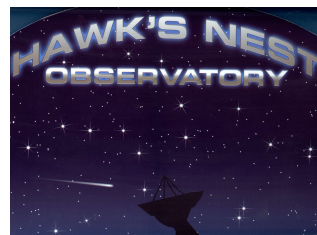
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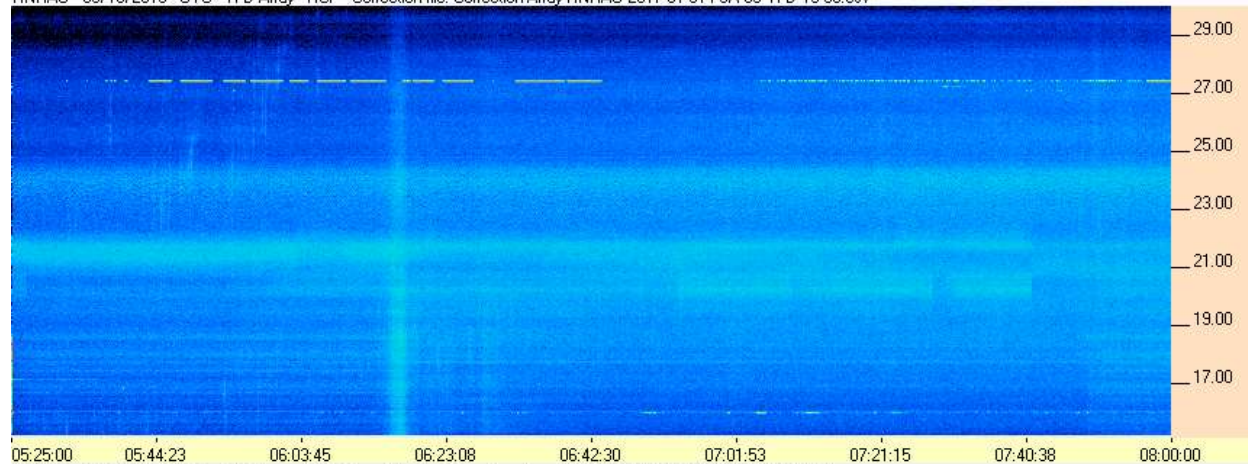


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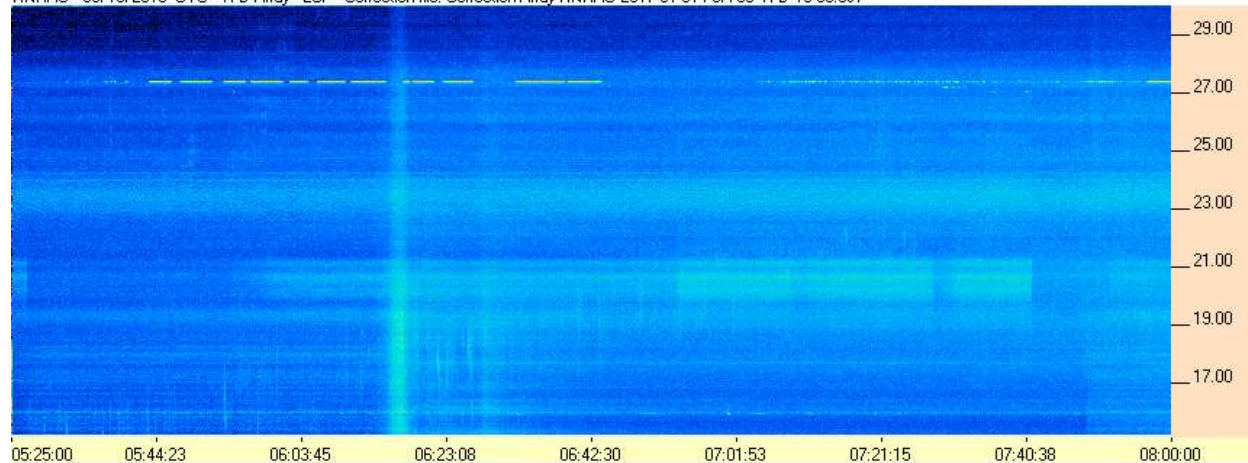


FSX-8S / TFD Array

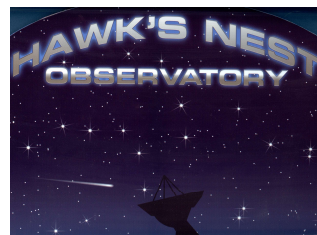
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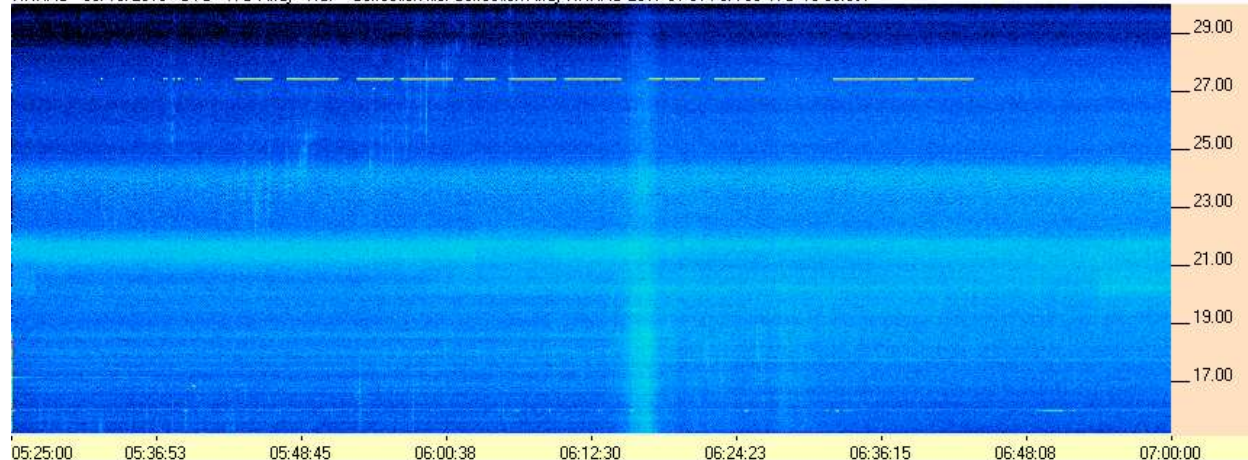
HNRAO - 05/16/2019 - UTC - TFD Array - LCP - Correction file: Correction Array HNRAO 2017 01 31 FSX-8S TFD 15-30.csv



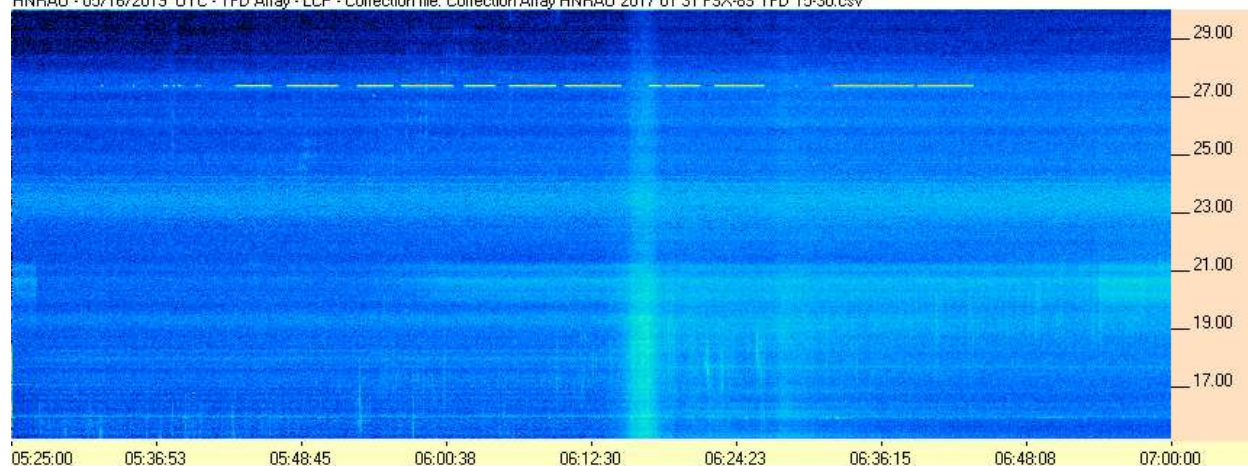
HNRAO Observing Log
40.673181 N – 80.437885 W
EN90sq



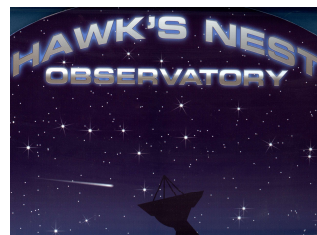
HNRAO - 05/16/2019 - UTC - TFD Array - RCP - Correction file: Correction Array HNRAO 2017 01 31 FSX-8S TFD 15-30.csv



HNRAO - 05/16/2019 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



JOVE II Receiver / JOVE Dipole Array

