

HNRAO Observing Log
40.673181 N – 80.437885 W
EN90sq



Date: December 8, 2019

Object: Jupiter – Io-D

Observer: Unattended

Start - Time UT:	1820	Planetary K-index:	1
Jupiter Altitude (deg):	26.0	Jupiter Azimuth (deg):	181.0
Jupiter CML:	243.3	Jupiter Io Phase:	356.29
Jupiter RA (hr/min):	18:03	Jupiter Dec (hr/min):	-23:19
Hour Angle (hr/min):	00:04	Polarization	LCP
Sun Altitude (deg):	24.4	Sun Azimuth (deg):	199.0
Sun RA (hr/min):	16:52	Sun Dec (hr/min):	-22:32

End – Time UT:	1852		
Jupiter Altitude (deg):	25.5	Jupiter Azimuth (deg):	189.1
Jupiter CML:	262.64	Jupiter Io Phase	000.77
Hour Angle (hr/min):	00:36	Duration (min):	32
Sun Altitude (deg):	22.1	Sun Azimuth (deg):	206.6
Max Frequency MHz	21	Min Frequency MHz	16
J/S Degree Separation	017.0	De:	-2.2

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	9/21/2019

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

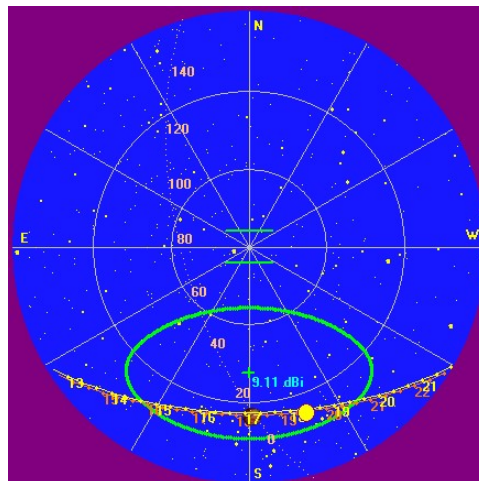
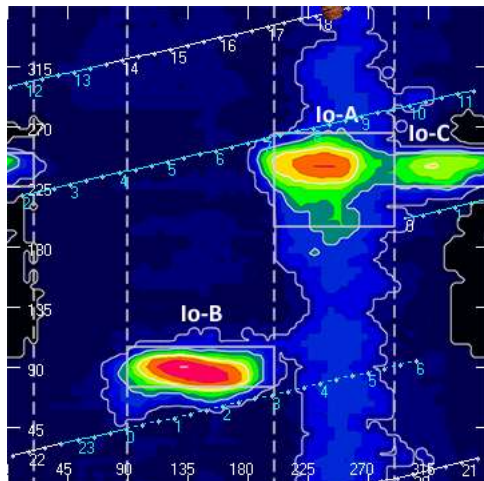
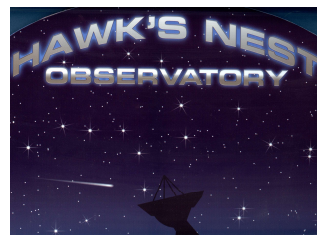
Radio Sky Spectrograph software version 2.9.30

Radio-SkyPipe software version 2.7.33 Radio-Jupiter Pro software version 3.8.2

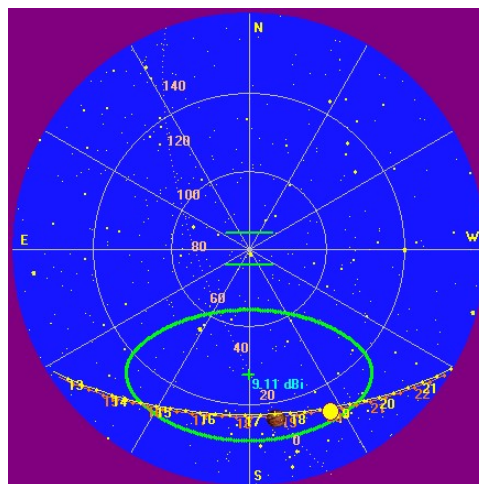
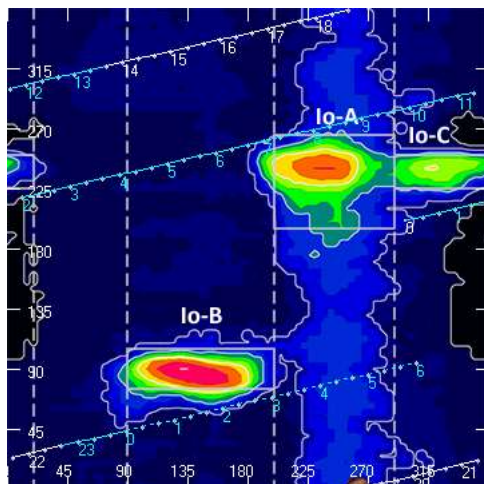
Network Time Server GpsNtp-Pi, Reeve Engineering

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

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Beginning of Pass



End of Pass



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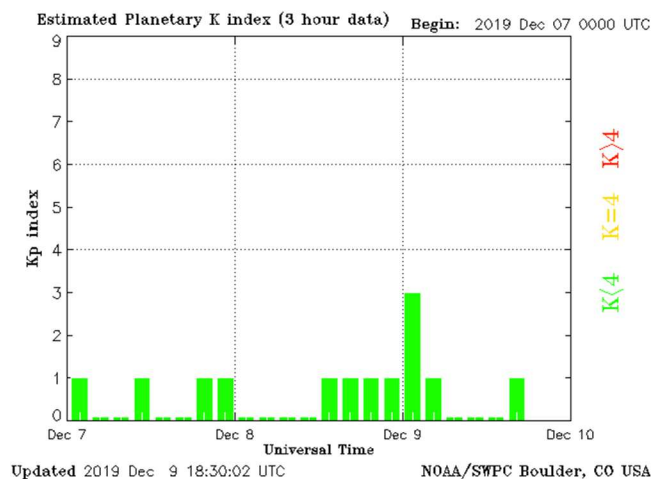


MODE	CML RANGE	Io RANGE	MAX F	POLAR	ARC	NOTES
Io-D	0-200	95-130	18	LH	Early	Also called "fourth source"
Io-B	(105 - 185)	(80-110)	39.5	RH	Early	Also called "early source"
non Io-B	80-200	0-360	38	RH	Early	Voyager info
Io-A	(200-270)	(205-260)	38	RH	Late	Also called "main source"
non-Io-A	(230-280)	0-360	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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Weather at the observatory was cloudy and 51 deg F.

The FSX-8S, FSX-2, SDRPlay RSP2 LCP spectrographs were operating normally and collecting good data. The FSX-2 spectrograph was in RCP mode and no data relevant to this storm was collected. The SDRPlay RSP2 RCP spectrograph was offline due to software issues. The Radio JOVE receiver was offline do to local RFI. All observatory antennas were nominal.

Foreign broadcast stations were strong below 16 MHz but were not strong enough to mask the Jupiter emissions. Another strong foreign broadcast station was at 21.5 MHz but since the emissions didn't reach that high, it didn't have any affect on the data.

Storm emission temperatures were measured with the MKII calibrator and RSS version 2.9.29.

An LCP Io-D storm with positive drift L-bursts and negative slope L4 modulation lanes.

Modulation lanes ranged from 50 kHz/sec at 16 MHz to 100 kHz/sec at 19 MHz.

Galactic background (GB) was sampled at 1820 UT and measured **76kK @ 16 MHz** and **87 kK @ 19 MHz**. The GB was again sampled at 1850 UT, at the end of the storm, to be **74 kK @ 16 MHz** and **87 kK @ 19 MHz**.

At 1820 UT, L-bursts with negative slope L4 modulation lanes appeared between 16 MHz and 17 MHz. These L-burst modulation lanes were slightly above GB at **78 kK @ 16.2 MHz**. Weak L-bursts continued between 16 MHz and 17 MHz until 1822:40 UT.

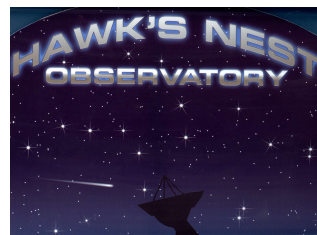
Between 1822:40 UT and 1822:55 UT, a relatively stronger emission group was observed, again between 16 MHz and 17 MHz. This group was observed to be, at its hottest, **116 kK @ 16.4 MHz**.

Another weak group from 1823:23 UT and 1823:41 UT between 16 MHz and 17 MHz. No other emissions observed until from 1825:28 UT to 1825:36 UT. This was a very weak group, slightly above GB. Other modulation lanes were visible, but these too were just above GB and difficult to see at hardware/software resolution.

At 1828 UT, one of the strongest emission group of the storm, between 16.4 MHz and 18 MHz, was observed with the hottest burst at 1828:16 UT as **400 kK @ 16.7 MHz**. This group was oval, spanning 2 MHz over a 14 second time period and lasted until 1828:23 UT. Very weak emissions continued from this point, and the drift continuing positive.

At 1830 UT, emissions were up to 18 MHz. A long period of no observed emissions between 1830:40 UT and 1838:50 UT. At 1840 UT, emissions became more regular as well as climbing higher in frequency.

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By 1846 UT, emissions were up to 19 MHz with a strong cluster, at its hottest, **263 kK @ 18 MHz**. Emissions reached 19.5 MHz by 1846:21 UT.

Two stronger clusters were observed between 1848:38 UT and 1848:50 UT, with the hottest emissions at **467 kK @ 19.4 MHz**, and another between 1849:10 UT and 1849:16 UT with the hottest emissions at **254 kK @ 19.7 MHz**.

Emissions leveled off near 20 MHz by 1849 UT.

The last recognizable Jupiter emissions were centered 19.5 MHz @ 1851:30 UT and these were very diffuse with the hottest emission at **151 kK @ 19.3 kK**.

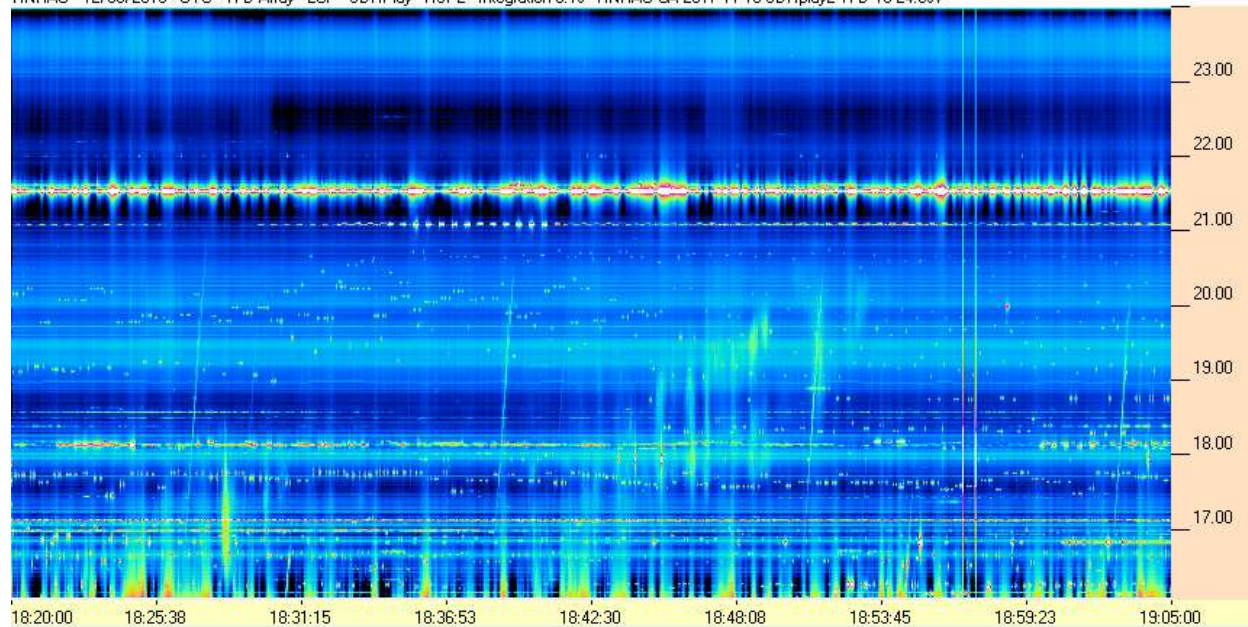
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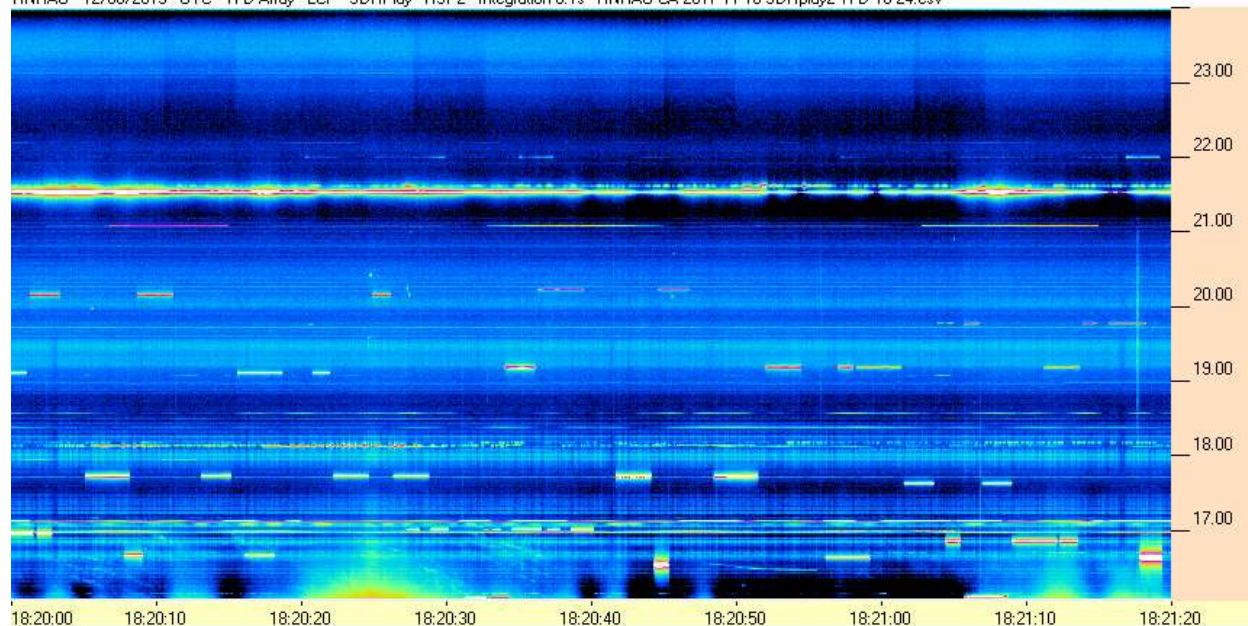


SDRPlay RSP2 / TFD Array

HNRAO - 12/08/2019 - UTC - TFD Array - LCP - SDRPlay - RSP2 - Integration 0.1s - HNRAO CA 2017 11 10 SDRplay2 TFD 16-24.csv



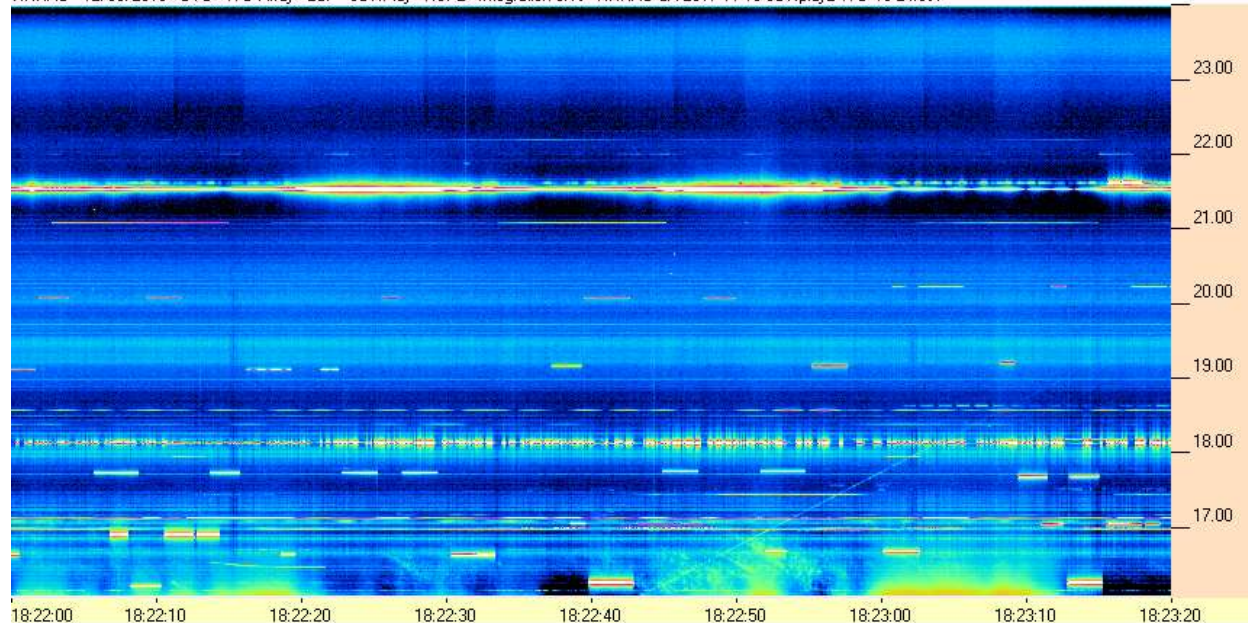
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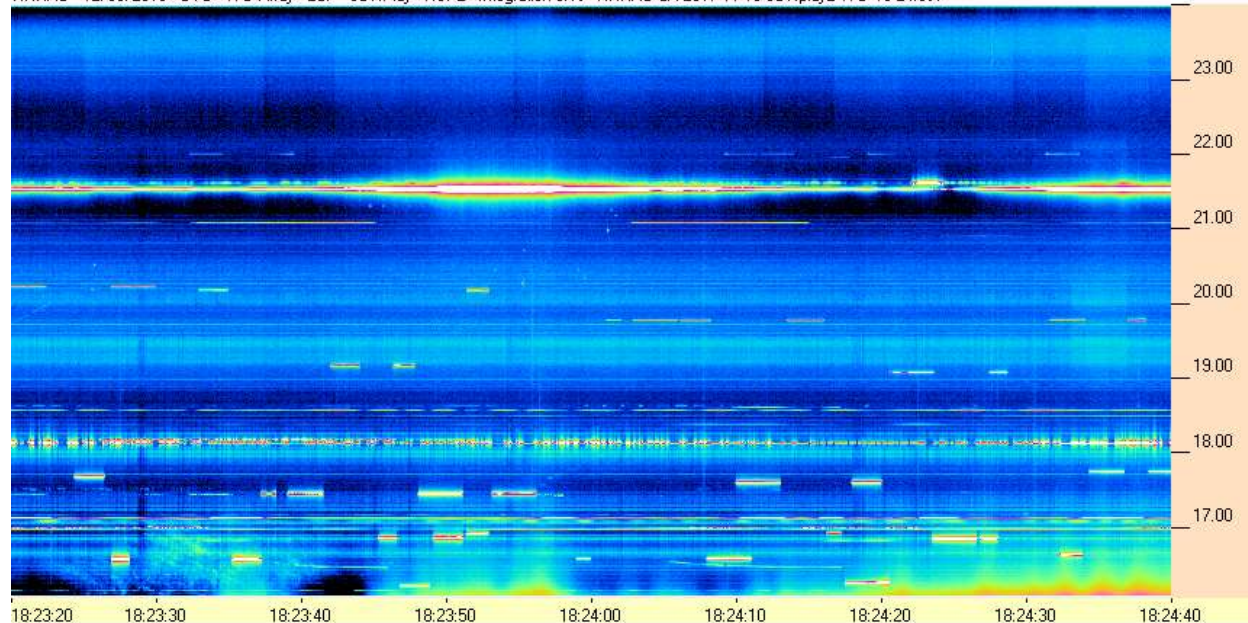
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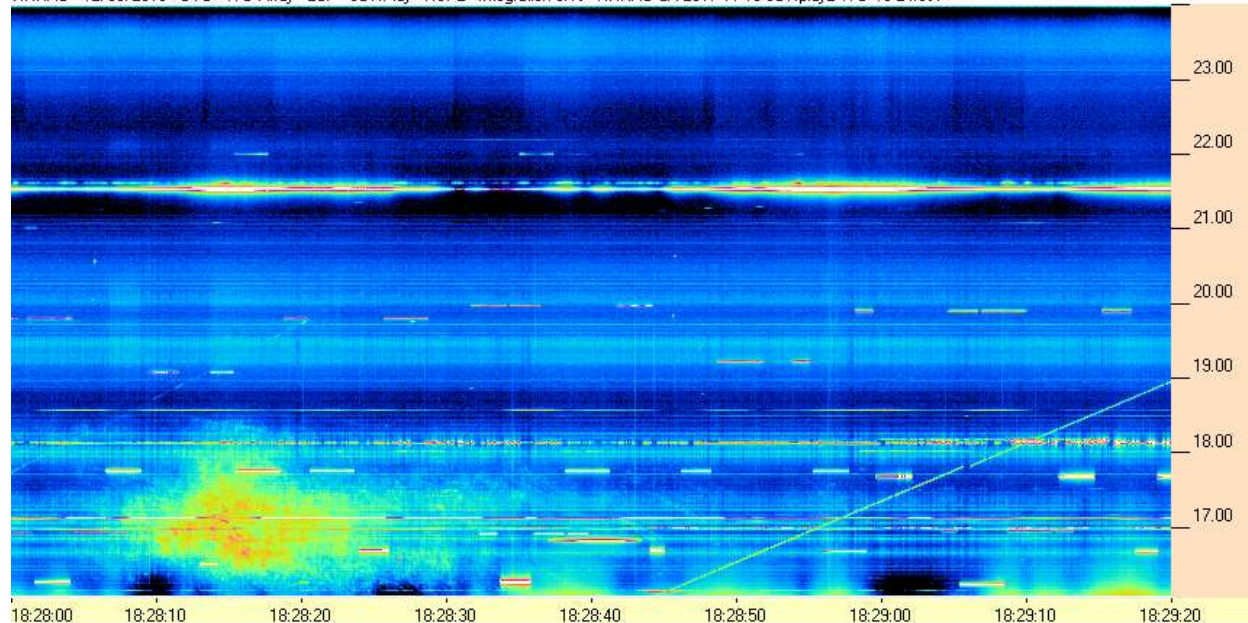


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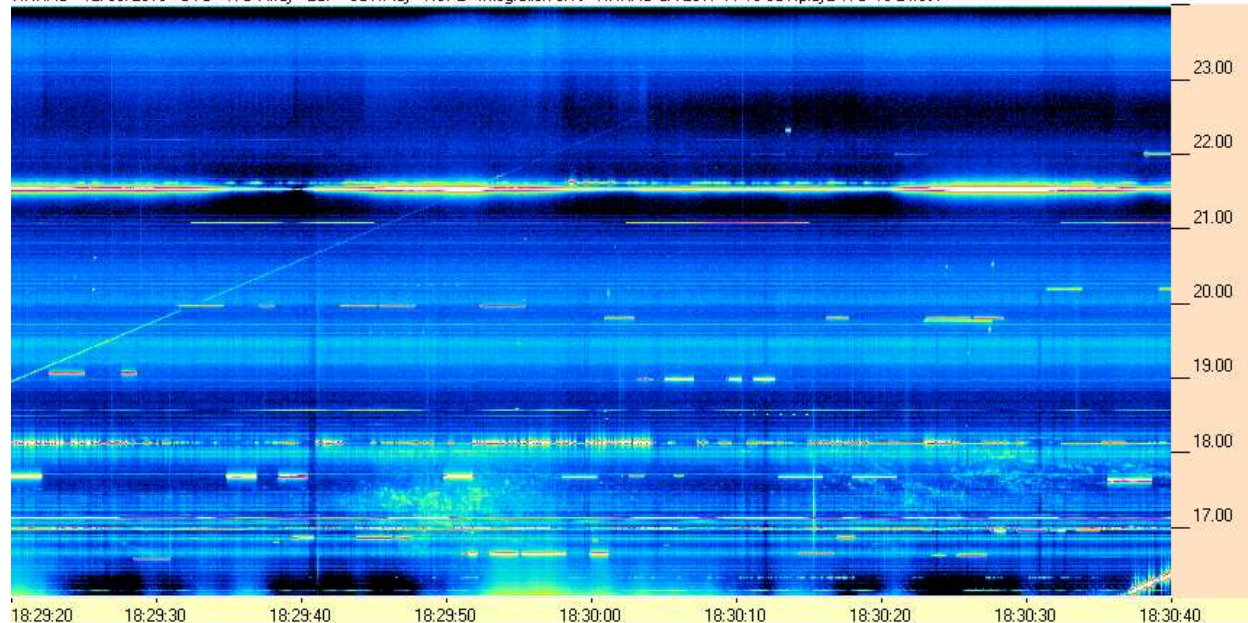
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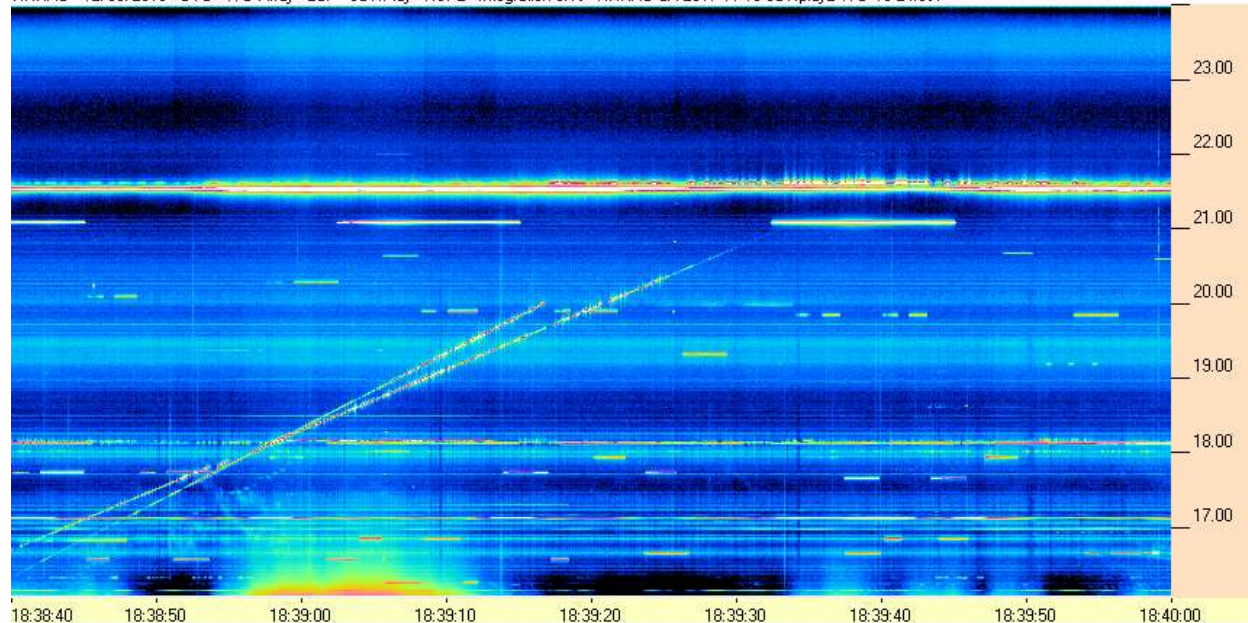
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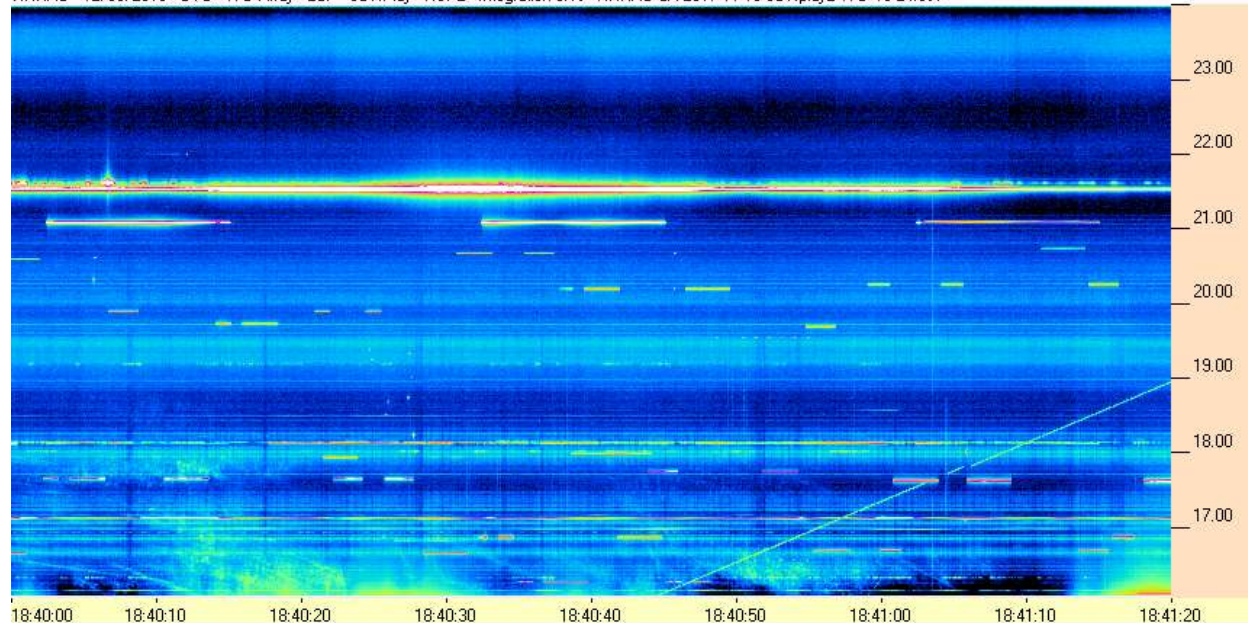
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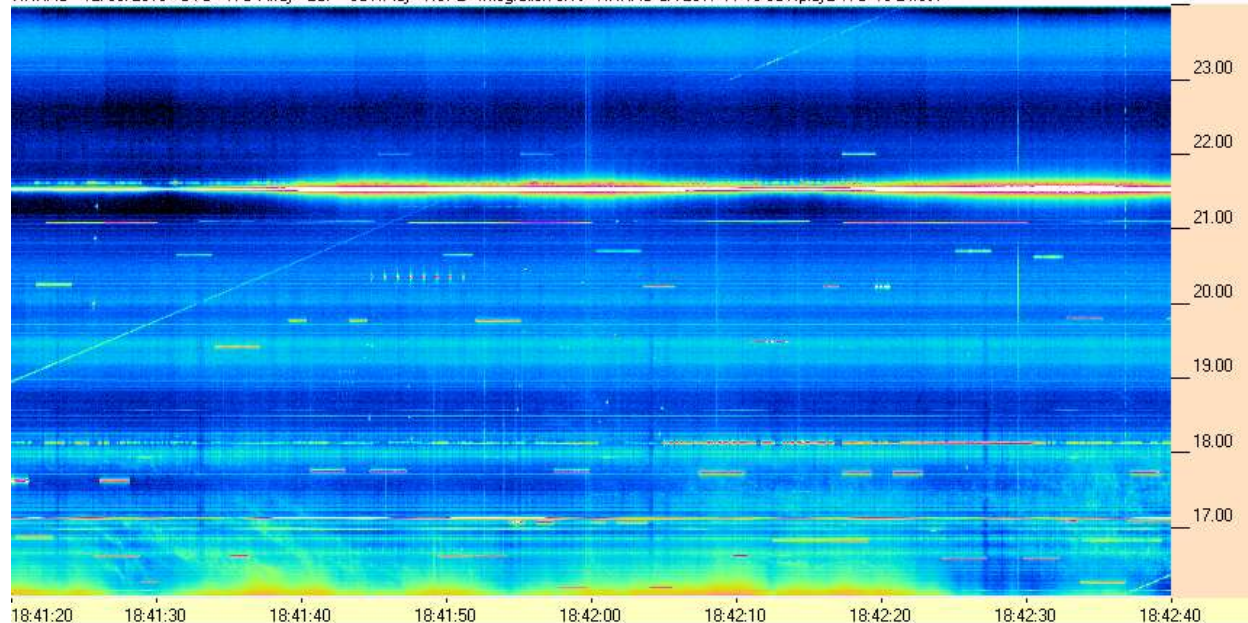
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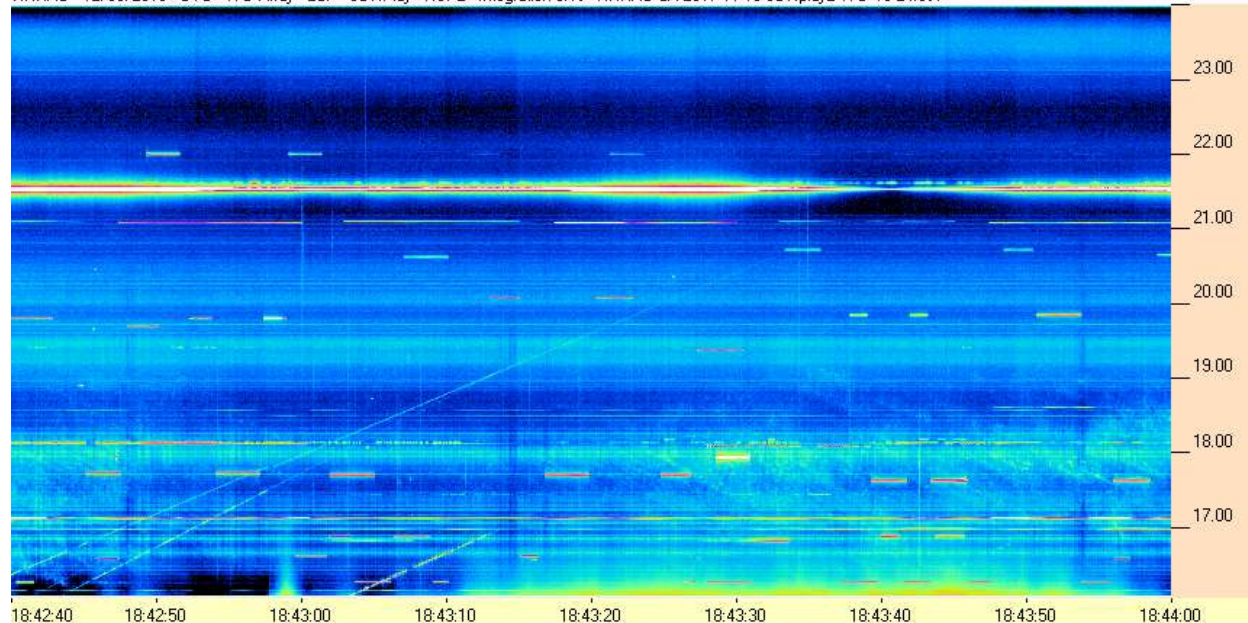
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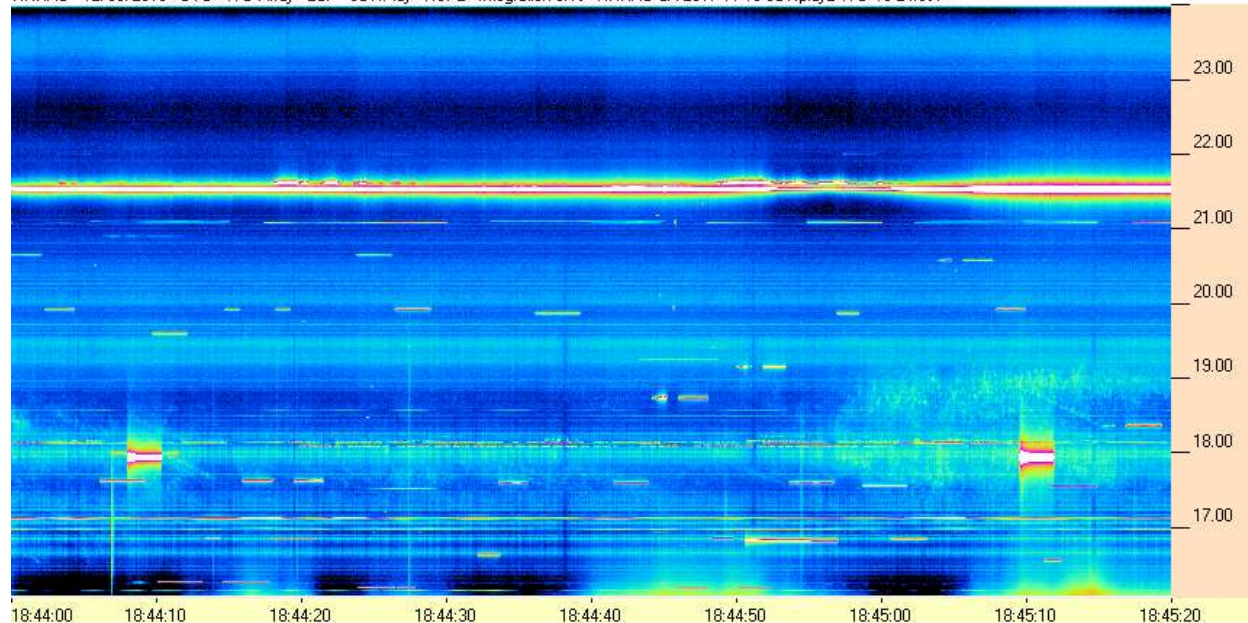
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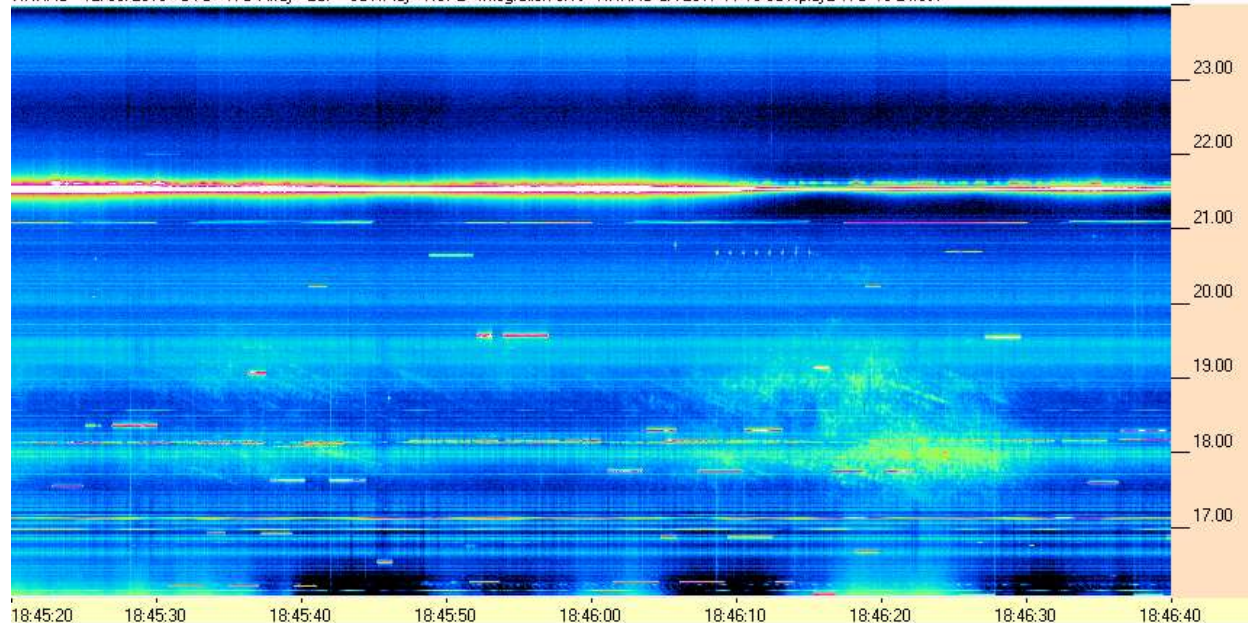
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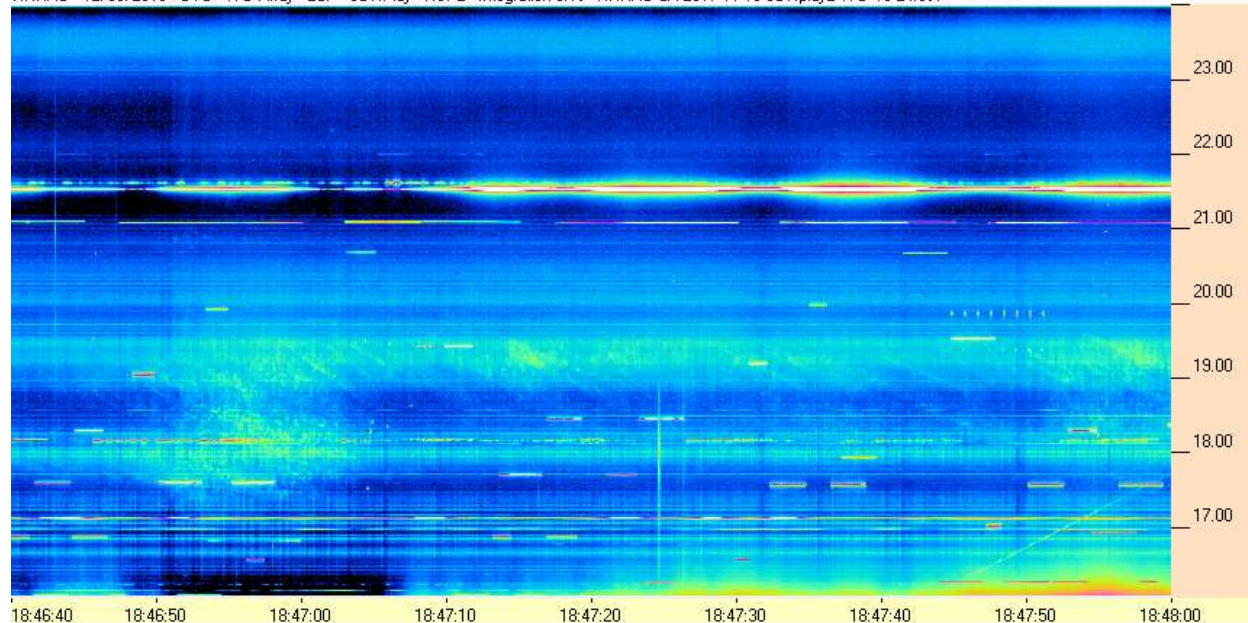
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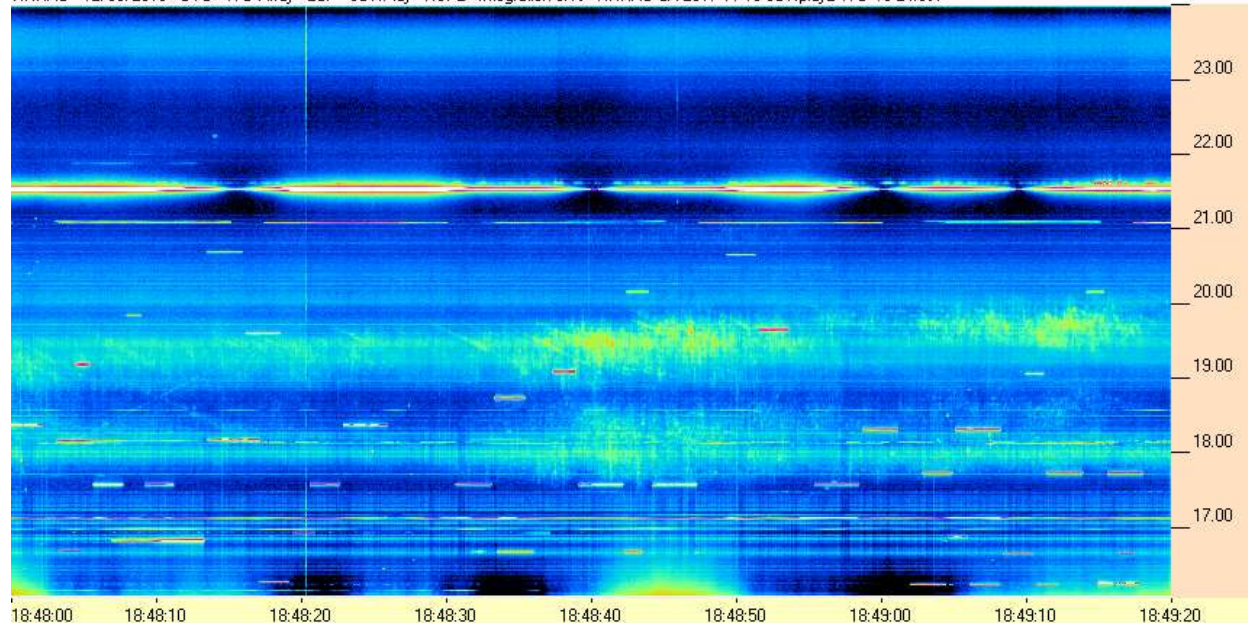
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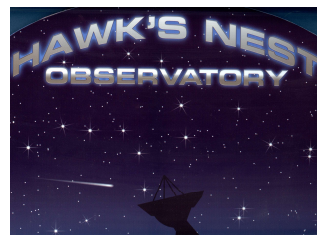
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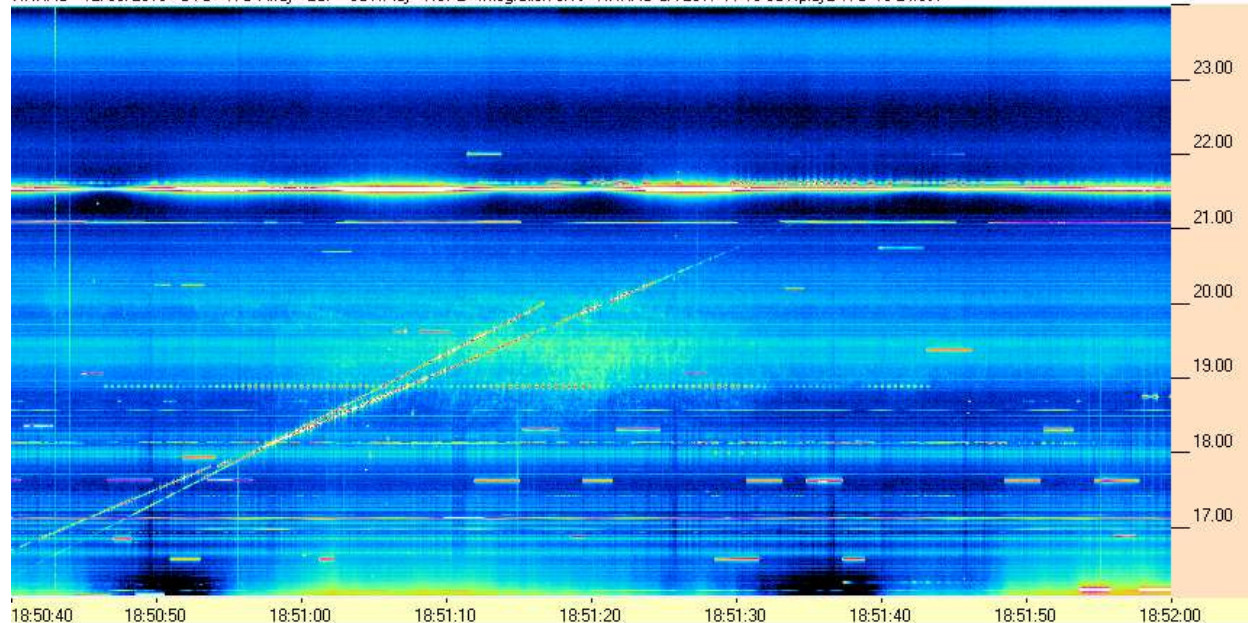
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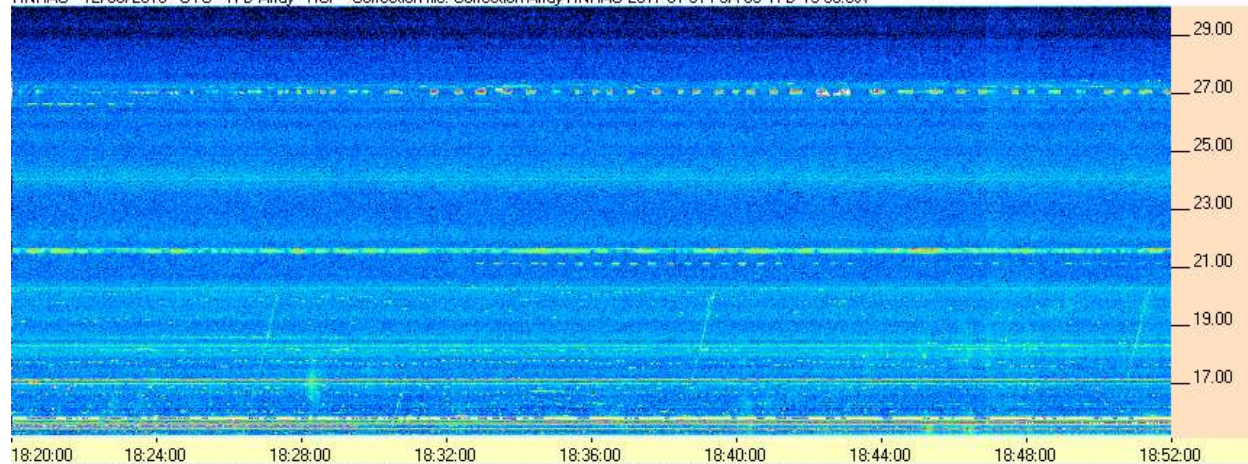


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FSX-8S / TFD Array

HNRAO - 12/08/2019 - UTC - TFD Array - RCP - Correction file: Correction Array HNRAO 2017 01 31 FSX-8S TFD 15-30.csv



HNRAO - 12/08/2019 - UTC - TFD Array - LCP - Correction file: Correction Array HNRAO 2017 01 31 FSX-8S TFD 15-30.csv

