

HNRAO Observing Log
40.673181 N – 80.437885 W
EN90sq



Date: 11 January 2017

Object: Jupiter – Io-B

Observer: JB

Start of pass:	0912 UT		
Jupiter Altitude:	33.8 degrees	Jupiter Azimuth:	140.9 degrees
Jupiter CML:	106.63	Jupiter Io Phase:	087.60
Jupiter RA:	13:22	Jupiter Dec:	-07:14
Sun Altitude:	-38.4 degrees	Sun Azimuth:	087.2 degrees
Sun RA:	19:24	Sun Dec:	-22:02

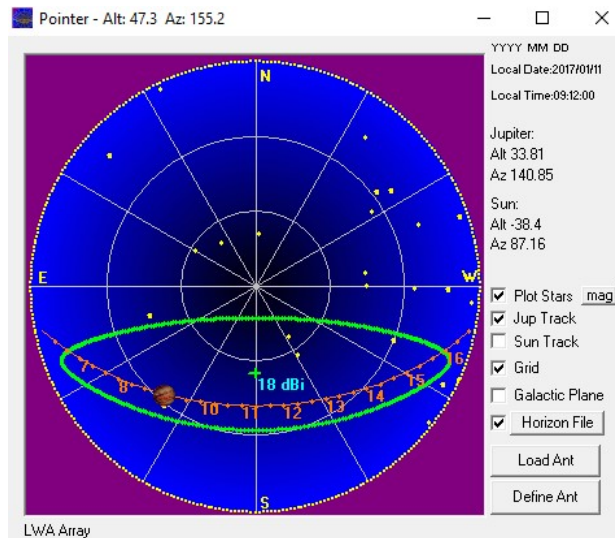
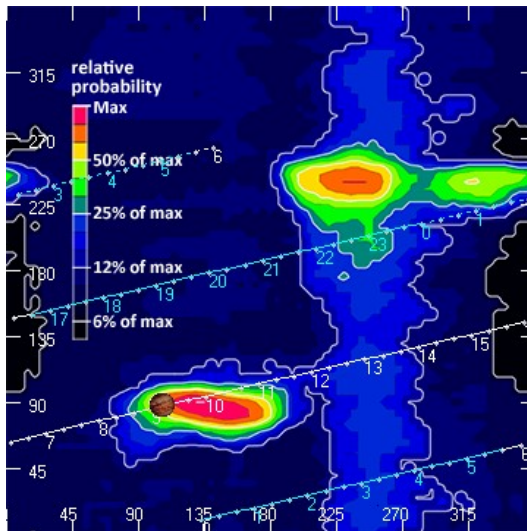
End of pass:	1111 UT		
Jupiter Altitude:	42.0 degrees	Jupiter Azimuth:	177.2 degrees
Jupiter CML:	178.57	Jupiter Io Phase	104.27
Sun Altitude:	-16.1 degrees	Sun Azimuth:	105.5 degrees

Observations made using:

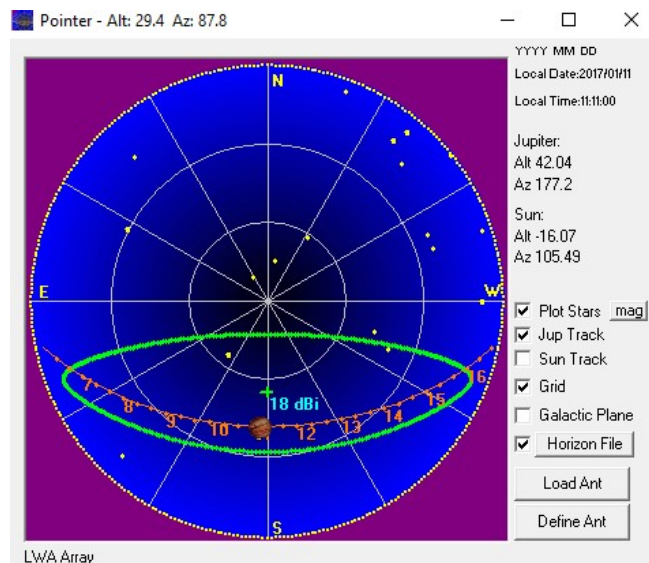
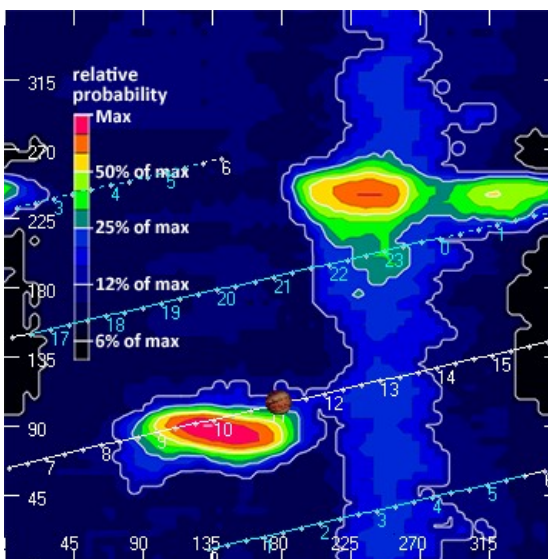
1. FSX-8S fed by the TFD array
 - a. Connect to array through HNRAO Multicoupler #1 and #2, port 2
 - i. HNRAO Multicoupler #1 – TFD/LCP
 - ii. HNRAO Multicoupler #2 – TFD/RCP
 - iii. Port 1 having 10 dB of gain, all other ports on Multicoupler have approximately 3 dB gain.
2. FSX-2 fed by the LWA array directly
 - a. LWA element configuration – 90 degrees
3. JOVE 2 receiver fed by phased JOVE dipoles @ 10' – phased for 2016-17 season
 - a. Calibrated 28 Nov. 2016
 - b. Connected to dipoles through HNRAO Multicoupler #3, port 1.
4. Icom R75 receiver fed by experimental DDRR antenna directly.
 - a. Calibrated 28 Nov. 2016

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Beginning of Pass



End of Pass

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An unremarkable Io-B storm, however, some very interesting structure at times. Emissions spanned the full spectrum being scanned, 15 MHz to 30 MHz. First emissions seen here began at 0912 UT and ended at 1111 UT. Starting, as it typical of an Io-B storm, with S-bursts and finishing with L-bursts. Beginning with S-burst clusters, emissions were near vertical but transitioned into positive sloping arcs about 1022 UT. The strongest emissions were between 1021 UT and 1030 UT. Modulation lanes were very evident. The last positive sloped arc between 1045 UT and 1115 UT rose to 25 MHz before the last emissions were observed here. There was a great deal of activity at 20.1 MHz for Radio JOVE observers. Simultaneous observations of the HNRAO, LGM and AJ4CO SkyPipe displays revealed the effect the ionosphere has on the reception of Jupiter radio emissions. At times, one station would have strong bursts and others none. LGM and AJ4CO are only a few miles apart, yet their SkyPipe charts varied greatly at times. My SkyPipe charts and images have been uploaded to the Radio JOVE archive.

- Completed step calibration of
 - Steps 94 kK, 188 kK, 375 kK, 747 kK, 1.5 MK, 3 MK, 6 MK, 12 MK, 24 MK, 47 MK
 - JOVE 2/Dipoles @ 0520 UT
 - Icom R75 @ 0525 UT
 - FSX-2/LWA pair @ 0530 UT
 - FSX-8S/TFD RCP @ 0531 UT
 - FSX-8S/TFD LCP @ 0533 UT
- Conditions at observatory
 - 50 degrees F
 - Partly cloudy
 - Wind advisory in effect until 0800 UT
- 0546 UT
 - Strong power line noise turned on.
 - SkyPipe shows it to be about 74 kK
 - Centered at 24 MHz but spans from 23-25 MHz
- 0800 UT
 - Earlier power line interference gone.
 - Weather clear. No rain.
 - FSX-8S quiet with mild power line banding
 - FSX-2 quiet with weak cable tv waves
 - JOVE 2/Dipoles quiet with no atmospherics
 - Reoccurring 14 second RFI on JOVE 2/SkyPipe
 - Closest lightning 1750 miles – Weather Bug
 - Solar activity was very low. A series of B-class flares occurred from a spotless area of plage near N16W80, the largest being a B8 flare at 10/1300 UTC. No

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spotted regions were present on the visible disk and no Earth-directed CMEs were observed in available coronagraph imagery. - NOAA

1. 0800 UT

- a. Initial GB readings
 - i. HNRAO JOVE 40 kK
 - ii. LGM JOVE 43 kK TFD 48 kK
 - iii. AJ4CO JOVE 22 kK TFD 25 kK
- b. Jupiter just entering outer band of Io-B region
 - i. Altitude 24.32 degrees
 - ii. Azimuth 124.79 degrees

2. 0815 UT

- a. **10:19 LMST**
- b. RJP Jupiter probability 12%
 - i. Altitude 26.31 degrees
 - ii. Azimuth 127.6 degrees

3. 0850 UT

- a. **10:55 LMST**
- b. RJP Jupiter 31% probability
 - i. Altitude 31.02 degrees
 - ii. Azimuth 135.27 degrees

4. 0912 UT

- a. **11:16 LMST**
- b. **S-bursts 17 MHz RCP**
 - i. Weak horizontal line
 - 1. Barely above GB
 - ii. FSX-2 only

5. 0921 UT

- a. S-bursts on SkyPipe
 - i. FSX-2

6. 0923 UT

- a. S-bursts higher @ 23 MHz
- b. SkyPipe now showing s-bursts
 - i. Strong cluster 0923 UT

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- ii. Showing on LGM and AJ4CO

7. 0925 UT

- a. 11:30 LMST
- b. Double bands of s-bursts
 - i. 19 MHz and 23 MHz

8. 0926:37 UT

- a. More s-bursts on SkyPipe

9. 0928 UT

- a. Very strong cluster of s-brsts
 - i. SkyPipe and FSX-1 and FSX-8S
 - ii. SkyPipe bursts show 234 kK

10. 0932 UT

- a. Strong cluste of S-bursts now at 25 MHz
- b. Long string with a decending arc
- c. Some bursts very strong

11. 0934:18 UT

- a. Another strong S-burst group
 - i. On SkyPipe
- b. One line at 19 MHz and another line at 24 MHz

12. 0940 UT

- a. L-bursts at 25 MHz
 - i. Particularly strong burst on SkyPipe 0940:07
 - ii. All three of us saw these emissions. Of the three, it was strongest here.
 - iii. Vertical emissions spanning 18-27 MHz

13. 0942 UT

- a. Wes and Dave show strong L-burst activity on their SkyPipe chart. There is virtually none on mine.

14. 0945 UT

- a. Modulation lanes at 25-27 MHz
- b. Emissions stronger on FSX-2/LWA than FSX-8S/TFD

15. 0946:20 UT

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- a. Another round of very strong activity on Wes and Daves SkyPipe with no sign of emissions here.

16. 0948:17 UT

- a. Weak SkyPipe

17. 0951:16 UT

- a. L-bursts SkyPipe

18. 0953 UT

- a. Activity has moved up from 25 MHz to beyond 30 MHz
- b. FSX-2/LWA continues to see stronger emissions than FSX-8S/TFD

19. 0958 UT

- a. Activity resumes in upward arc from 15 MHz
- b. SkyPipe shows L-burst at 0958:28 UT

20. 1001:20 UT

- a. L-bursts SkyPipe

21. 1007:47 UT

- a. L-bursts SkyPipe

22. 1022 UT

- a. Very strong emissions centered at 17 MHz
 - i. **Strongest of the storm**
 - ii. Modulation lanes very prominent
 - iii. SkyPipe @ 1023:09 UT
 - iv. Upward arc to emissions
 - v. Continued SkyPipe activity as emissions pass through passband of JOVE receiver.

23. 1025 UT

- a. From 1025 UT, positive emissions arc. Passing to 25 MHz.
- b. Secondary arc beginning at 1026 UT also positive
- c. All L-bursts

24. 1028 UT

- a. Very strong emissions between 17-20 MHz
 - i. Modulation lanes very prominent

25. 1030:38 UT

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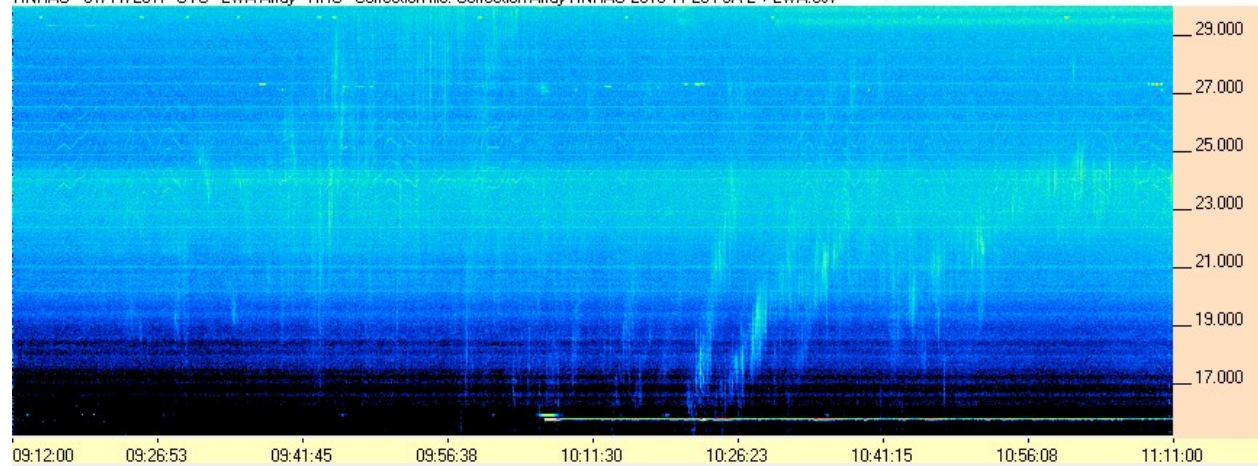
- a. L-bursts on SkyPipe
 - i. 1031:32
- 26. 1045 UT**
 - a. Emissions continue. 19 MHz
- 27. 1046:41 UT**
 - a. SkyPipe L-bursts
- 28. 1050 UT**
 - a. Emissions continue at 21 MHz
- 29. 1111 UT**
 - a. The end of emissions observed here
- 30. 1117 UT**
 - a. Ending session with stepped calibration runs
 - i. Radio JOVE 2 receiver
 - ii. FSX-2 RCP
 - iii. FSX-8S – RCP/LCP

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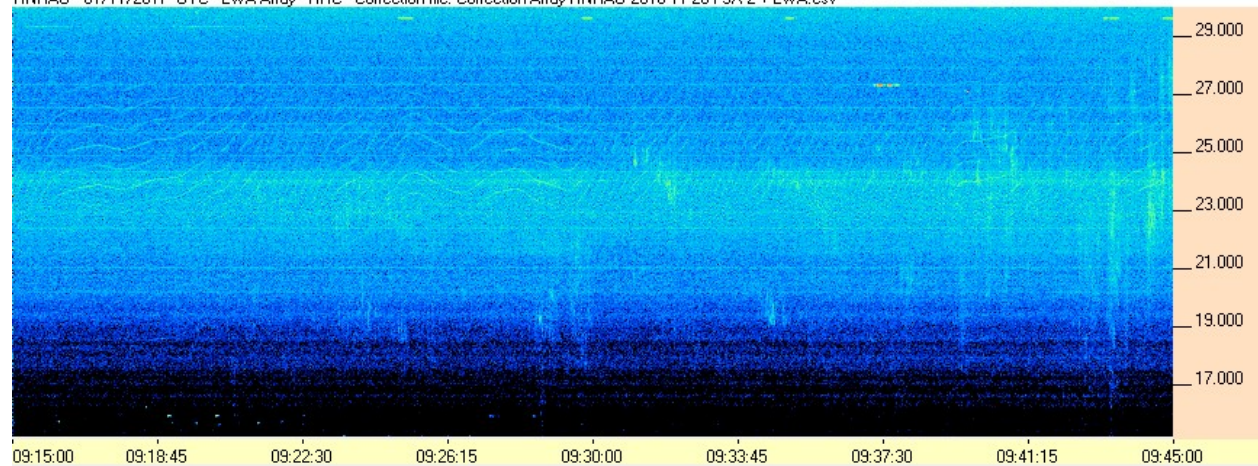


FSX-2/LWA Pair

HNRAO - 01/11/2017 UTC - LWA Array - RHC - Correction file: Correction Array HNRAO 2016 11 20 FSX-2 + LWA.csv



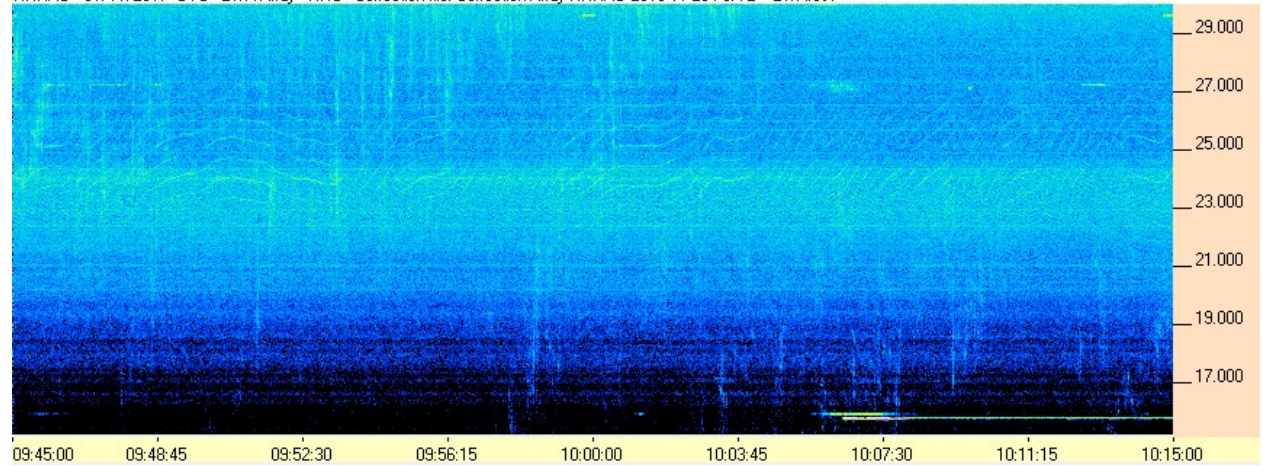
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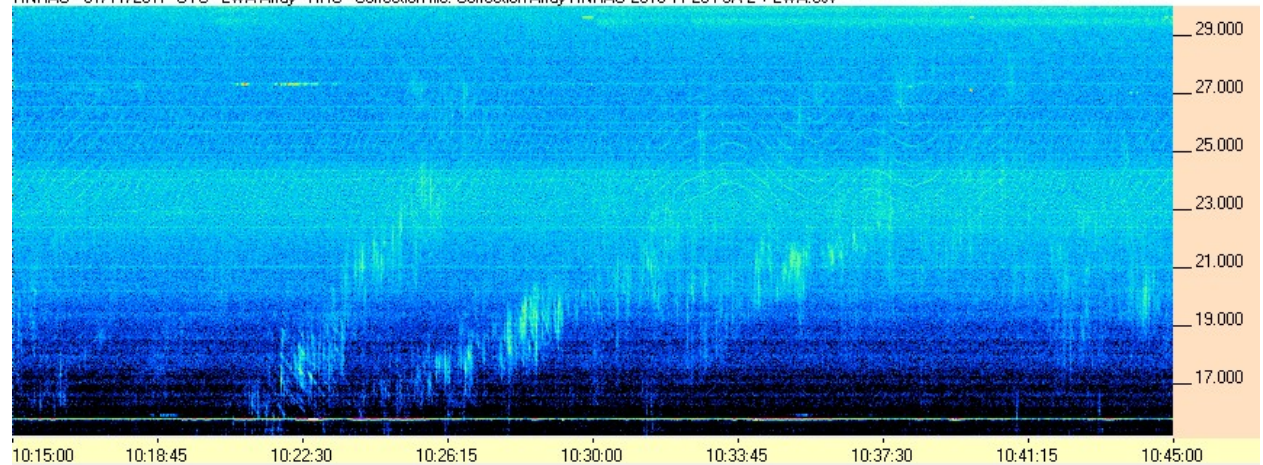
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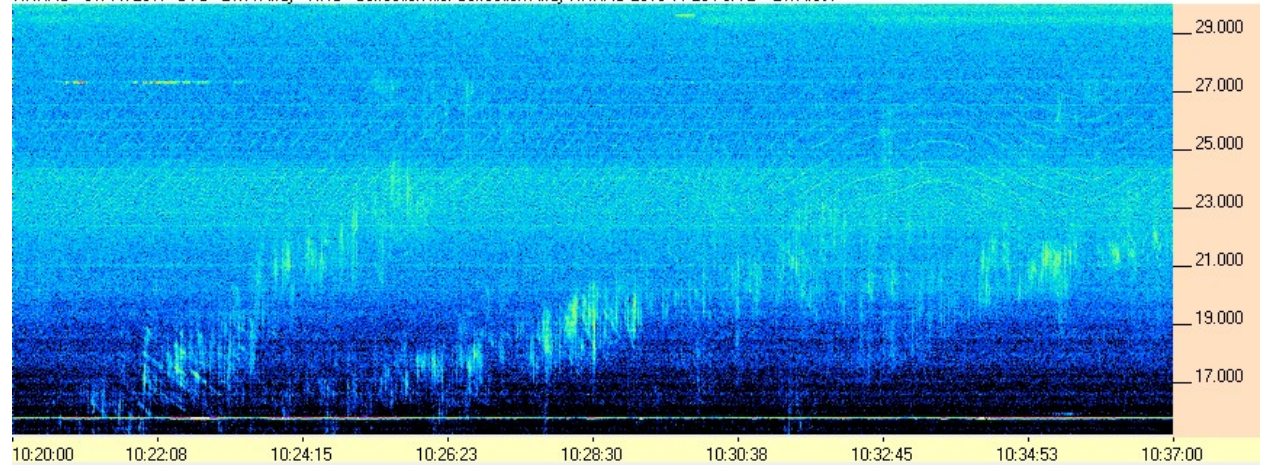
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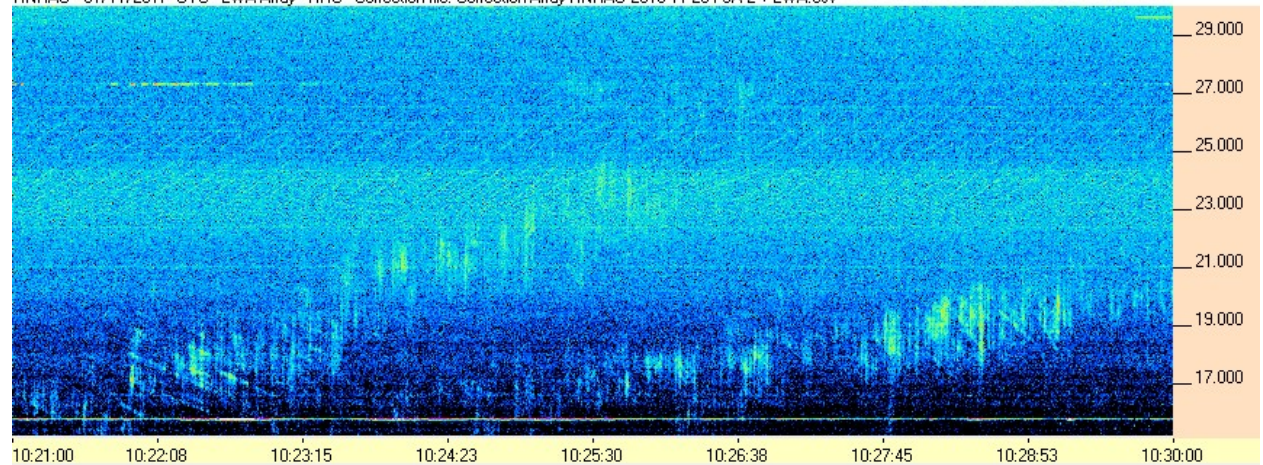
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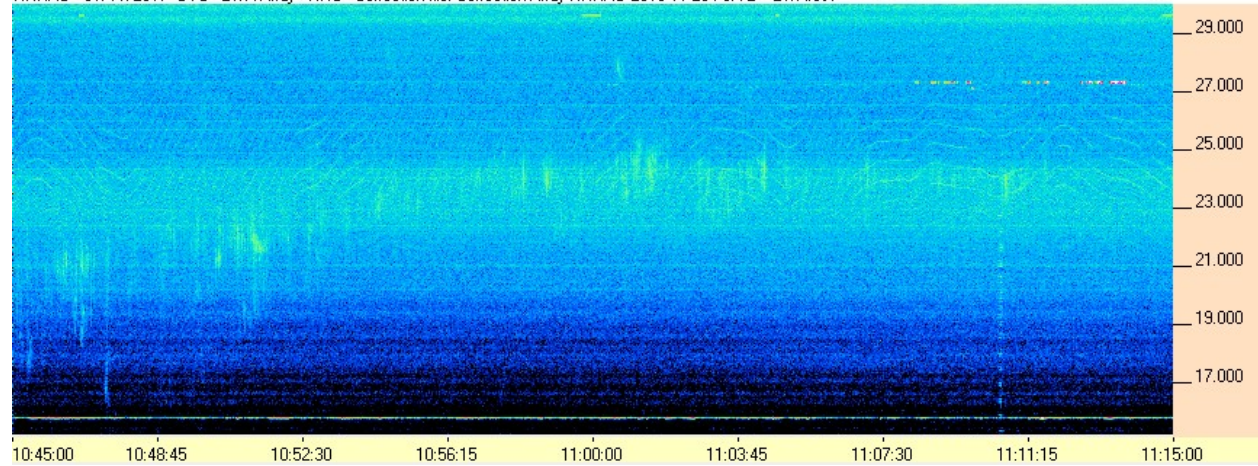
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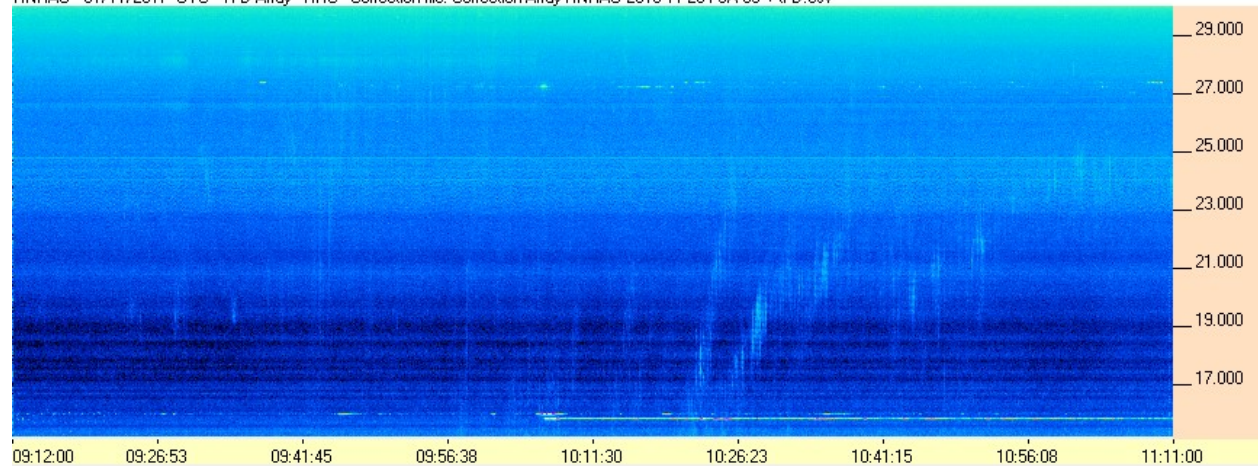


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FSX-8S/TFD Pair

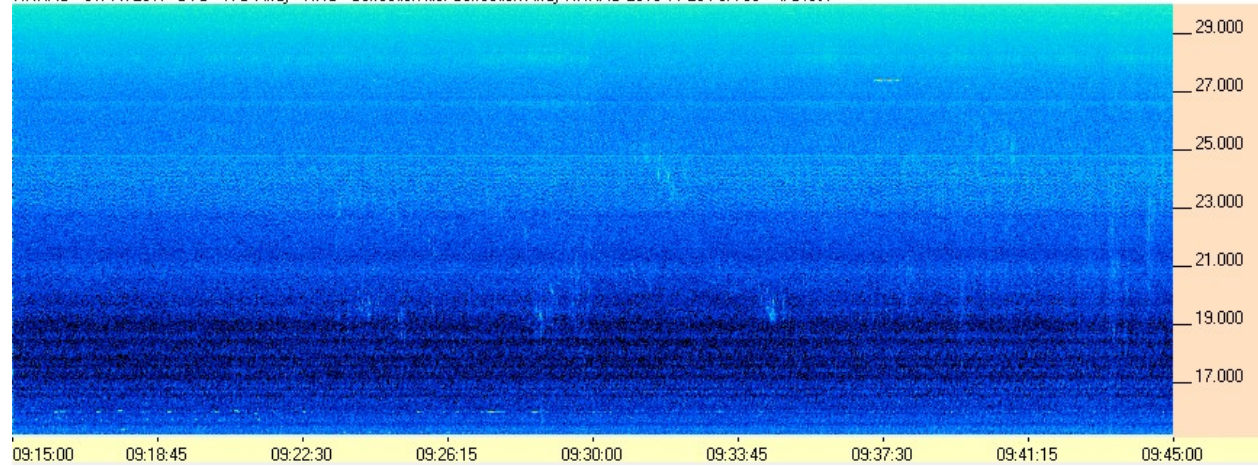
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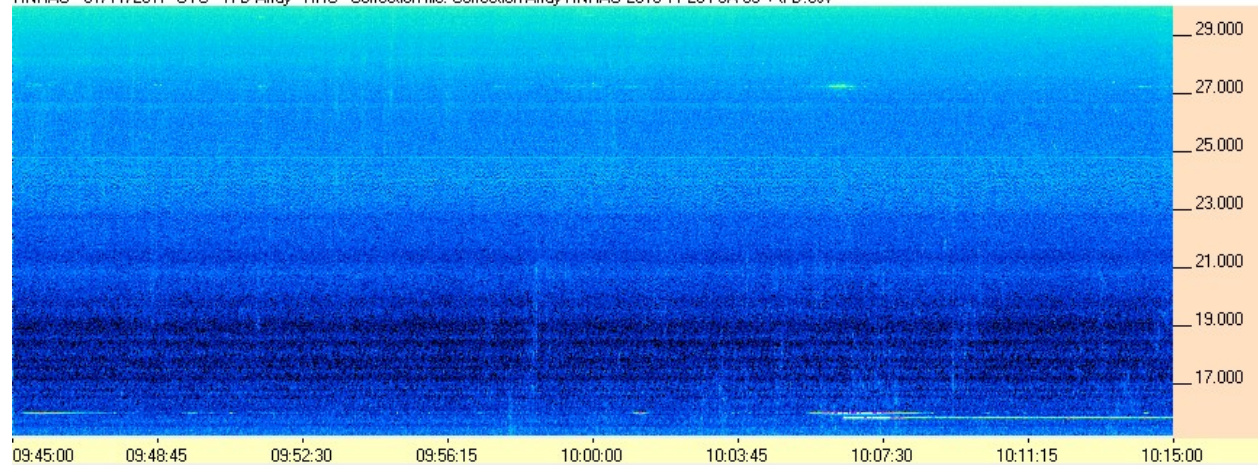
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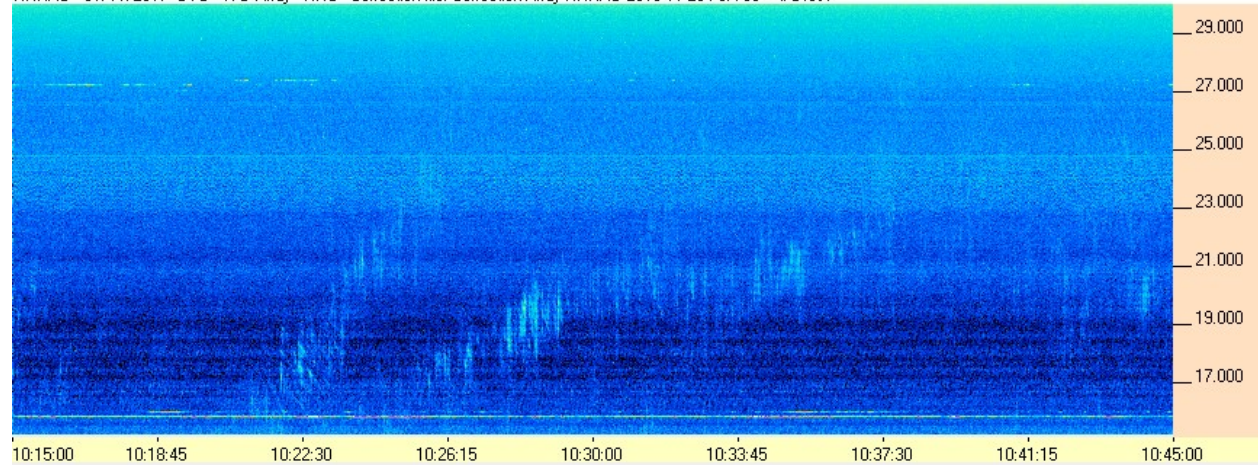
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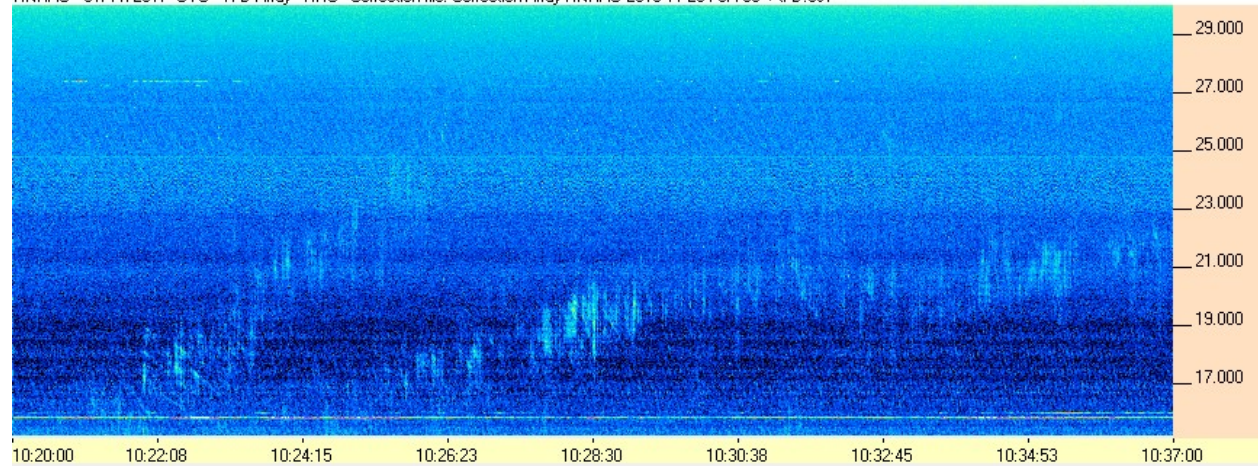
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HNRAO - 01/11/2017 UTC - TFD Array - RHC - Correction file: Correction Array HNRAO 2016 11 20 FSX-8S + IFD.csv



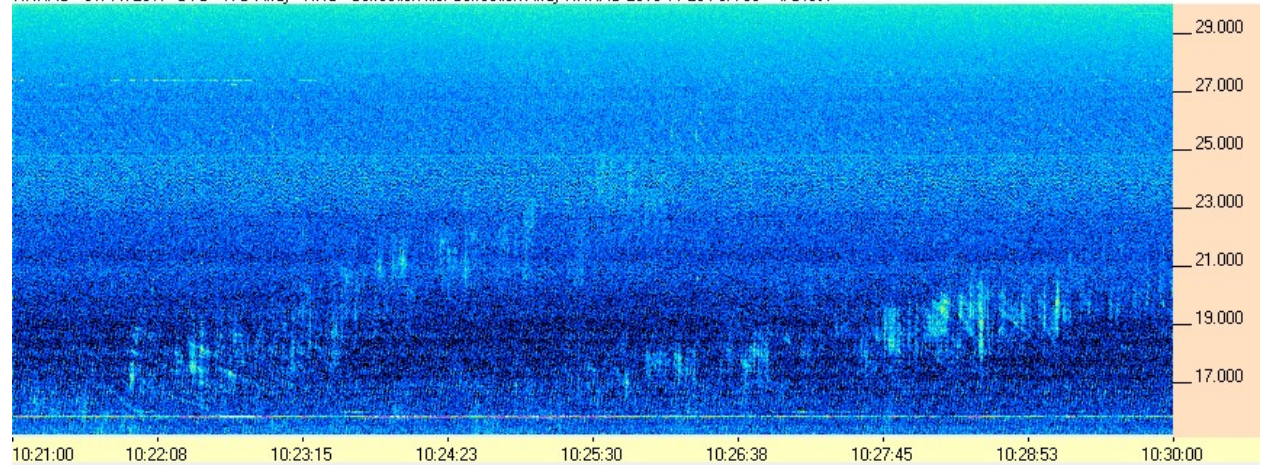
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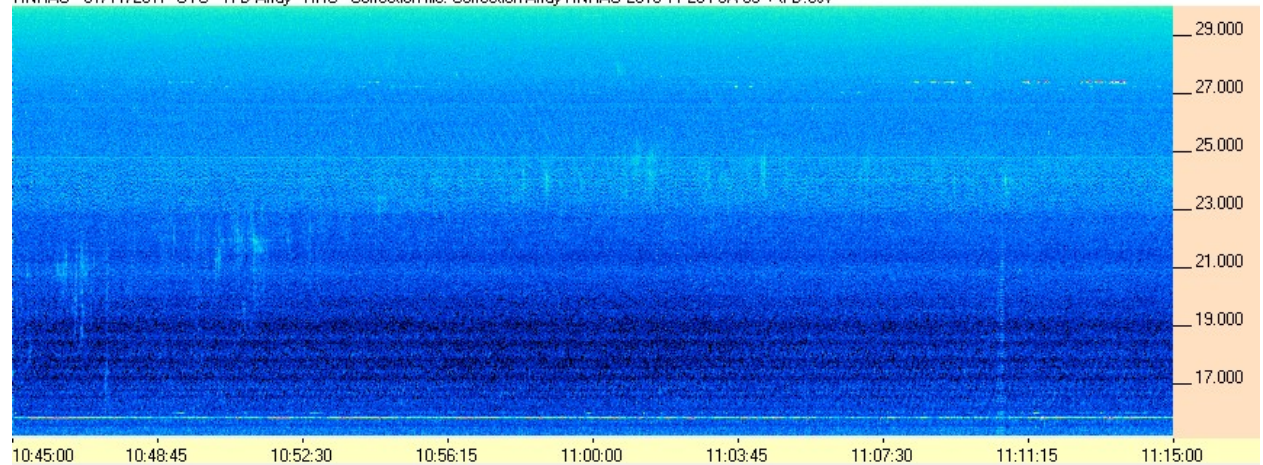
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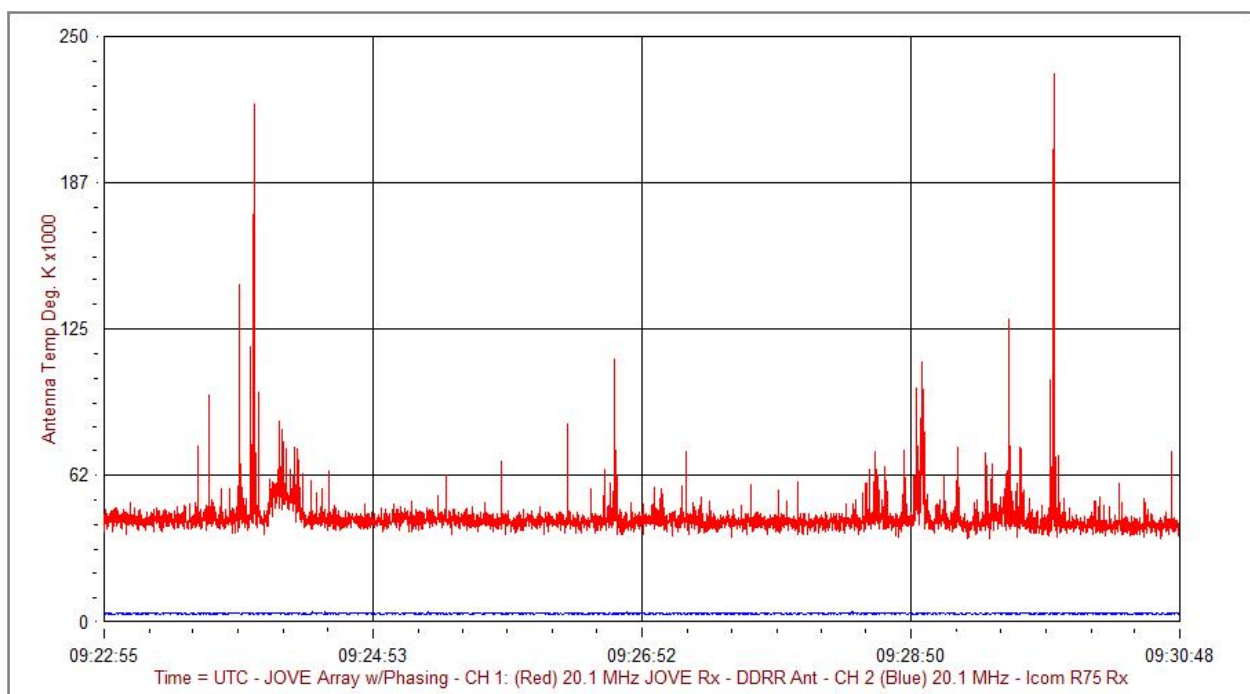
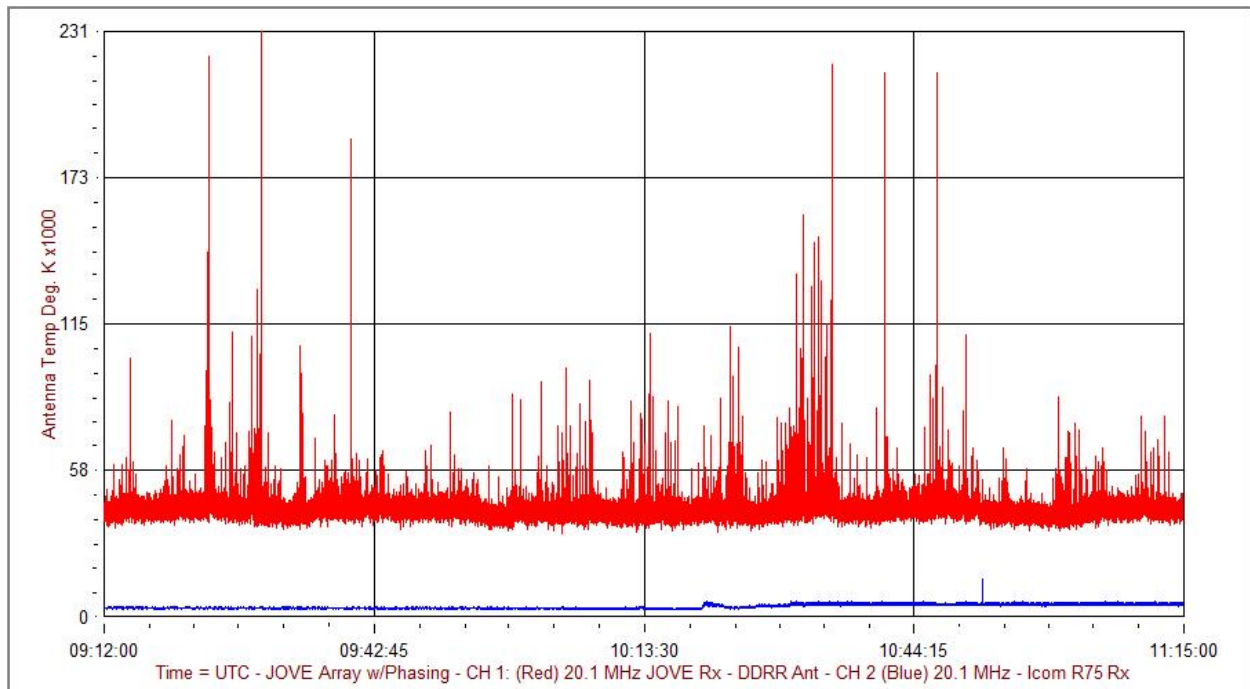
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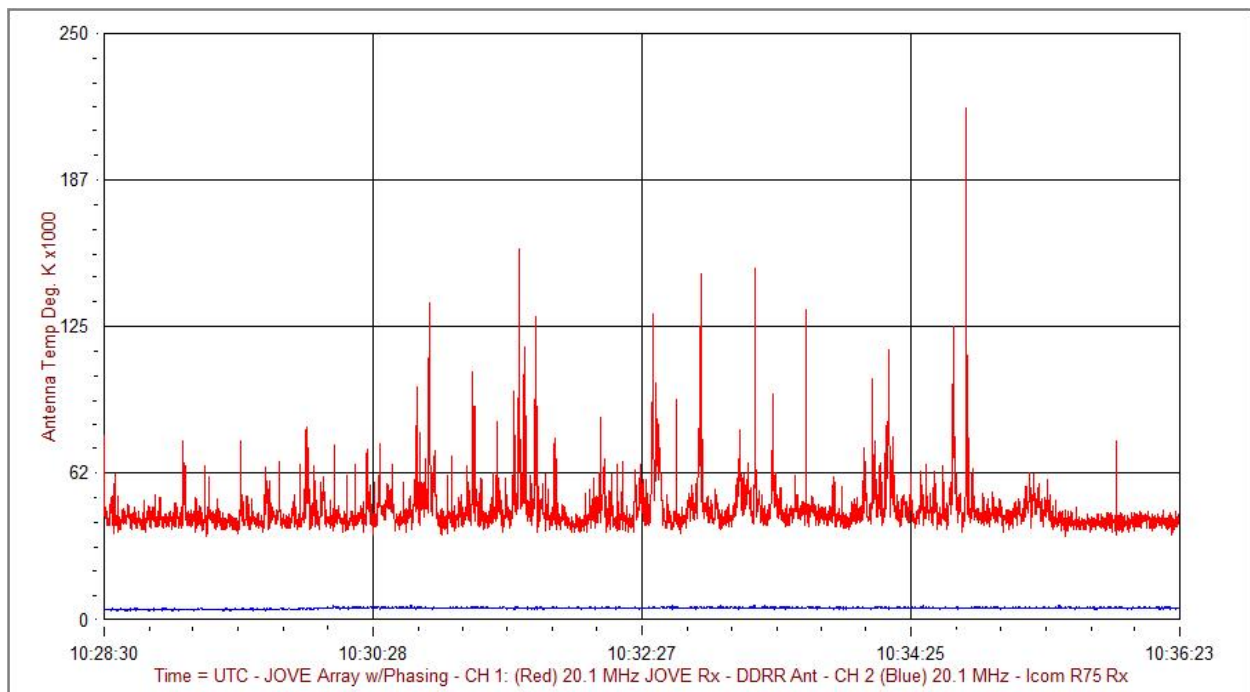
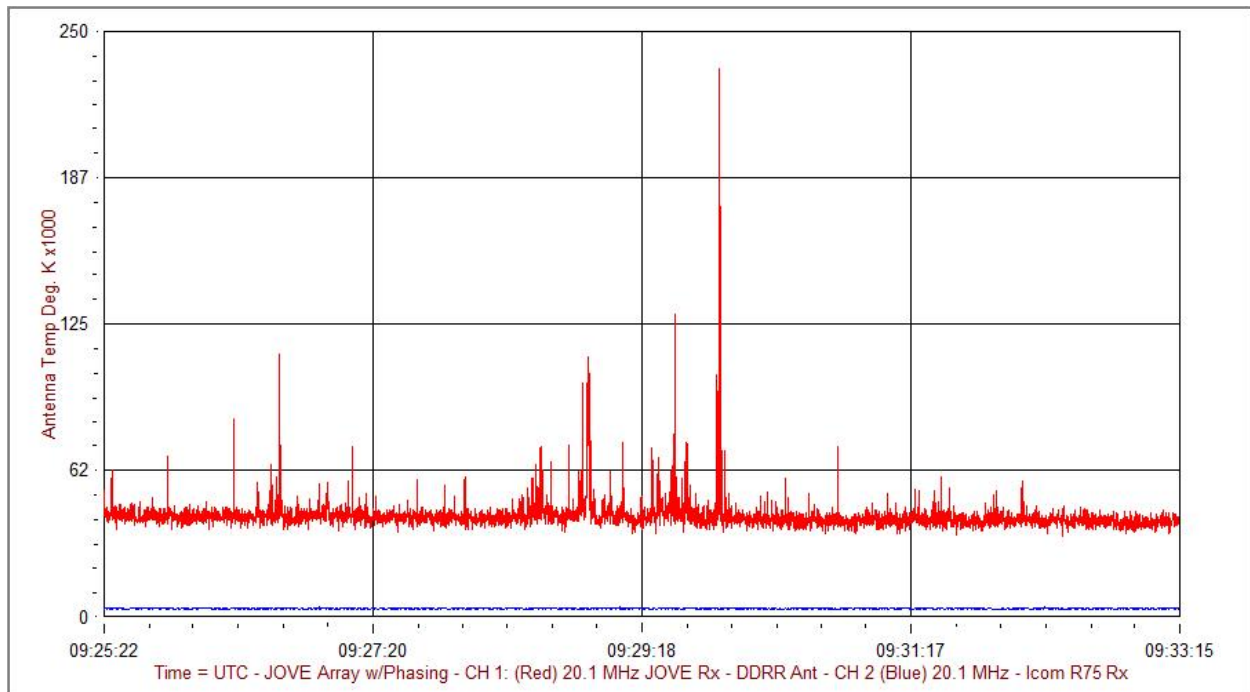
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Selected SkyPipe – JOVE/Dipole



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Galactic Background 11 Jan 2017					
Time UT	HNRAO JOVE	LGM JOVE	LGM TFD	AJ4CO JOVE	AJ4CO TFD
800	40	43	48	22	25
815	41	42	48	22	25
830	41	42	47	22	25
845	41	47	47	22	25
900	41	46	47	22	26
915	41	46	52	22	28
930	40	45	51	22	28
945	44	45	51	22	28
1000	40	49	52	22	28
1015	42	49	52	22	28
1030	42	49	52	22	29
1045	42	49	52	22	28
1100	42	49	55	24	31
1115	42	49	55	24	31

