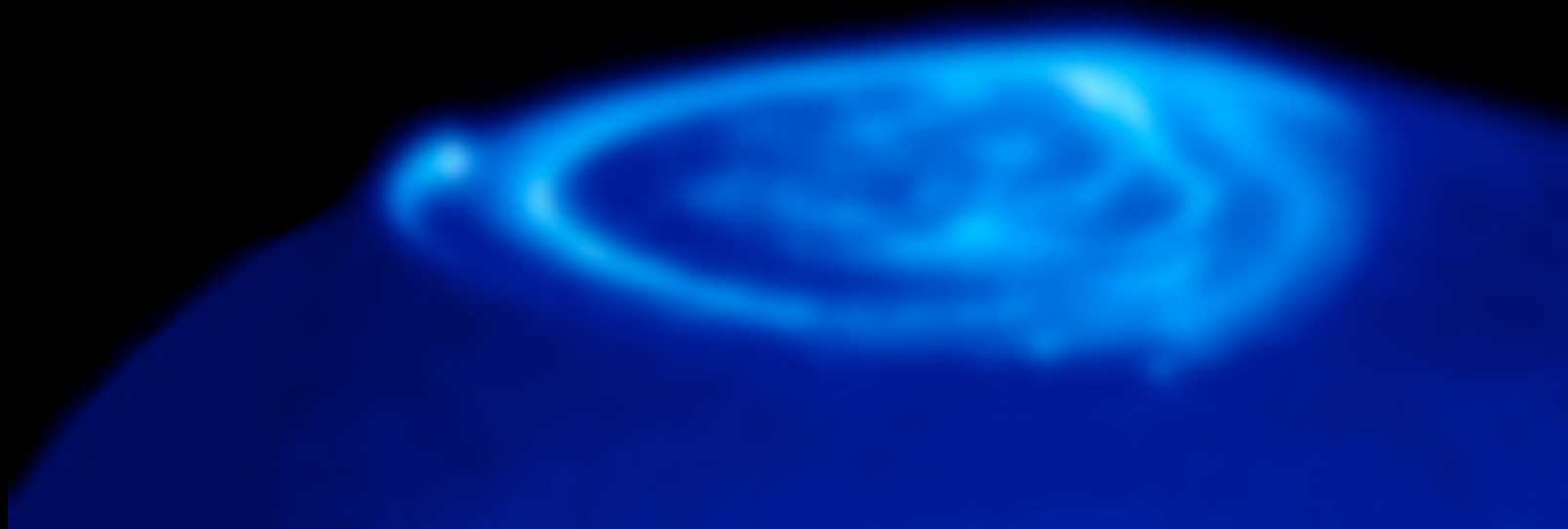
Ted Jaeger - NRC/NRL Fellow
Tracy Clarke – NRL

LWA Users Meeting, May 12th, 2011

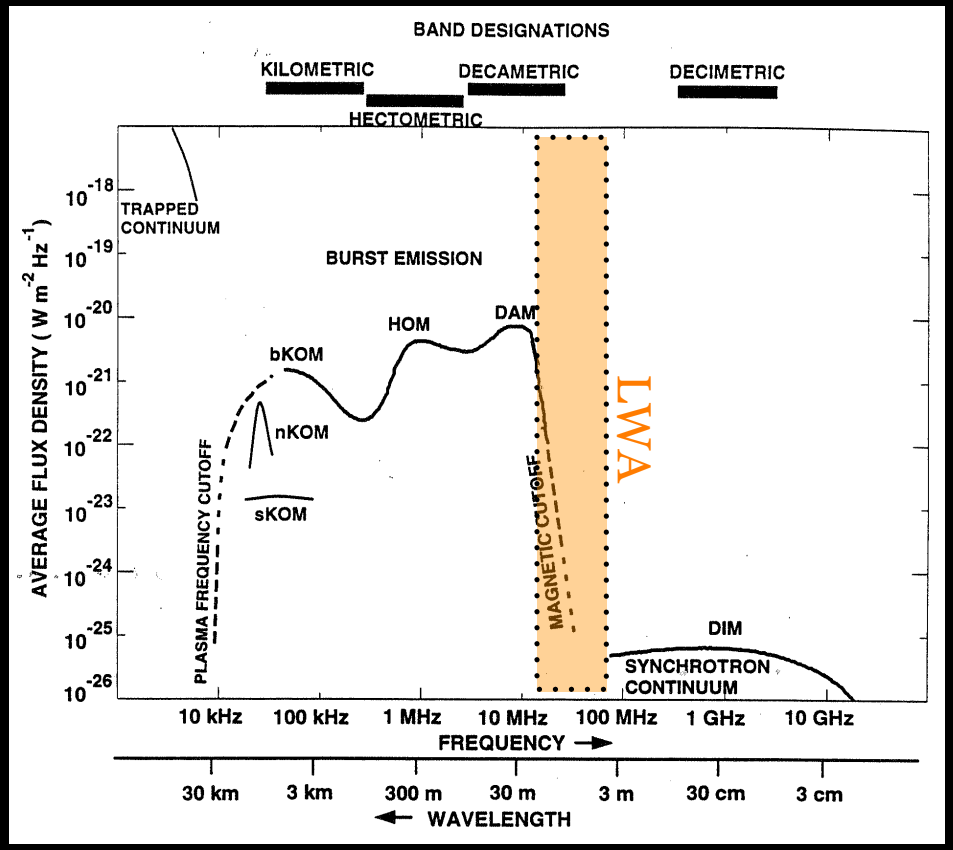
Jovian Emission with the LWA

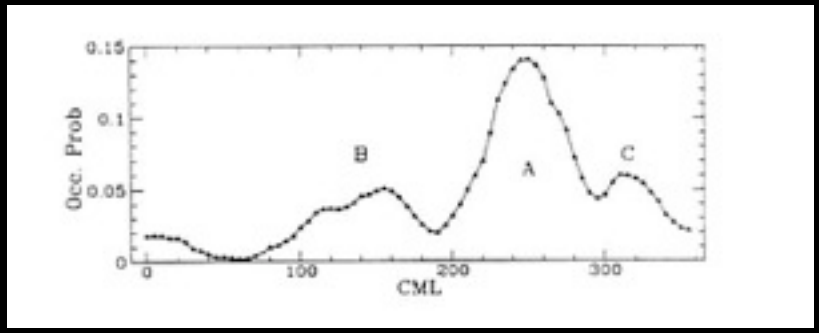


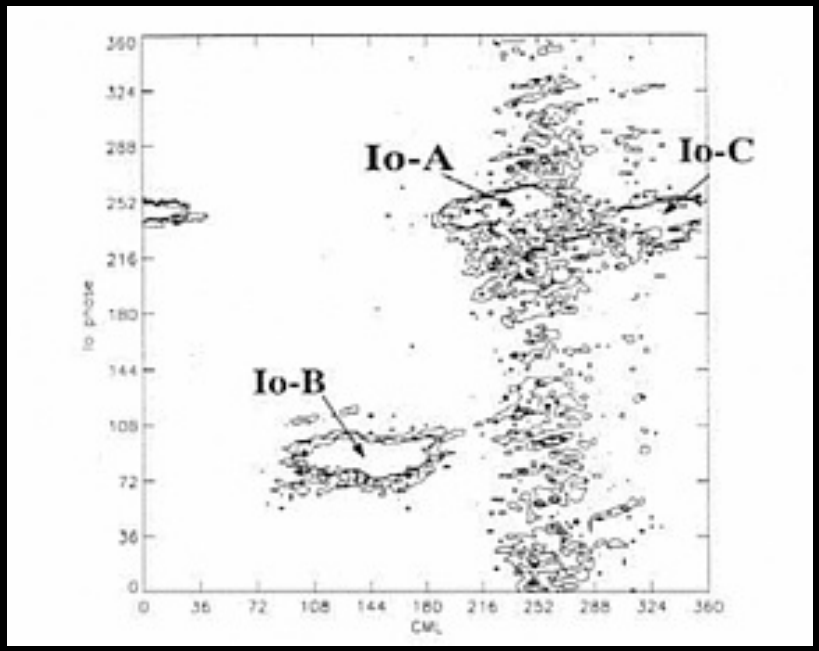
Project Collaborators

- Chuck Higgins (MTSU) : Analysis of data streams and scientific interpretation. Jovian emission expert and Radio Jove project developer.
- Lee J Rickard (UNM) : Development of data capture software.
- Joe Craig (UNM) : Development of data capture software.
- Bryan Butler (NRAO) : Analysis and scientific interpretation.
- Joe Lazio (JPL) : Software development and scientific analysis.
- Namir Kassim (NRL) : Expertise in low frequency radio astronomy.
- Bill Erickson (UTAS) : General scientific and technical advice.

Emission Properties

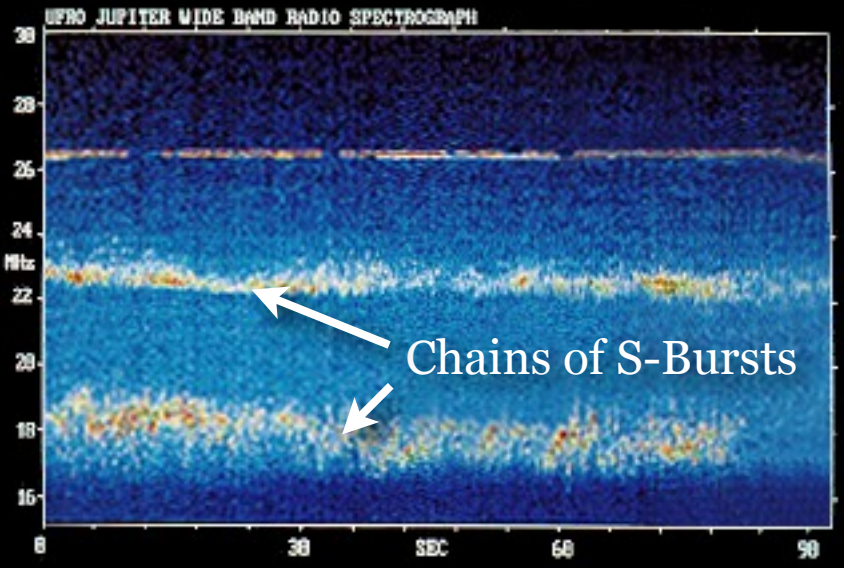


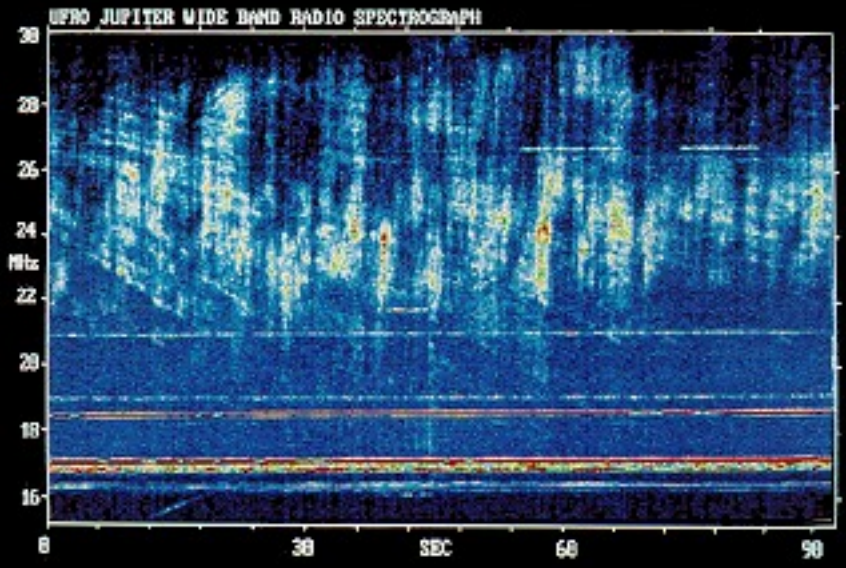




Emission Properties

- S-Bursts
  - Narrow Band, ms-Timescales
- L-Bursts
  - Broad Band, sec-Timescales





Credit: University of Florida Radio Observatory (UFRO)

LWA-1 TBW Observations

Date/Time (UTC)	Δt	Ant/Pol/Type
2010-11-10T01:02:34	34	19/NS/A,C
2010-11-11T04:10:08	158	19/NS/B
2010-11-19T03:40:03	70	19/NS/A
2010-11-26T04:05:02	148	20/NS/A
2010-12-04T04:50:02	20	20/NS/A
2010-12-10T05:20:03	111	20/NS/A
2010-12-11T23:45:03*	114	20/NS/A
2010-12-13T00:20:03	171	20/NS/B
2010-12-18T23:30:03	180	20/NS/A,C
2010-12-20T02:20:03	120	20/NS/B

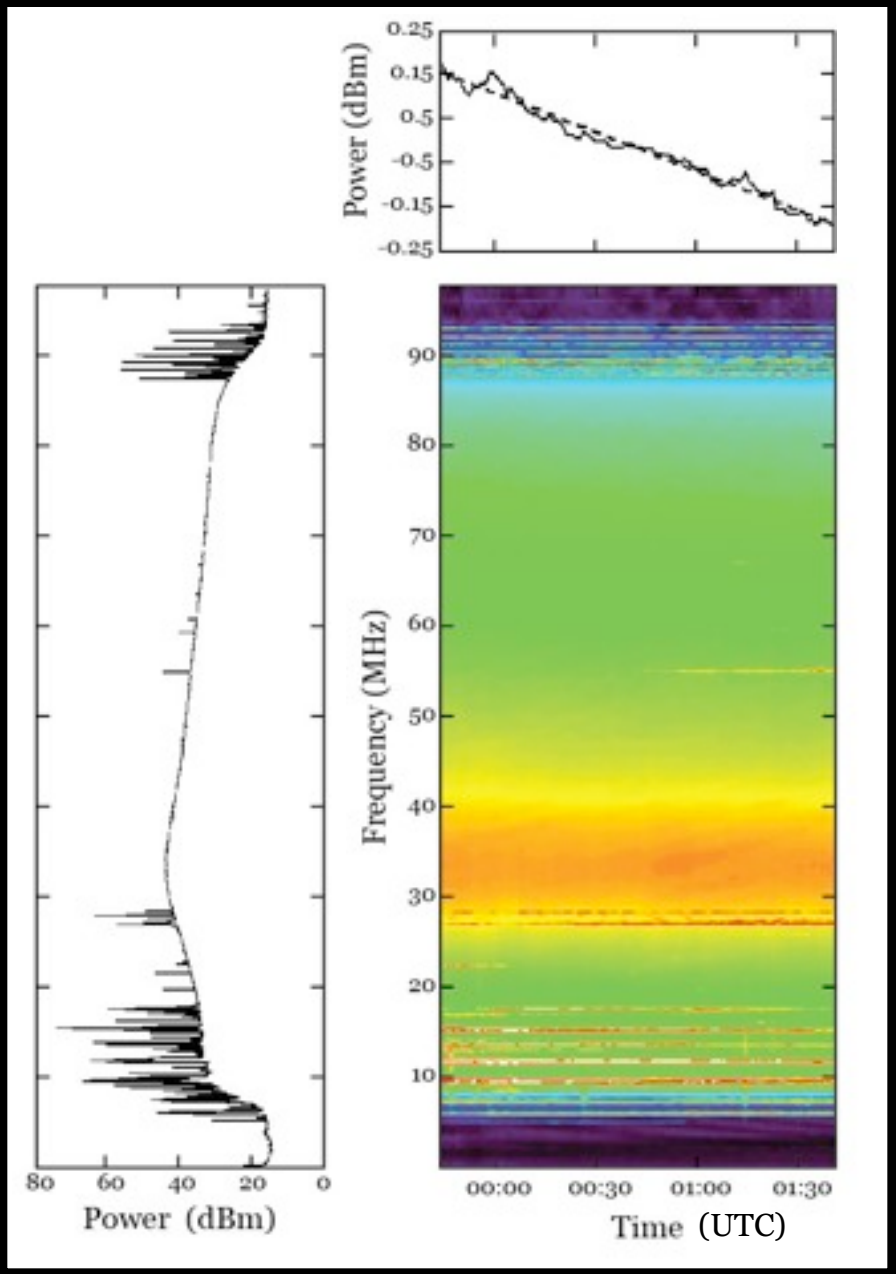
Date/Time (UTC)	Δt	Ant/Pol/Type
2010-12-20T23:30:03	120	20/NS/A
2010-12-26T00:05:03	90	20/NS/A
2010-12-28T00:20:03	180	20/NS/A
2011-01-04T01:00:02	180	20/NS/A
2011-01-05T03:40:03	60	20/NS/B
2011-01-11T01:58:02	180	20/NS/A,C
2011-01-18T02:45:03	120	20/NS/A
2011-01-25T03:30:01	60	20/NS/A
2011-01-29T20:52:01	150	20/NS/NA
2011-02-26T00:00:03	150	8/Dual/A

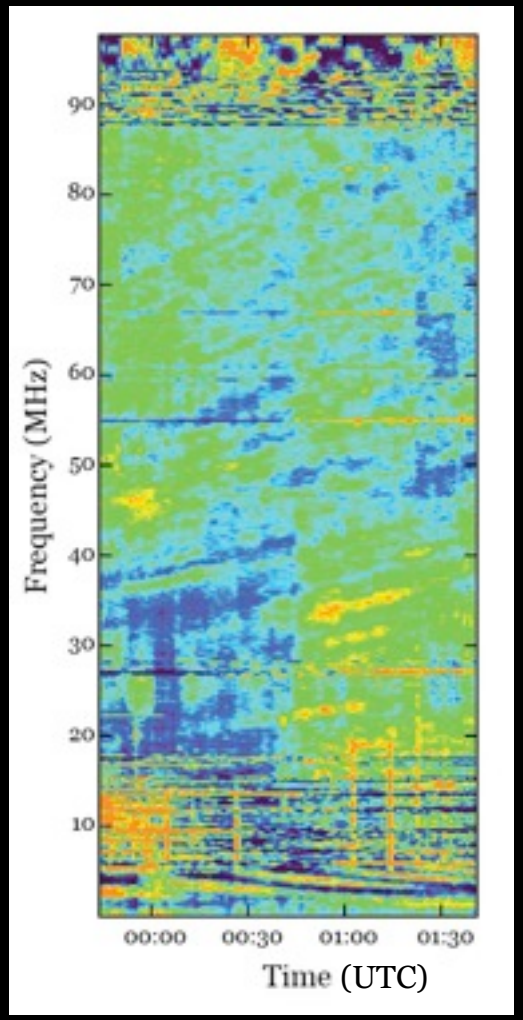
* Presented Here

Coincident Radio Jove (Archive)

LWA-1 TBW Observations

2010-12-11T23:45:03
114 min
20 Ant, NS Pol





200 kHz, 1 sec (61 ms)

Corrected for
- Bandpass (Jovian)
- Power Variation

No T_{sys} Calibration
- Linear Scale
- +/- 5 dBm (Red to Violet)

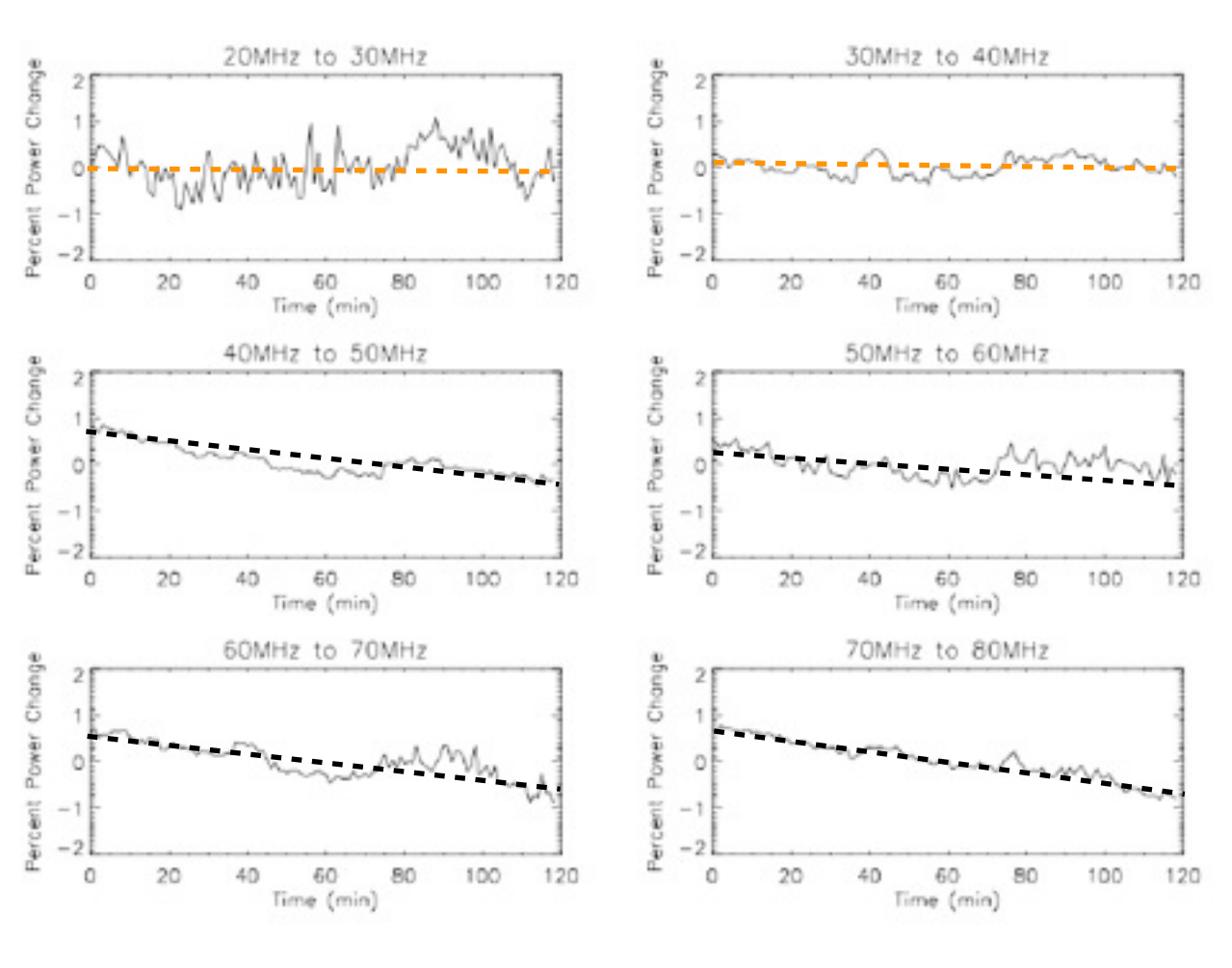
LWA-1 TBW Observations

2010-12-11T23:45:03
114 min
20 Ant, NS Pol

Integrated Power vs. Time

Flat Slope < 40 MHz

Negative Slope > 40 MHz
- El ~ 50 deg (Start), 60 deg (End)

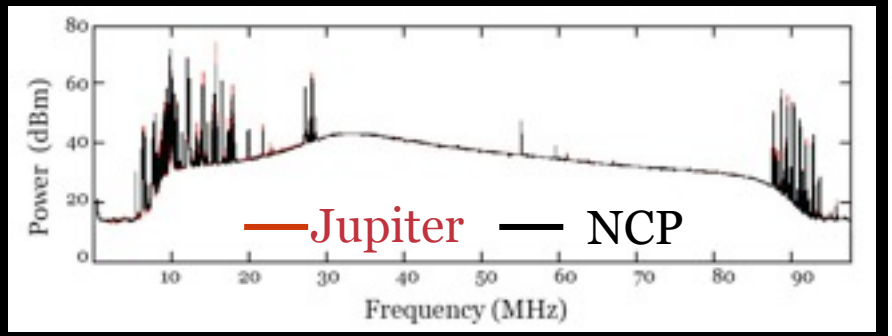


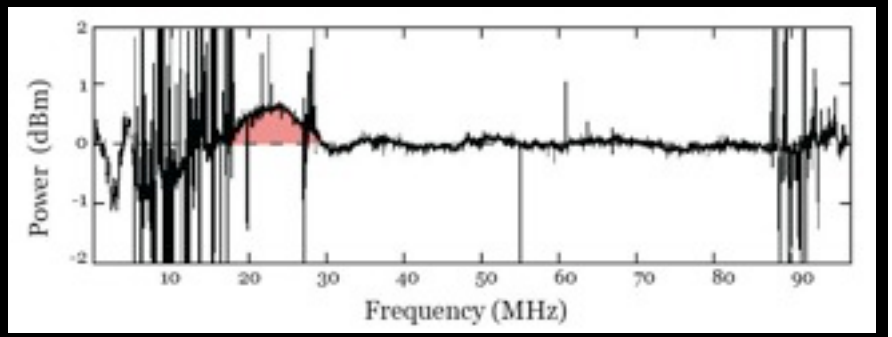
LWA-1 TBW Observations

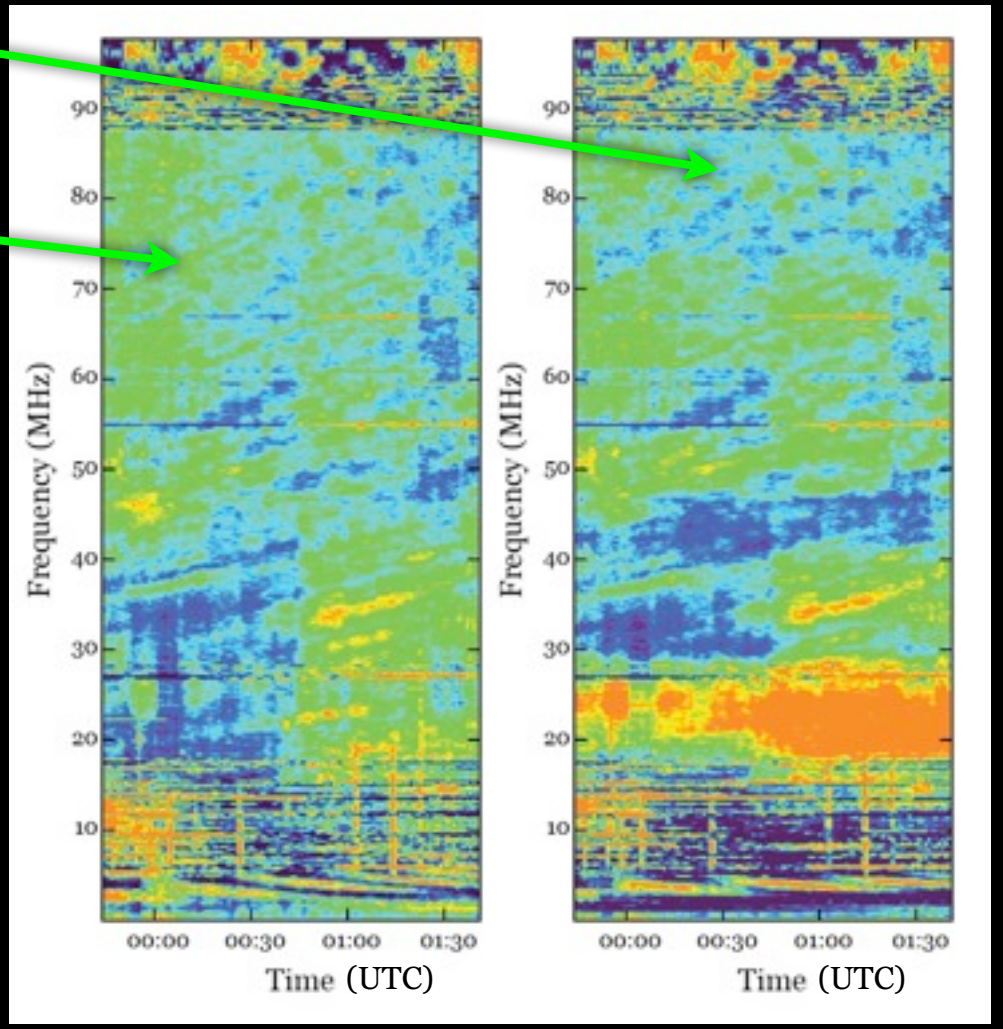
2010-12-11T23:45:03
114 min
20 Ant, NS Pol

North Celestial Pole (NCP)-based Bandpass

Jovian-based Bandpass

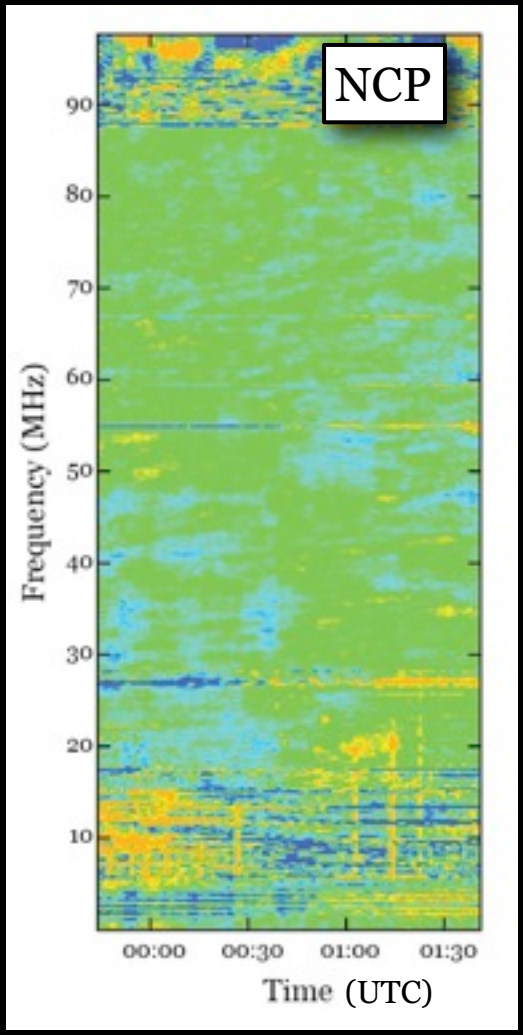


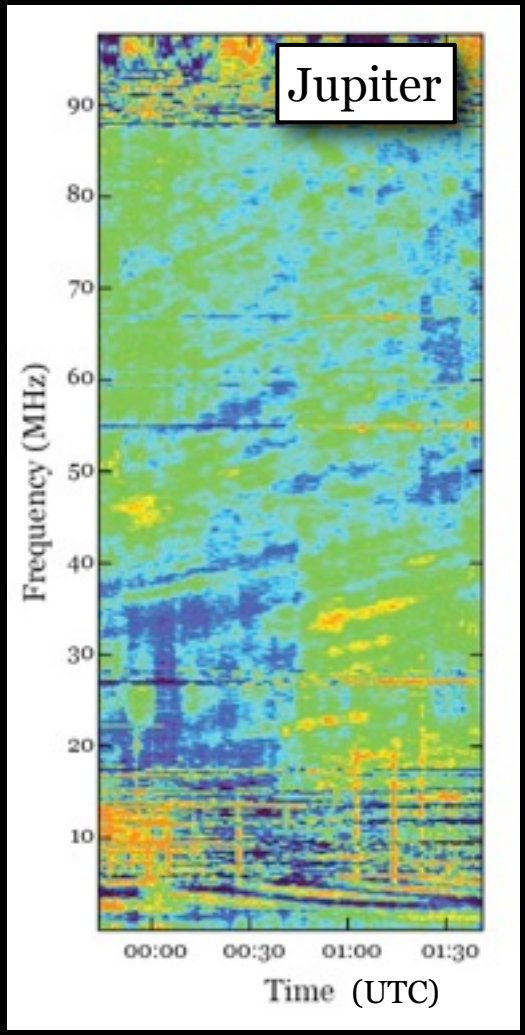


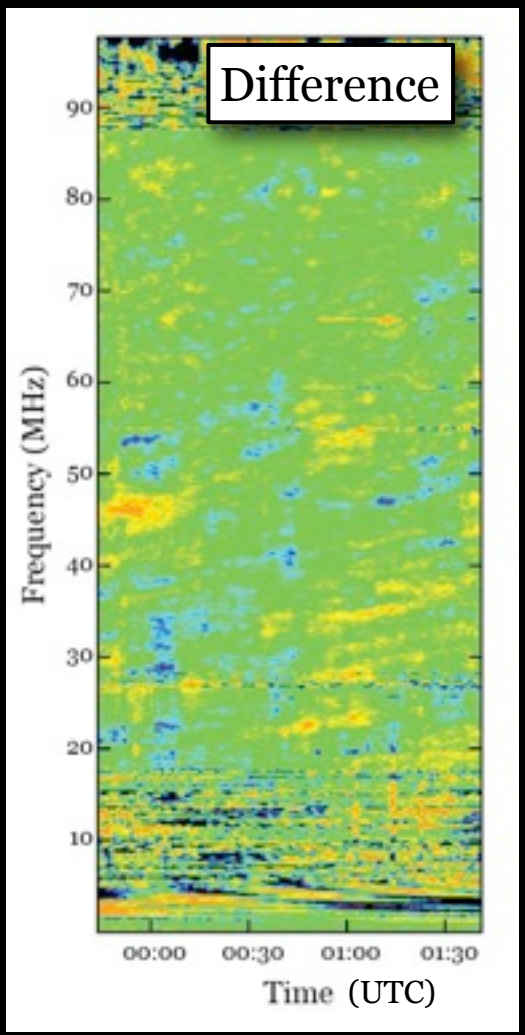


LWA-1 TBW Observations

2010-12-11T23:45:03
114 min
20 Ant, NS Pol



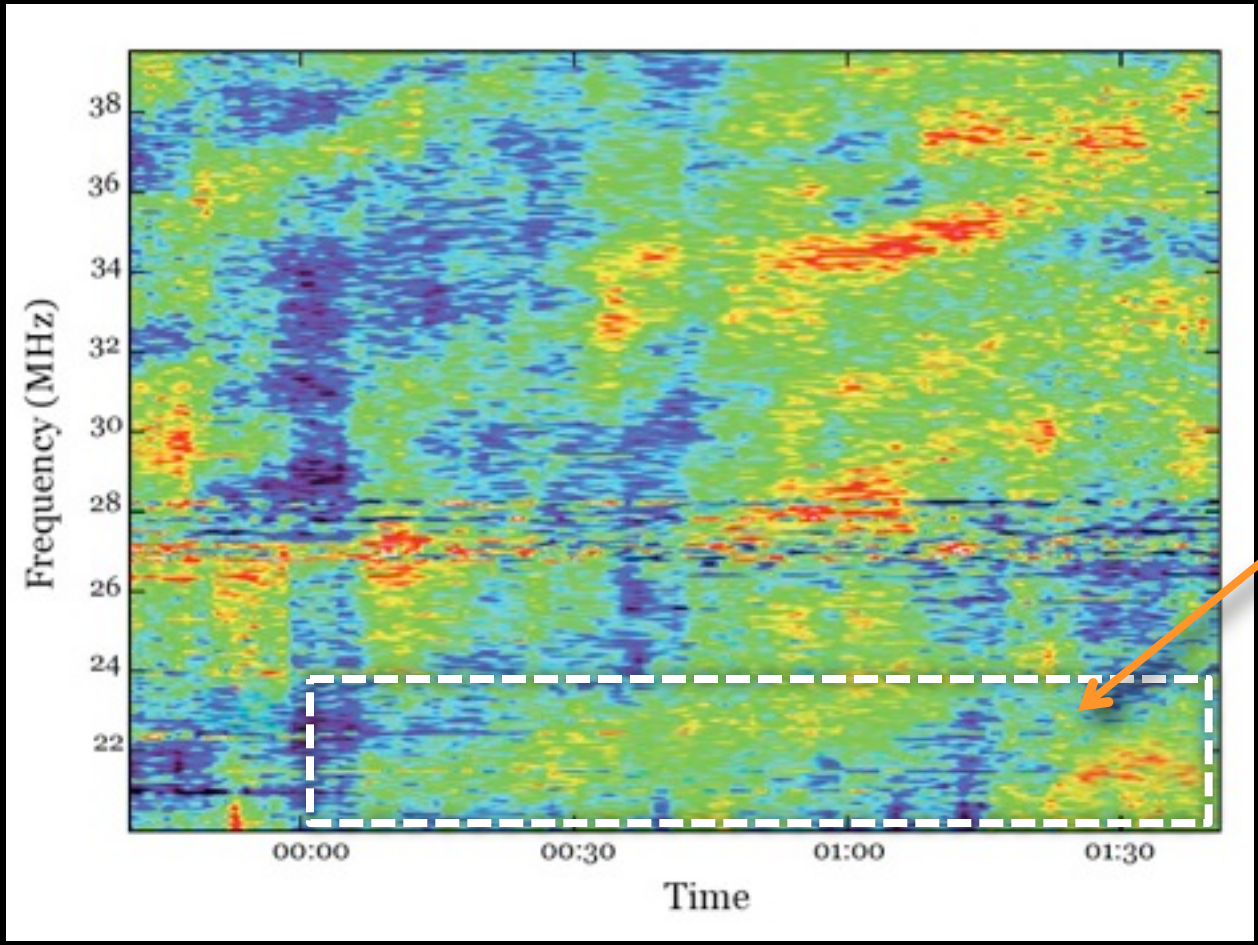




LWA-1 TBW Observations

2010-12-11T23:45:03
114 min
20 Ant, NS Pol

Jovian Decametric Zoom, 20 MHz - 40 MHz

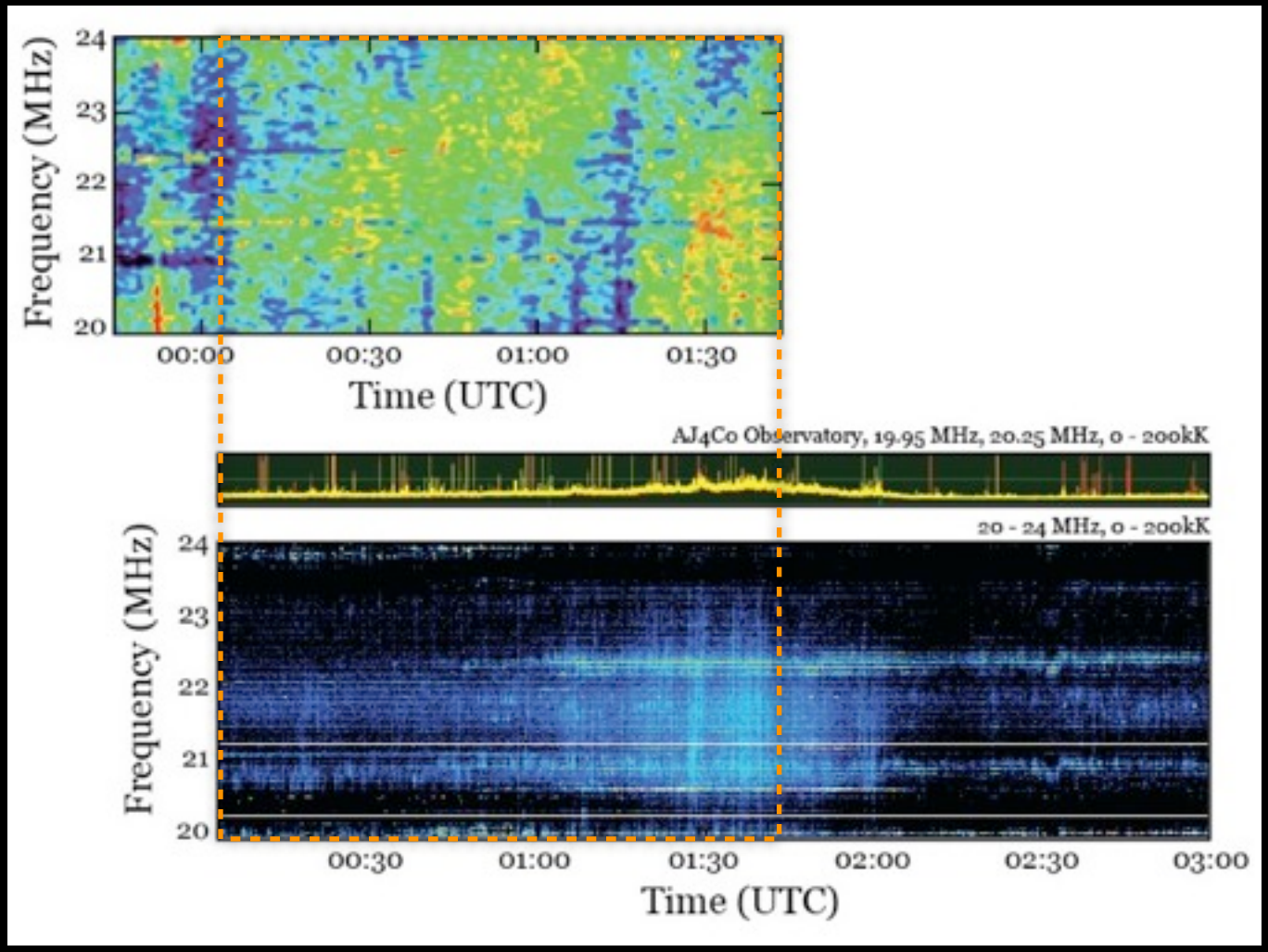


10 kHz, 1 sec (61 ms)

Coincident Radio Jove Coverage

LWA-1 TBW Observations

2010-12-11T23:45:03
114 min
20 Ant, NS Pol



Credit: Dave Typinski, Radio Jove

Conclusions

- Strong indication of Jovian A, Io-A Bursts using LWA-1 TBW with 20 single pol antennas
  - Excess emission between 20 - 30 MHz
  - Confirmed Radio Jove Jupiter burst

Future Work

- Apply Techniques to Full LWA-1
  - Increased Sensitivity, Polarization Information
  - Spectra via DRX
- Study Fine Temporal Structure of Jovian Bursts
- Monitor Jovian Variability and Identify Cause