radiojove.gsfc.nasa.gov

Radio Jove Citizen Science

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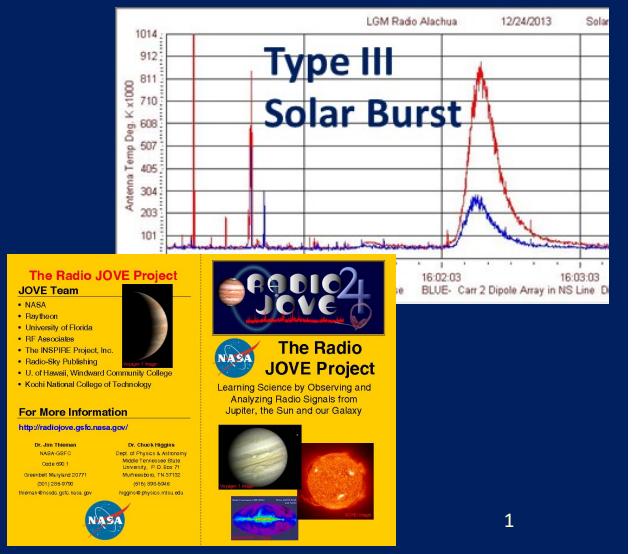
Goals:

- Citizen Science via radio astronomy and space physics
- Science literacy with NASA education partners (NSSEC) doing outreach, lessons, and projects
- Provide a hands-on experience in radio astronomy
- Enable access to Online observatories and real data
- Facilitate the exchange of data and ideas



Radio Jove Participants

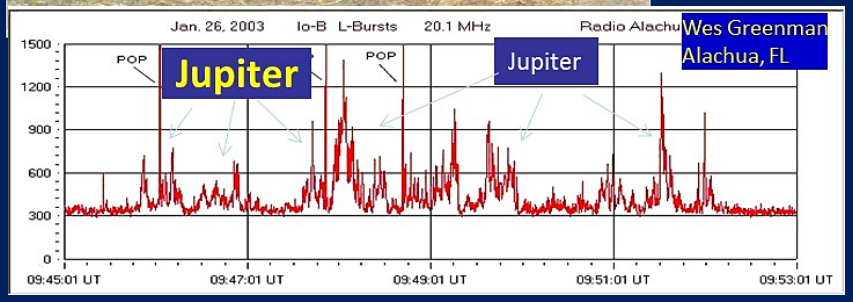
70 Countries have participated in Radio Jove
More than 2300 kits sold

- Citizen Scientists
- Interested amateurs
- High Schools
- Colleges & Universities

Hardware and Software

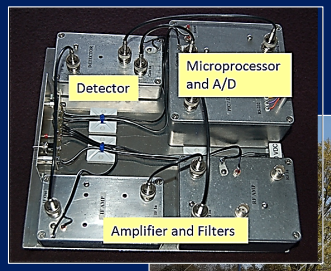
Radio Jove
20 MHz Receiver

Dual Dipole
Antenna

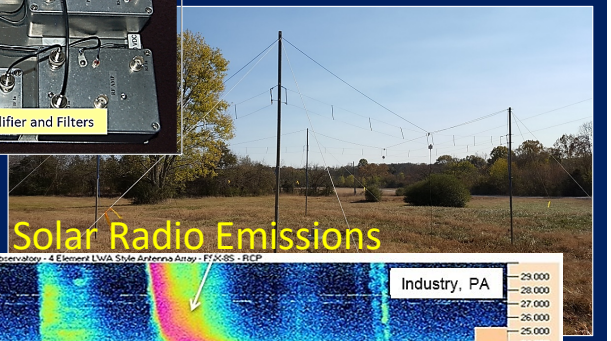


Observing Software from **Radiosky.com**

- You build it
- You operate it
- You collect data
- You analyze data
- You archive data
- You do science



Spectrograph and
Wide Band Antenna



Solar Radio Emissions

Observing Software from **Radiosky.com**

Basic System

- 20 MHz Receiver
- Dipole Antenna
- Recording and Analysis Software
- $300 + computer

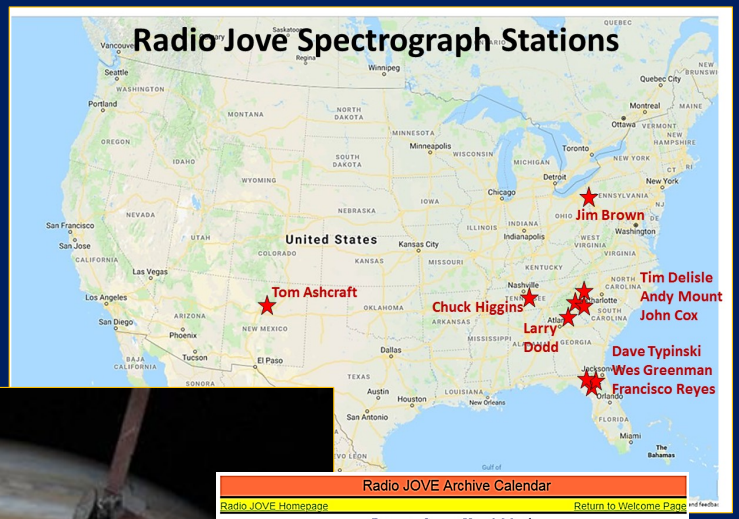
Advanced Systems

- 15-30 MHz Radio Spectrograph
- Wide band antenna
- Spectrograph Software
- $2000 + computer

Space Science Education Partners

Partner #1. NASA Space Science Education Consortium (NSSEC)

- 26 Space Science Education Partners
- Collaborate in Education and Public Outreach

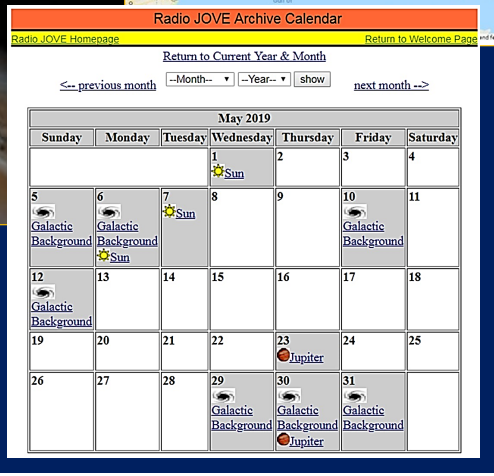


Partner #2. Citizen Scientists

- 11 spectrograph stations established in the USA
- Jupiter/Solar radio emissions, ionosphere, and space weather
- Many worldwide observers doing basic observations
- + Society of Amateur Radio Astronomers (SARA)

Partner #3. Juno Mission

- Support the Juno Mission with observations
- Collaborate with professional radio observatories



Partner #4. Worldwide Data Archives

- NASA-Planetary Data System (PDS)
- Virtual Wave Observatory (heliophysics wave data)
- VESPA – Virtual European Solar and Planetary Access

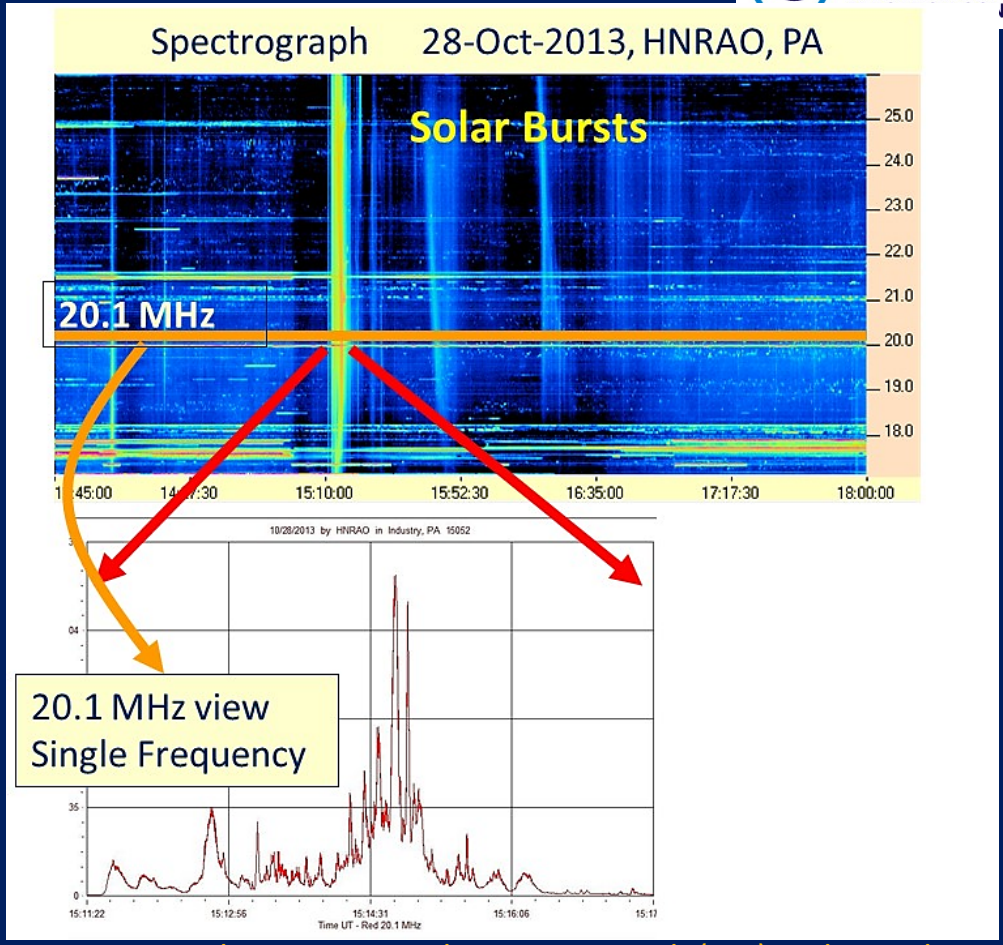
Research and Projects

Research Interests

- Jupiter Radio Emission Structure
- Solar Radio Emissions
- Ionosphere Radio Wave Propagation
- Milky Way Galaxy

Projects

- Build a system and Make Observations
- Analyze, Compare, and Share Data
- Archive data for science investigations
- Join coordinated observations
- Advanced Projects (spectrographs, ionosphere, long-term studies)

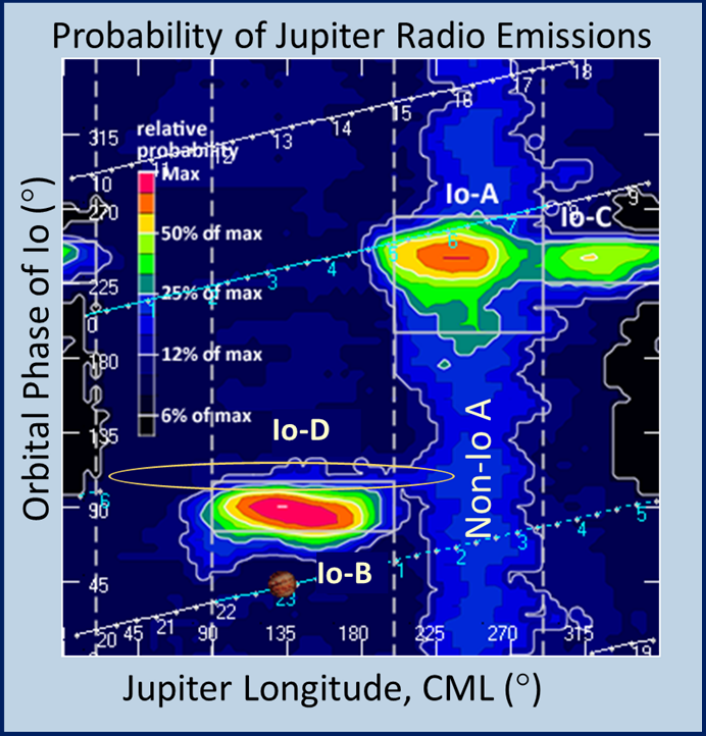


Comparison observations with a spectrograph (top) and a single frequency receiver (bottom). [Data from J. Brown]

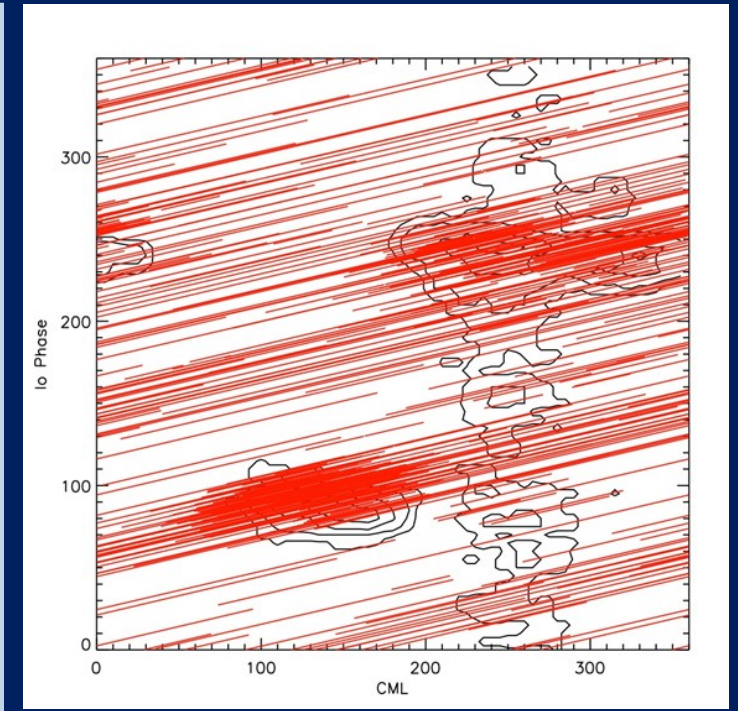
Research and Projects

Projects

- Maps of the Jupiter Radio sources
- Jupiter Emission microstructure



Jupiter radio emission occurrence probability plotted as a function of orbital phase of Io and Jupiter longitude (CML). [J. Sky, **radiosky.com**]



About 750 Jupiter radio observations in the Radio Jove archive over an Io Phase vs Jupiter Longitude (CML) plot. The observations are most concentrated near Io-related Jupiter radio storms. [L. Garcia]

Research and Projects

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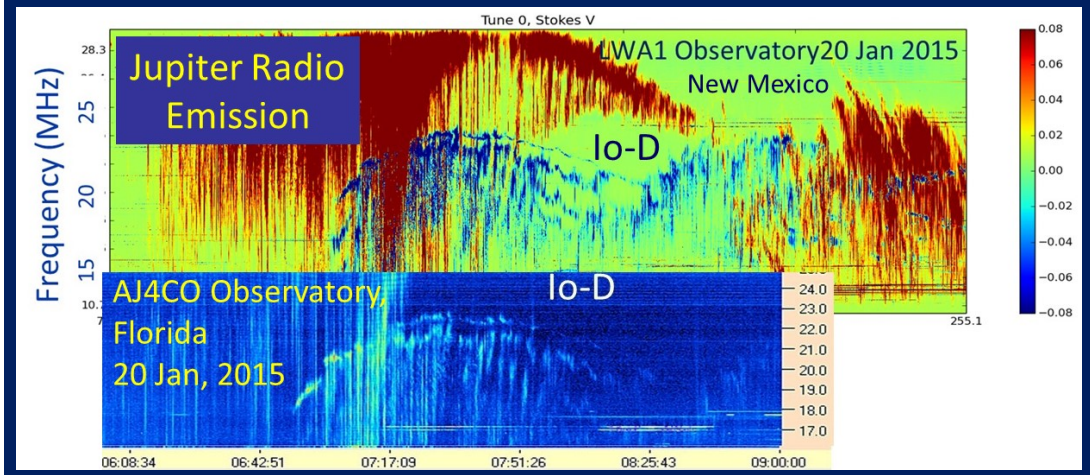
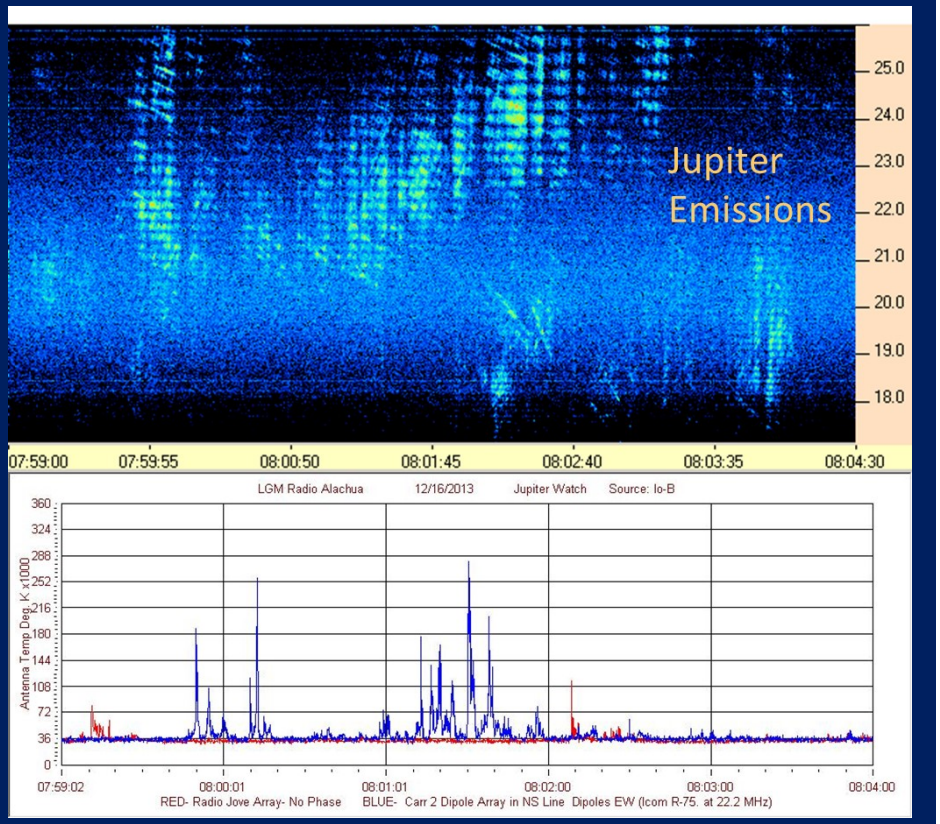


Polarized spectroscopic observations of Jupiter's spectral structure. [D. Typinski]



Jupiter observations with a spectrograph and a 20 MHz receiver. showing fine spectral structure such as modulation and Faraday lanes due to propagation effects. [J. Brown and W. Greenman]

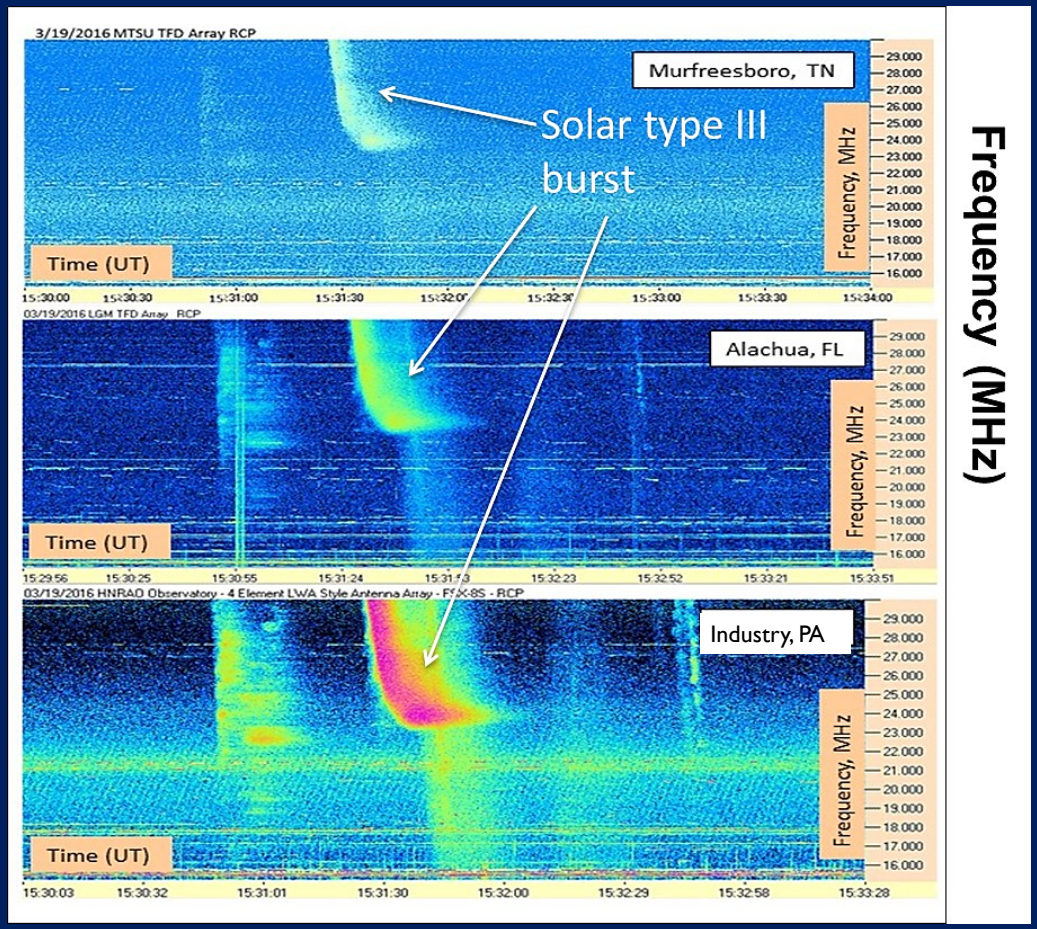
Research and Projects

Research Interests

- Solar Radio Emissions
- Ionosphere Radio Wave Propagation
- Milky Way Galaxy

Frequency-time spectrogram comparison observations of solar radio bursts seen by different observers.

Differences in observed spectra result from difference ionospheric conditions and the angular spectrum of solar radio emissions. Horizontal bands represent radio interference.
[C. Higgins, W. Greenman, and J. Brown]



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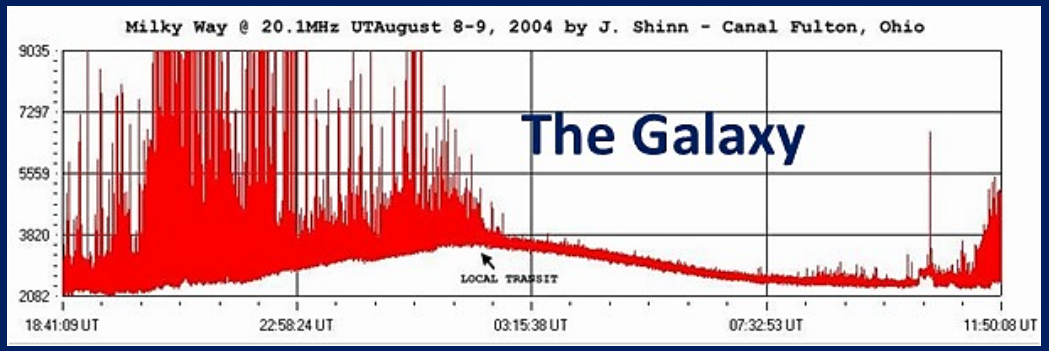
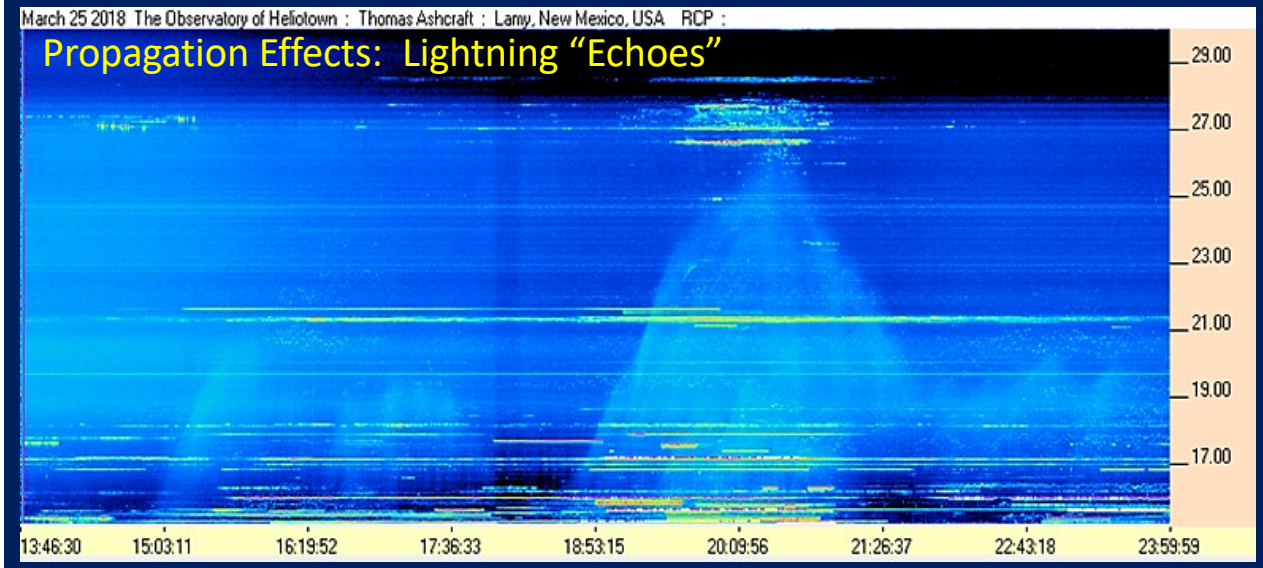


24-hr intensity-time radio emission showing the Galaxy [J. Shinn]

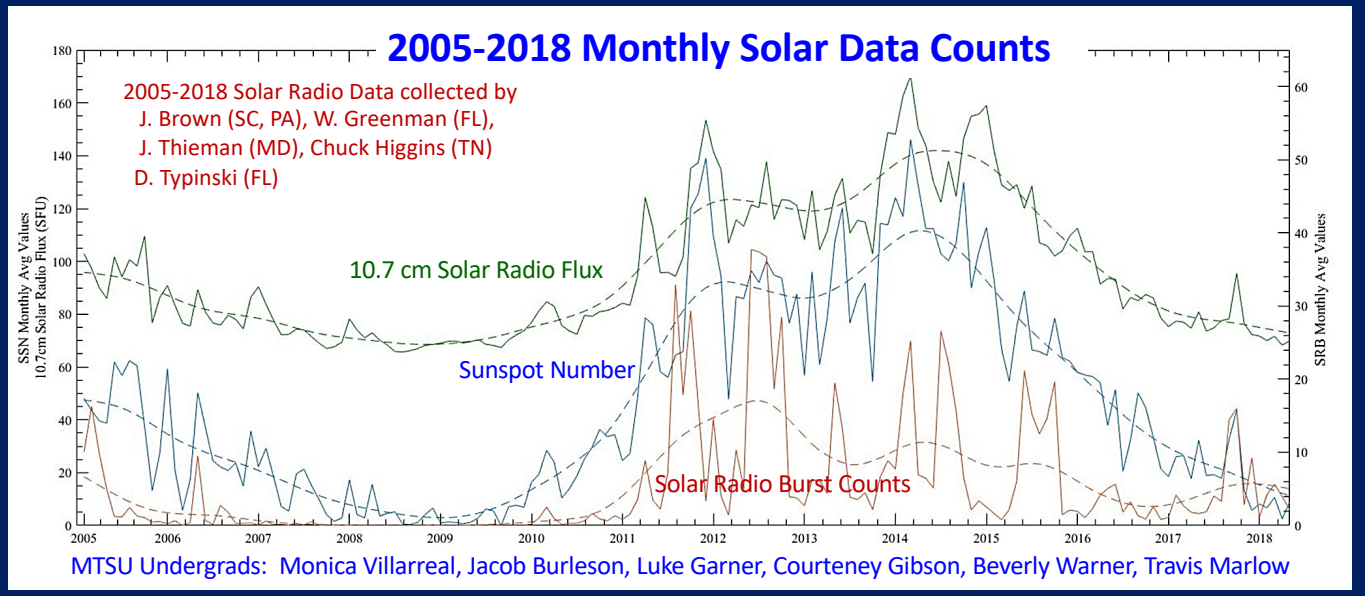


Frequency-time data of lightning reflection and propagation in Earth's ionosphere [T. Ashcraft]

Solar Radio Education Activity

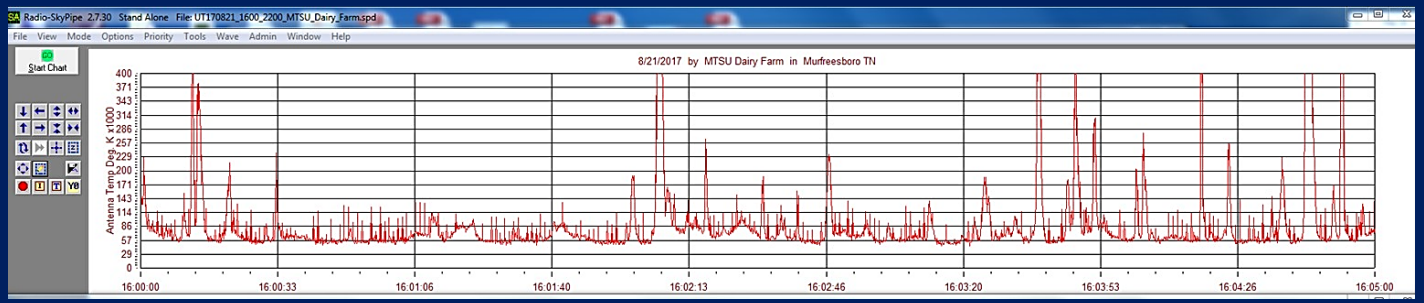
Solar Radio Burst Counts

1. Observe the Sun with a Radio Jove telescope
2. Count daily solar bursts
3. Compute average for 1 month
4. Send Data to Radio Jove
5. Your name added to a graph

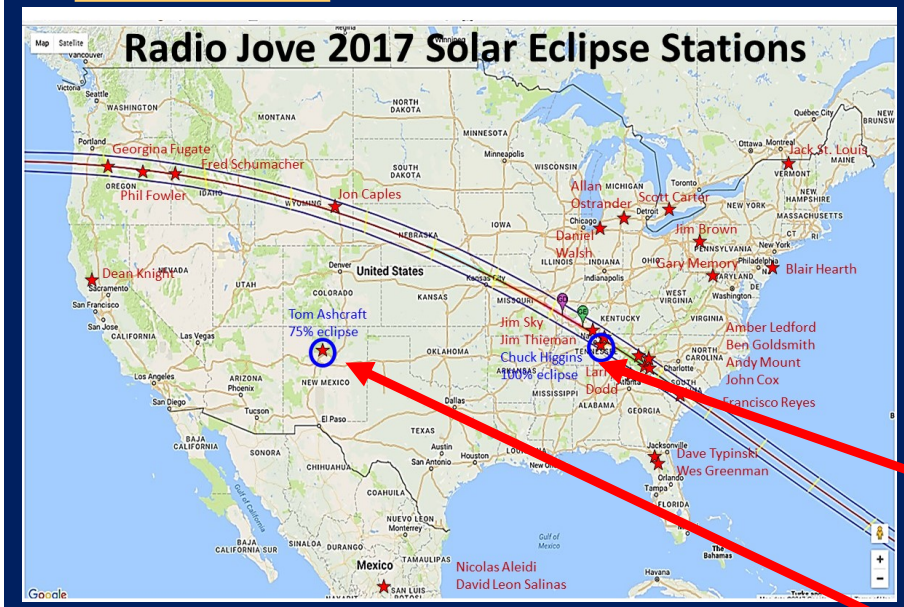


2005 – 2018 Monthly Solar Radio Burst Counts (SRB) at 20 MHz correlate well with the visible Sunspot Number (SSN) and the 10.7 cm (2800 MHz) Radio Flux data. 20 MHz correlation with SSN is 67%.

Example Raw Radio Data with solar radio emissions



2017 Solar Eclipse

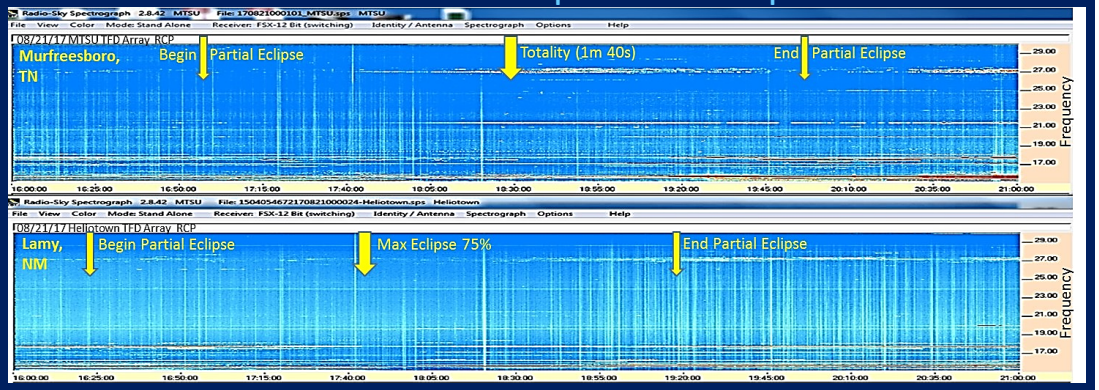


Twenty-five Radio Jove observers are shown on the map for the August 21, 2017 total eclipse. [Background: eclipse.gsfc.nasa.gov]

2017 Coordinated Activity

- 25 Radio Jove groups observed the solar eclipse
- Only 7-8 observers made science-quality observations
- Citizens Scientists → Large Learning Curve
- Two stations show evidence that the lunar shadow affected the received solar emissions

Example Solar Eclipse Observations



Frequency-Time spectrograph solar eclipse observations on August 21, 2017 from 16-21 UT at 15-30 MHz in TN (100% eclipse) and NM (75% eclipse). Radio burst intensity are reduced near the time of totality in the Murfreesboro, TN data as compared with the data from Lamy, NM.

New effort for 2024 Solar Eclipse

Radio JOVE Summary

radiojove.gsfc.nasa.gov

- Radio JOVE is an active citizen science project
- 4 Partnerships: NASA Education (NSSEC), Citizen Scientists, Juno Mission, and Data Archives
- Collaborate in Science, Education, and Public Outreach
- 11 active citizen scientists – looking to expand the network
- Continue to coordinate observations to support science
- Jupiter, Solar, Ionosphere research projects

Brochures available on request