

As the Sun gets more active it can send storms that cause beautiful Northern + Southern Lights, as well as affect large tech grids. Learning more about this is important!



Join the Helio Big Year to celebrate the Sun in an active time + enjoy 2 different solar eclipses!



from boring, trying to do as many of a thing as possible in 1 year

HELIOPHYSICS BIG YEAR

The Sun is a huge magnet. Every 11 years, the Sun reverses its poles. This causes active times + quiet times. Active times are heading into an active time!



the study of the Sun + everything it affects

HELIOPHYSICS



Join us **Oct. 2023 to Dec. 2024** for a global celebration of solar science and the Sun's influence on Earth and the entire solar system.



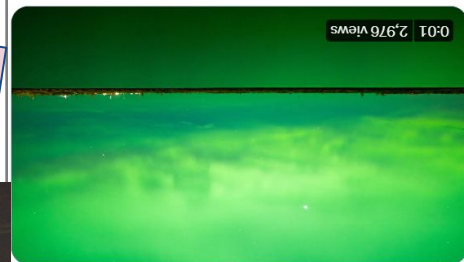
Visit go.nasa.gov/HelioBigYear to learn more!

2 solar eclipses
1 active Sun
JOIN
the celebration!

Did you know?
citizen scientists discovered
a new kind of aurora that
they called STEVE.



Have you met
STEVE?



#aurora #northernlights

Vincent Ledvina @VincentLedvina · Dec 20, 2022
Pulsating aurora (my favorite kind of aurora) fills the sky in Churchill as the next substorm gears up! Sometimes it takes hours for the aurora to recover and get ready to dance again, like an intermission for a second act

Did you know?
There are names for
different aurora patterns.

awesome sauce is
Green

Jack Fischer @Astro2fish

People have asked me what a "burrito of awesomeness smothered in awesome sauce" is... Well folks, it looks like this...awesome sauce is green.



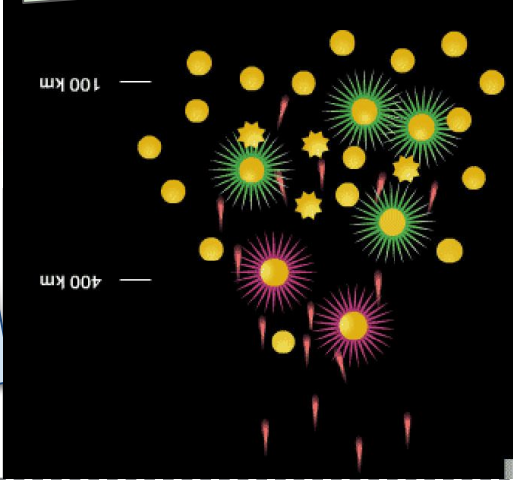
Aurora from the International Space Station
Time-lapse imagery as we fly through the amazing aurora 250 miles above at 17,500 mph.

You can help!

Join the chase and take photos of aurora with Aurorasaurus.org

Find patterns in aurora photos with the North Dakota Dual Aurora Cameras (NoDDAC) on Zooniverse.org (coming soon!)

Auroras are made of many tiny flashes of light produced by high energy particles in the Earth's upper atmosphere.



HELIOPHYSICS BIG YEAR

Join us **Oct. 2023 to Dec. 2024** for a global celebration of solar science and the Sun's influence on Earth and the entire solar system.

Visit go.nasa.gov/HelioBigYear to learn more!

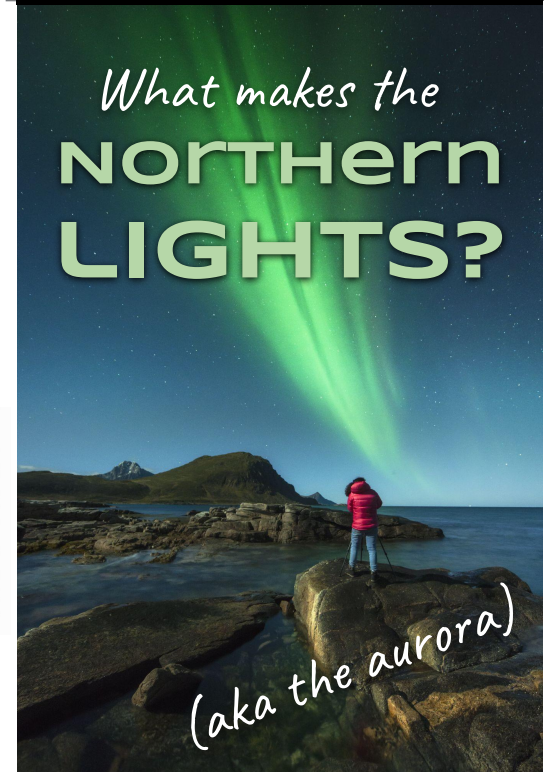
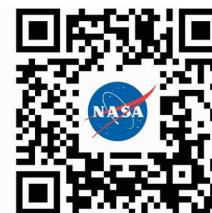


Image credit: NASA Goddard Space Flight Center

structure and motion in the corona.

Using polarized light, we will study fine

opportunity.

a fantastic one-of-a-kind viewing

eclipse allows us to see that from Earth in

The corona is surprisingly hot, and a solar

**YOU CAN BE PART OF
TEAMS HELPING TO
SOLVE THE MYSTERY OF
THE HOT CORONA!**

During the 2024 eclipse, CATE will take
a 60-minute video of the solar corona
with 35+ groups of citizen scientists
along the US eclipse path.

hot plasma flowing out of the sun.

complex magnetic field and the

of the sun's

the structure

we can see

In the corona



(the corona).

atmosphere

the sun's outer

blocks the sun, allowing us to see

During a solar eclipse, the moon



We are seeking volunteers
regardless of age or
experience.

Interested? Contact us!
cate@boulder.swri.edu

**DID YOU KNOW THE
CORONA WE SEE IN THE
ECLIPSE IS STILL A
MYSTERY?**



The Citizen Continental America
Telescopic Eclipse (CATE) Next-
Generation 2024 Experiment



HamSCI and its members are excited to offer numerous **Heliophysics Big Year** events, including ham radio competitions and research opportunities. All will utilize the skills available in the ham radio community.

1



Welcoming
ham radio operators
into the realm of
space physics research

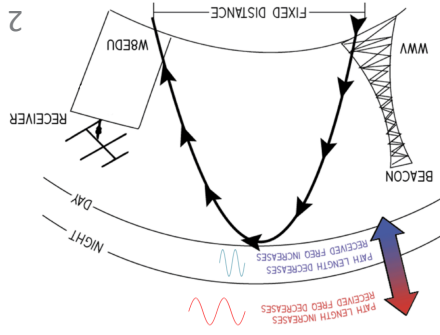
Ham Radio Science Citizen Investigation

IOWEII



Join us in **Oct. 2023** and **Apr. 2024** for HamSCI's FOEIS. Thousands of amateur (ham) radio operators doing what they do best - communicating via radio - generating data for solar eclipse-based space physics research. Visit hamsci.org/eclipse to learn more!

V 1.0



2

HamSCI members will be studying 'space weather' during the upcoming North American solar eclipses. We will be monitoring the eclipses' effects on the ionosphere, the region of charged particles existing 80 to 300 km above our heads.



HamSCI members will be transmitting and receiving shortwave radio signals before, during and after the eclipses, generating millions of data points for later analysis.

3

Summary

HamSCI's researchers have long utilized the skills of Amateur (ham) Radio Service licensees to advance space physics knowledge. The HBY presents many more collaboration opportunities.

6



Many participants will utilize their existing equipment.

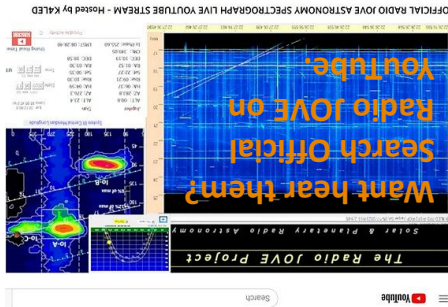
The simplest PSWS is the *Grape 1*. It is a user-built printed circuit board radio that is connected to the Web via a Raspberry Pi, allowing for data collection on a 24/7 basis.



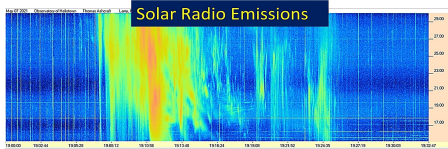
5

However, hams, long known for building their own gear, are encouraged to assemble *Personal Space Weather Stations (PSWS)*, designed by HamSCI.

4



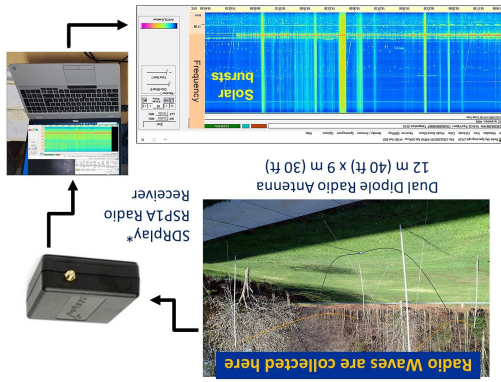
Electromagnetic radio waves are not sound waves. However, like a radio station transmitter they can be converted to sound waves.



Solar Radio Bursts, May 7, 2021
[T. Ashcraft, New Mexico]

You can set up and use your own radio telescope.

Computer with Radio-Sky Spectrograph Recording Software
Radio JOVE Dual Dipole antenna, SDRplay RSP1A receiver, and Radio-Sky Spectrograph (RSS) software. [Kit Cost = \$220 + shipping + \$120 antenna support structure (computer is not included)]. *SDRplay (www.sdrplay.com) is a UK-based company that manufactures Software Defined Radio (SDR) radios. Radio-Sky Spectrograph software from radiosky.com.

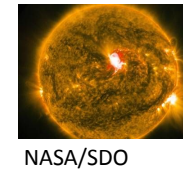


Solar radio waves can be detected using simple radio telescopes.

Science Question: How do solar eclipses affect radio waves through the ionosphere?



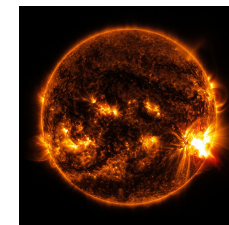
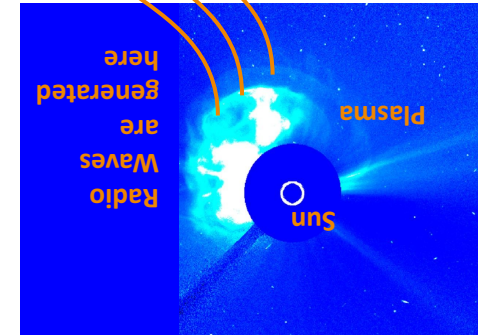
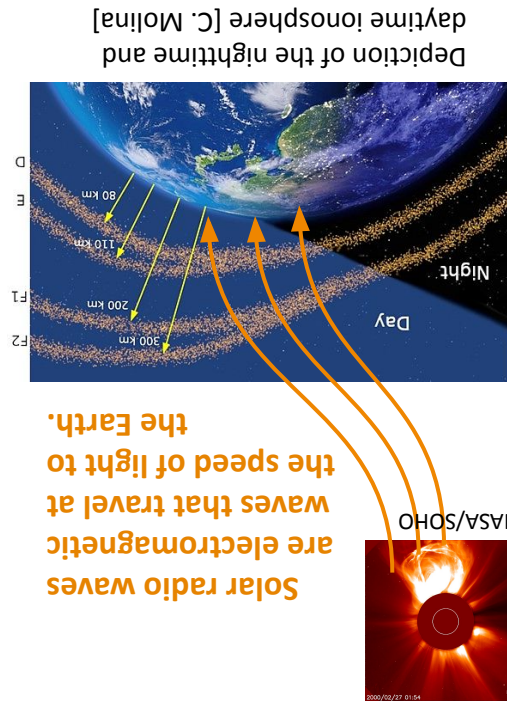
Map of Radio JOVE Telescope Sites
Radio JOVE needs people to observe the 2023 and 2024 solar eclipses.



Do you want to become a solar radio observer?

Join Radio JOVE:
radiojove.gsfc.nasa.gov

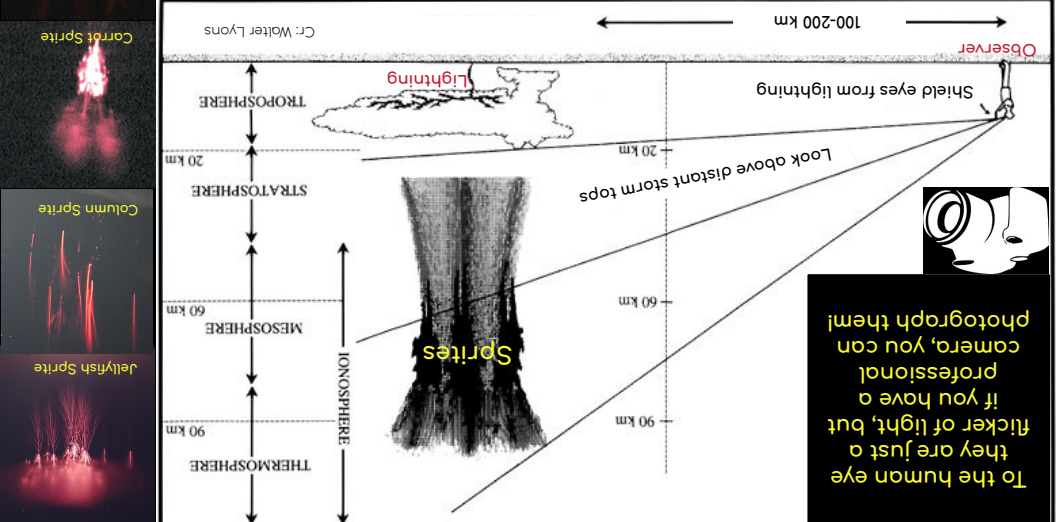
Contact Chuck Higgins:
chiggins@mtsu.edu



NASA/SDO

Have you heard the Sun?





How to look for Transient Luminous Events (TLEs)! Here is an example for Sprites

"Scientist - Citizen Scientist Partnership": A sprite chasing campaign in Oklahoma!

CHASING SPRITES

THE GREAT SPRITES CHASE - The Sun Spot

THE GREAT SPRITES CHASE THE GREAT SPRITES CHASE A NASA scientist and night-sky fanatic chase the elusive lights across Oklahoma. The odds are not in their favor. By Lina Tran

Chasing Sprites in Electric Skies

Paul Smith is a night-sky fanatic and photographer. His obsession is sprites.

Spritacular

Capturing the Strange Lights Above Thunderstorms

A Q&A with NASA scientist Dr. Burcu Kosar

NASA Sun Science

October 28, 2022

Join NASA scientist Burcu Kosar on Halloween (this Monday!) at 12pm EDT to learn about jets, sprites, and halos!

These are the names of colorful flashes above thunderstorms collectively known as Transient Luminous Events - or TLEs - and they are not well understood. To learn about these natural phenomena Burcu has released a new citizen science project named Spritacular where photographers can submit their TLE images to the scientific community. Here are a few people from around the world who have become experts at capturing these elusive lights on camera.

NASA Sun Science

October 28, 2022

Want to know how to photograph the tops of thunderstorms? In this Q&A, NASA's Dr. Burcu Kosar talks about her new citizen science project Spritacular and how you can help advance the science of these mysterious electrical phenomena. Dr. Kosar is answering your questions live in the comments - leave them below!

A night of adventurous chasing...

Left to Right: Paul Smith, Lina Tran, Burcu Kosar (top), Joy Ng (bottom), and Terrill Graham.

...ends with capture of column sprites!

You Can Help Advance NASA Science!

Spritacular

Spritacular (pronounced sprite-tacular) leverages the power of crowdsourcing to advance the science of sprites and TLEs!

@spritacular

www:// spritacular.org

Join the Chase from the ground!

Engage with our community!

NASA Partner

100 km

Altitude

0 km

50 km

Troposphere

Stratosphere

Mesosphere

Ionosphere

Electron density

Blue jets

Blue glimmers

Electron-positron Beam

Gamma-rays

Gigantic Jet

Halo

Red Sprite

Blue Sprite

Elve

Transient Luminous Events (TLEs)

The more we study the electrical nature of thunderstorms, the more we learn about their magic.

Ben Franklin

To this day, lightning still remains a mystery, long after Ben Franklin's kite experiment in 1752...

The region of space above the thunderstorms is a zoo of electrical activity! Collectively they are known as Transient Luminous Events (TLEs).

Credit: NASA

HELIOPHYSICS BIG YEAR

Join us Oct. 2023 to Dec. 2024 for a global celebration of solar science and the Sun's influence on Earth and the entire solar system.

Visit go.nasa.gov/HelioBigYear to learn more!

QR code linking to go.nasa.gov/HelioBigYear

Spritacular

A Citizen Science Project Studying Electricity Above Thunderstorms

NASA Partner

What zap was that?