
Visit go.nasa.gov/HelioBigYear to learn more!
The Sun is a huge magnet. Every 11 years, the Sun reverses its poles. This causes active times and quiet times. We are heading into an active time?

**HELIOPHYSICS**
the study of the Sun and everything it affects

**BIG YEAR**
From birding, trying to do as many of a thing as possible in 1 year
As the Sun gets more active it can send storms that cause beautiful Northern and 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 and enjoy the different solar eclipses?

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

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

Vincent Ledvina @Vincent_LEDVINA · 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!

#aurora #northernlights

Have you met STEVE?

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

You can help!

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

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!) 6

Aurora from the International Space Station
Time-lapse imagery as we fly through the amazing aurora 250 miles above at 17,500 mph.
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
During a solar eclipse, the moon blocks the sun, allowing us to see the sun’s outer atmosphere (the corona).

In the corona we can see the structure of the sun’s complex magnetic field and the hot plasma flowing out of the sun.
The corona is surprisingly hot, and a solar eclipse allows us to see that from Earth in a fantastic one-of-a-kind viewing opportunity.

Using polarized light, we will study fine structure and motion in the corona.

Image credit: NASA Goddard Space Flight Center
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.
Visit hamsci.org/eclipse for solar eclipse-based space physics research. For best communicating via radio, generating data they do best - communicating via radio - generating data... Thousands of amateur (ham) radio operators doing what they do best - communicating via radio - generating data they do best. Join us in Oct 2023 and Apr 2024 for HamSCI's FoEIS.

HamSCI
Ham Radio Science Citizen Investigation

Welcoming ham radio operators into the realm of space physics research.
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.

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.

Many participants will utilize their existing equipment.

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

More complex, commercially produced versions of the PSWS are under development. The goal is to present a range of experiences and cost points to citizen scientists. See [hamsci.org/psws](http://hamsci.org/psws) for details.

**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.
Do you want to become a solar radio observer?

Join Radio JOVE: radiojove.gsfc.nasa.gov

Contact Chuck Higgins: chiggins@mtsu.edu
Solar radio waves
are electromagnetic
waves that travel at
the speed of light to
the Earth.

Coronal Mass Ejection
(CME) with outgoing
shock [NASA/SOHO]

Solar Radio waves are
caused by moving charged
particles (plasma).
An active Sun causes many
radio waves.

Depiction of the nighttime and
daytime ionosphere [C. Molina]
Solar radio waves can be detected using simple radio telescopes.

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

Want hear them? Search Official Radio JOVE on YouTube.
Radio data are color displayed as a 15-30 MHz radio frequency vs time spectrogram.

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

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

You can set up and use your own radio telescope.

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


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Spritacular
A Citizen Science Project Studying Electricity Above Thunderstorms

What zap was that?
To this day, lightning still remains a mystery, long after Ben Franklin’s kite experiment in 1752...

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

The region of space above the thunderstorms is a zoo of electrical activity! Collectively they are known as Transient Luminous Events (TLEs).
How to look for Transient Luminous Events (TLEs)!
Here is an example for Sprites

To the human eye they are just a flicker of light, but if you have a professional camera, you can photograph them!

Look above distant storm tops

Shield eyes from lightning

Observer 100-200 km

Sprites

Lightning

Cr: Walter Lyons

Amazing Photographs from Citizen Scientists all around the world!
(Credits: Nicolas Escurat, Levi Riggins, Martin Popek, Oscar van der Velde, Frankie Lucena, Patrick Huet)

Jellyfish Sprite
Column Sprite
Carrot Sprite
Gigantic Jet
Blue Jet
Sprite & Halo
ELVEs
Halo
Angel Sprite
"Scientist - Citizen Scientist Partnership": A sprite chasing campaign in Oklahoma!

You Can Help Advance NASA Science!

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

@spritacular
www://spritacular.org

A night of adventurous chasing...

...ends with capture of column sprites!

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

Join the Chase from the ground!

Engage with our community!