National Aeronautics and Space Administration

The Framework for Heliophysics Education: Community Presentations

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About NASA HEAT

The NASA Heliophysics Education Activation Team (NASA HEAT) is comprised of scientists, engineers, and educators who work collaboratively to bring heliophysics resources to learning spaces across the country. All of NASA HEAT's resources can be accessed through the Framework for Heliophyisc Education and the Heliophysics Resource Database.

Learn More about the Framework for Heliophysics Education

LOCATION
NASA Goddard Space Flight Center

PRINCIPLE INVESTIGATOR
Dr. Michael Kirk

CO-INVESTIGATING INSTITUTIONS
5

MEMBER OF
NASA's Science Activation Program

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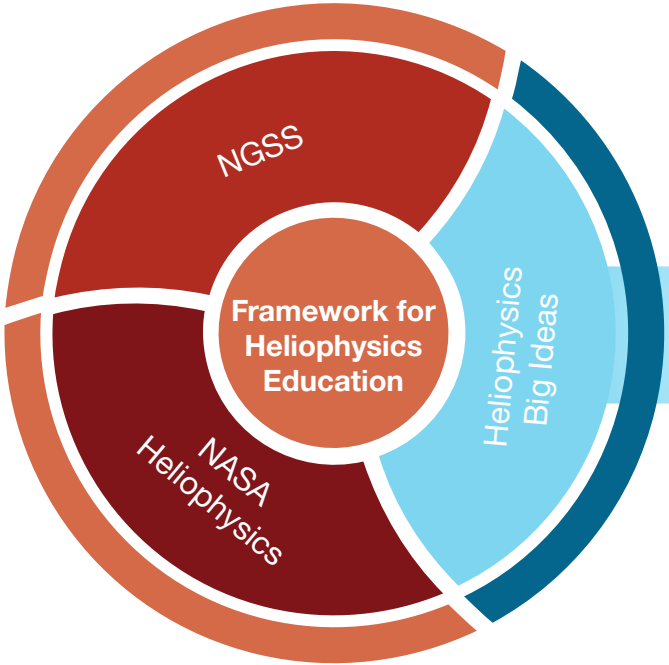
The Framework for Heliophysics Education



Heliophysics Big Ideas Breakdown by Level

K-5	Guiding Question	• Background Knowledge • NGSS Connection • Activities
MS	Guiding Question	• Background Knowledge • NGSS Connection • Activities
HS	Guiding Question	• Background Knowledge • NGSS Connection • Activities

Heliophysics Resource Database

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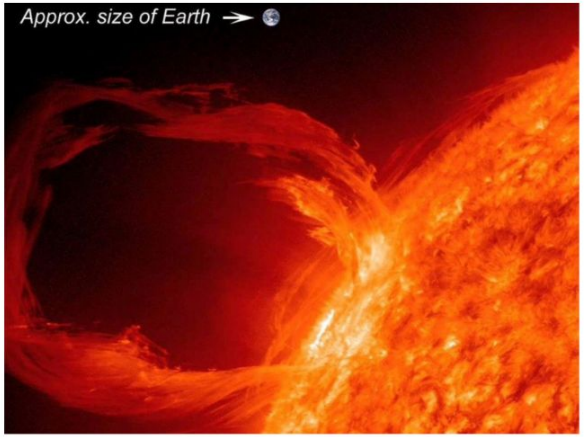
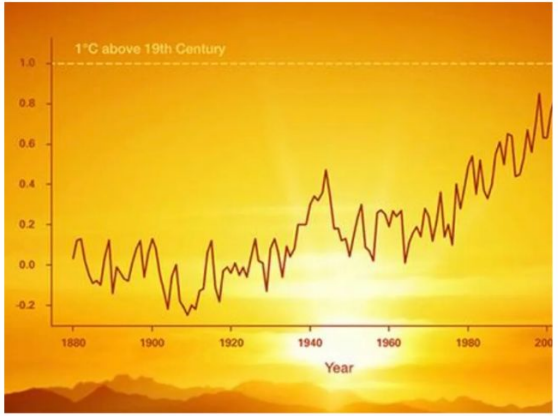
Heliophysics Big Ideas

What are the impacts of the changing Sun on humanity?



The Sun is really big and influences all objects in the solar system.

The Sun is active and can impact technology on Earth via space weather.



The Sun's energy drives Earth's climate, but the climate is in a delicate balance and is changing due to human activity.

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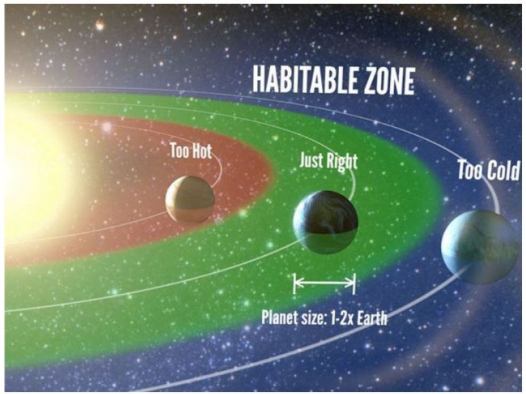
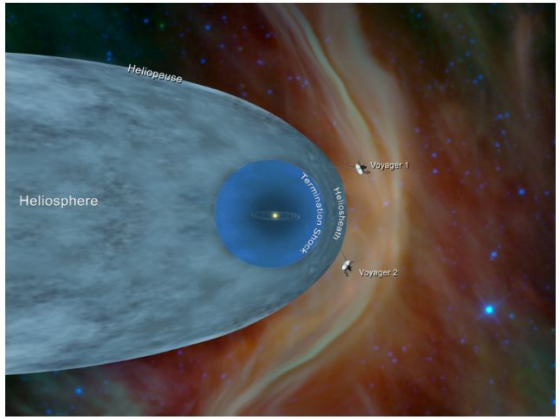
Heliophysics Big Ideas

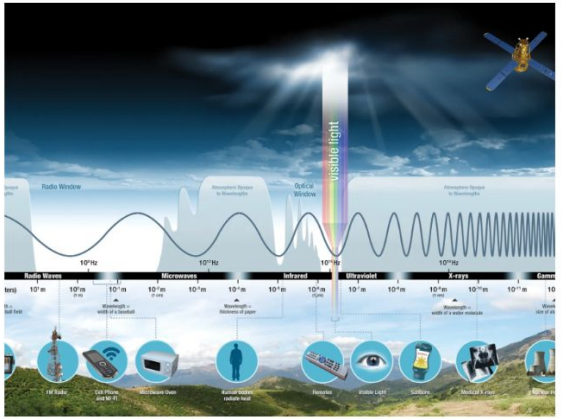
How do Earth, the solar system, and the heliosphere respond to changes on the Sun?



Life on Earth has evolved with complex diversity because of our location near the Sun. It is just right!



The Sun defines the space around it, which is different from interstellar space.



The Sun is the primary light source in the solar system.

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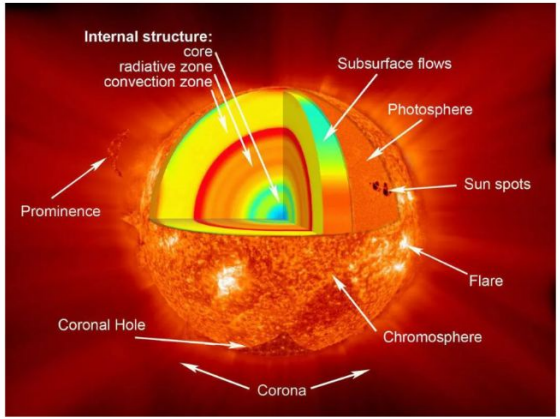
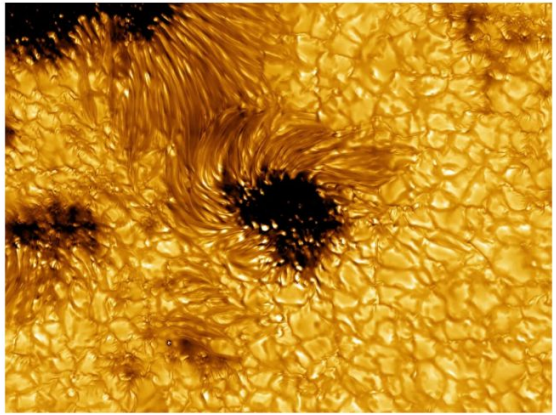
Heliophysics Big Ideas

What causes the Sun to vary?



Energy from the Sun is created in the core and travels outward through the Sun and into the heliosphere.



The Sun is made of churning plasma, causing the surface to be covered with complex, tangled magnetic fields.

Our Sun, like all stars, has a life cycle.

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June 2, 2026

HELIOPHYSICS EDUCATION COMMUNITY PRESENTS

Northern Lights: Rocket Science

Like crime scene investigators, two scientists use clues at the "crash site" and work backward to investigate the cause. As principal investigators of rocket missions, they fly rockets through active auroras to reveal what sent them on their destructive courses.

All About Flickering and Vanishing Auroras

Auroras are caused by particles from the Sun that run into and dance with Earth's magnetic field. Seen usually toward the North and South Poles, some may appear as ribbons of colors in the night sky. Others flicker or pulsate, or are riddled with holes. Launching sounding rockets help us learn the causes of different types of auroras, understand our space environment, and protect spacecraft and astronauts.

Tuesday, June 2
2026 at 1 PM EDT

Click to join!

Meeting ID: 217 328 263 763
Passcode: fiuSmP

Drs. Marilia Samara and Robert Michell
Principal Investigators, Sounding Rockets

Launching rockets to study pulsating or missing auroras at the right time takes a mix of experience, intuition, and determination. Drs. Marilia Samara and Robert Michell are both heliophysicists at NASA's Goddard Space Flight Center. Their missions study different types of auroras by measuring the energy, quantity, and relative arrival times of the electron populations forming them.

Monthly Meeting Convener:
Michael Kirk of NASA's Heliophysics Education Activation Team (NASA HEAT)

Upcoming Community Meetings

July 7 - Artemis II and Heliophysics
August 4 - The Summer Sun

For additional information, contact Carolyn Ng at carolyn.y.ng@nasa.gov

Northern Lights and Heliophysics Big Ideas

The Sun is active and can impact technology on Earth via space weather.

Heliophysics Big Idea 1.2
Driving Question: *What are the impacts of the changing Sun on humanity?*
Relevant Topics: atmosphere, aurora, coronal mass ejection, geomagnetic storm, ionization, magnetic fields, magnetic reconnection, magnetosphere, magnetotail, plasma, radio blackout, solar cycle, solar flare, solar wind, space weather, sunspots, Van Allen belts

Guiding Questions

Introductory Learner (K-5)
How does the Earth keep us safe from the harmful effects of the Sun?

Intermediate Learner (6-8)
How does space weather impact my daily life?

Advanced Learner (9-12+)
How do scientists predict space weather?

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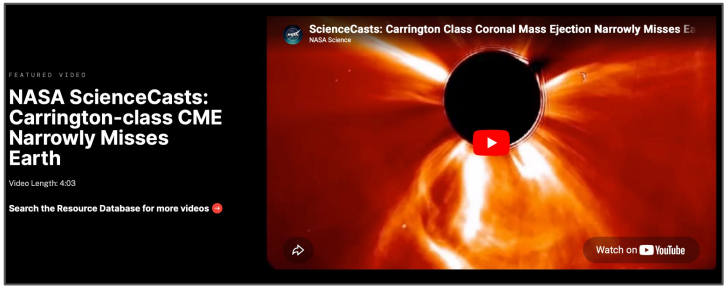
Big Idea 1.2 Advanced Learner Resources

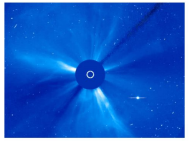
Advanced Learner (9-12+)

How do scientists predict space weather?



Recommended Resources

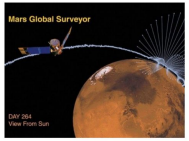
Explore this guiding question with these featured advanced level resources.



Lesson Plan

Tracking High-energy Protons from Coronal Mass Ejections

Resource



Digital Activity

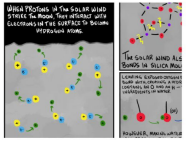
Planetary Magnetism "Digi Kit"

Resource

Math-infused Activities

Space Weather Math Educator Guide

Resource



Article + Video

Solar Wind: Mad Science at the Lunar Surface

Resource

Educator Background

Scientists use a variety of methods to predict space weather. There are both ground-based observatories and satellites in Earth's orbit (and in orbit around the Sun) that take measurements that can help to predict space weather. Scientists predict space weather by monitoring the solar cycle (approximately 11 years), which can be observed by counting the number of sunspots, measuring changes in Earth's magnetic field, and by studying the Sun's atmosphere, the corona.

Learning Constraints

At this level students have a deeper understanding of electromagnetism (HS-PS2-4,5), can quantify field interactions with Coulomb's Law (HS-PS2-4), and explain how Earth is able to generate a magnetic field, due to a rotating liquid outer core of Earth (HS-ESS2-3).

Connect to Heliophysics

Connect to the Sun by focusing on the magnetic interactions on the Sun, including magnetic reconnection, and how the Sun's magnetic fields interact with Earth's magnetic field. Scientists use the Kp-Index to quantify the level of disturbance in Earth's magnetic field in order to predict space weather. Have students compare their analysis of sunspot data to their analysis of data from Earth-based magnetometers.

Extend Exploration

Extend student exploration by having students explore the Van Allen Radiation Belts, which are essentially particles from the solar wind caught in the Earth's magnetosphere.

Differentiate for Beginner Learners

Support beginner students by reviewing the basics of magnetic field interactions (MS-PS2-5).

Differentiate for More Advanced Learners

Challenge students at the next level to investigate how technologies are impacted. For example, changes in Earth magnetic fields cause electrical currents to flow in the Earth's crust. Sometimes these currents can find their way into transformers, causing the transformers to overheat and fail, resulting in electrical blackouts.

This image was created by adding together 54 observations of the sun's 10-million degree outer atmosphere, called the corona. The observations were made between Aug. 17 and Oct. 4. Perhaps the most striking feature of this visualization is how the activity is concentrated in horizontal bands above and below the equator. These so-called "activity belts" start closer to the poles and gradually move to low latitudes as the 11-year solar cycle progresses. We're currently in the maximum phase of this cycle, when there are many active regions clustered around 15 degrees above and below the equator. In the coming years, activity will concentrate even closer to the equator, as it peters out and the cycle begins anew. The driver of the activity belts is the solar dynamo, which generates the sun's magnetic field and ultimately produces all of the fun events documented on this site. However, the dynamo is a mysterious beast. The basics of it are very much the same as the electromagnetic you probably made in science class, where a magnetic field is created by sending an electric current through a coiled wire (Ampère's law). For the sun, the electric current is the plasma swirling around its interior. But beyond that, the details get murky and scientists are working hard on sorting them out.
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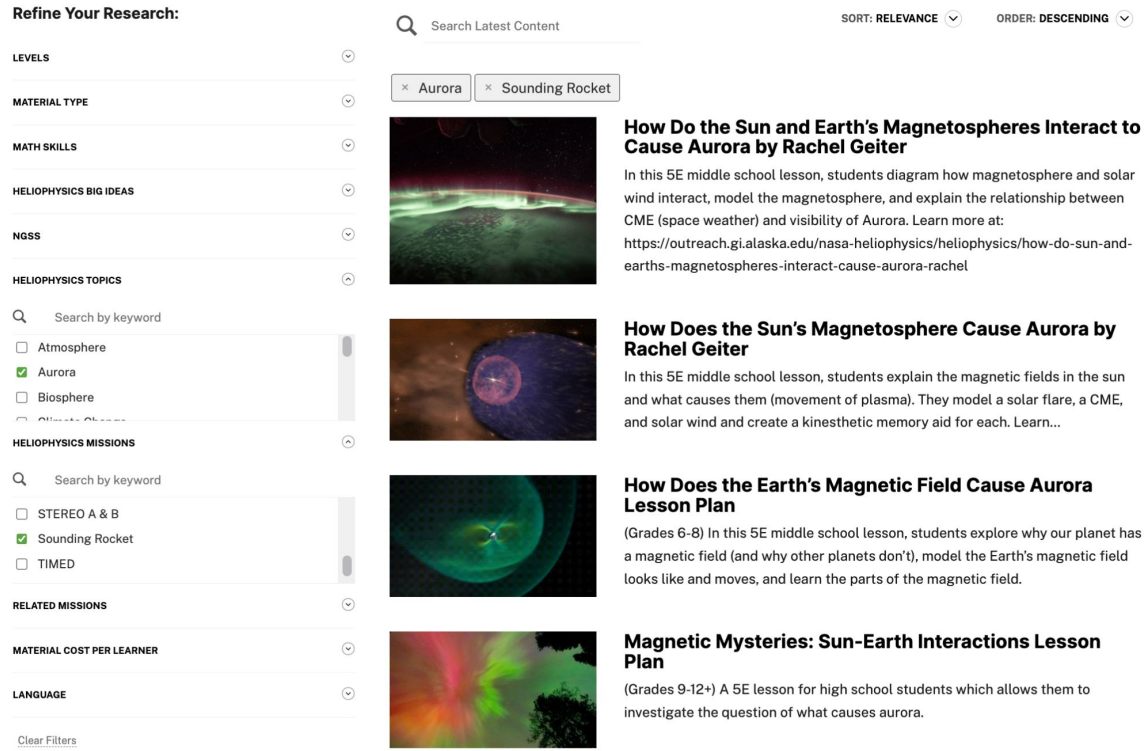
Heliophysics Resource Database



Filters:

Helio Topic: Aurora

Helio Mission: Sounding Rocket

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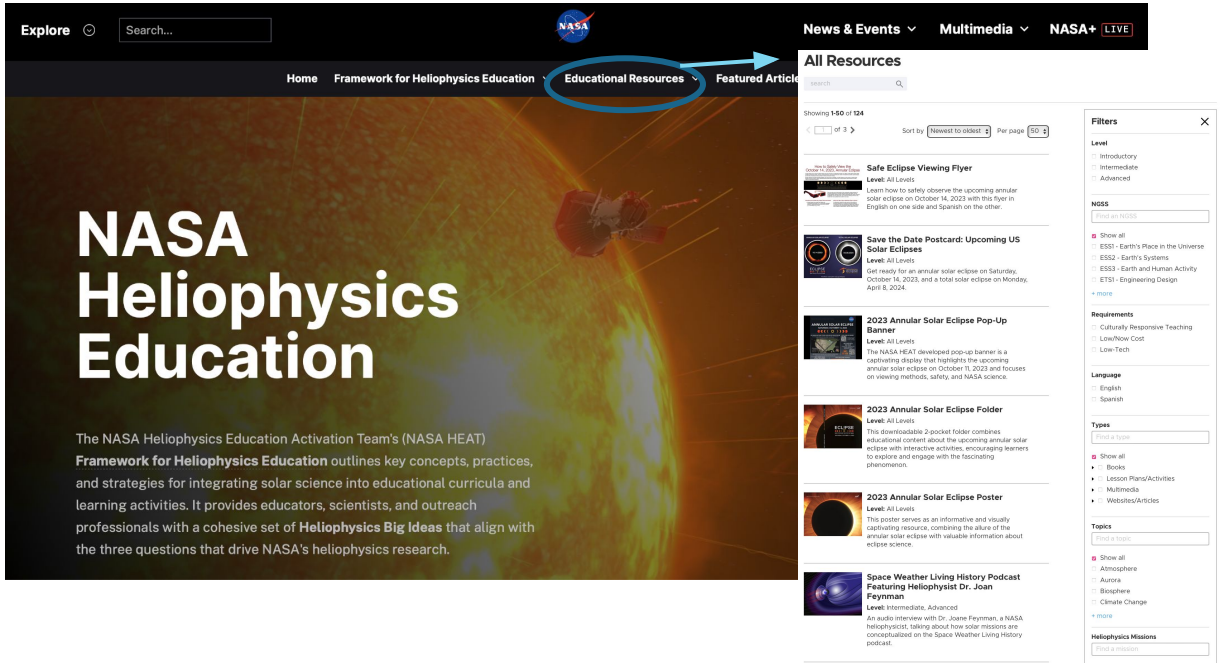
NASA HEAT Website

Learn more about the Framework for Heliophysics Education and search for activities by level, topic, NGSS PE, mission, and more on the NASA HEAT website.



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Professional Development Resources

This heliophysics community presentation will be uploaded into our database and will be featured on our new Professional Development webpage (coming soon), with resources specifically for use to train staff on how to implement educational programming or outreach events.