National Aeronautics and Space Administration

The Framework for Heliophysics Education: Community Presentations

NASA HEAT

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Principal Investigator: Dr. Michael Kirk

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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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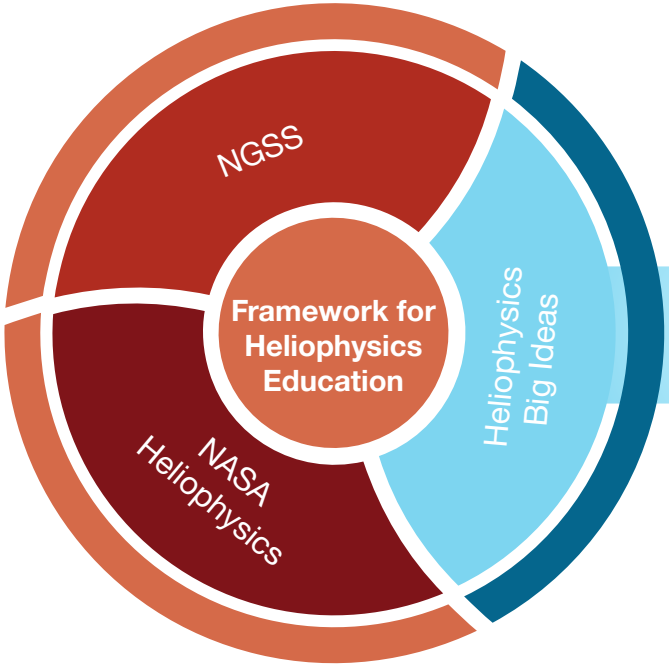
The Framework for Heliophysics Education



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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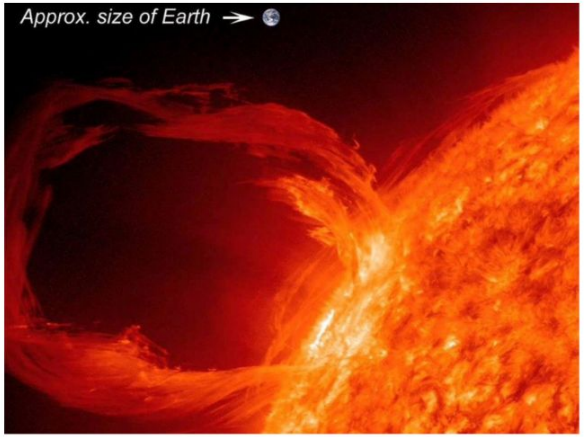
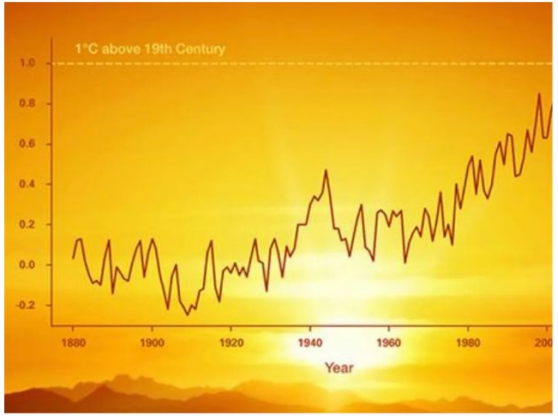
Heliophysics Big Ideas

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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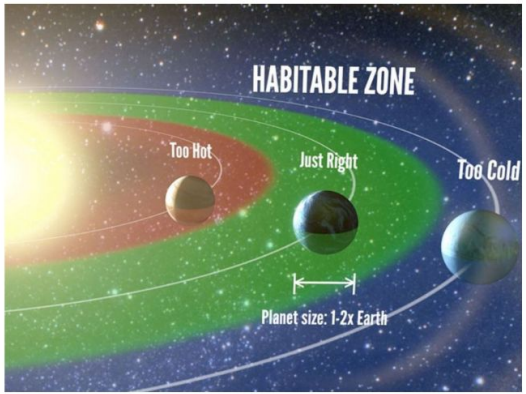
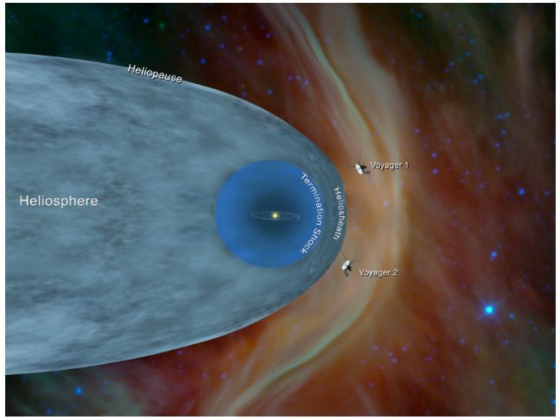
Heliophysics Big Ideas

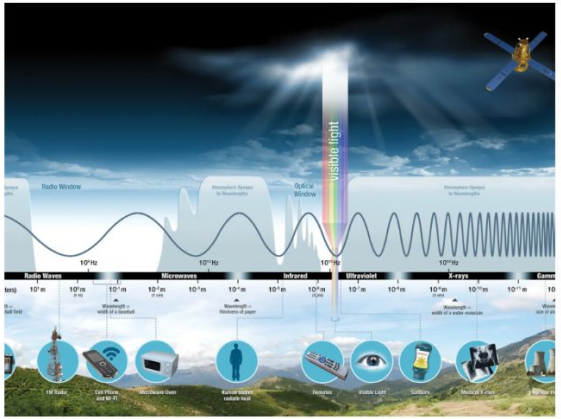
How do Earth, the solar system, and the heliosphere respond to changes on the Sun?



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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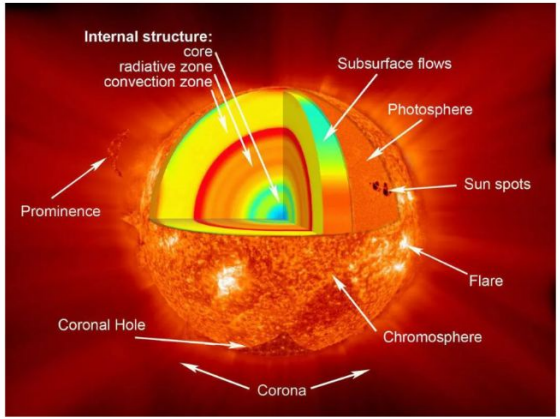
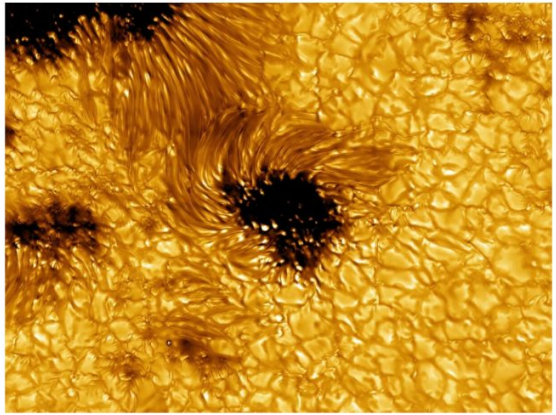
Heliophysics Big Ideas

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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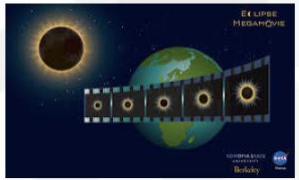
July 28, 2026

HELIOPHYSICS EDUCATION COMMUNITY PRESENTS

Eclipse Megamovie Finds Secrets of Solar Jets and Plumes

During the last total solar eclipse, volunteers along the path of totality took pictures using high-resolution cameras on sun-tracking mounts. These pictures were stitched together into a megamovie to help scientists study the Sun.



Citizen Scientists Help Solve Solar Mysteries

Building on the success of its 2017 predecessor, *Eclipse Megamovie 2024* was a NASA funded project to uncover the secret lives of solar jets and plumes. Following the April 2024 total solar eclipse, over 140 volunteers contributed more than 1 terabyte worth of photographs for scientific analysis. How did scientists comb through the voluminous data, and what did they discover?

Tuesday, August 4, 2026 at 1 PM EDT

Click to join!

Meeting ID: 219 953 739 794 38
Passcode: QD7Z4w6Y

Dr. Laura Peticolas, Megamovie Principal Investigator

Dr. Laura Peticolas, a space physicist, leads the *Eclipse Megamovie 2024* team. She is the Director of EdEon STEM Learning at Sonoma State University, where she engages teachers, high school students, and college students in Earth and Space Sciences with coding, hardware, and experimental design. She is also a co-investigator of NASA's Neurodiversity Network, and the Project Director of the Department of Education's Scaling an innovative STEM And Computing Education Support (STEMACES) Model for Improved Science Learning Mid-Phase Program.

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

Upcoming Community Meetings

September 1, 2026 – STEREO Mission: 20 years of observations
October 6, 2026 – Heliopause: what do Voyager, IBEX and IMAP see?

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

Eclipses and Heliophysics Big Ideas

01

The Sun is really big and its gravity influences all objects in the Solar System.

Relevant Topics: corona, lunar eclipse, lunar phases, Newton's Law of Gravity, seasons, solar eclipse, solar system, transits

Explore

A solar eruptive prominence as seen in extreme UV light on March 30, 2010 with Earth superimposed for a sense of scale.
NASA/SDO

Guiding Questions

Introductory Learner (K-5)

What causes the changes we observe in the sky each day, month, and year, i.e. light, shadows, and positions of objects?

Intermediate Learner (6-8)

How do gravitational forces in the Sun-Earth-Moon system cause seasons, eclipses, and lunar phases?

Advanced Learner (9-12+)

Why don't we experience an eclipse each month?

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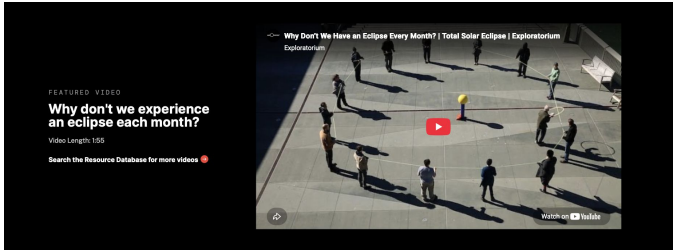
Big Idea 1 Advanced Learner Resources

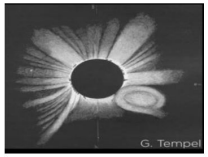
Advanced Learner (9-12+)

Why don’t we have an eclipse every month?



Recommended Resources

Explore this guiding question with these featured advanced level resources.



Lesson Plan

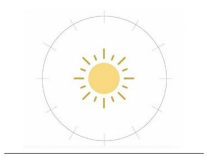
What Do Scientists Learn About the Universe From Observing Solar Eclipses?

Resource

Digital Activity

Learning from Stars and Solar Eclipses

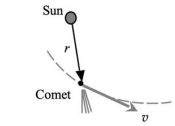
Resource



Hands-on Activity

Modeling the Sun-Earth-Moon System

Resource



Math-infused Activity

Angular Momentum and Kepler's Second Law

Resource

Educator Background

We don't experience eclipses every month on Earth because the orbit of the Moon is tilted with respect to Earth's orbit around the Sun, causing the Sun-Moon-Earth alignment needed for an eclipse to be less frequent. Eclipses only occur around the time of the equinoxes, which is a direct connection with the different orbital planes of Earth and the Moon.

Learning Constraints

At the high school level, students are applying math to predict the motion of objects in the Solar System (HS-ESS1-4) and are quantifying Newton's Law of Gravity and Kepler's Laws of Motion (HS-PS2-4).

Connect to Heliophysics

Connect to the Sun by having students explore how the motions of Earth and the Moon are controlled by gravity (Newton) and how this determines the duration of eclipses and other variables that affect the appearance of the eclipse, for example the type of eclipse. The elliptical shape of the Moon's orbit around Earth determines whether we experience an annular or total solar eclipse (Kepler).

Extend Exploration

Extend student exploration by investigating why orbits change over time. Have them use their calculations to model how scientists predict future eclipses and to predict when the last total solar eclipse will be possible on Earth.

Differentiate for Beginner Learners

Support beginner students by having them develop models for the basic mechanics of eclipses, including the stages of an eclipse (MS-ESS1-2,3).

Differentiate for More Advanced Learners

Challenge students at the next level by having them investigate the scientific breakthroughs made by scientists by observing the Sun during a total solar eclipse, including evidence used to prove Einstein's General Theory of Relativity.

On August 21st, 2017, DSCOVR EPIC captured a total solar eclipse over North America.
NASA EPIC Team

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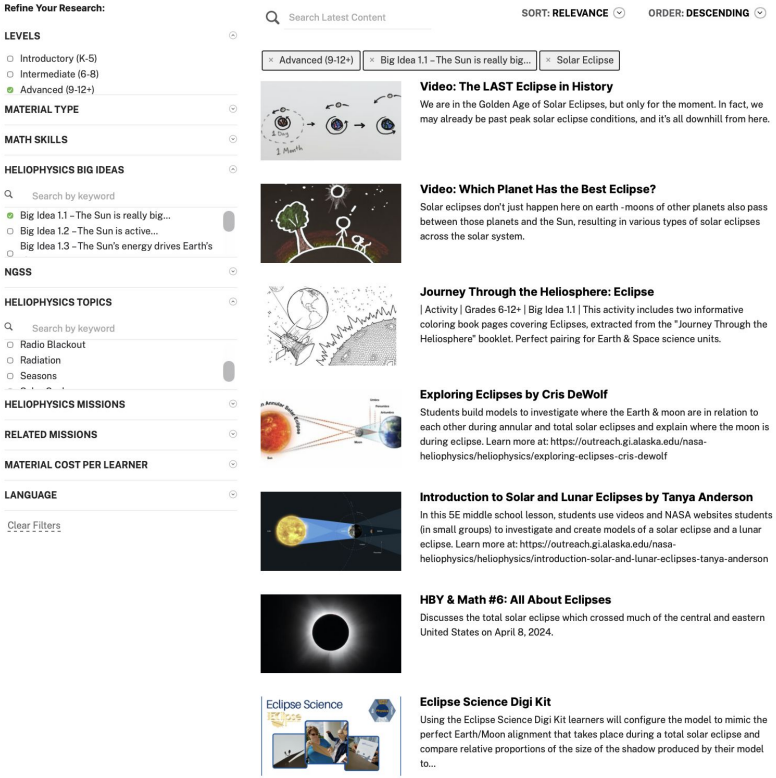
Heliophysics Resource Database



Filters:

Levels: Advanced

Helio Big Idea: 1

Helio Topic: Solar Eclipse

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Solar Jets, Plumes, and Heliophysics Big Ideas

07

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

Relevant Topics: coronal mass ejection, electromagnetism, energy, ionization, magnetic fields, magnetic reconnection, plasma, solar cycle, solar flare, solar wind, space weather, sunspots

Explore

A solar eruptive prominence as seen in extreme UV light on March 30, 2010 with Earth superimposed for a sense of scale.
NASA/SDO

Guiding Questions

Introductory Learner (K-5)

What is the Sun made of?

Intermediate Learner (6-8)

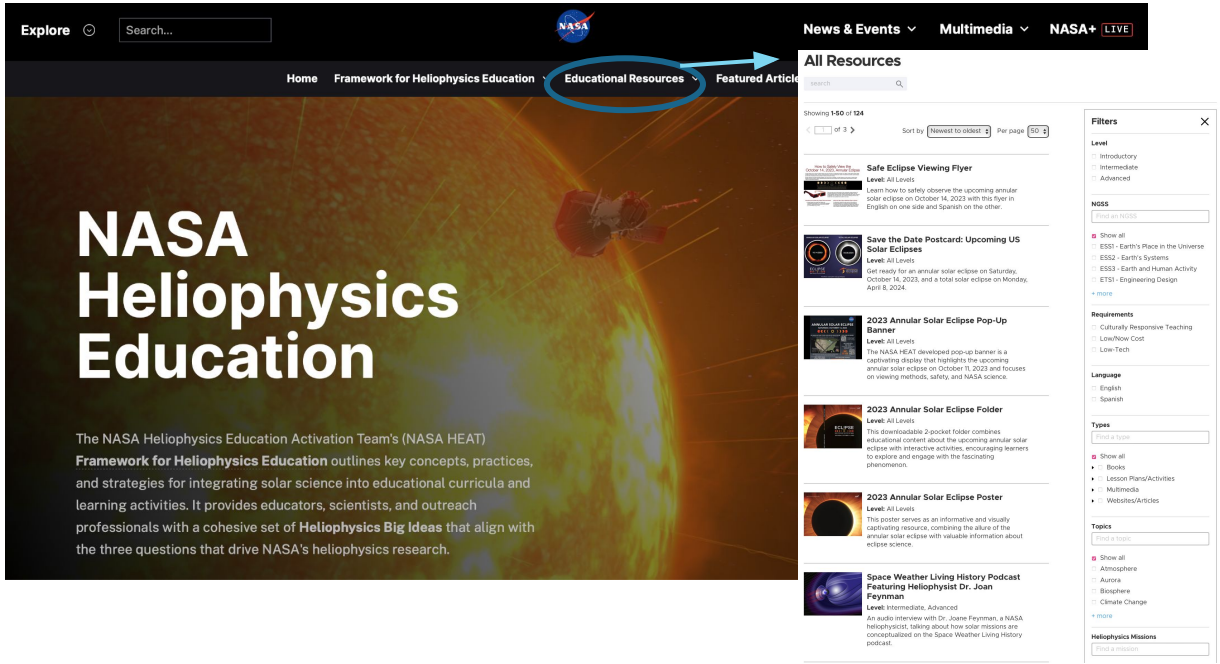
How do the Sun's magnetic fields compare to that of Earth's?

Advanced Learner (9-12+)

What are the properties of plasma and how do those properties make the Sun a giant sphere of massive energy?

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.