National Aeronautics and Space Administration

NASA

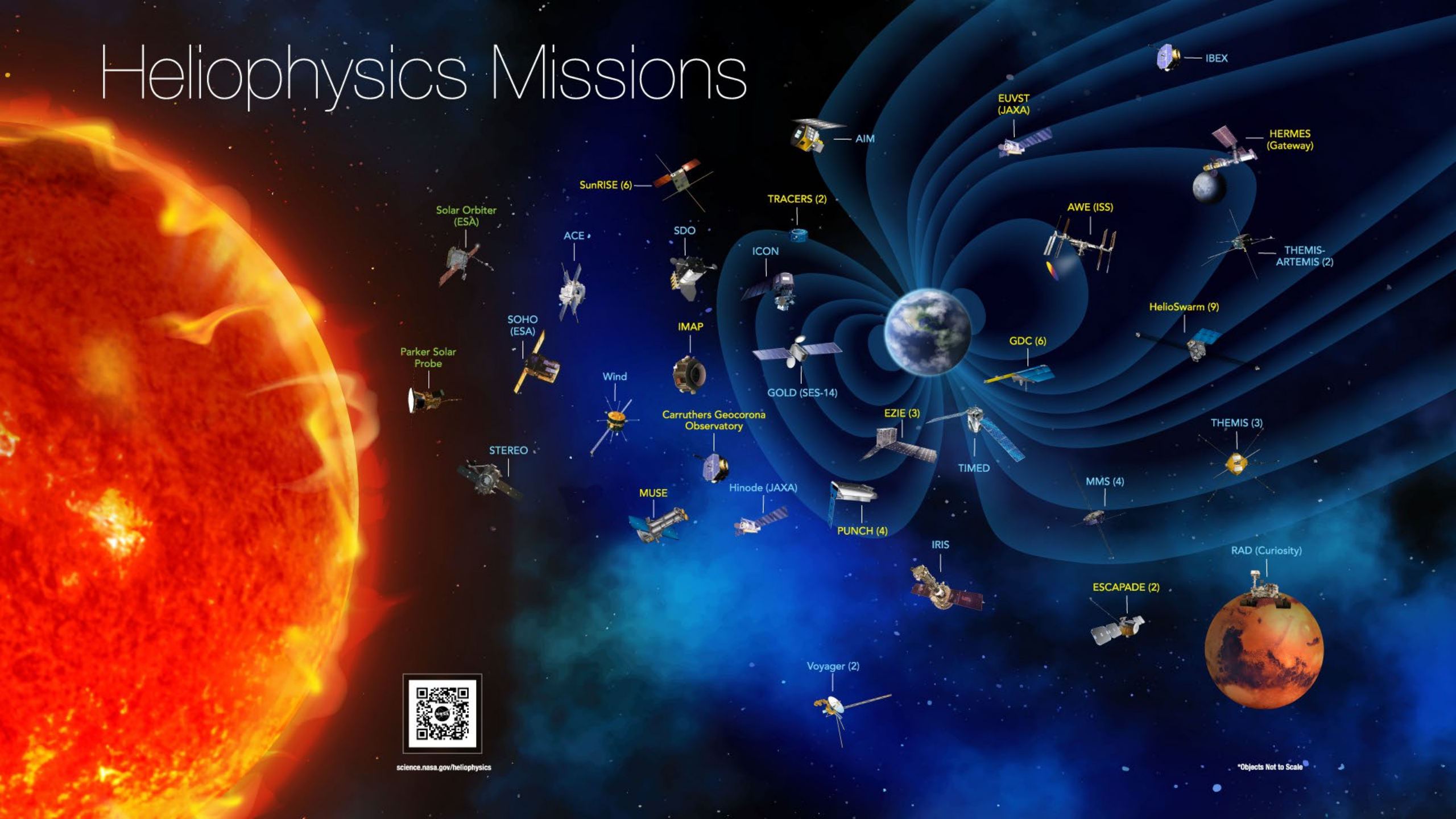
2024 Total Solar eclipse

THROUGH THE EYES OF NASA

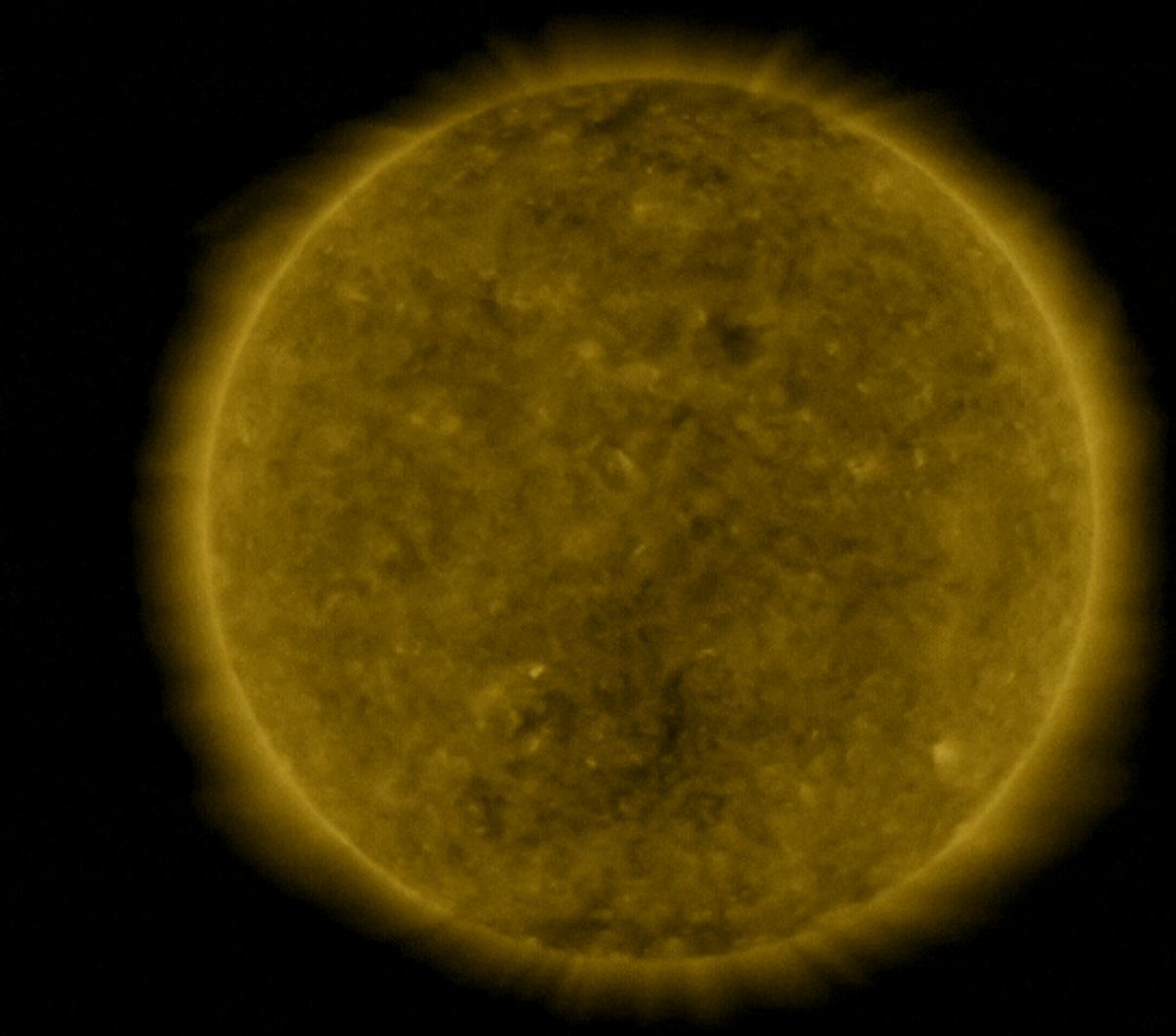
Dr. Kelly Korreck
Program Manager

“THE SUN TOUCHES EVERYTHING”

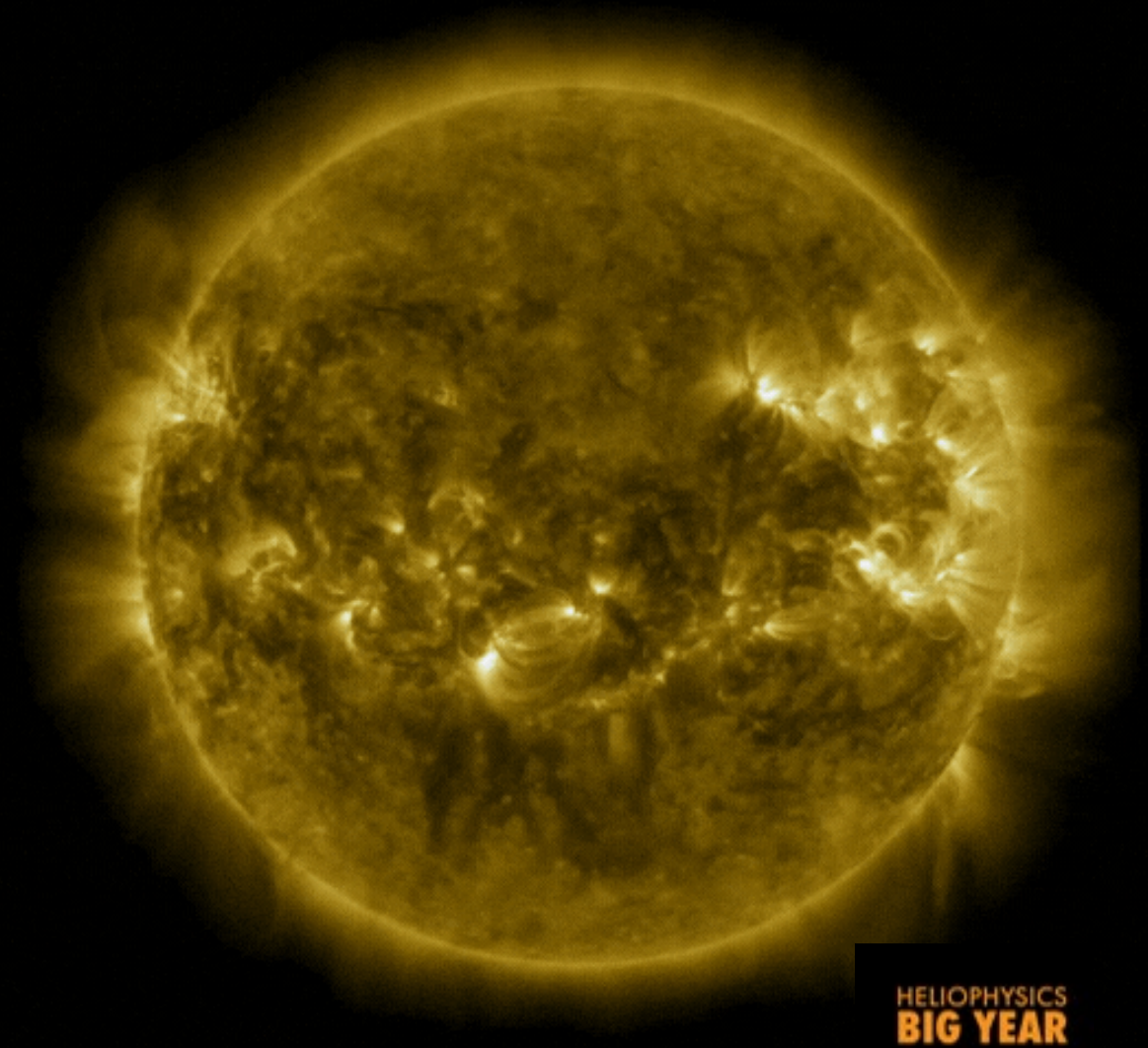
Heliophysics Missions



SOLAR **MINIMUM**



SOLAR **MAXIMUM**



HELIOPHYSICS
BIG YEAR

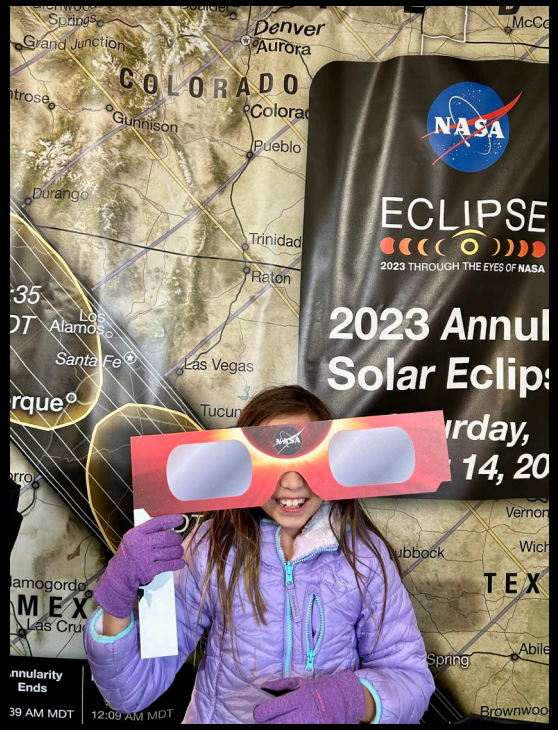
NASA’s Involvement in the Eclipse

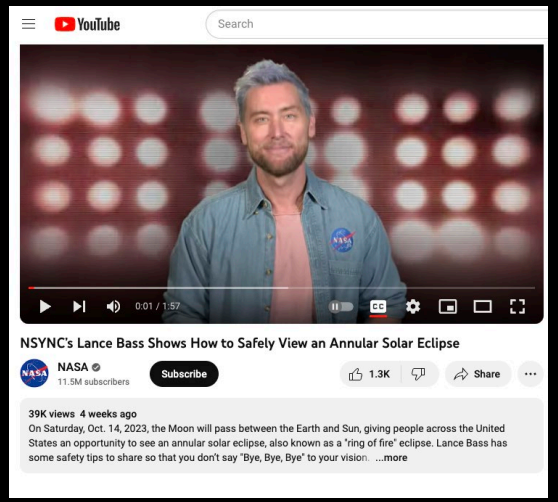
- Safety
- Science
  - ROSES Awards
  - Capability building
  - Citizen Science
- Agency level visibility
- STEM engagement

National Aeronautics and Space Administration

www.nasa.gov

Safety First!



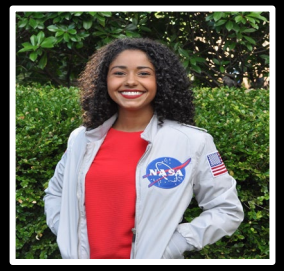


NASA Promoted safe eclipse viewing through distribution of glasses to partner organizations, creation of a safety flyer in partnership with NOAA, NSF, and the American Astronomical Society, Public Safety Announcements by celebrities, and modeling safe viewing by our Heliophysics leadership.

NASA's Live Broadcast

October 14, 2023, 10:30 a.m. – 12:15 p.m. CT

Kerrville, TX



Tahira Allen
Host

Dr. Gina DiBraccio
Co-Host

James Tralie
Eclipse Desk

Albuquerque, NM

Joy Ng
Host

Dr. Michael Kirk
Co-Host

Balloon Fiesta

- Fifty NASA Science team members supported the NASA Science tent at the International Balloon Fiesta event, held in Albuquerque, NM, October 12-15, 2023
- Estimated attendance was 80,000 each day, with 125,000 attendees reported on October 14 (annular eclipse).
- The outdoor NASA tent featured 9 hands-on activities, including an eclipse photo station, eclipse DIY activities, 3D Hubble experiences, astrophysics demos, real-time ozone and atmospheric particulate data collection, GLOBE temperature data collection, augmented reality with Earth data, and building virtual flight logs.

Balloon Museum

Partnership with NOAA and NSF

How to Safely View the October 14, 2023, Annular Eclipse

A solar eclipse occurs when the Moon blocks any part of the Sun. On Saturday, October 14, 2023, a solar eclipse will be visible (weather permitting) in North, Central, and South America. All 49 continental U.S. states will experience at least a partial eclipse, as will most of Canada and all countries in Central and South America.

During a partial or annular (ring) solar eclipse, such as the one on October 14, 2023, there is no time when it is safe to look directly at the Sun without using a special-purpose solar filter that complies with the transmission requirements of the ISO 12312-2 international standard.

The only safe way to look directly at the uneclipsed, partially eclipsed, or annularly eclipsed Sun is through special-purpose solar filters, such as "eclipse glasses" (example shown at left) or handheld solar viewers. Ordinary sunglasses, even very dark ones, are not safe for looking at the Sun; they transmit far more sunlight than is safe for our eyes.

Instructions for the Safe Use of Solar Filters and Viewers

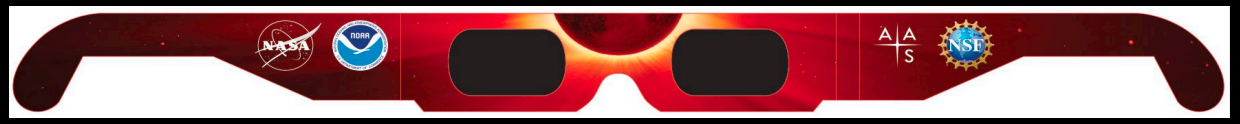
- Always inspect your solar filter before use. If scratched, punctured, torn, or otherwise damaged, discard it. Read and follow any instructions printed on or packaged with the filter.
- Always supervise children using solar filters.
- If you normally wear eyeglasses, keep them on. Put your eclipse glasses on over them or hold your handheld viewer in front of them.
- Stand still and cover your eyes with your eclipse glasses or solar viewer before looking up at the bright Sun. After looking at the Sun, turn away and remove your filter – do not remove it while looking at the Sun.
- Do not look at the uneclipsed, partially eclipsed, or annularly eclipsed Sun through an unfiltered camera, telescope, binoculars, or other optical device.
- Similarly, do not look at the Sun through an unfiltered camera, telescope, binoculars, or any other optical device while wearing your eclipse glasses or using a handheld solar viewer in front of your eyes — the concentrated solar rays could damage the filter and enter your eyes, causing serious injury.
- Seek expert advice from an astronomer before using a solar filter with a camera, telescope, binoculars, or any other optical device; note that solar filters must be securely attached to the front of any telescope, binoculars, camera lens, or other optics.

What If You Don't Have a Safe Solar Filter or Viewer?

An alternative method for safe viewing of the partially or annularly eclipsed Sun is indirectly via pinhole projection. For example, cross the outstretched, slightly open fingers of one hand over the outstretched, slightly open fingers of the other, creating a waffle pattern. With your back to the Sun, look at your hands' shadow on the ground. The little spaces between your fingers will project a grid of small images on the ground, showing the Sun as a crescent during the partial phases of any solar eclipse or as a ring during the annular phase of an annular eclipse. Or look at the shadow of a leafy tree during a partial or annular eclipse; you'll see the ground dappled with crescent or ring-shaped Suns projected by the tiny spaces between the leaves.

A solar eclipse is one of nature's grandest spectacles. By following these simple rules, you can safely enjoy the view and be rewarded with memories to last a lifetime. For more information about eye safety and the eclipse, visit https://eclipse.aas.org/safety

This safety information has been endorsed by the American Astronomical Society, the American Academy of Ophthalmology, the National Aeronautics and Space Administration, the National Oceanic and Atmospheric Administration, the American Optometric Association, and the U.S. National Science Foundation.



Riverfest Kerrville, TX

Heliophysics Education Activation Team (NASA HEAT)

Eclipse Ambassadors

Navigating the Path of Totality

The Eclipse Soundscapes Citizen Science Project

Earth to Sky (ETS)

Science Through Shadows

Eclipse Ballooning

Eclipse-Focused NASA Science Activation Projects

https://science.nasa.gov/learners/science-activation-teams


National Aeronautics and
Space Administration
NASA
Total Solar Eclipse
2024
www.nasa.gov

NASA Priorities for 2024 Total Solar Eclipse

- Safety
- Broadening Participation
- Science
- Public Engagement
- Science Activation
- Citizen Science

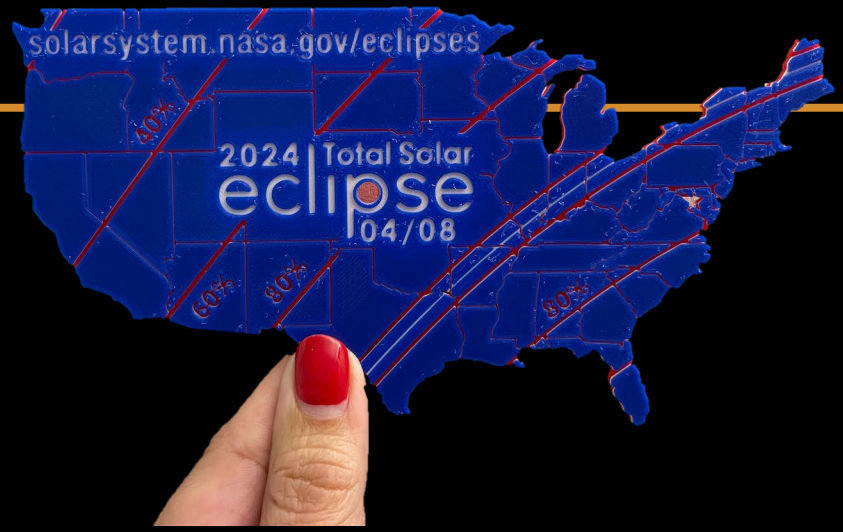

Path of Totality
2024 Total Solar Eclipse
12:20 PM CST
12:25 CST
12:30 CST
1:30 CDT
1:35 CDT
1:40 CDT
1:45 CDT
1:50 CDT
1:55 CDT
2:00 CDT
2:05 CDT
3:05 EDT
3:10 EDT
3:15 EDT
3:20 EDT
3:25 EDT
3:30 EDT
4:35 PM ADT
Gulf of Mexico
Atlantic Ocean
2024 Maximum Partial Obscuration (%)
NASA

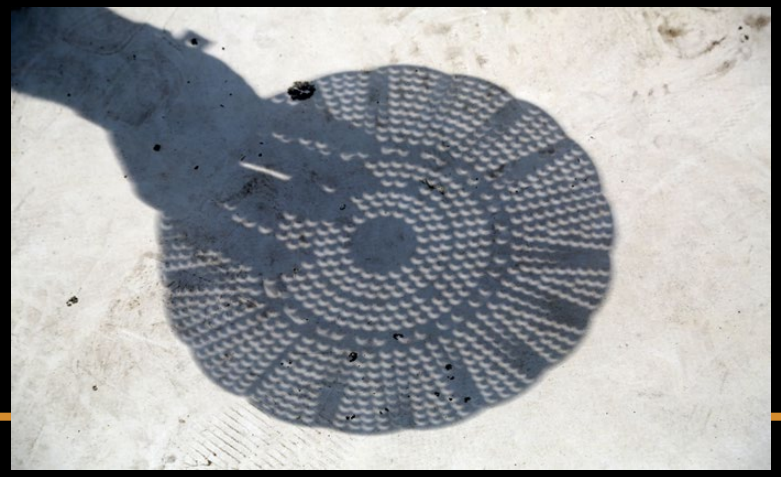
Safety First!

During a partial eclipse, it is never safe to look directly at the Sun without specialized eye protection designed for solar viewing.

https://science.nasa.gov/eclipses/safety/

Indirect Viewing Methods





https://science.nasa.gov/eclipses/safety/

ECLIPSE SOUNDING ROCKETS

Three instrumented rockets are launching during both the annular and total solar eclipses.

Launch Sequence

- **Rocket 1:** launching ~35 minutes before peak eclipse
- **Rocket 2:** launching at peak eclipse
- **Rocket 3:** launching ~35 minutes after peak eclipse

Objectives

- Explore how the eclipse shadow promotes irregularities in the ionosphere
- Understand how the ionosphere responds to local changes in density, temperature, and conductivity
- Assess how lower atmosphere cooling due to the eclipse impacts ionospheric dynamics

SOLAR ECLIPSE SCIENCE

Eclipse Chasing with NASA's High-Altitude Research Planes

- Planes will take observations with a camera that images in infrared and visible light at high resolution and high speed.
- They will study a dust ring around the Sun and search for asteroids that may orbit near the Sun.

Airborne Imaging and Spectroscopic Observations of the Corona

NASA's WB-57s will fly cameras and spectrometers, yielding insight into the constant stream of particles emitted by the Sun.

https://go.nasa.gov/3JnKx9q

SOLAR ECLIPSE SCIENCE

‘Listening Party’ for Amateur Radio Operators

Will record how strong and far radio signals go to observe how the ionosphere changes during the eclipse. Past experiments have shown that these changes, due to solar eclipses, have significant impacts on how radio waves travel.

Solar Radiation’s Effects on Earth’s Upper Atmosphere Layer

Will use three SuperDARN radars to study the ionosphere during the eclipse and compare the measurements to answer questions about how the ionosphere reacts to a solar eclipse.

Bringing the Sun’s Magnetic ‘Hot Spots’ Into Sharper Focus

Will use the 34-meter Goldstone Apple Valley Radio Telescope to distinguish light signals coming from one portion of solar active regions versus another. This measures changes to the radio emissions from active regions.

HELIOPHYSICS
BIG YEAR

NASA’s Total Solar Eclipse Broadcast

Through the Eyes of NASA

April 8, 2024
1:30 p.m. ET – 4:00 p.m. ET

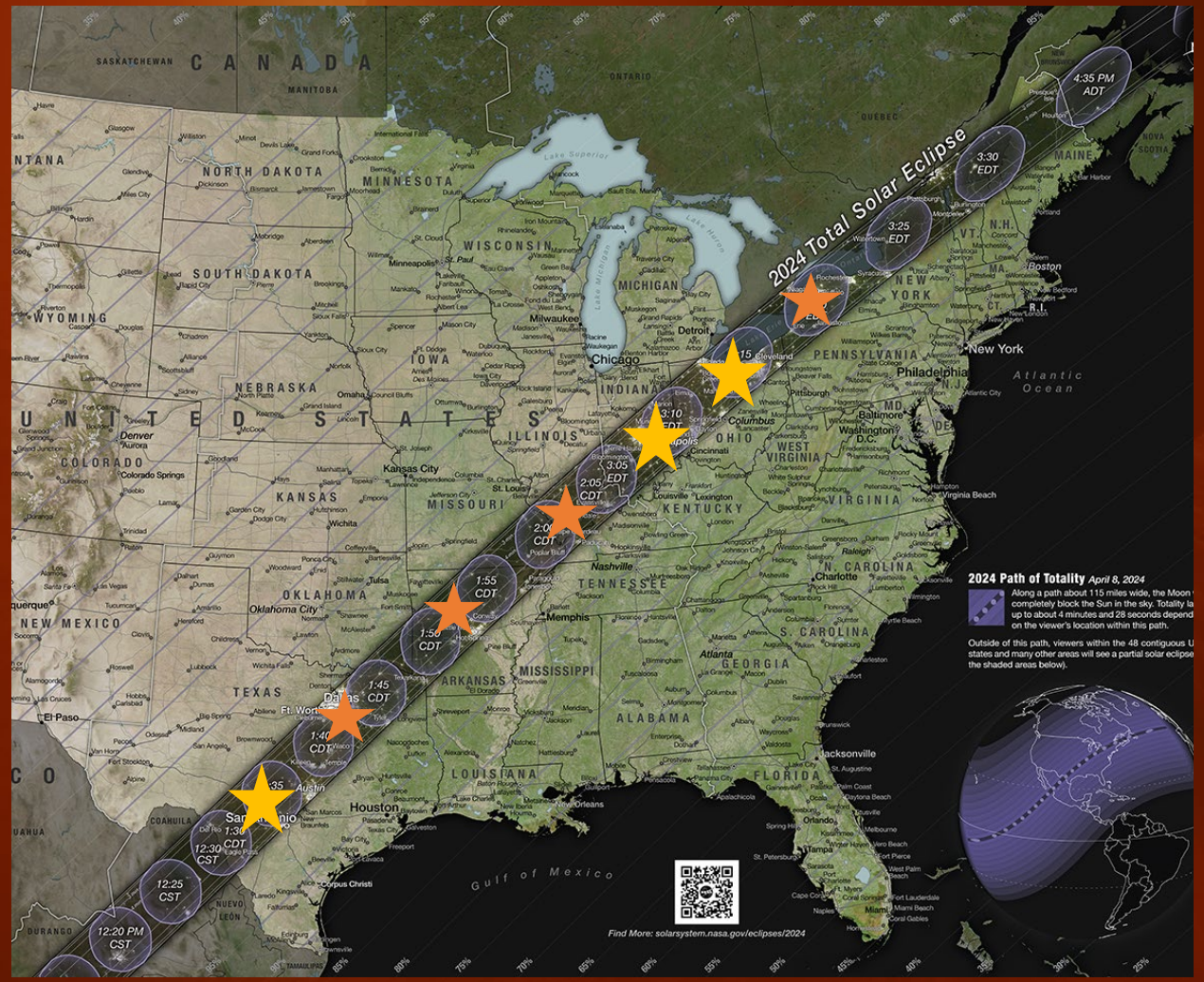
Cleveland, OH
- Host stage at the Great Lakes Science Center / NASA Glenn Visitor Center

Kerrville, TX
- Host stage at Louise Hays Park at the River Festival

Indianapolis, IN
- Host stage at Indianapolis Motor Speedway

Other Locations
- Highlighting community events, eclipse views, eclipse experiments, watch parties, etc.

+ Telescope Feeds from across the path



Where to Watch: NASA + | NASA App | NASA.GOV | NASA Social Media Channels

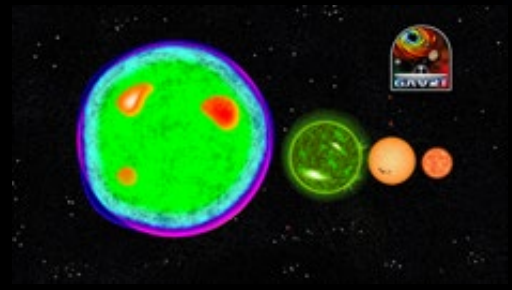
THE HELIO BIG YEAR IS HERE

Planet Hunters TESS

HELIOPHYSICS BIG YEAR

EXOPLANET WATCH

Solar Patrol (GAVRT)



Citizen Science Project
ECLIPSE SOUNDSCAPES

Citizen CATE

Dynamic Eclipse Broadcast Initiative

ECLIPSE MEGAMOVIE

+ more by Semeter, Young

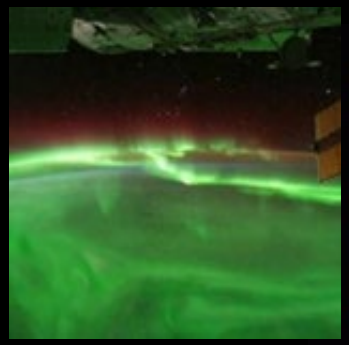
SunSketcher™

Eclipse projects
For more info, check out overview posts on citizen science from @NASASun and the Aurorasaurus blog.

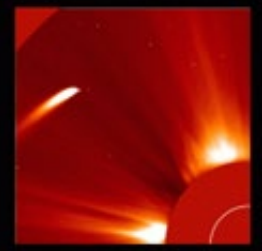
RADIO JOVE 2.0

GLOBE

Aurorasaurus



Sungrazers



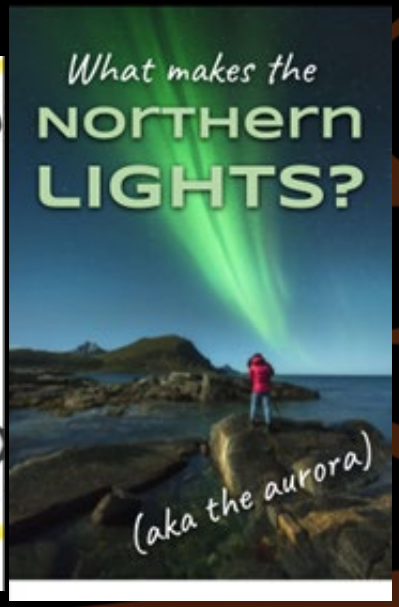
HELIO BIG YEAR UPDATES

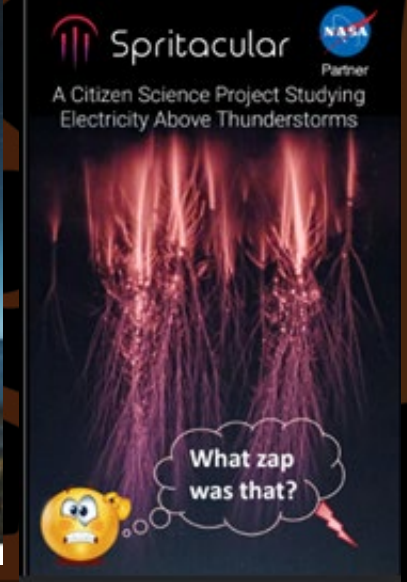
Points of contact: Ha-Hoa Hamano, Liz MacDonald
hq-heliobigyear@mail.nasa.gov

New Helio Big Year poster connecting readers to projects and resources

Stay updated with everything HBY. Subscribe to our new community mailing list.

Join in on the fun and create a zine or spotting guide with this template.





HELIOPHYSICS BIG YEAR

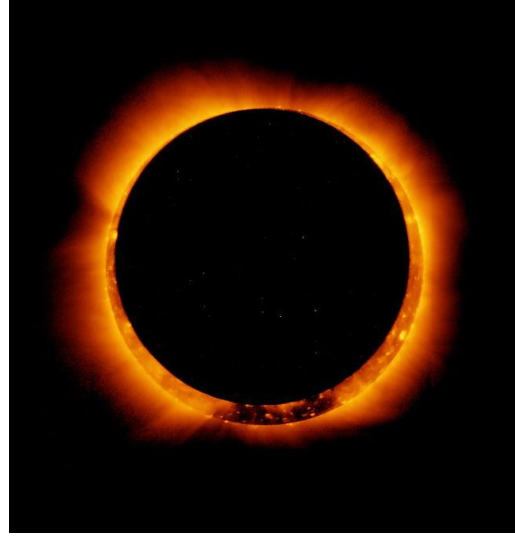
Preview our participatory HBY Zine activity guide. Look out for a zine digital library debut / use cases.

Upcoming Opportunities

- Help us help you! Feel free to share these authentic science opportunities or further curate them to suit your needs
- December's Helio Big Year theme is citizen science

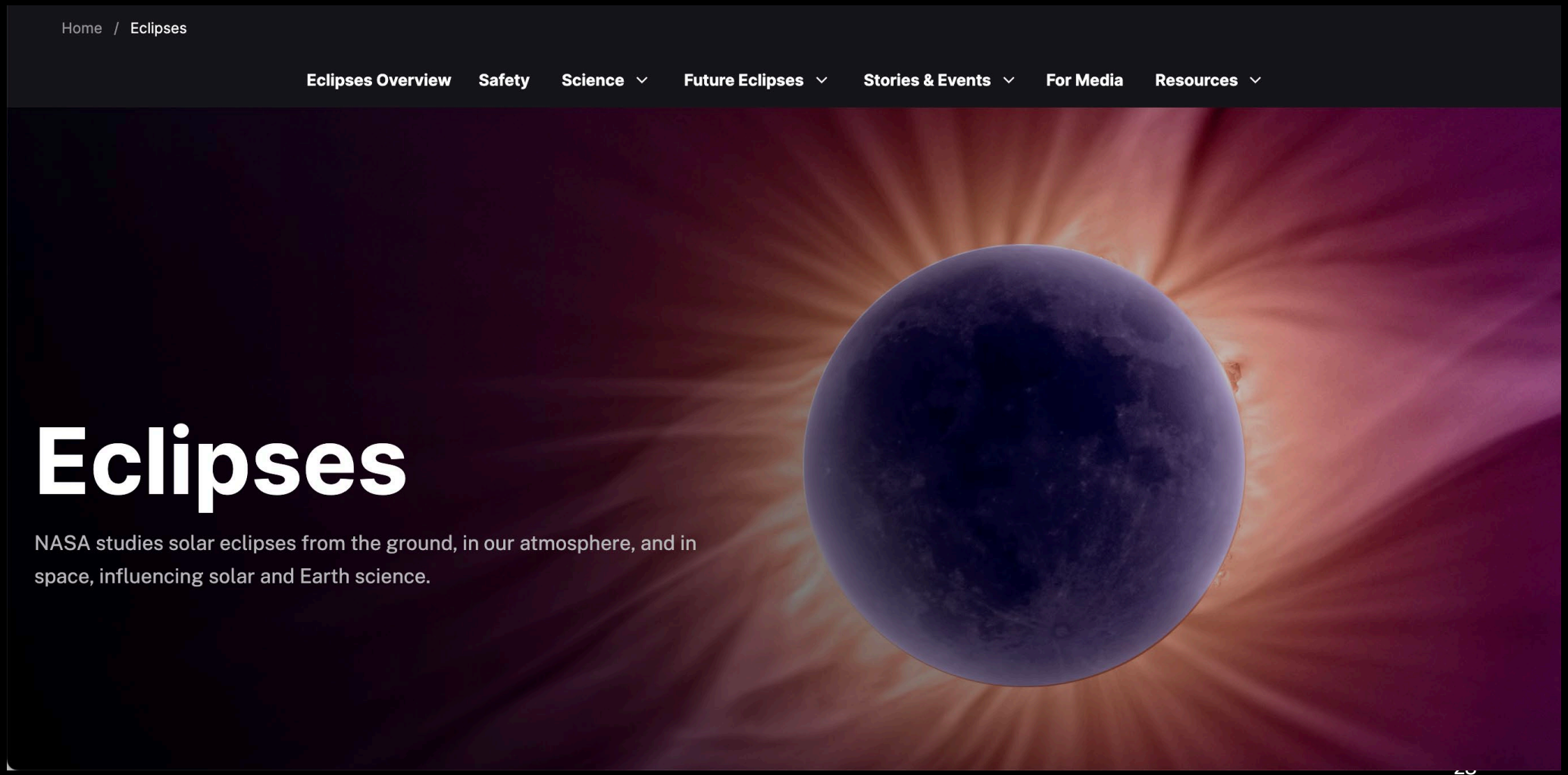
ROSES

- H-CSI (3 year) Citizen Science Investigations
  - Step 1 Nov 15 2023
  - Step 2 Jan 26 2024
- Seed funding CSSFP (1 year)
  - NOI (optional!) Nov 21 2023
  - Proposals due Jan 24 2024



NASA Eclipse Main Webpage

https://science.nasa.gov/eclipses/



How to Get Involved

- Scientists at NASA can contact their center lead and join the NASA Eclipse Collective Team.
- Scientists involved with NASA missions can work with the mission to do outreach around the mission during the eclipse.
- In general, help spread safety & Heliophysics Big Year messages
- Host an eclipse-viewing event
  - Show NASA TV Broadcast
  - Explore additional STEM Activities, Speakers, etc.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Space Administration
NASA
Thank you!
www.nasa.gov