
National Aeronautics and
Space Administration
NASA
EXPLORE
SOLAR SYSTEM&BEYOND
Two Solar Eclipses and a Solar Max:
HELIOPHYSICS
BIG YEAR
HamSCI 2023 Workshop
Esayas Shume
NASA Heliophysic Division
March 18, 2023, Scranton, PA

Heliophysics Big Year (HBY)

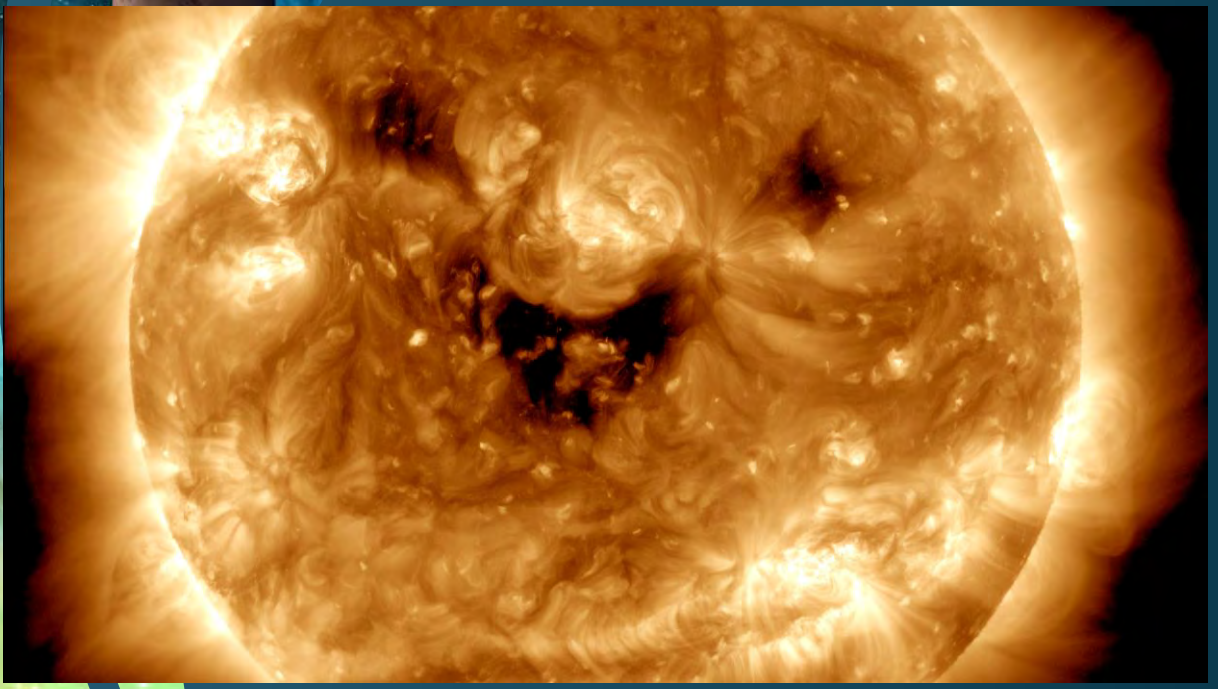
NASA Heliophysics Division anticipates strong community participation including the HamSCI community in the HBY

- Annular solar eclipse (Oct 14, 2023)
- Total solar eclipse (Apr 8, 2024)
- Solar Max (Solar Cycle 25).

https://solarsystem.nasa.gov/eclipses/

The Great American Total Solar Eclipse, Aug 21, 2017.

UV light imagery of the Sun: 10262022



NASA SDO provides ultra high-definition image of the Sun in 13 different wavelengths of light.

NASA's Heliophysics Strategic

Objective: To understand the Sun & its interactions with the Earth & the solar system, including space weather.

NASA Space Weather Program Vision: Advance the science of space weather to empower a technological society safely thriving on Earth & expanding into space.

NASA Heliophysics System Observatory

Heliophysics Missions

Heliophysics Mission Fleet

Heliophysics missions are strategically placed throughout our solar system, working together to provide a holistic view of our Sun and space weather, along with their impacts on Earth, the other planets, and space in general. NASA's heliophysics mission fleet includes 19 operating missions using 26 spacecraft, 13 missions in development, 1 mission under study, a robust sounding rocket program and a variety of CubeSat missions.

- ESA = European Space Agency
- JAXA = Japan Aerospace Exploration Agency

*Numbers in parentheses indicate how many spacecraft each mission includes.

UNDER DEVELOPMENT

- AWE (ISS)
- Carruthers Geocorona Observatory
- ESCAPADE (2)
- EUVST (JAXA)
- EZIE (3)
- GDC (6)
- HelioSwarm (9)
- HERMES (Gateway)
- IMAP
- MUSE
- PUNCH (4)
- SunRISE (6)
- TRACERS (2)

PRIMARY OPERATION

- Parker Solar Probe
- Solar Orbiter (ESA)

EXTENDED OPERATION

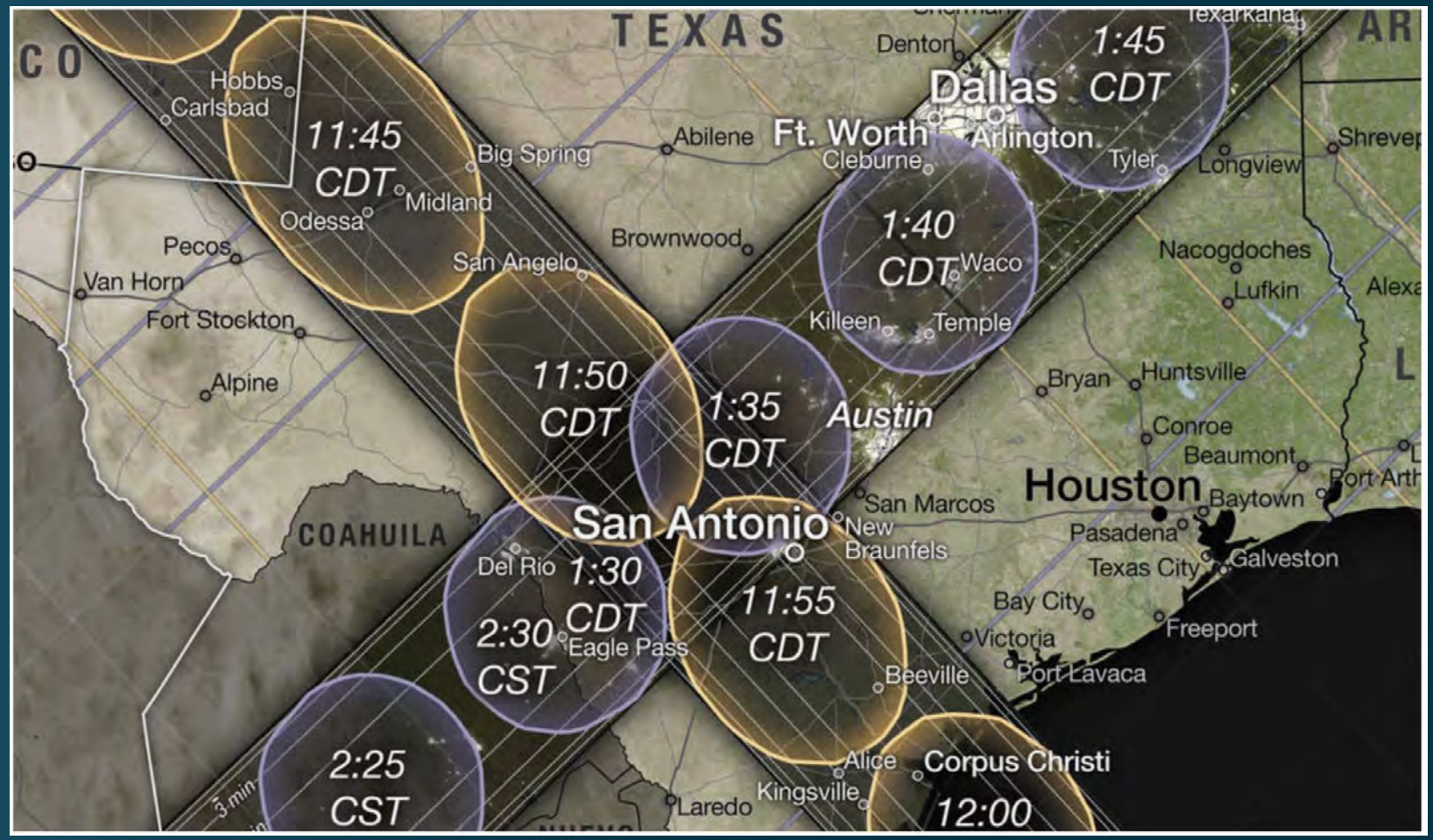
- ACE
- AIM
- GOLD (SES-14)
- Hinode (JAXA)
- IBEX
- ICON
- IRIS
- MMS (4)
- RAD (Curiosity)
- SDO
- SOHO (ESA)
- STEREO
- THEMIS-ARTEMIS (2)
- THEMIS (3)
- TIMED
- Wind
- Voyager (2)

science.nasa.gov/heliophysics

NASA Map: 2023 &2024 Solar Eclipses in the US

Map: Details the path of the Moon's shadow as it crosses the US during the annular (Oct 14, 2023), & total (Apr 8, 2024) solar eclipses

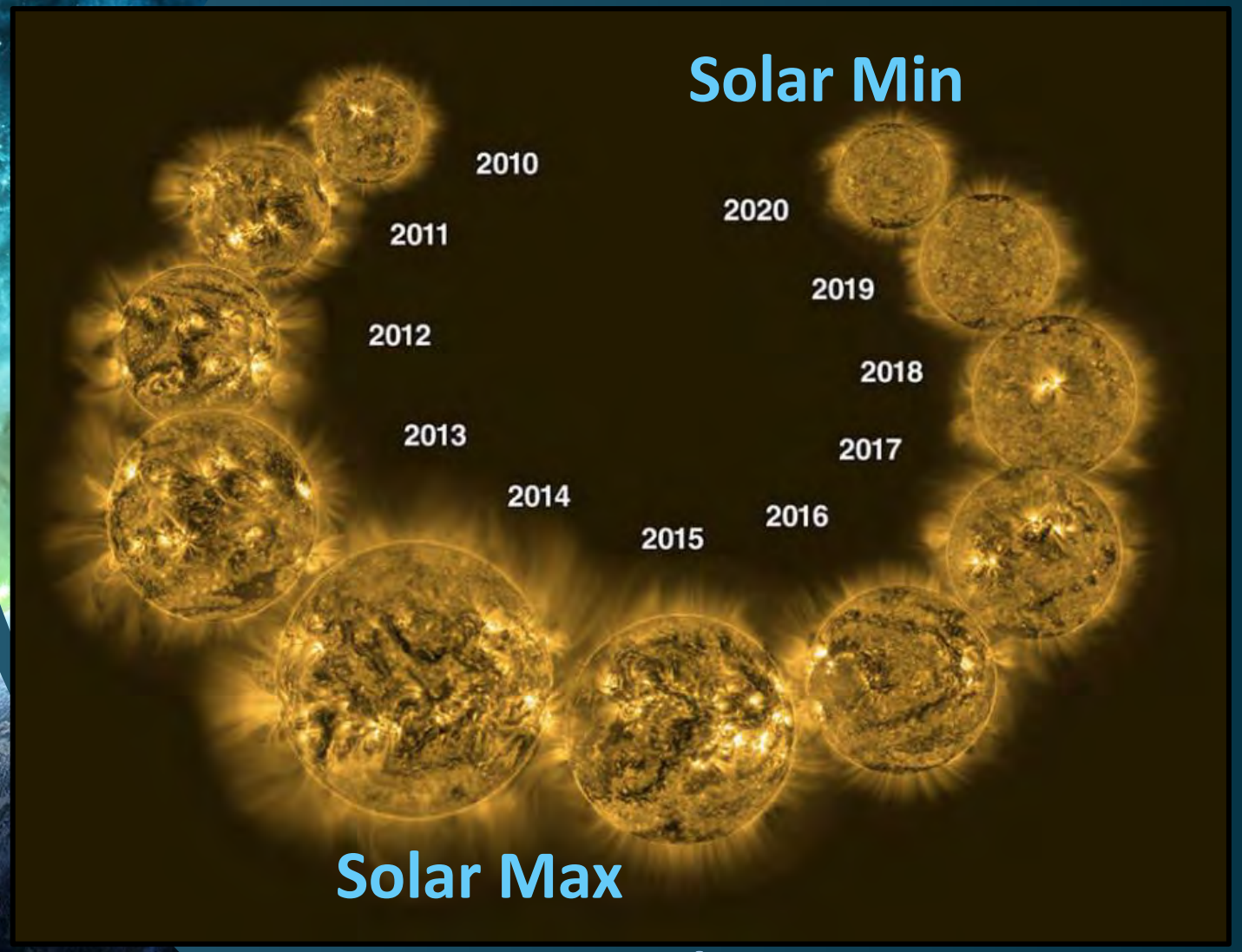
https://www.nasa.gov/feature/goddard/2023/sun/new-nasa-map-details-2023-and-2024-solar-eclipses-in-the-US



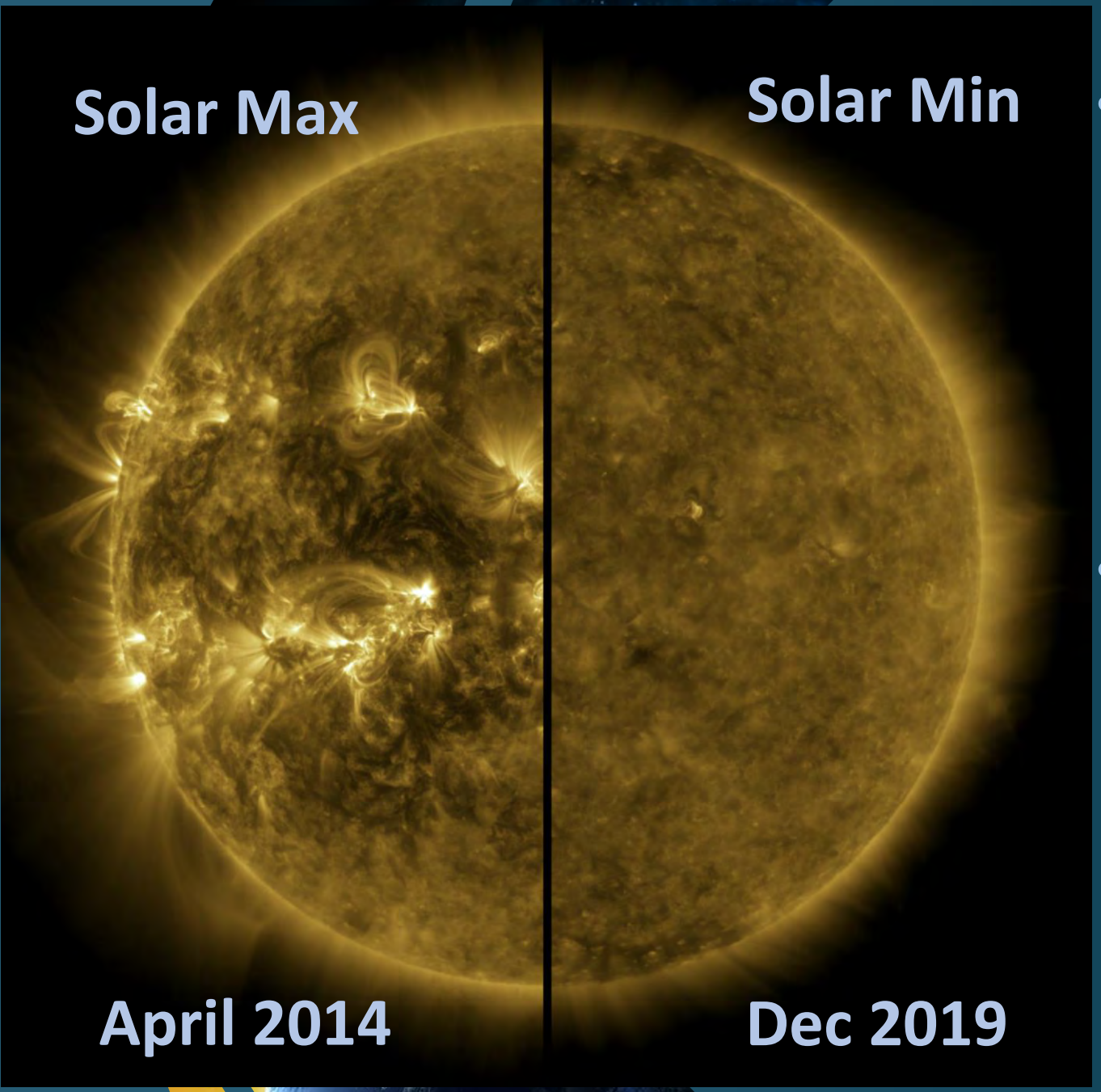
An area of Texas near San Antonio, where the two eclipse paths cross, will experience both the annular eclipse 2023 & the total eclipse 2024.

Solar eclipse occurs when the Moon passes between the Sun and the Earth, casting its shadow on the Earth.

Sun's evolution in EUV light 2010-2020, seen on the PROBA2 spacecraft.



Credit: ESA (NOAA/JPL-Caltech)



- Split image showing the difference between an active Sun during solar max & a quiet Sun during solar min
- Dec 2019 marks the beginning of Solar Cycle 25, and the Sun's activity will ramp up until solar max, predicted for 2025.

Credits: NASA/SDO

Citizen Science

- During the Heliophysics Big Year HBY, NASA Heliophysics Division is challenging everyone to participate in as many Heliophysics or sun-related activities as possible.
- A great way to participate in the HBY is through citizen science activities such as Ham Radio Operators.

Citizen Science

Ham Radio Operators community contributes to a better understand the Earth's Ionosphere.

Ham Radio Science Citizen Investigation: Have brought together the amateur radio and professional science communities for mutual benefit.

Science Mission Directorate SMD Citizen Science Policy Document SPD-33

SMD's portfolio of citizen science projects shall contribute to building a scientifically literate nation by:

1. Providing opportunities for U.S. citizen scientists;
2. Encouraging highly educated volunteers who can benefit NASA via their expertise;
3. Leveraging existing communities of citizen scientists or other enthusiasts for a variety of projects; and
4. Connecting citizen scientists with NASA Subject Matter Experts who provide role models and mentorship.

NASA Heliophysics Division Research Programs

The ROSES programs solicit research proposals: NASA spacecraft observations along with amateur radio observations could be utilized for innovative science and technology proposal submission.

NASA Space Apps Challenge 2023

October 7-8, 2023

The largest annual space and science hackathon in the world!

2022 Space Apps Challenge:

- Over 31,500 registrants
- Across 162 countries and territories.
- Using open data from NASA
- 11 partner space agencies
- 22 challenges and produced 3,094 projects.

Feedbacks about the 2022 Space Apps Challenge are welcome.

Thanks for your attention