



National Aeronautics and  
Space Administration

# Inspired Science: Powered by NASA

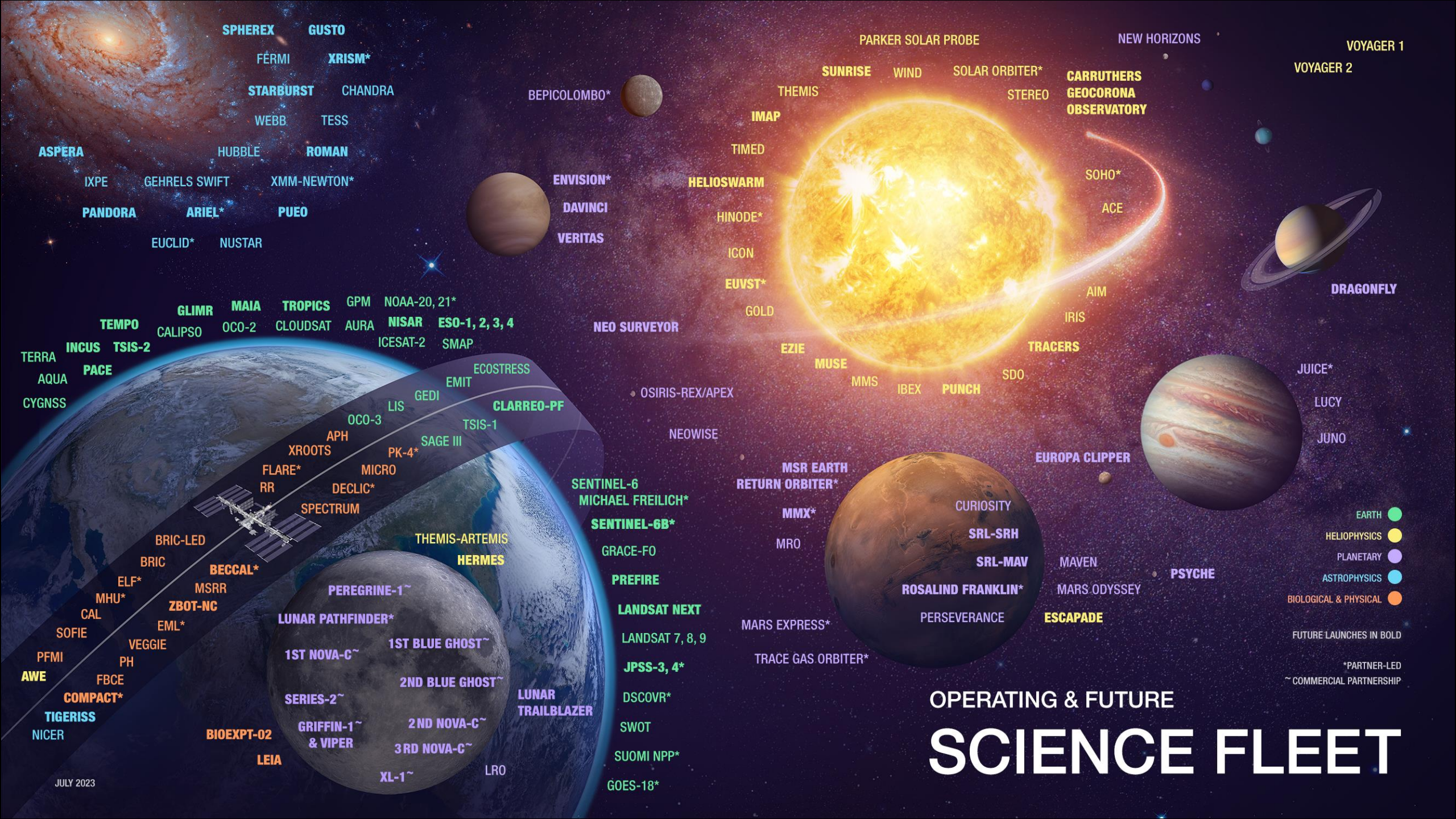
**Dr. Nicola Fox**

Associate Administrator, Science  
Mission Directorate

Maryland Space Business Roundtable

August 16, 2023





SPHEREX  
FERMI  
STARBURST  
WEBB  
HUBBLE  
ROMAN

GUSTO  
XRISM\*  
CHANDRA  
TESS  
ROMAN  
XMM-NEWTON\*

ASPERA  
IXPE  
PANDORA  
EUCLID\*  
NUSTAR

GEHRELS SWIFT  
ARIEL\*  
PUEO  
EUCLID\*  
NUSTAR

TEMPO  
CALIPSO  
GLIMR  
MAIA  
TROPICS  
GPM  
NOAA-20, 21\*  
NISAR  
ESO-1, 2, 3, 4  
ICESAT-2  
SMAP

TERRA  
AQUA  
CYGNSS  
INCUS  
PACE  
TSIS-2  
CLARREO-PF  
ECOSTRESS  
EMIT  
GEDI  
OCO-3  
LIS  
SAGE III  
TSIS-1

BRIC-LED  
BRIC  
ELF\*  
MHU\*  
CAL  
SOFIE  
PFMI  
AWE  
COMPACT\*  
TIGERISS  
NICER

BECCAL\*  
MSRR  
ZBOT-NC  
EML\*  
VEGGIE  
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FBCE

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AWE  
COMPACT\*  
TIGERISS  
NICER

BEPICOLOMBO\*

ENVISION\*  
DAVINCI  
VERITAS

NEO SURVEYOR

OSIRIS-REX/APEX  
NEOWISE

SENTINEL-6  
MICHAEL FREILICH\*

SENTINEL-6B\*

GRACE-FO

PREFIRE

LANDSAT NEXT

LANDSAT 7, 8, 9

JPSS-3, 4\*

DSCOVR\*

SWOT

SUOMI NPP\*

GOES-18\*

PARKER SOLAR PROBE

SUNRISE  
WIND  
SOLAR ORBITER\*  
STEREO

IMAP

TIMED

HELIOSWARM

Hinode\*

ICON

EUVST\*

GOLD

EZIE

MUSE

MMS

IBEX

PUNCH

SDO

MSR EARTH  
RETURN ORBITER\*

MMX\*

MRO

MARS EXPRESS\*

TRACE GAS ORBITER\*



NEW HORIZONS

CARRUTHERS  
GEOCORONA  
OBSERVATORY

SOHO\*

ACE

AIM

IRIS

TRACERS

EUROPA CLIPPER

MAVEN

MARS ODYSSEY

PSYCHE

ESCAPADE

PERSEVERANCE

ROSA LIND FRANKLIN\*

SRL-SRH

SRL-MAV

CURIOSITY

MMX\*

MARS EXPRESS\*

TRACE GAS ORBITER\*

ESCAPADE

PERSEVERANCE

ROSA LIND FRANKLIN\*

SRL-SRH

SRL-MAV

CURIOSITY

MMX\*

MARS EXPRESS\*

TRACE GAS ORBITER\*

VOYAGER 1

VOYAGER 2

DRAGONFLY

JUICE\*

LUCY

JUNO



EARTH

HELIOPHYSICS

PLANETARY

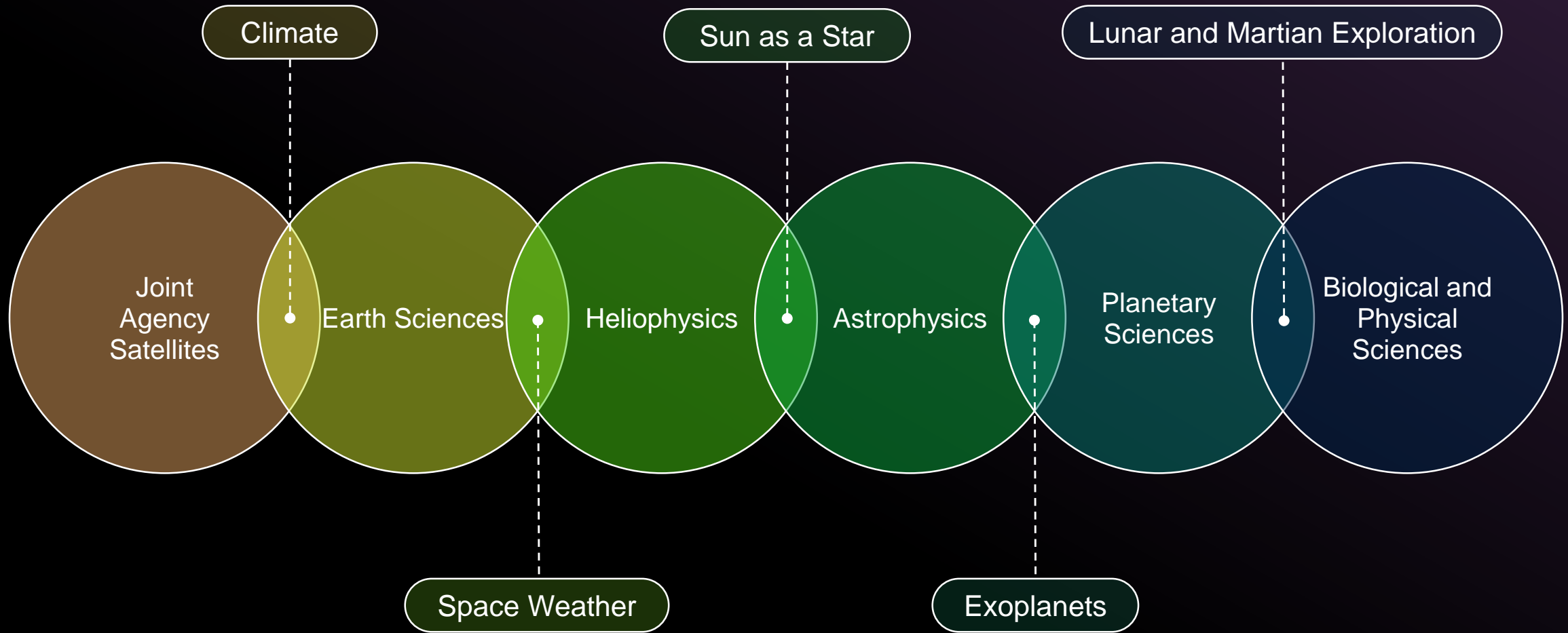
ASTROPHYSICS

BIOLOGICAL & PHYSICAL

FUTURE LAUNCHES IN BOLD

\*PARTNER-LED  
~ COMMERCIAL PARTNERSHIP

# OPERATING & FUTURE SCIENCE FLEET



## RECENT HIGHLIGHTS



*JWST image of the Rho Ophiuchi cloud complex released in commemoration of JWST one year in orbit*

# Recent Launches



Tropospheric Emissions:  
Monitoring of Pollution  
(TEMPO)

April 7, 2023



Time-Resolved Observations of  
Precipitation structure and storm  
Intensity with a Constellation of  
Smallsats (TROPICS)

May 8, 2023

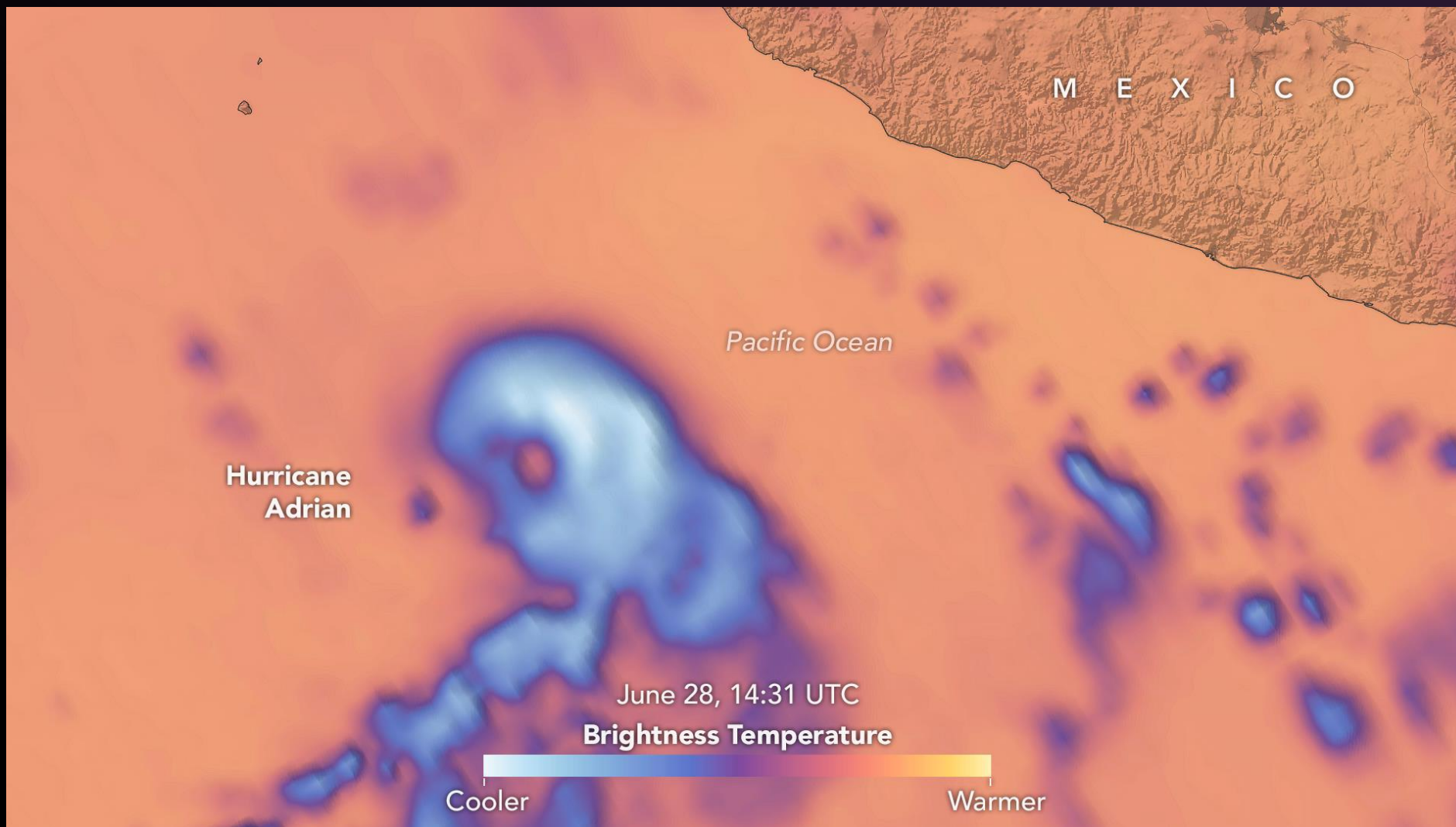
May 26, 2023



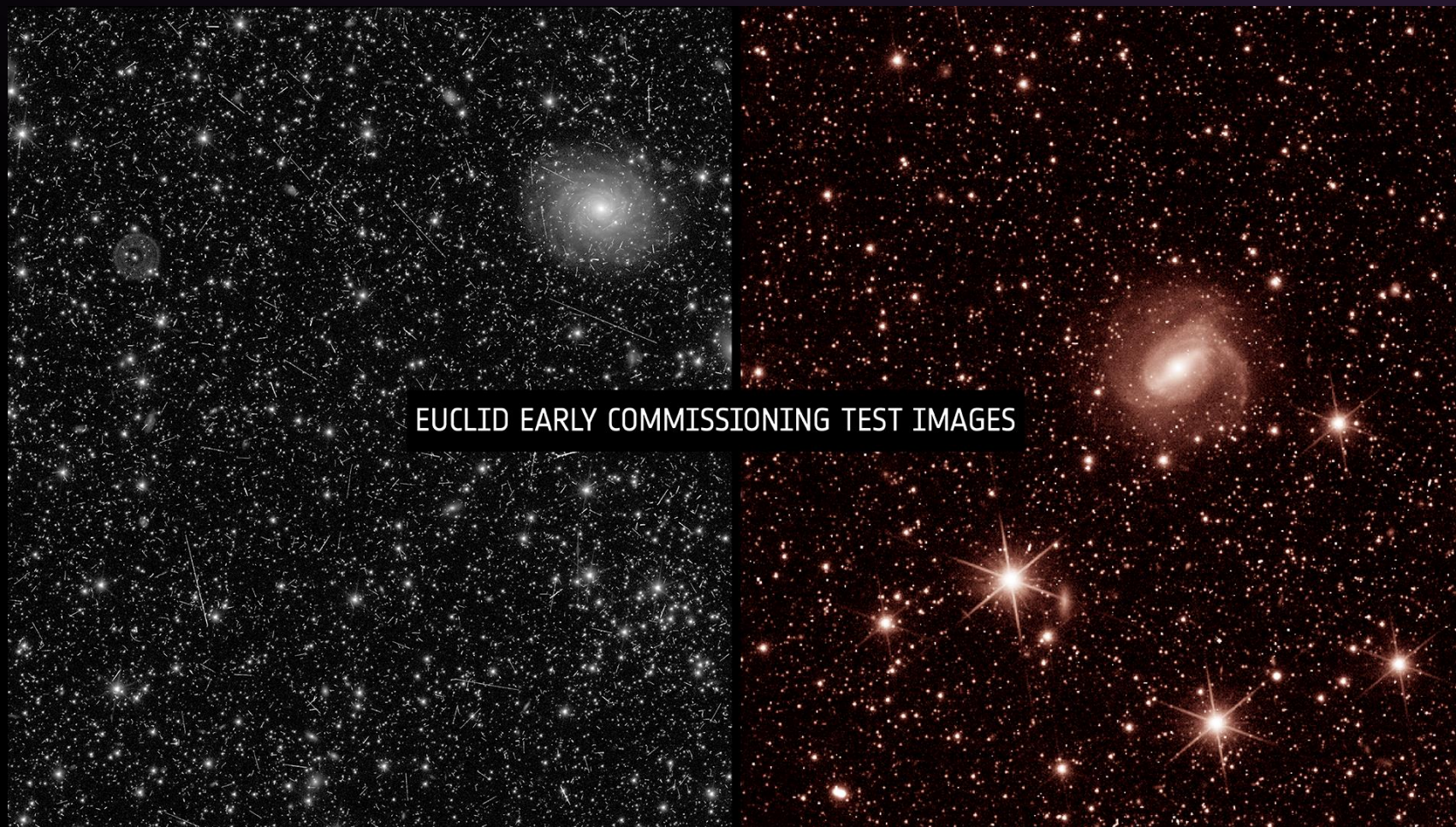
A SpaceX Falcon 9 rocket lifts off from Cape  
Canaveral Space Force Station in Florida at  
11:12 a.m. EDT on Saturday, July 1, carrying the  
ESA (European Space Agency) Euclid  
spacecraft, which has contributions from NASA

July 1, 2023

# TROPICS First Light



# Euclid First Light Imagery



Test Images from Euclid's two instruments captured on July 31, 2023. Euclid launched on July 1, 2023 from Cape Canaveral, Florida



# PLANETARY SCIENCES



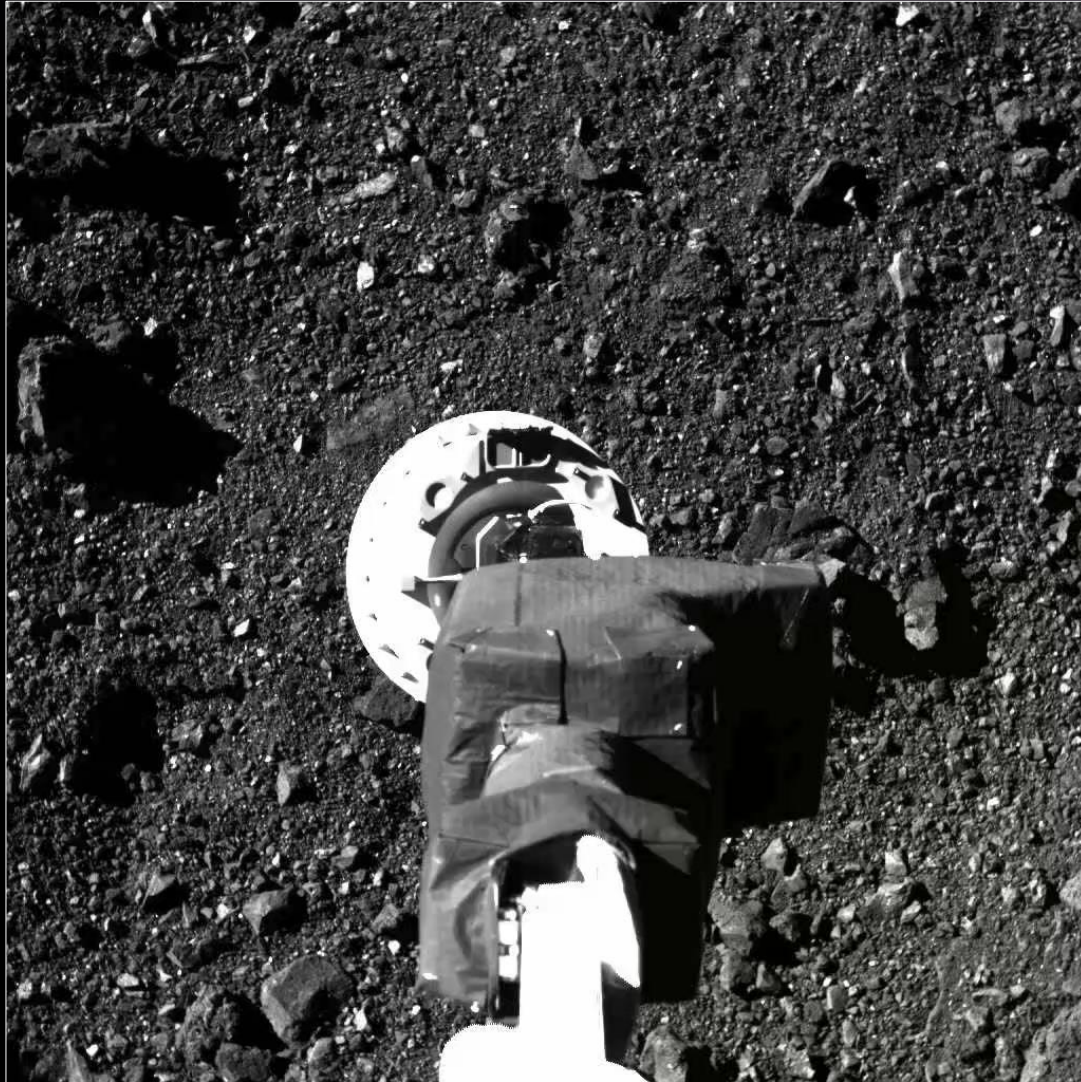


## Dr. David Grinspoon

Senior Scientist  
Astrobiology Strategy (SSAS)

- Dr. Grinspoon's papers have been published in Nature, Science, and numerous other journals
- Frequently gives talks to all levels of audiences around the world
- Received awards for innovative ways of teaching astrobiology to both undergraduates and graduates at multiple universities
- Participated in numerous NASA-related strategic planning and advisory roles
- Currently serving on the Unidentified Anomalous Phenomena Independent Study Team

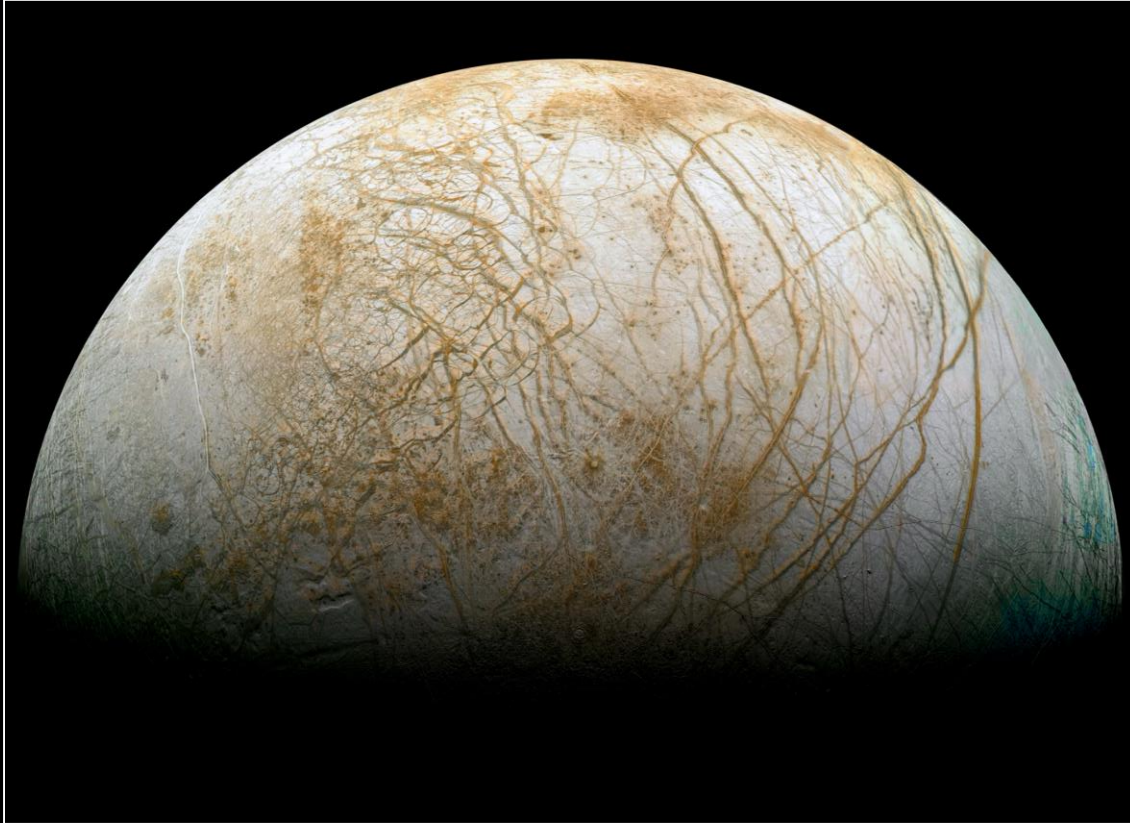
OSIRIS-REx



PSYCHE

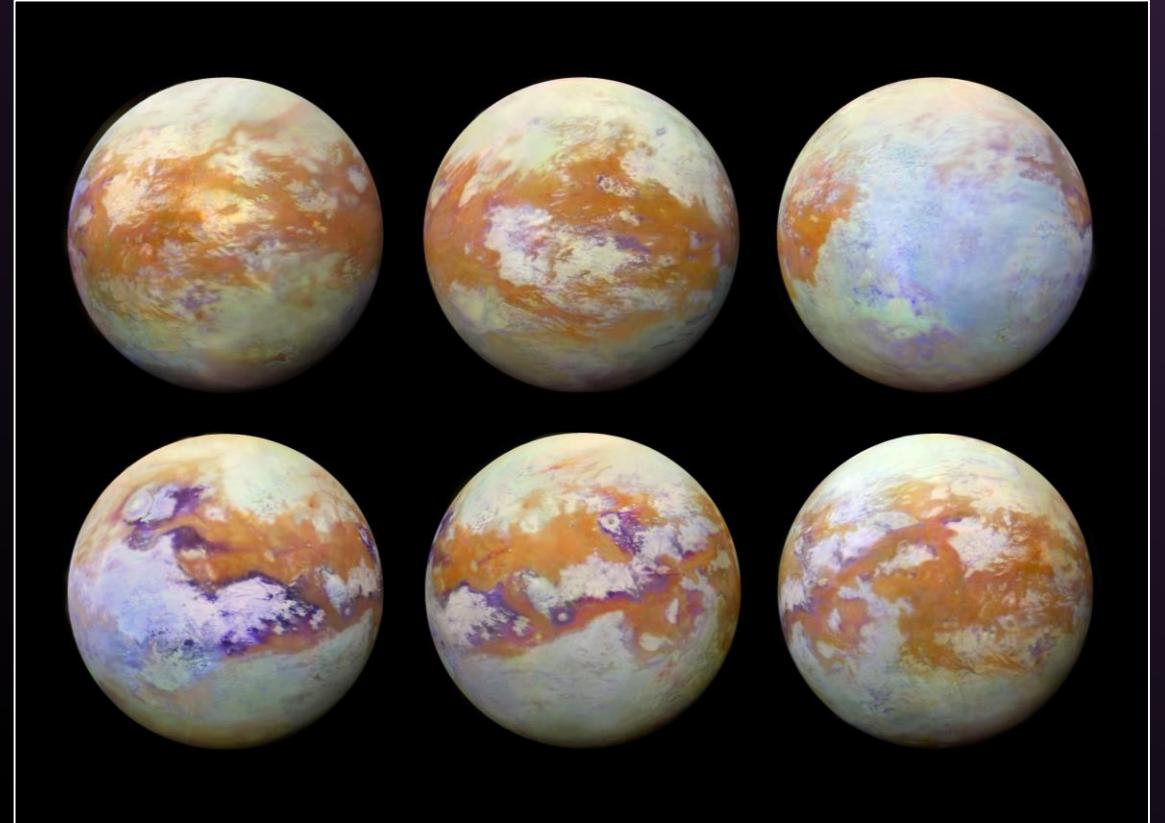


## EUROPA



**EUROPA CLIPPER** will perform close flybys of Jupiter's moon Europa to investigate whether it could have conditions suitable for life.

## TITAN



**DRAGONFLY** will sample and examine sites around Saturn's moon Titan to characterize the habitability of its environment.

# Message in a Bottle

- June 1st 2023, Europa Clipper launched NASA's next "Send Your Name" public engagement campaign, called *Message in a Bottle*.
- NASA's *Message in a Bottle* campaign is a special collaboration, uniting art and science, by NASA, the U.S. Poet Laureate and the Library of Congress.
- Participant's names and a poem written by the U.S. Poet Laureate will be engraved onto a chip and mounted on NASA's Europa Clipper spacecraft and travel 1.8 billion miles on its voyage to the Jupiter system.
- The poem connects two water worlds - Earth and Europa, a moon of Jupiter believed to contain a vast ocean.
- To participate please visit [go.nasa.gov/MessageInABottle](https://go.nasa.gov/MessageInABottle)



From left to right: Librarian of Congress Carla Hayden, U.S. Poet Laureate Ada Limon, NASA SMD AA Dr. Nicky Fox, and Library of Congress Chair for Astrobiology Dr. Sheri Wells-Jensen held a discussion on stage at the Library of Congress during the June 2023 unveiling of Europa Clipper poem.



# EARTH SCIENCE



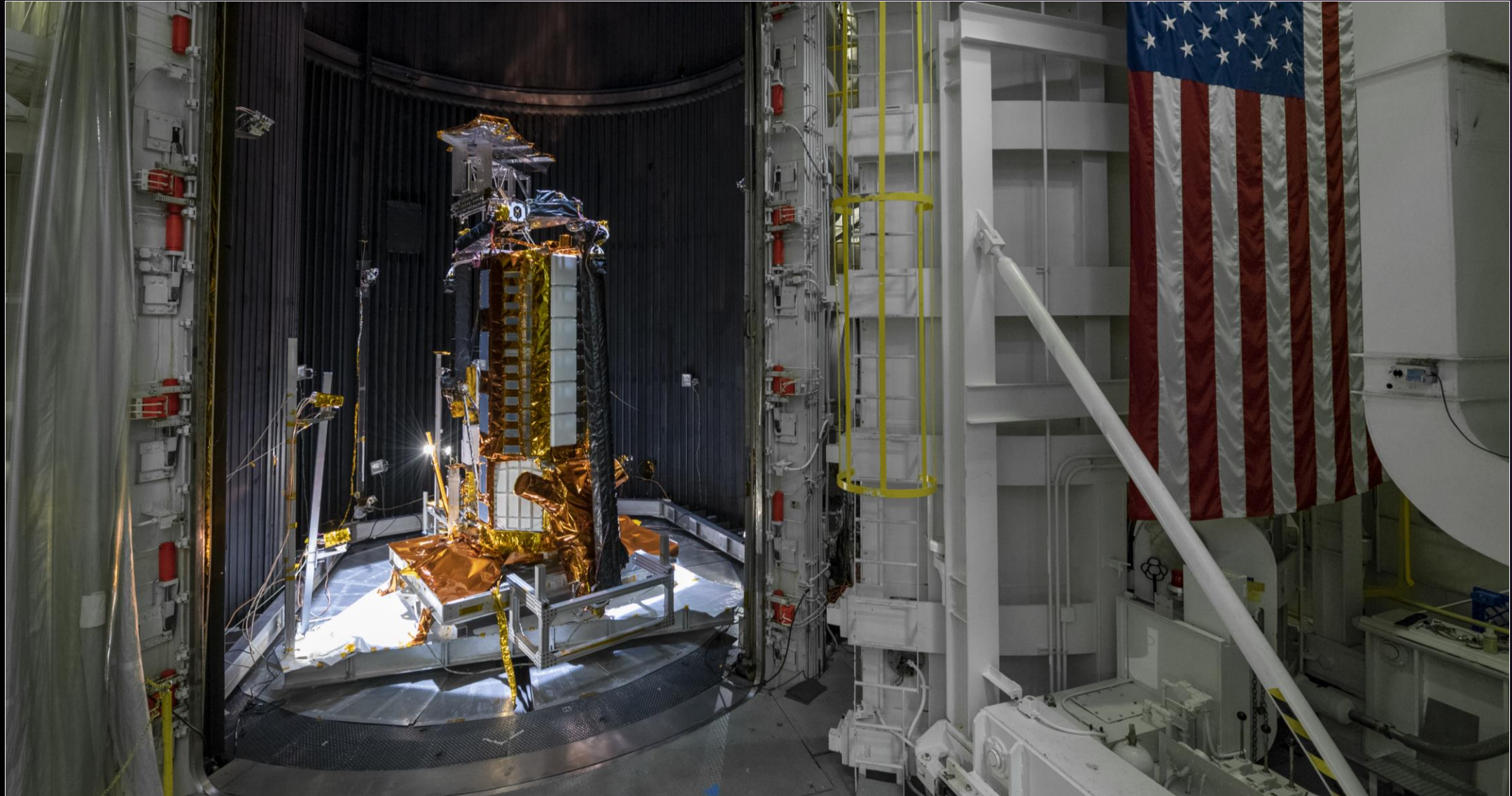
# Earth Information Center

A physical and virtual space to engage and amplify impact – *to show people our Earth as we see it.*

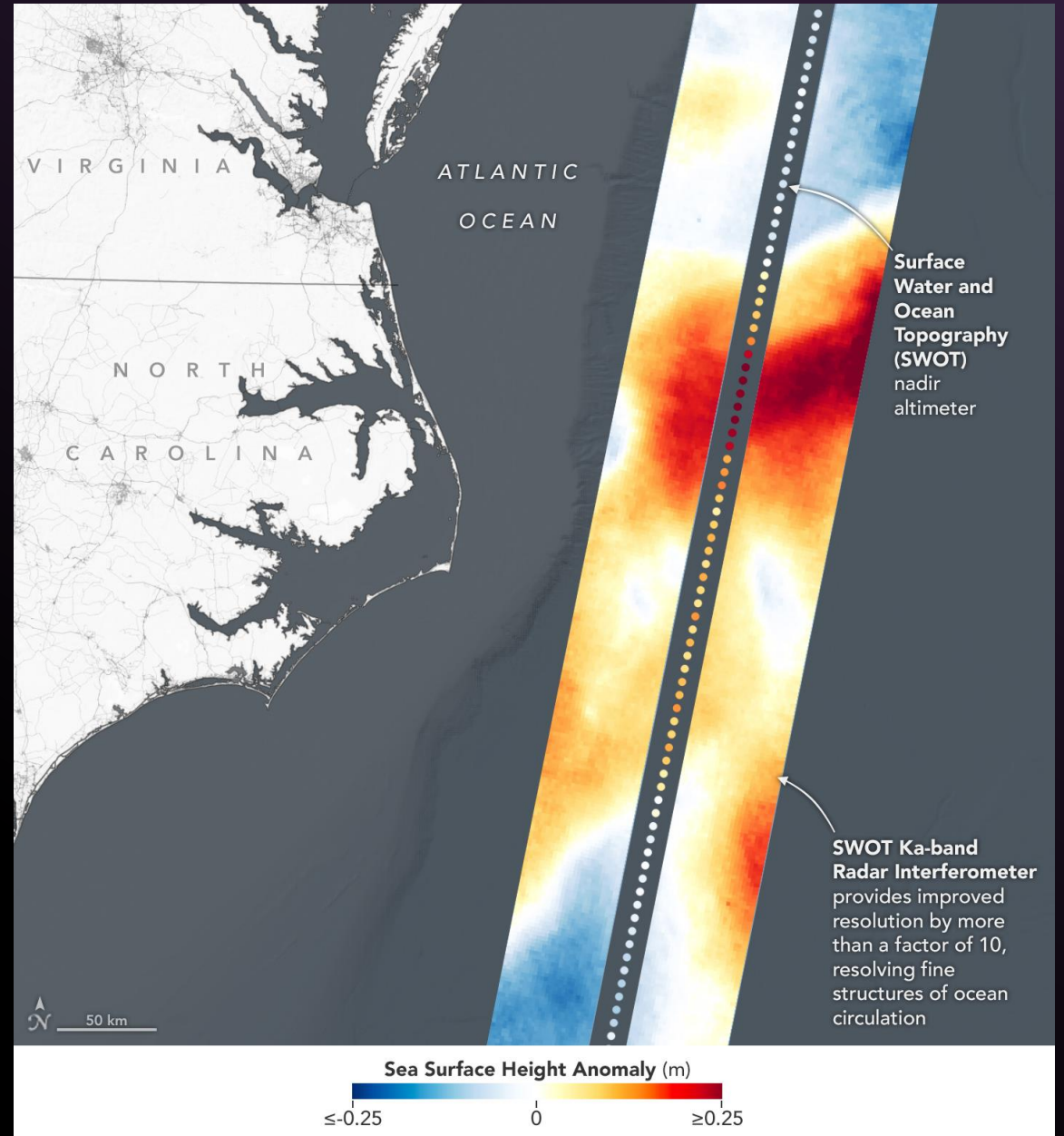
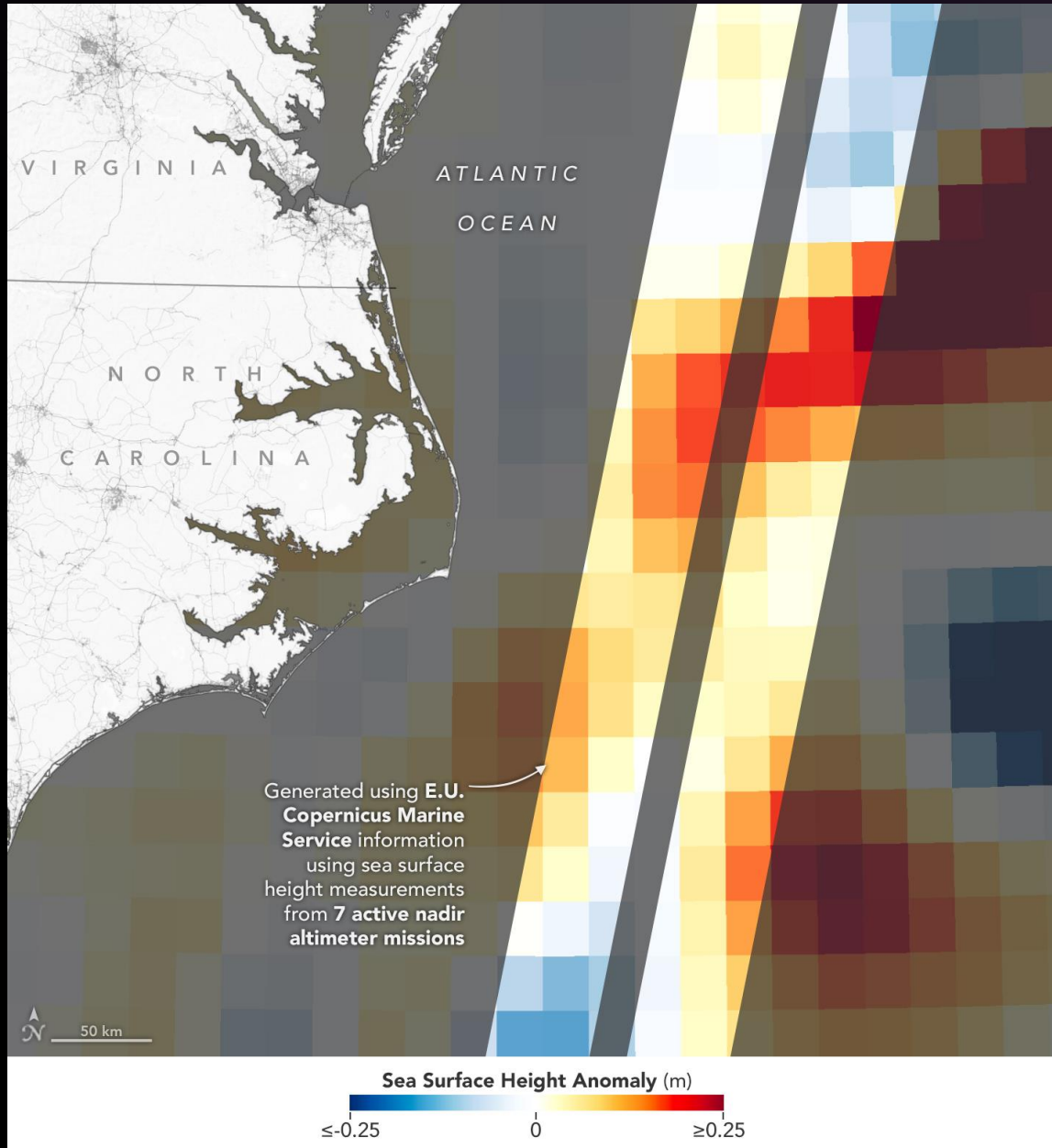
- This center showcases large, awe-inspiring visualizations, as well as interactive media, stories, and narratives to inspire action. The intent is to stimulate communities to explore solutions and provide opportunities for connecting science to action



An observer watching real-time data collection in the newly opened Earth Information Center at NASA HQ



*NISAR's flight antenna system before the chamber door was closed, as it underwent thermal vacuum testing at NASA's Jet Propulsion Laboratory in January 2022*

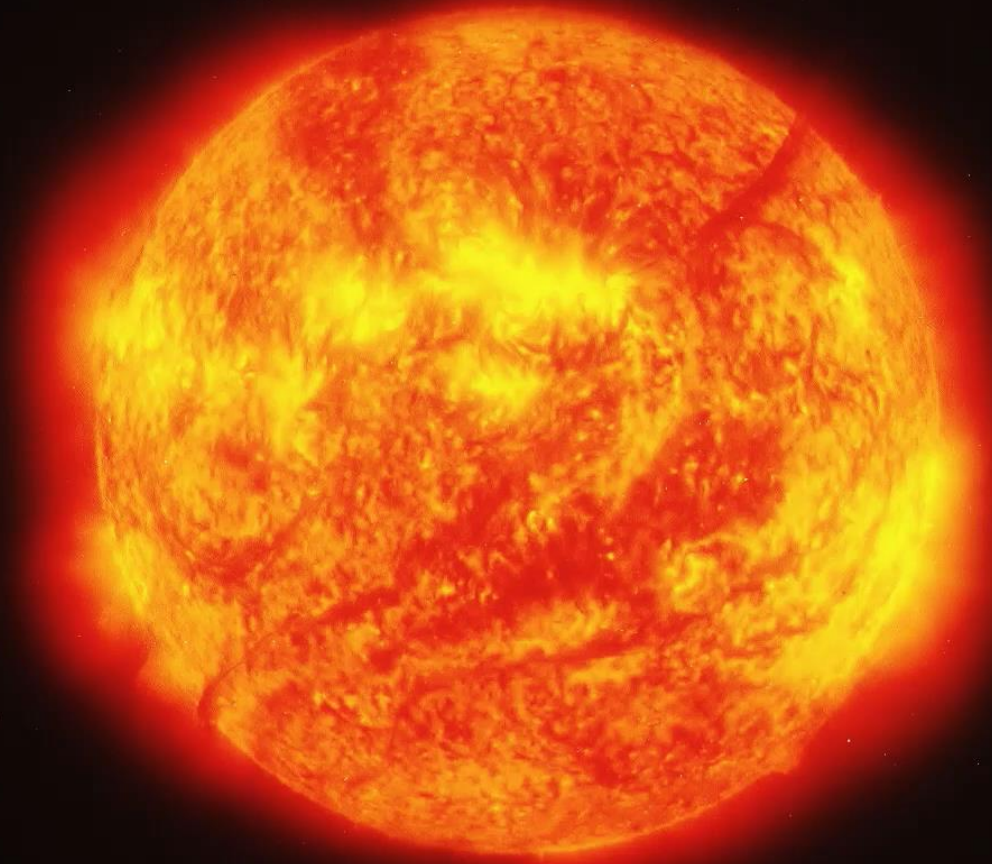




# HELIOPHYSICS



# PARKER SOLAR PROBE ORBIT #16



## Solar Eclipses Across North America:

- Oct. 14, 2023: Annular
- April 8, 2024: Total

## Solar Cycle 25:

- Solar maximum increases opportunities to experience and observe space weather

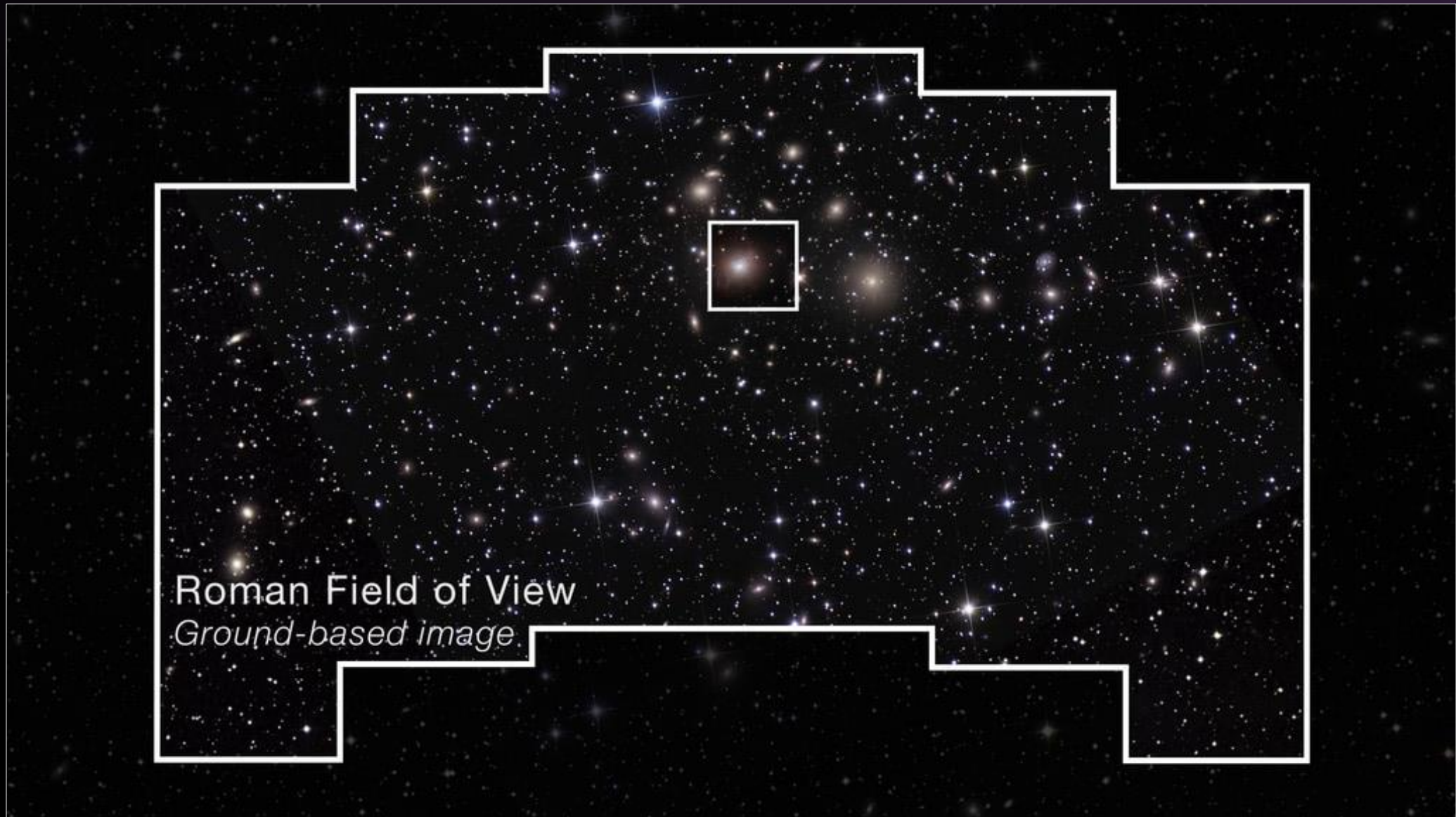
## Parker Solar Probe:

- Parker will make its closest approach to the Sun in Dec. 2024



# ASTROPHYSICS

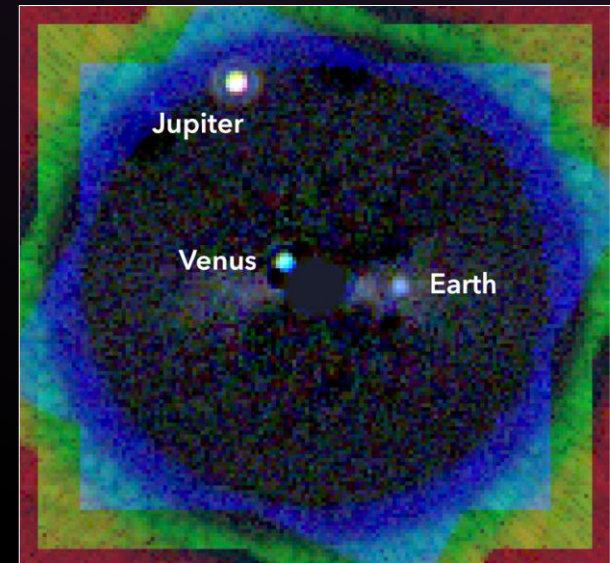
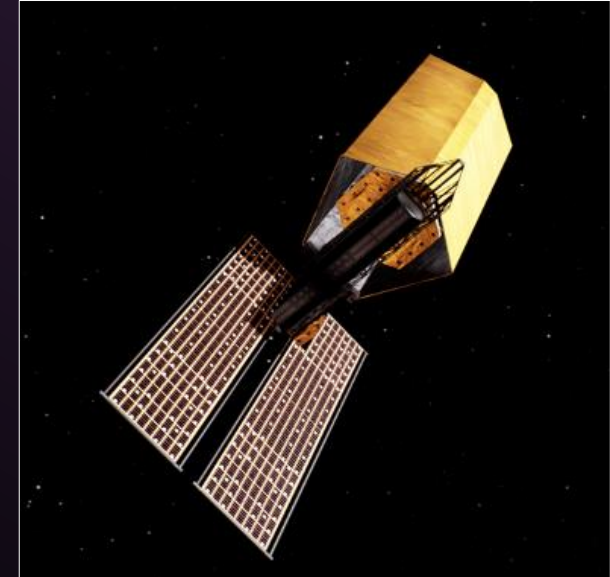




Roman Field of View  
*Ground-based image*

# Habitable Worlds Observatory

- Decadal Survey (ASTRO2020) priority science area
  - Are there habitable planets harboring life elsewhere in the universe?
  - Survey sun-like, nearby stars for habitable planets and search for evidence of life
- Response to primary recommendation:
  - Space telescope similar in wavelength coverage to Hubble, with an aperture of  $\geq 6$  meter and coronagraphic imaging capability
- Primary technical approach
  - 6-meter segmented mirror telescope
  - Active control of optics to achieve
    - Ultrastability at level of  $\sim 10$  pm over control cycle
  - Coronagraph achieving contrast levels of  $10^{-10}$
- Habitable Worlds Observatory
  - Survey and characterization of habitable worlds candidates
  - General astrophysics program



# BIOLOGICAL & PHYSICAL SCIENCES





## Dr. Lisa Carnell

Division Director  
Biological & Physical Sciences Division

- Recently served as BPS's Program Scientist for Translational Research
- Led strategic partnership initiatives with other government agencies, including NIH, BARDA, FDA, DARPA, NSF, and the USDA
- Holds a PhD from Duke University
- Formerly served as the Space Radiation Medical Countermeasure Lead for NASA's Human Research Program
- Extensive background in understanding and mitigating radiation-induced health effects on humans



# BPS-USDA Plant Research at EPCOT

## MICROBIAL MAGIC AT WORK



Plant growing chambers visible at the USDA Biotechnology Lab (Credit: Mark Sperry/USDA Agricultural Research Service)



ARTEMIS





# CLPS Deliveries

## 2023-2027

**Delivery Site:**  
Gruithuisen Domes  
**Provider:** TBD  
*CP-21 | 2026*

**Delivery Site:**  
Sinus Viscositatis  
**Provider:** Astrobotic  
*TO2-AB | NLT 2023*

**Delivery Site:**  
Lunar Far Side &  
Orbit Insertion  
**Provider:** Firefly  
*CS-3 | 2025*

**Delivery Site:**  
Reiner Gamma  
**Provider:** IM  
*CP-11 | Apr 2024*

**Delivery Site:**  
Ina Irregular Mare Patch  
**Provider:** TBD  
*CP-32 | Q2 2027*

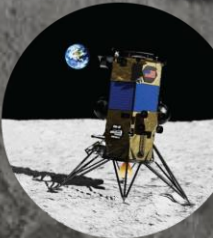
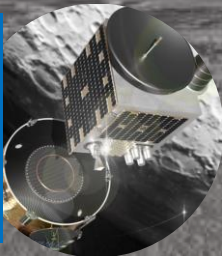
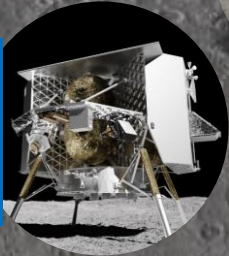
**Delivery Site:**  
Mare Crisium  
**Provider:** Firefly  
*TO19D | 2024*

**Delivery Site:**  
Shackleton Connecting Ridge  
**Provider:** IM  
*TO PRIME-1 | Nov 2023*

**Delivery Site:** Malapert A  
**Provider:** Intuitive  
Machines (IM)  
*TO2-IM | NET Q3 2023*

**Delivery Site:**  
South Pole Region  
**Provider:** TBD  
*CP-22 | 2026*

**Delivery Site:**  
Mons Mouton  
**Provider:** Astrobotic  
*VIPER | Nov 2024*





# 2023 is NASA's Year of Open Science

TOPS will energize and uplift open science across the scientific community through:



## Visibility

Publishing articles, appearing on podcasts, developing targeted communication that expands footprint

Integrating Open Science into themes at large-scale events and conferences



## Capacity Sharing

Producing online, free, Open Science curriculum on Open edX

Hosting workshops, events, cohorts, science team meetings, hackathons

Constructing multiple pathways to Open Science Badge



## Incentives

Developing Open Science Badge/Certification

Sponsoring high profile prizes and challenges

Establishing high profile awards in support of open science research



## Moving Towards Openness

Recognizing open science practices

Holding open meetings

Sharing hidden knowledge

Inclusive collaboration



EXPLORE

With Us