National Aeronautics and
Space Administration

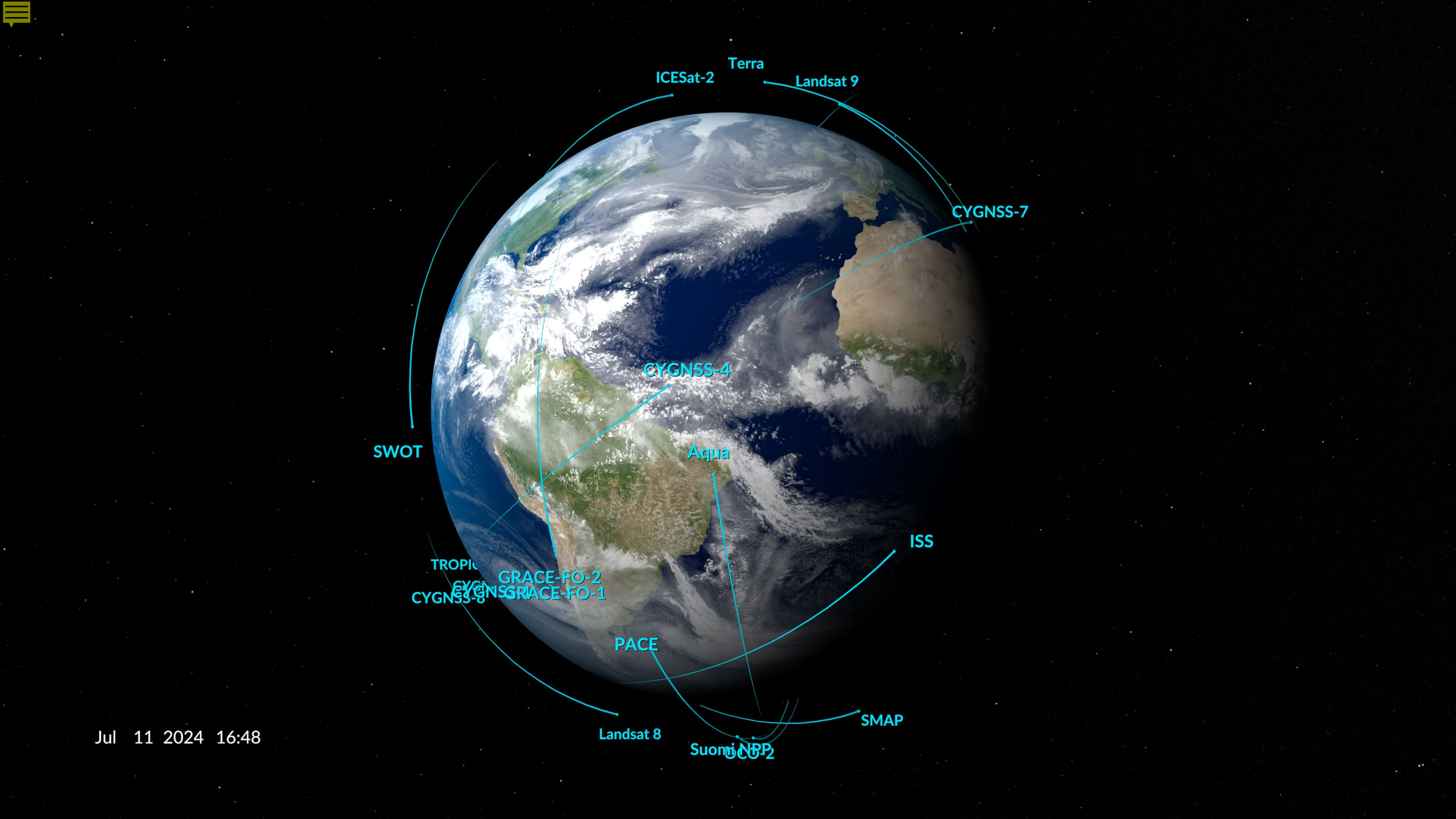
NASA earth

CONSEO: Global Partnership is the Key to Understanding Climate Change

Karen St. Germain, PhD

Director

Earth Science Division


Terra
ICESat-2
Landsat 9
CYGNSS-7
CYGNSS-4
SWOT
Aqua
ISS
GRACE-FO-2
GRACE-FO-1
PACE
SMAP
Landsat 8
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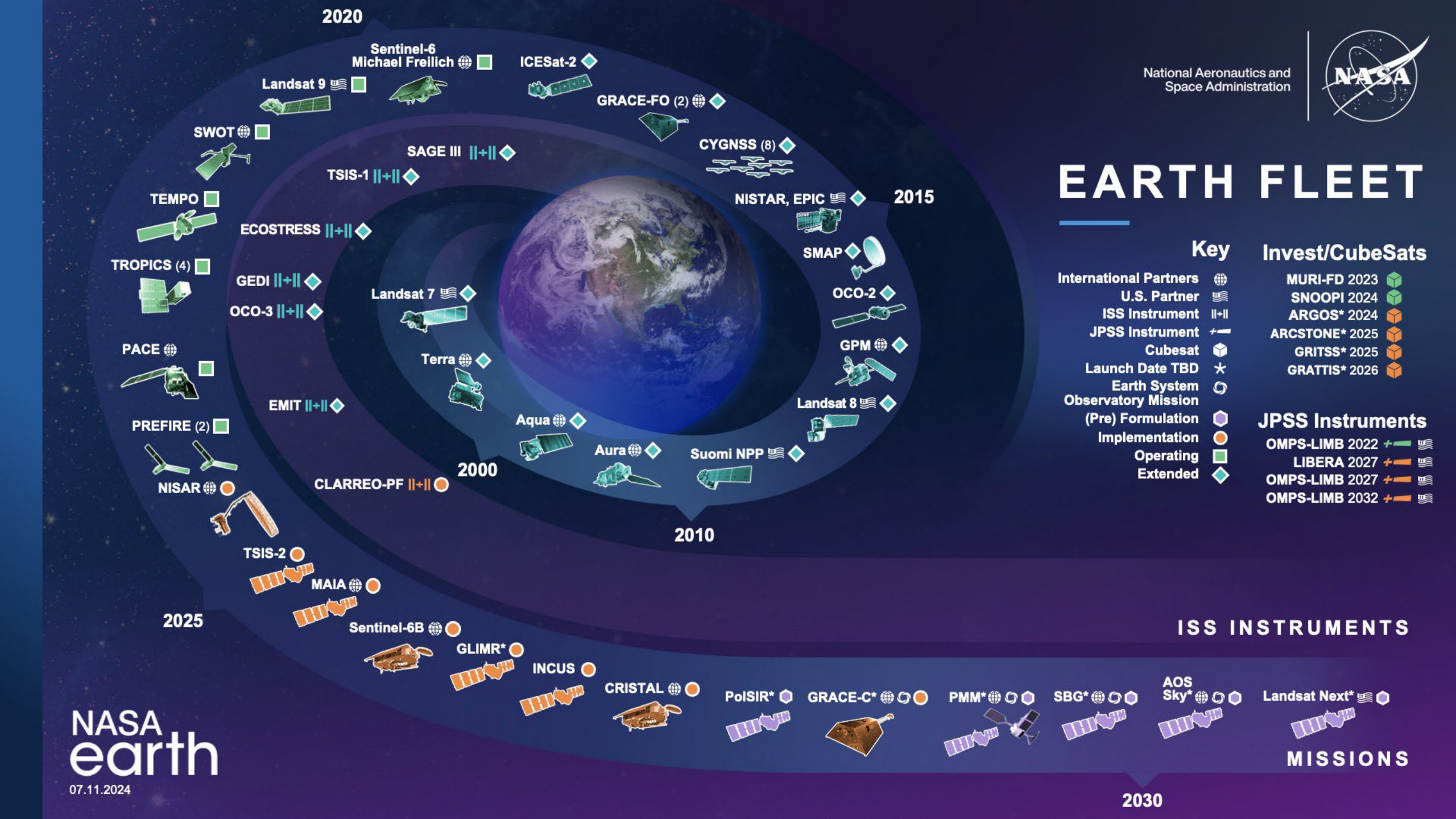
2020
Sentinel-6 Michael Freilich
ICESat-2
Landsat 9
GRACE-FO (2)
SWOT
CYGNSS (8)
SAGE III
TSIS-1
TEMPO
NISTAR, EPIC
2015
ECOSTRESS
SMAP
TROPICS (4)
GEDI
Landsat 7
OCO-2
OCO-3
PACE
GPM
Terra
EMIT
Landsat 8
Aqua
PREFIRE (2)
Aura
Suomi NPP
2000
NISAR
CLARREO-PF
TSIS-2
MAIA
2025
Sentinel-6B
GLIMR*
INCUS
CRISTAL
PolSIR*
GRACE-C*
PMM*
SBG*
AOS Sky*
Landsat Next*
ISS INSTRUMENTS
MISSIONS
2030
NASA earth
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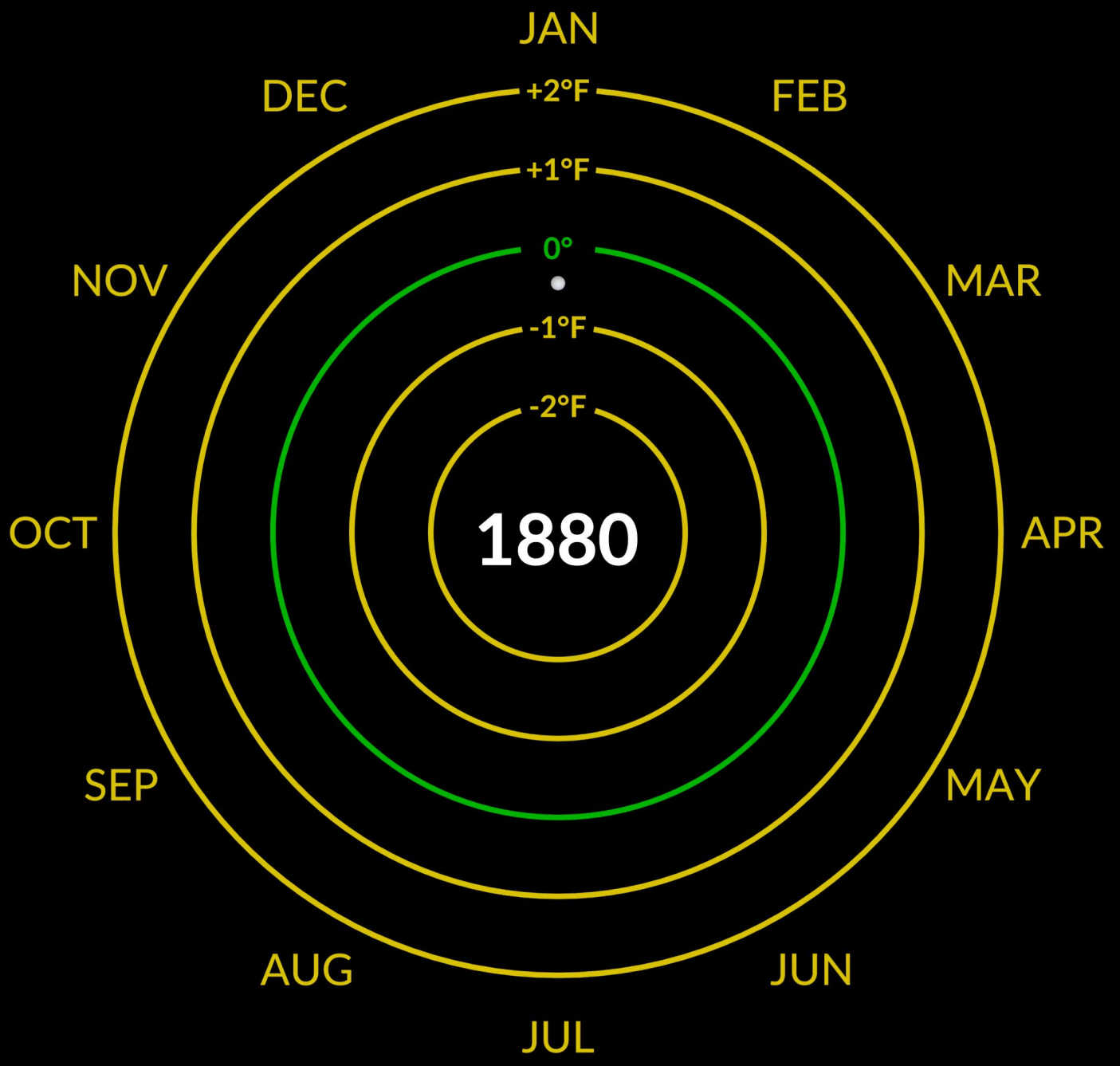
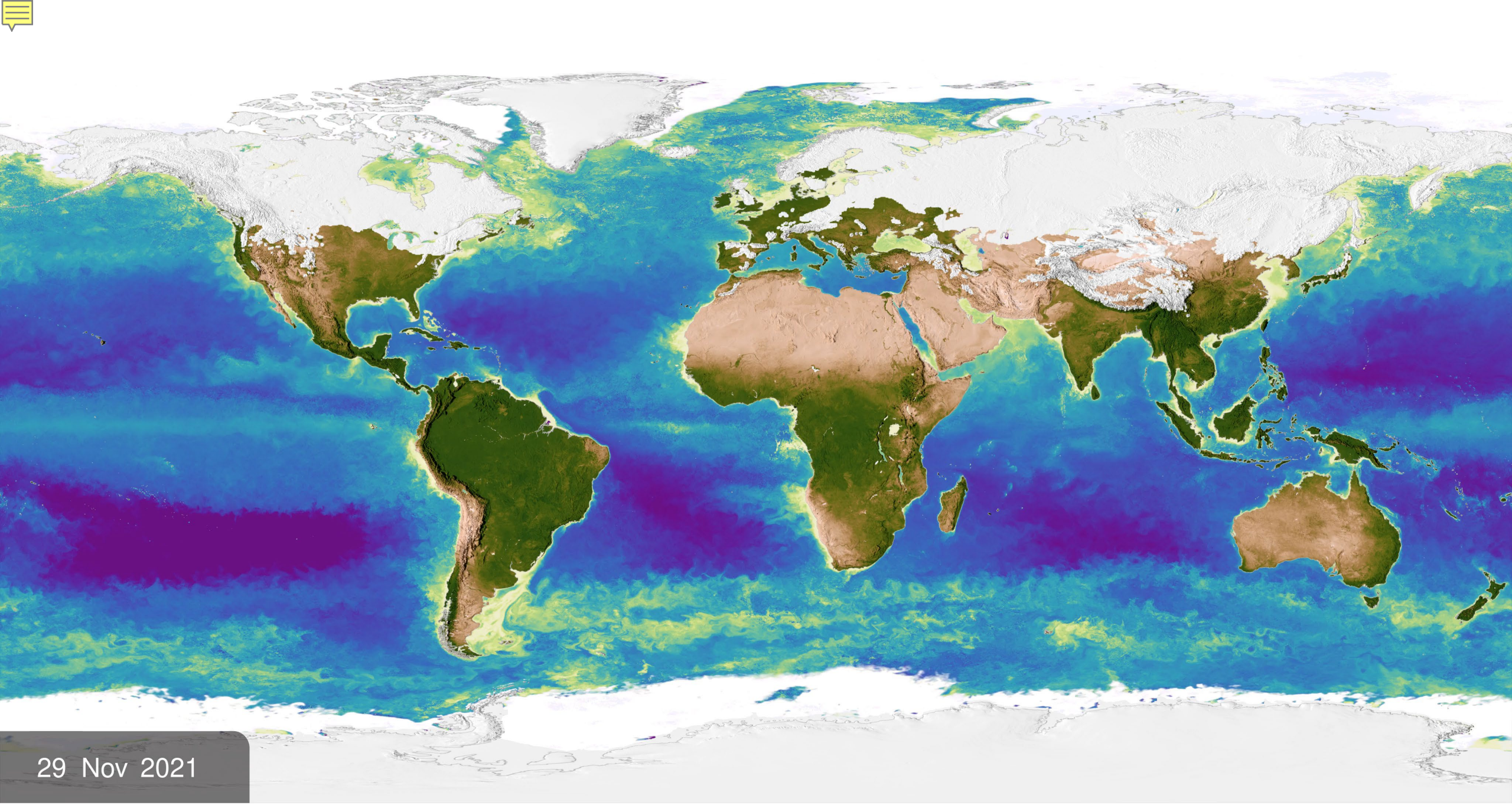
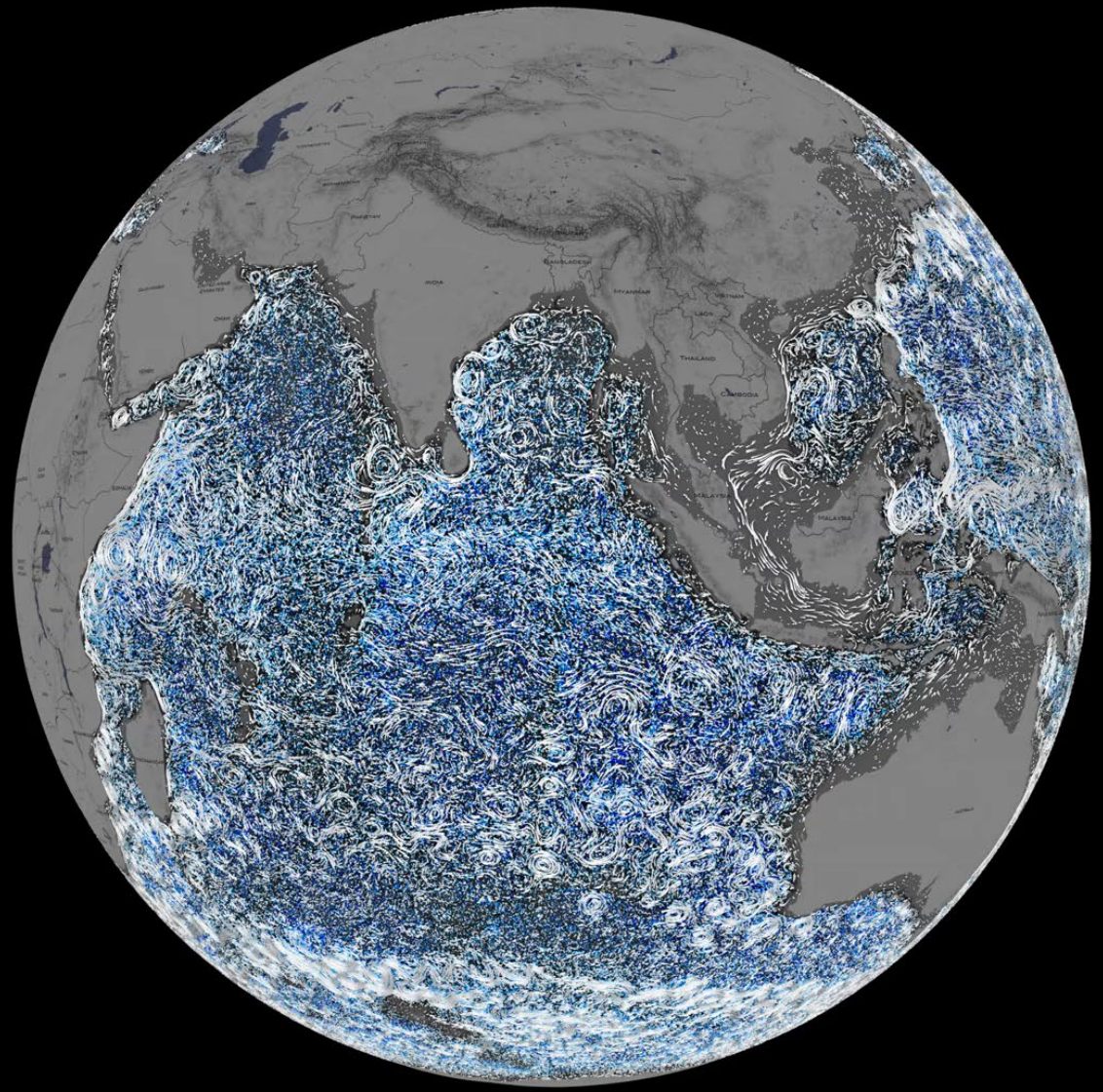
NASA
EARTH FLEET
Key
International Partners
U.S. Partner
ISS Instrument
JPSS Instrument
Cubesat
Launch Date TBD
Earth System Observatory Mission
(Pre) Formulation
Implementation
Operating
Extended
Invest/CubeSats
MURI-FD 2023
SNOOPI 2024
ARGOS* 2024
ARCSTONE* 2025
GRITSS* 2025
GRATTIS* 2026
JPSS Instruments
OMPS-LIMB 2022
LIBERA 2027
OMPS-LIMB 2027
OMPS-LIMB 2032

Climate Trends Assessment

The GISS Surface Temperature Analysis (v4) is an estimate of global surface temperature change, from 1880-2022.



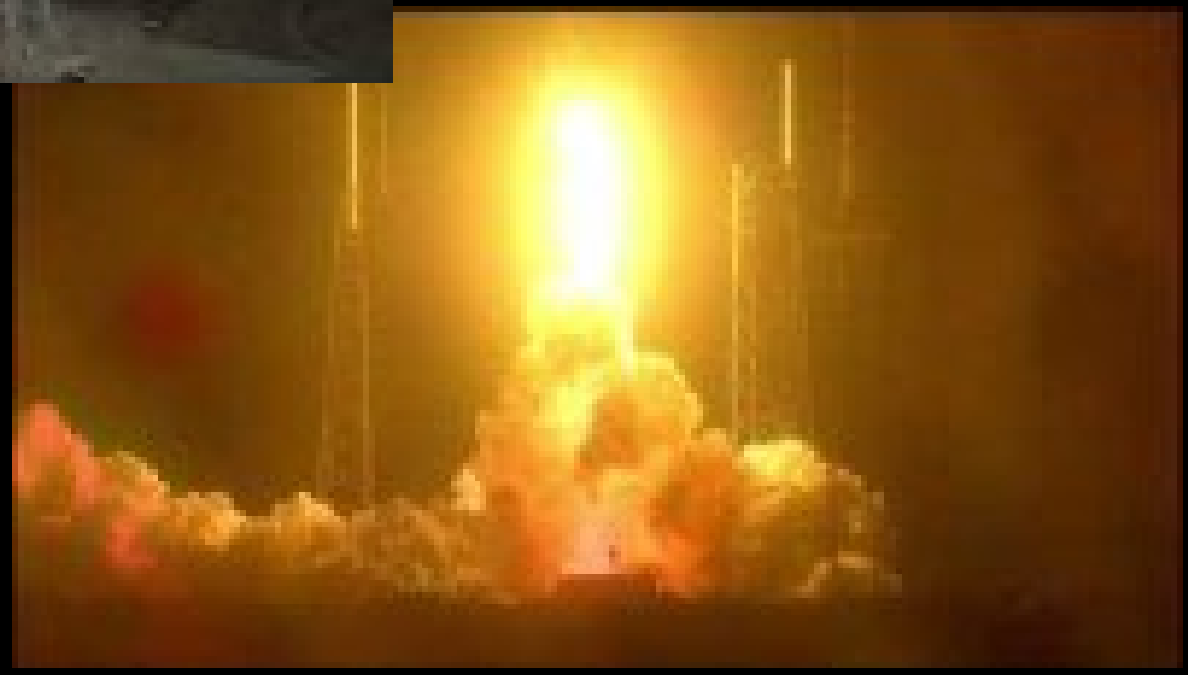

29 Nov 2021


PAKISTAN
INDIA
BANGLADESH
MYANMAR
VIETNAM
LAOS
THAILAND
CAMBODIA
MALAYSIA

From Innovation to Launch: SWOT and PACE

SWOT launched Dec. 16, 2022 from Vandenberg Space Force Base in California

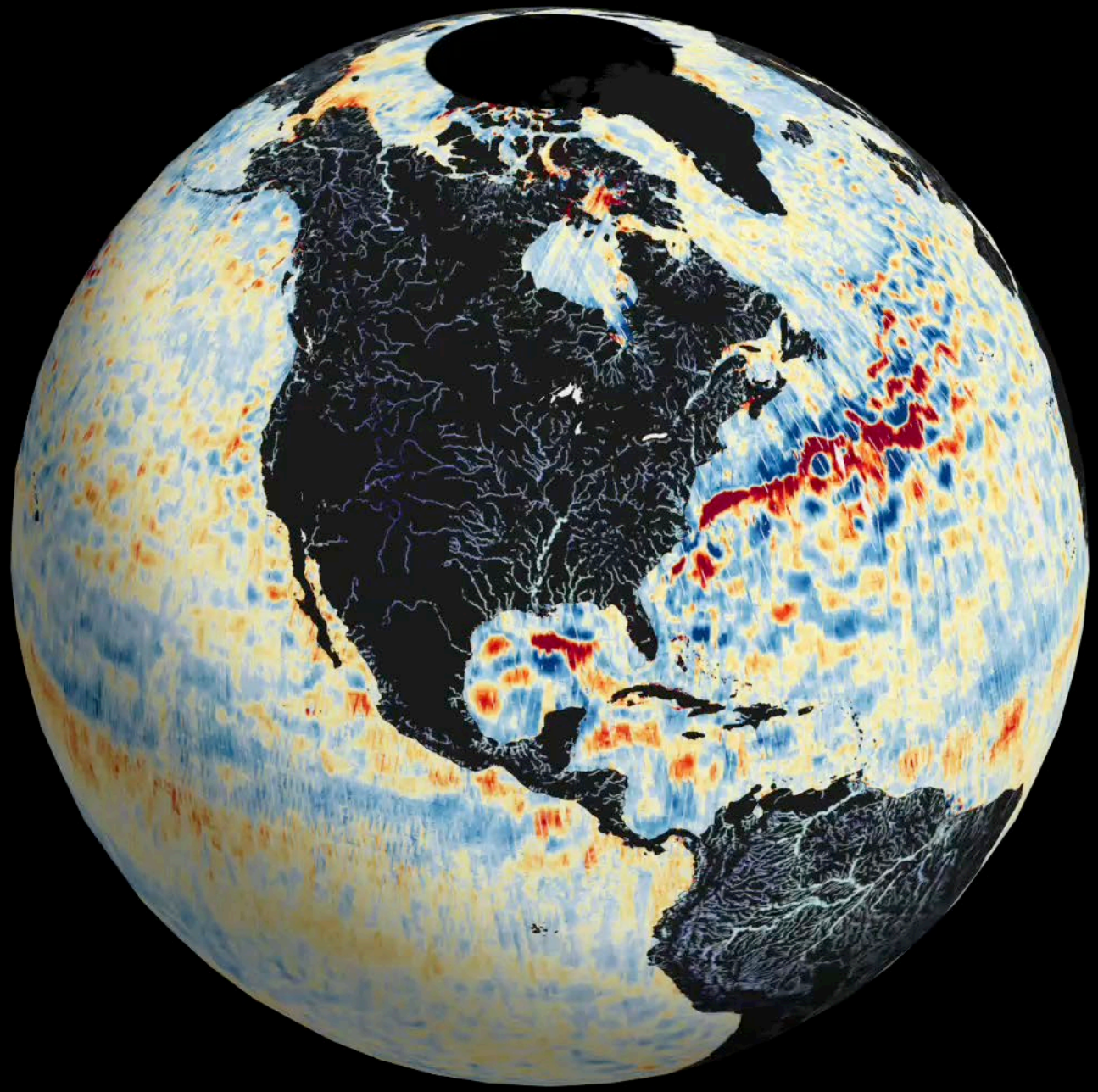
PACE launched Feb. 8, 2024 from Cape Canaveral Space Force Station in Florida



Source: NASA TV

SWOT: Sea Surface Height Anomalies

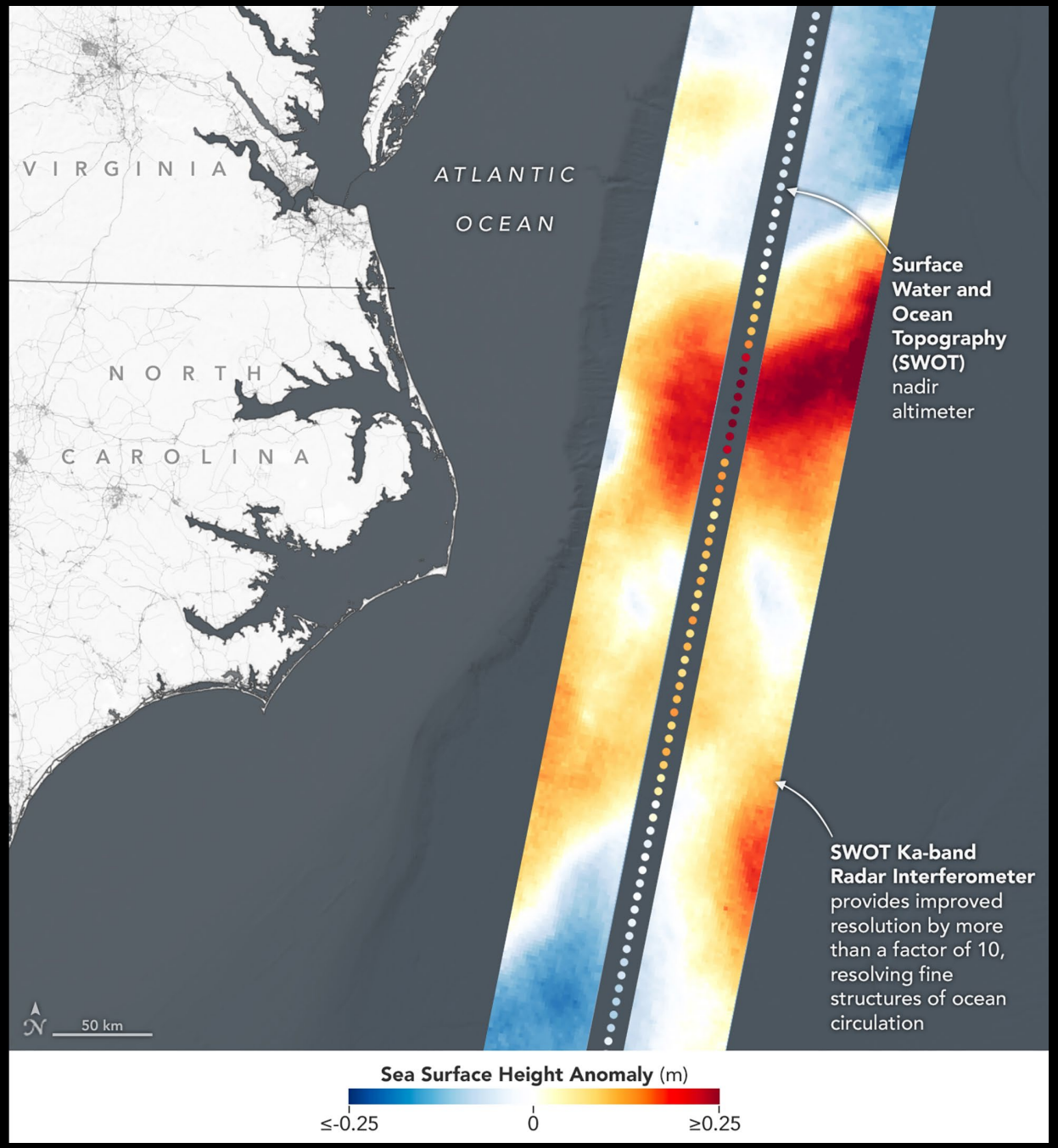
First 21-day cycle of SWOT measurements – first complete global coverage of Earth water elevation, including sea surface height observations



SWOT: Gulf Stream Sea Surface Height

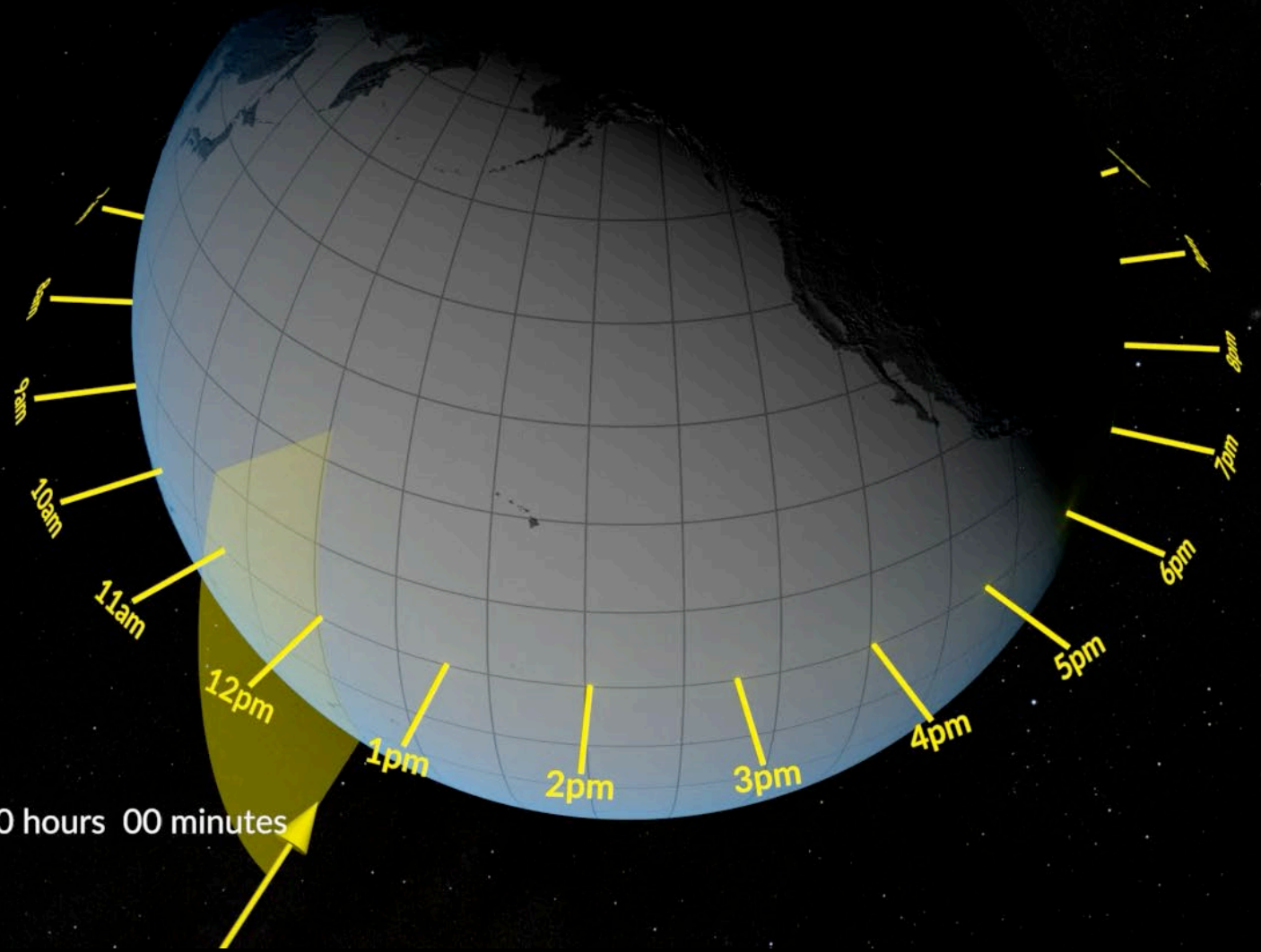
Red and orange represents sea levels higher than global average. Blue shades are lower than average.

SWOT's spatial resolution is 10 times greater than composite data gathered over the same area by seven other satellites on Jan. 21, 2023



PACE Technology: Ocean Color Instrument & Two Polarimeters

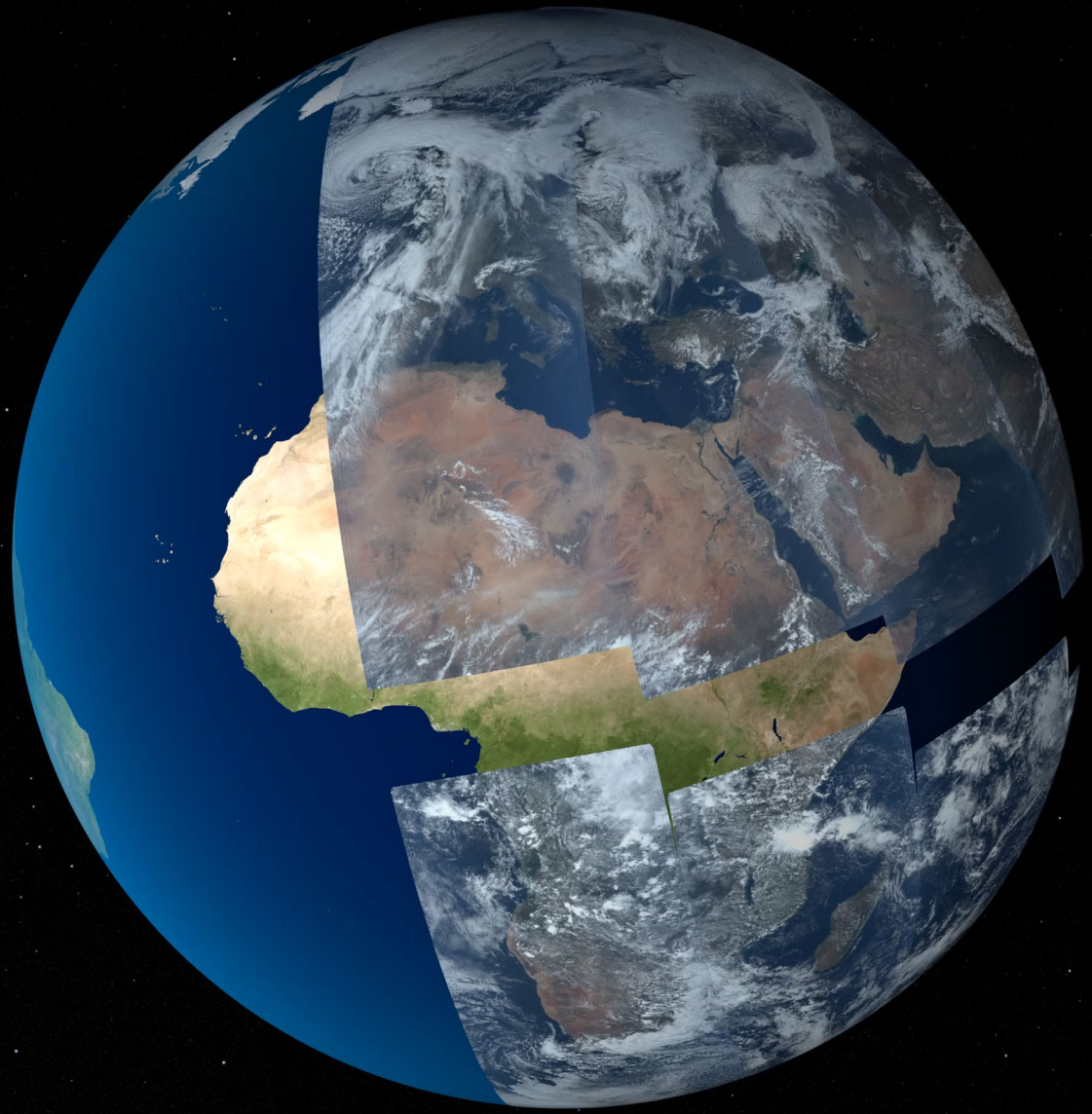
Completing orbit in 98.3 minutes, PACE carries OCI, HARP2 and SPEXone



PACE Instrument: OCI

What PACE shows us: Ocean Color

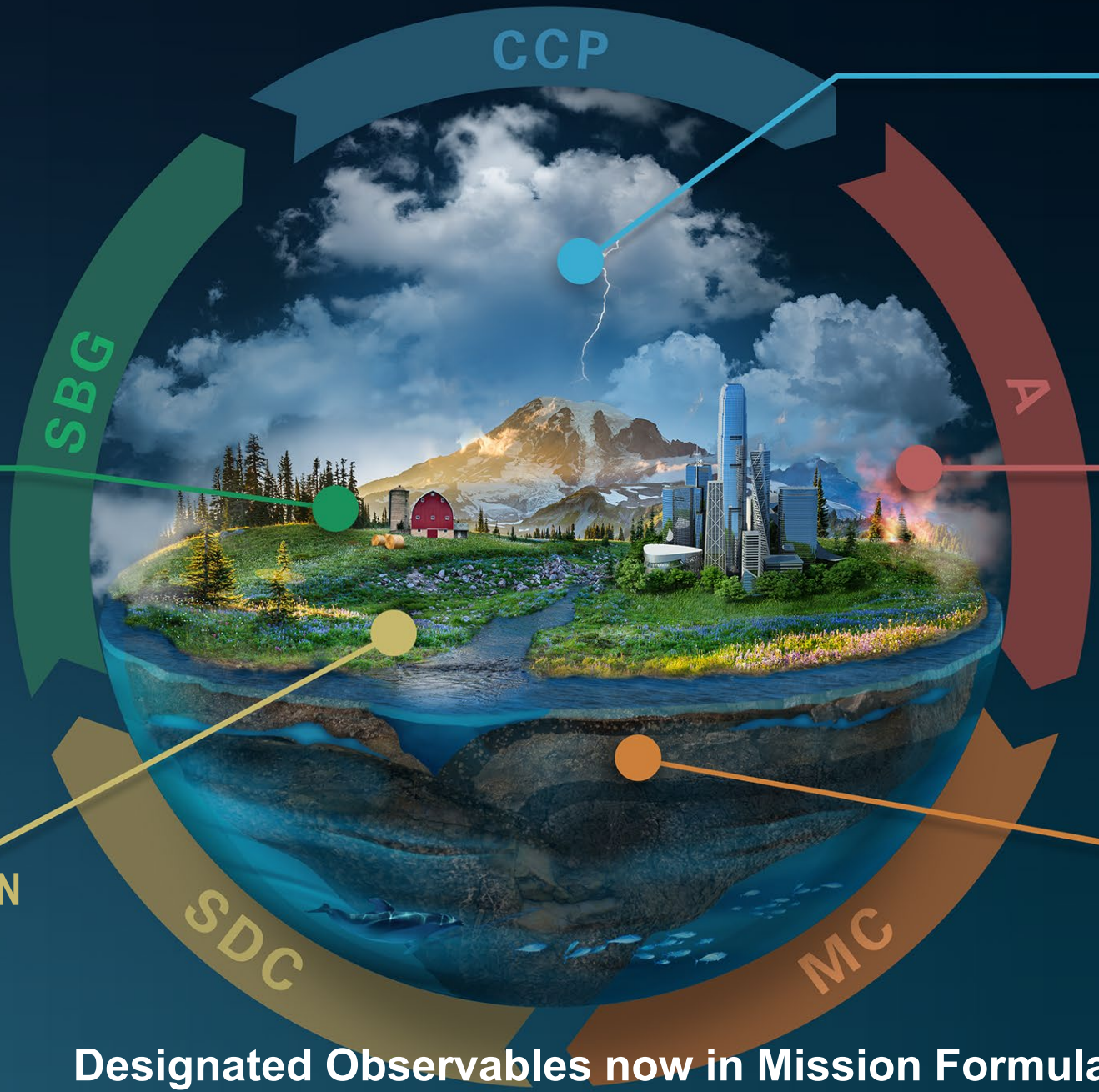
PACE reveals the colors of Earth. The color of the ocean can be used to determine phytoplankton abundances, and with PACE, phytoplankton community composition.



Gaps in data are OCI geometry adjustment to look away from the Sun

EARTH SYSTEM OBSERVATORY

INTERCONNECTED CORE MISSIONS



AOS-Storm and AOS-Sky

CLOUDS, CONVECTION AND PRECIPITATION

Water and Energy in the Atmosphere

AEROSOLS

Particles in the Atmosphere

SURFACE BIOLOGY AND GEOLOGY

Earth Surface & Ecosystems

GRACE-Continuity

MASS CHANGE

Large-scale Mass Redistribution

SURFACE DEFORMATION AND CHANGE

Earth Surface Dynamics

Met by NISAR launch in 2024

Designated Observables now in Mission Formulation

Earth Science to Action Strategy

Virtuous Cycle
- User needs inform next iteration of programs, missions and initiatives

Public Understanding & Exchange
- Put more scientific understanding into public sphere
- Deliver applied science to users
- Participate in multi-way info exchange
- Use input to inform subsequent work

Solutions & Societal Value
- Offer models, scientific findings and info through Open-Source Science principles
- Support climate services
- Provide science applications and tools to inform decisions

Earth System Science & Applied Research
- Grow scientific understanding of Earth's systems
- Develop predictive modeling for science applications and tools to mitigate, adapt and respond to climate change

Foundational Knowledge, Technology, Missions & Data
- Technology innovation
- Earth observations missions
- Data collected from space, air and ground

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05.01.2024

NASA: Forefront Link in USG Climate Services Knowledge Value Chain

Generate **climate information:**
- Observations
- Modeling and simulation
- Indigenous and traditional knowledge
- Lived experience

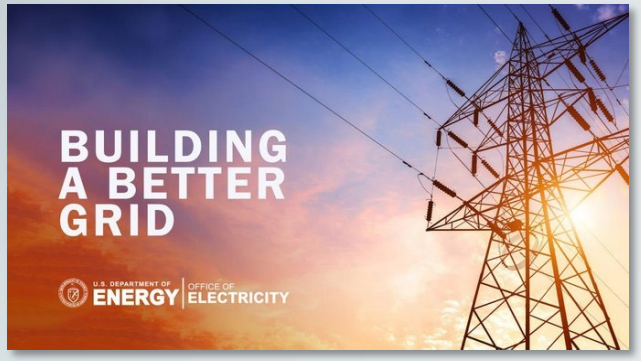
Deliver **climate services:**
- Mapping and visualization
- Extension services
- Training and capacity building
- Storytelling

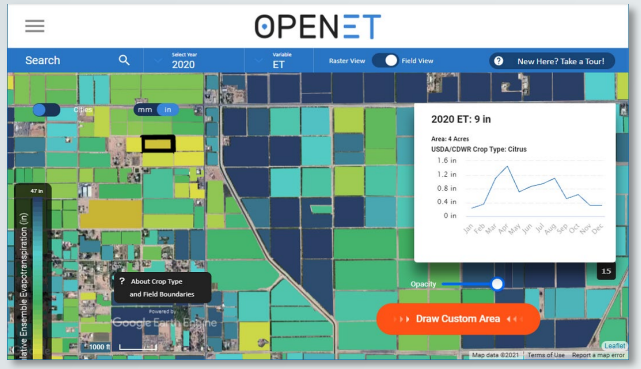
Evaluate **climate services:**
- Peer review
- User surveys
- Benefit/cost analysis
- Randomized control trials

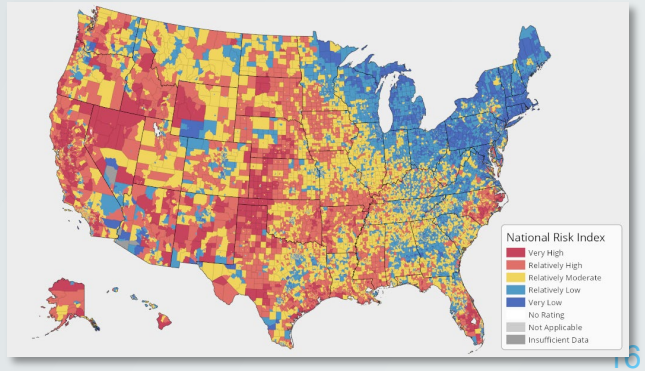
Develop **climate services:**
- Science translation
- User engagement
- Design co-production
- Application development

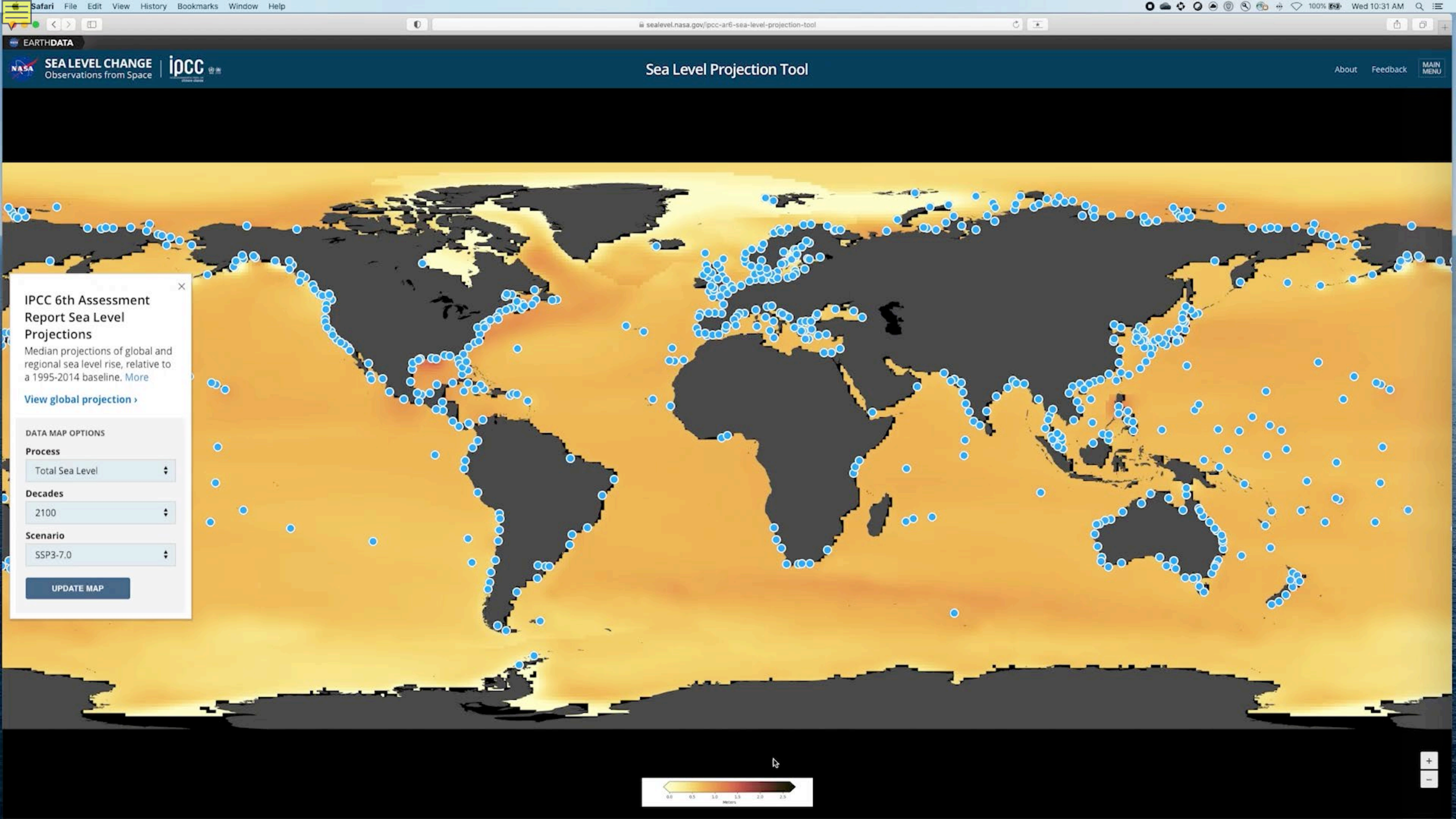
Use **climate services:**
- Risk assessment
- Hazard mitigation
- Project design and planning
- Investing and asset management

NASA Enables Climate-Informed Services Across the USG





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sealevel.nasa.gov/ipcc-ar6-sea-level-projection-tool
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Observations from Space
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IPCC 6th Assessment Report Sea Level Projections
Median projections of global and regional sea level rise, relative to a 1995-2014 baseline. More
View global projection ›
DATA MAP OPTIONS
Process
Total Sea Level
Decades
2100
Scenario
SSP3-7.0
UPDATE MAP
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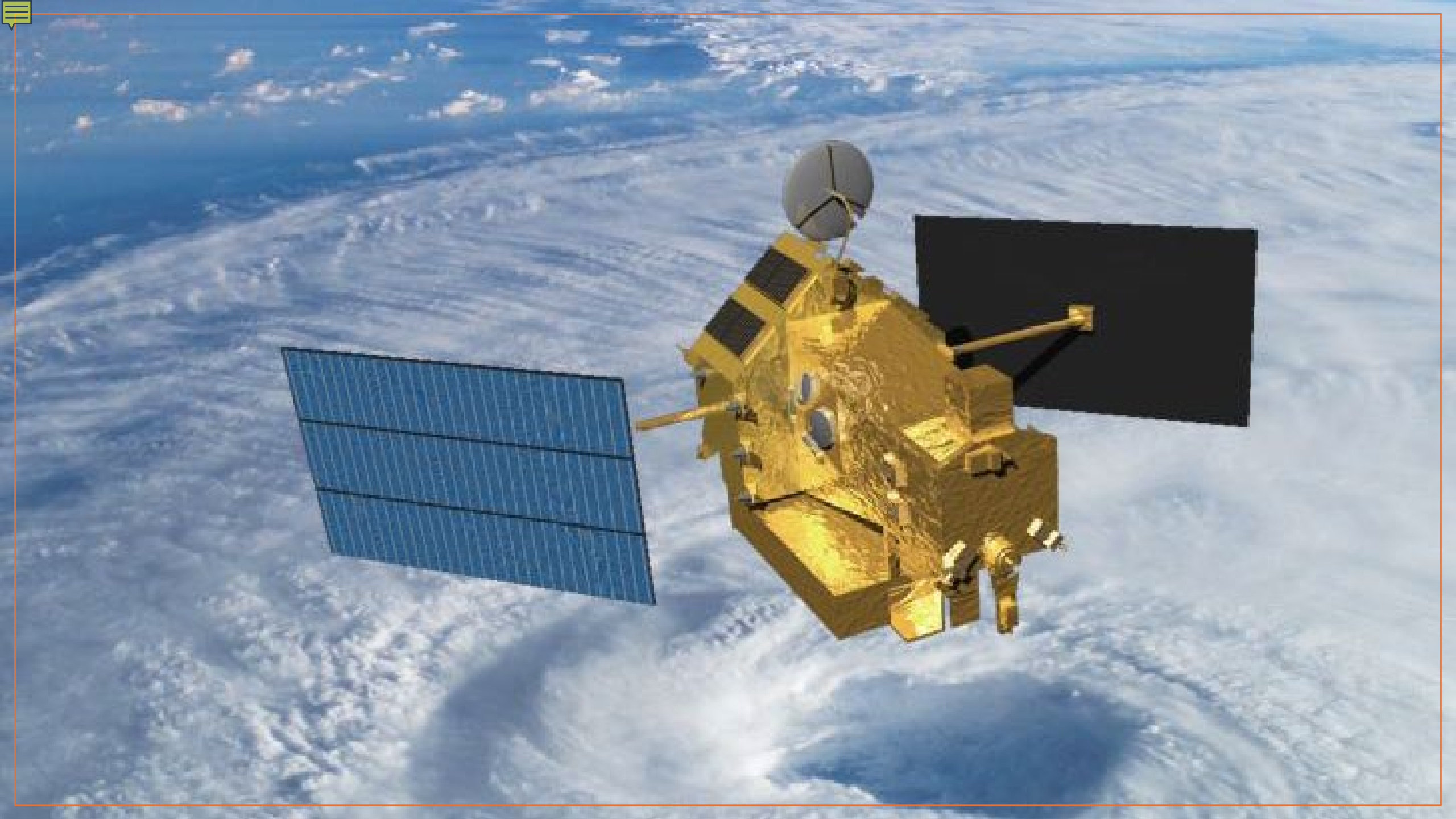
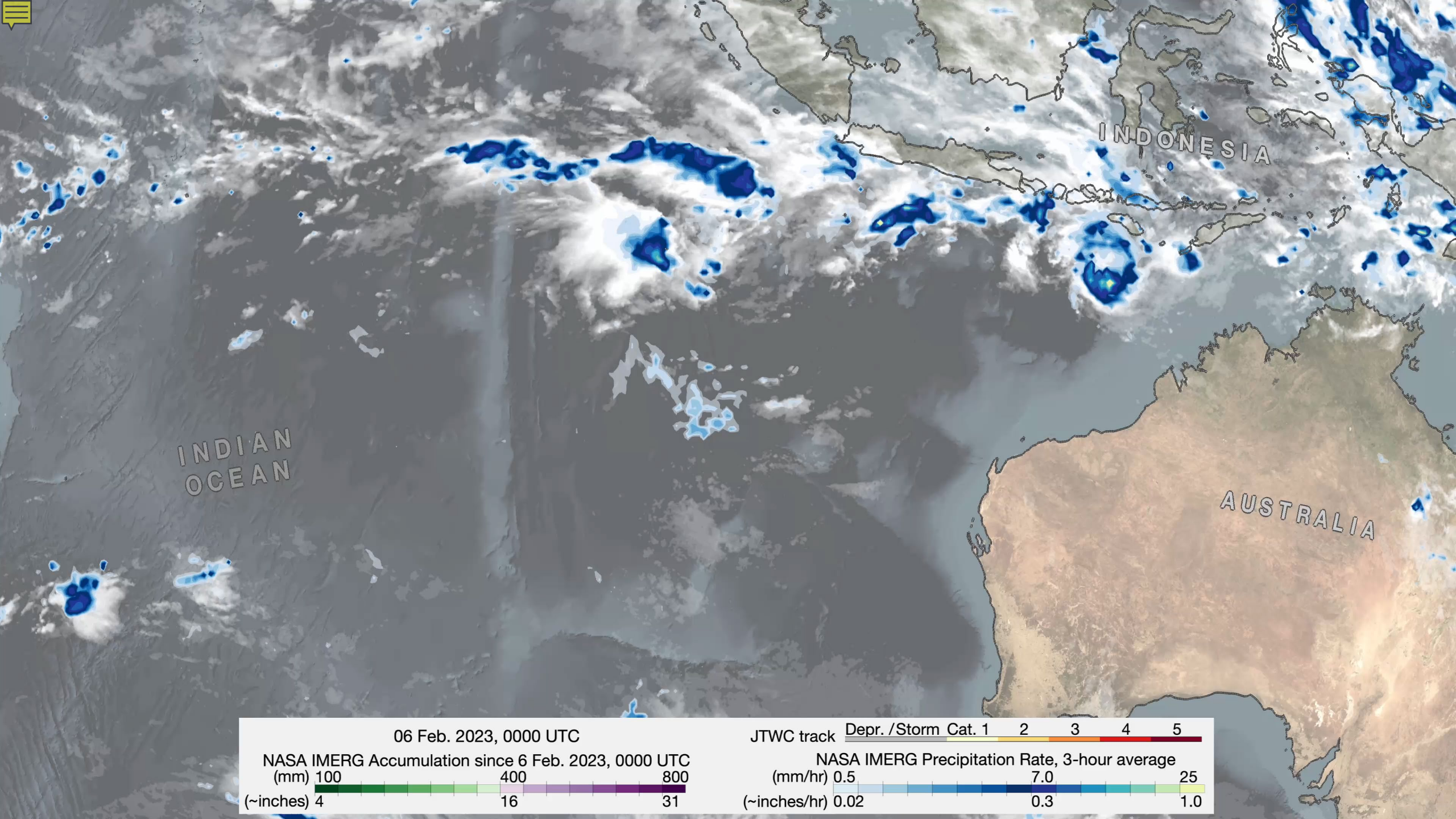
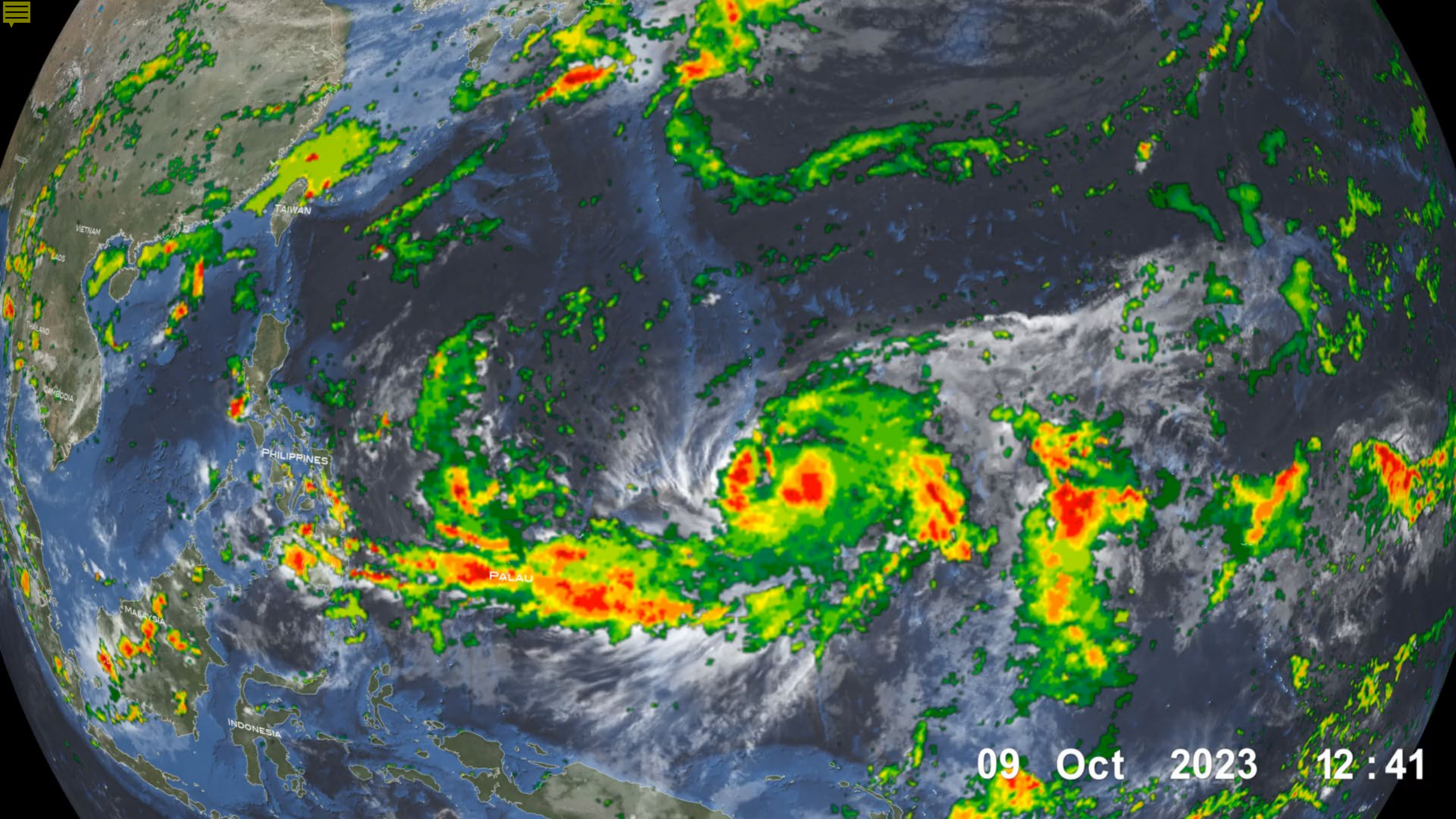
0.5
1.0
1.5
2.0
2.5
Meters




INDONESIA
INDIAN OCEAN
AUSTRALIA
06 Feb. 2023, 0000 UTC
NASA IMERG Accumulation since 6 Feb. 2023, 0000 UTC
(mm) 100 400 800
(~inches) 4 16 31
JTWC track Depr. / Storm Cat. 1 2 3 4 5
NASA IMERG Precipitation Rate, 3-hour average
(mm/hr) 0.5 7.0 25
(~inches/hr) 0.02 0.3 1.0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LAOS
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INDONESIA
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