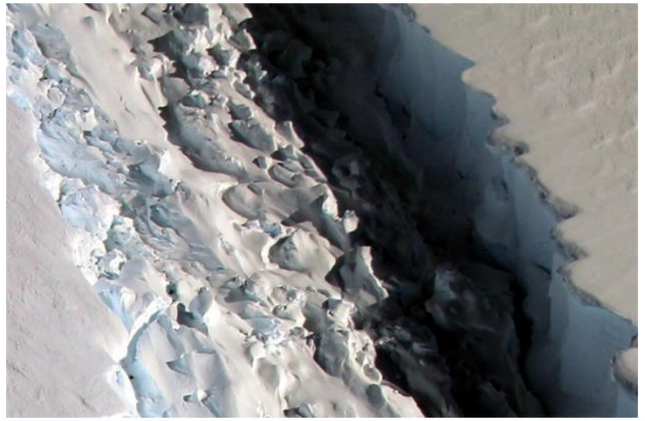
National Aeronautics and Space Administration

SCIENCE

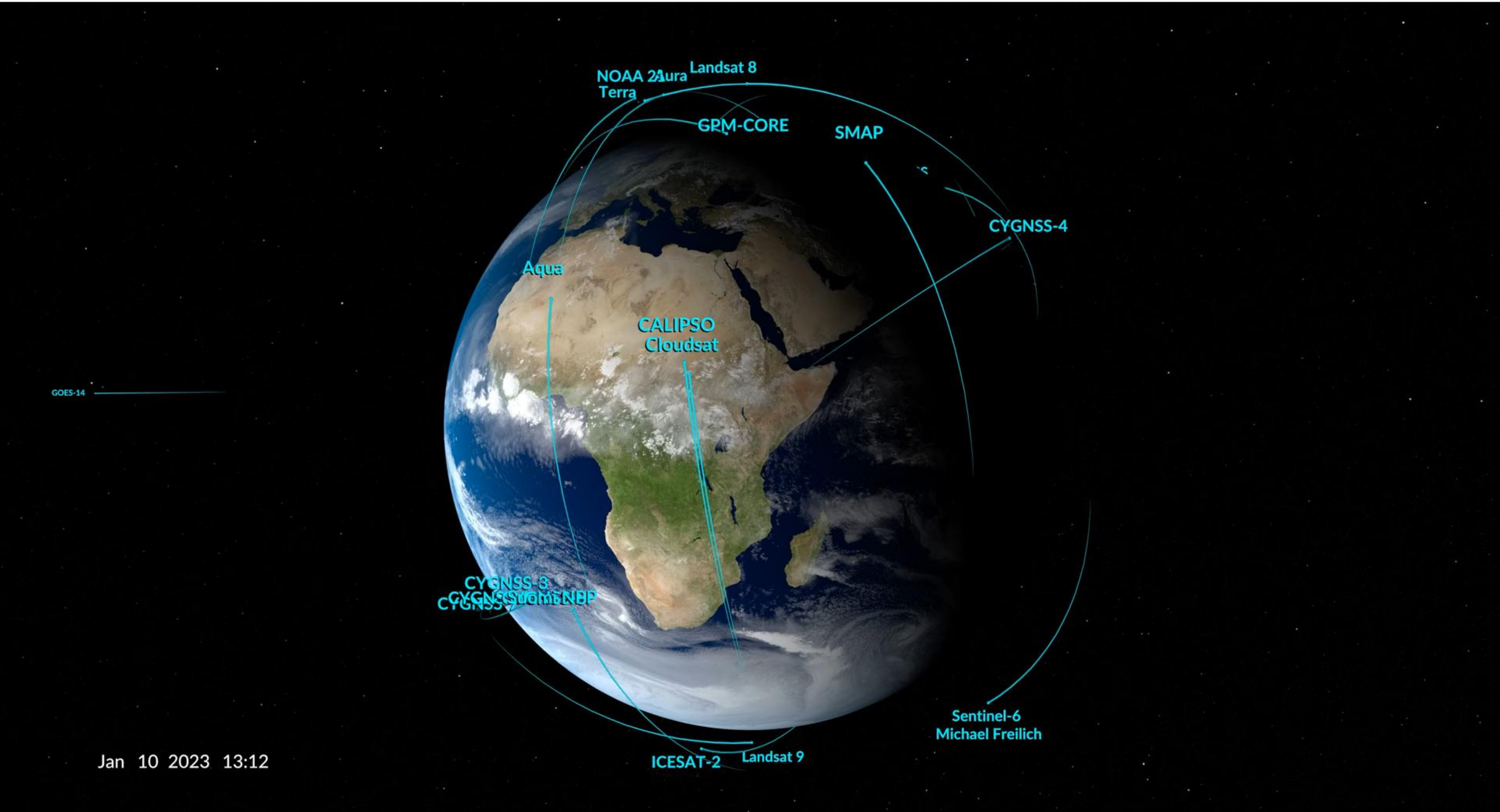


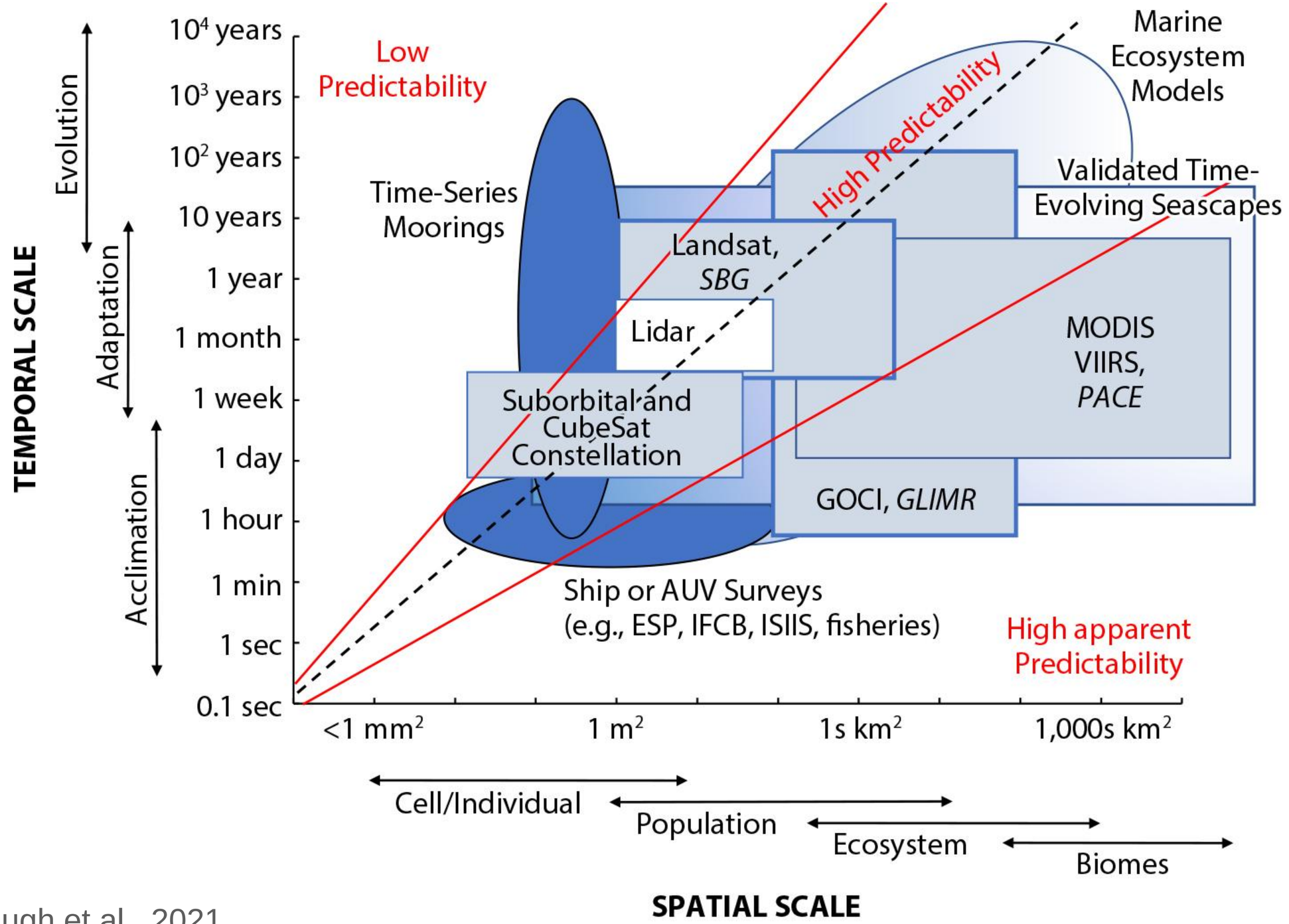



NASA Earth Observations to investigate our (water) world

Bridget Seegers
NASA Goddard Space Flight Center
Ocean Ecology Laboratory

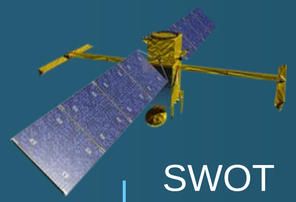
Monday, Nov. 27th, 2023


NOAA 21
Aura
Landsat 8
Terra
GPM-CORE
SMAP
CYGNSS-4
Aqua
CALIPSO
Cloudsat
GOES-14
CYGNSS-3
Suomi NPP
Sentinel-6
Michael Freilich
ICESAT-2
Landsat 9
Jan 10 2023 13:12

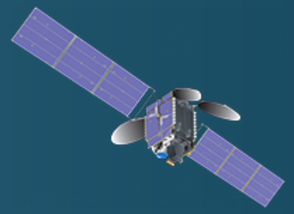


From Kavanaugh et al., 2021

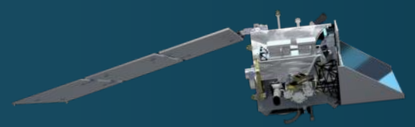
Recent and Upcoming Earth Science Launches



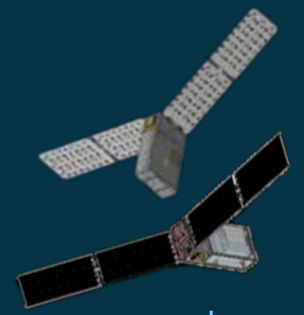
SWOT



TEMPO



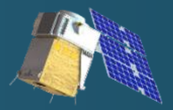
PACE**



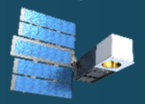
PREFIRE****

2022 | **2023** | **2024**

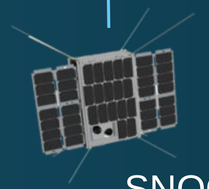
December | January | April | May | February | May | June | August | October



MURI

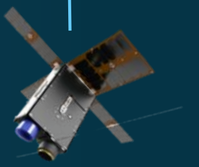


TROPICS 2, 3



SNOOPI*

HyTI***



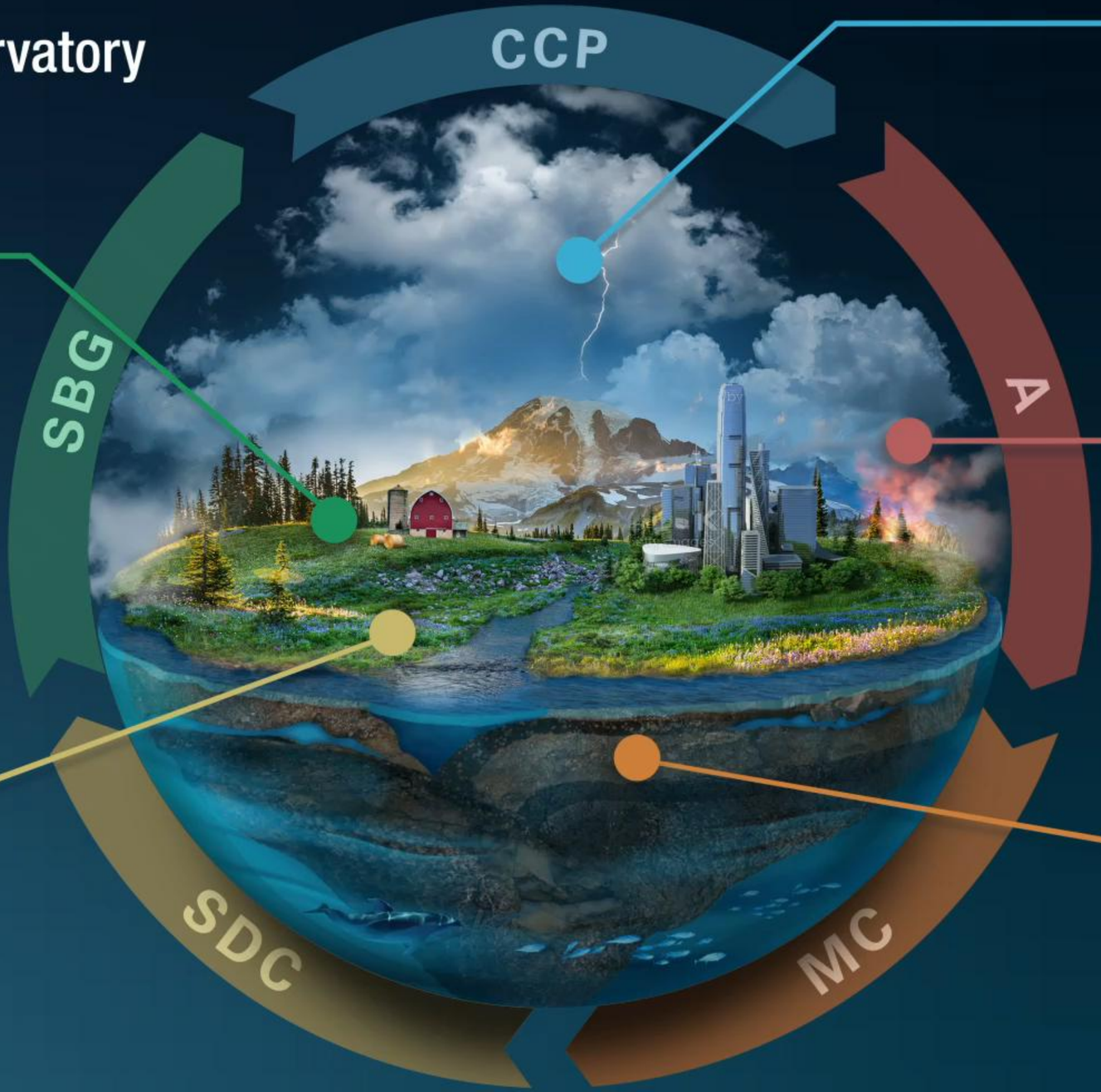
NISAR*****

*Launch Date NET February 2024
**Agency LRD May 2024
***Launch Date NET June 2024
****Agency LRD Aug 2024
*****Agency LRD Oct 2024

09.20.23

Earth System Observatory

Interconnected Missions



CLOUDS, CONVECTION AND PRECIPITATION

Water and Energy in the Atmosphere

AEROSOLS

Particles in the Atmosphere

MASS CHANGE

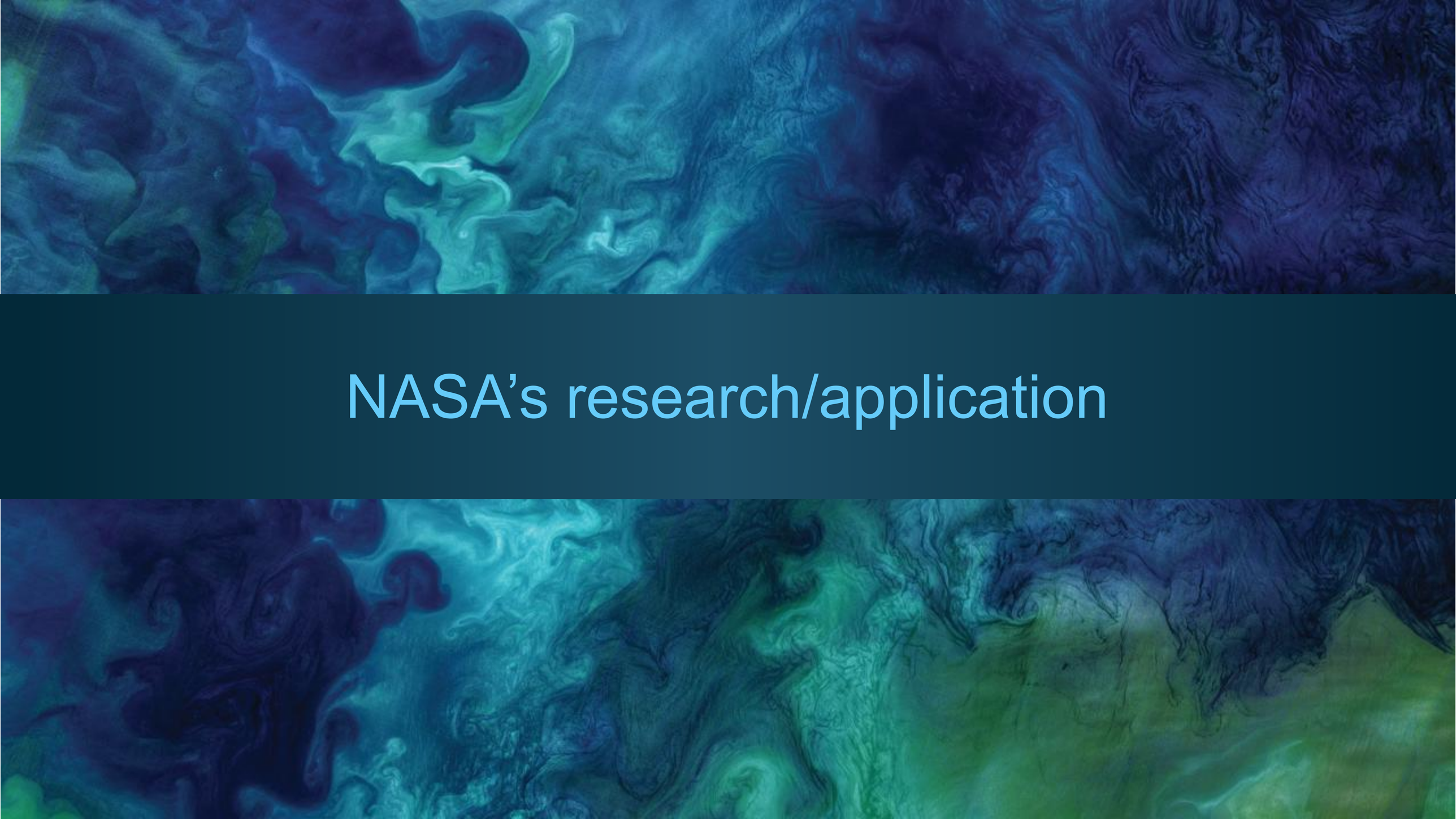
Large-scale Mass Redistribution

SURFACE BIOLOGY AND GEOLOGY

Earth Surface & Ecosystems

SURFACE DEFORMATION AND CHANGE

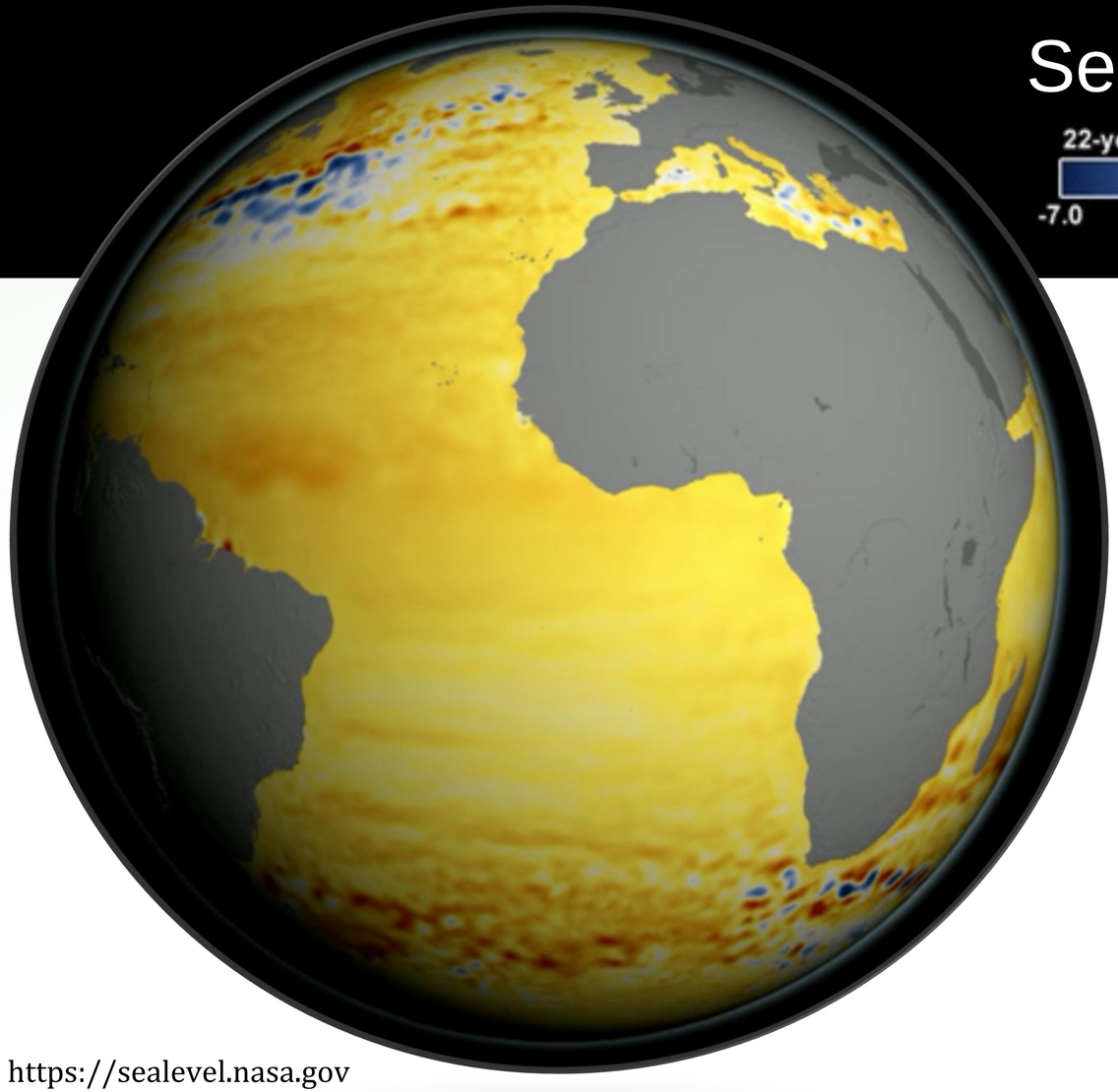
Earth Surface Dynamics



NASA’s research/application

Changes in ocean conditions: Sea Level

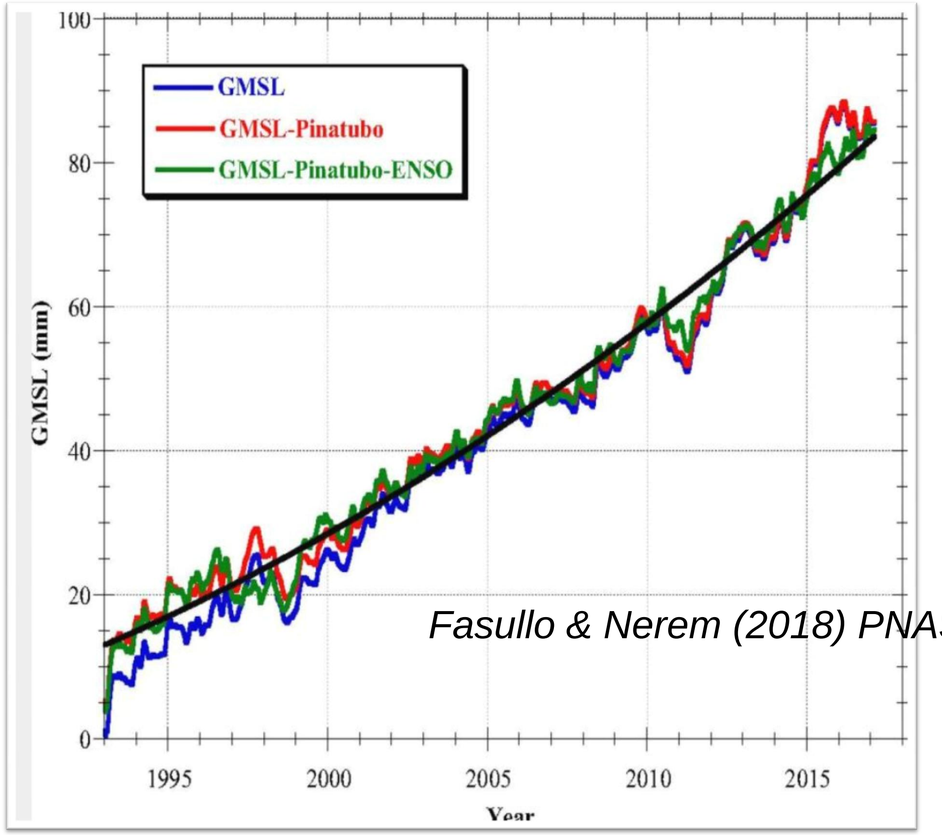
Sea Level



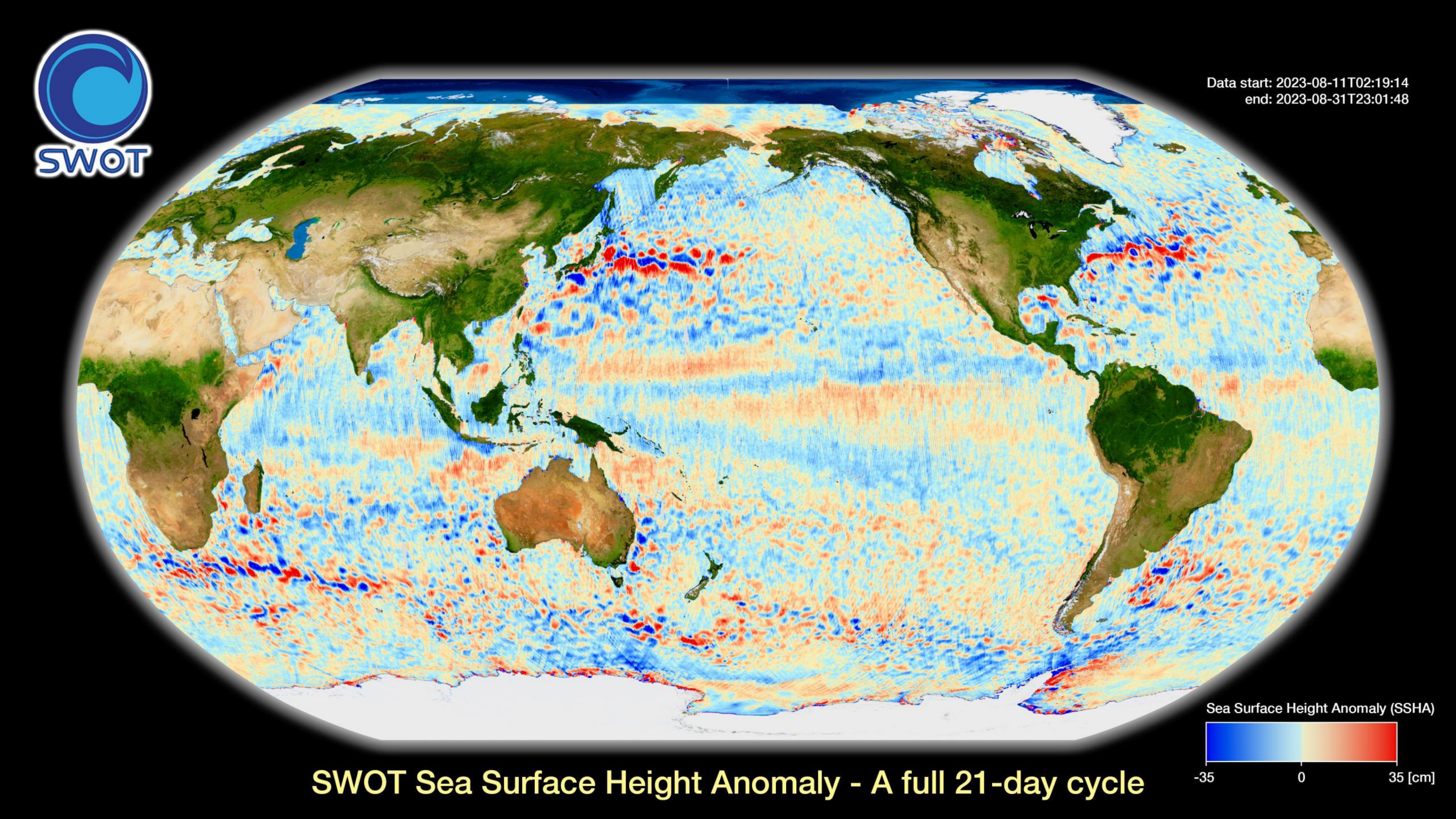
https://sealevel.nasa.gov

Changes in glaciers

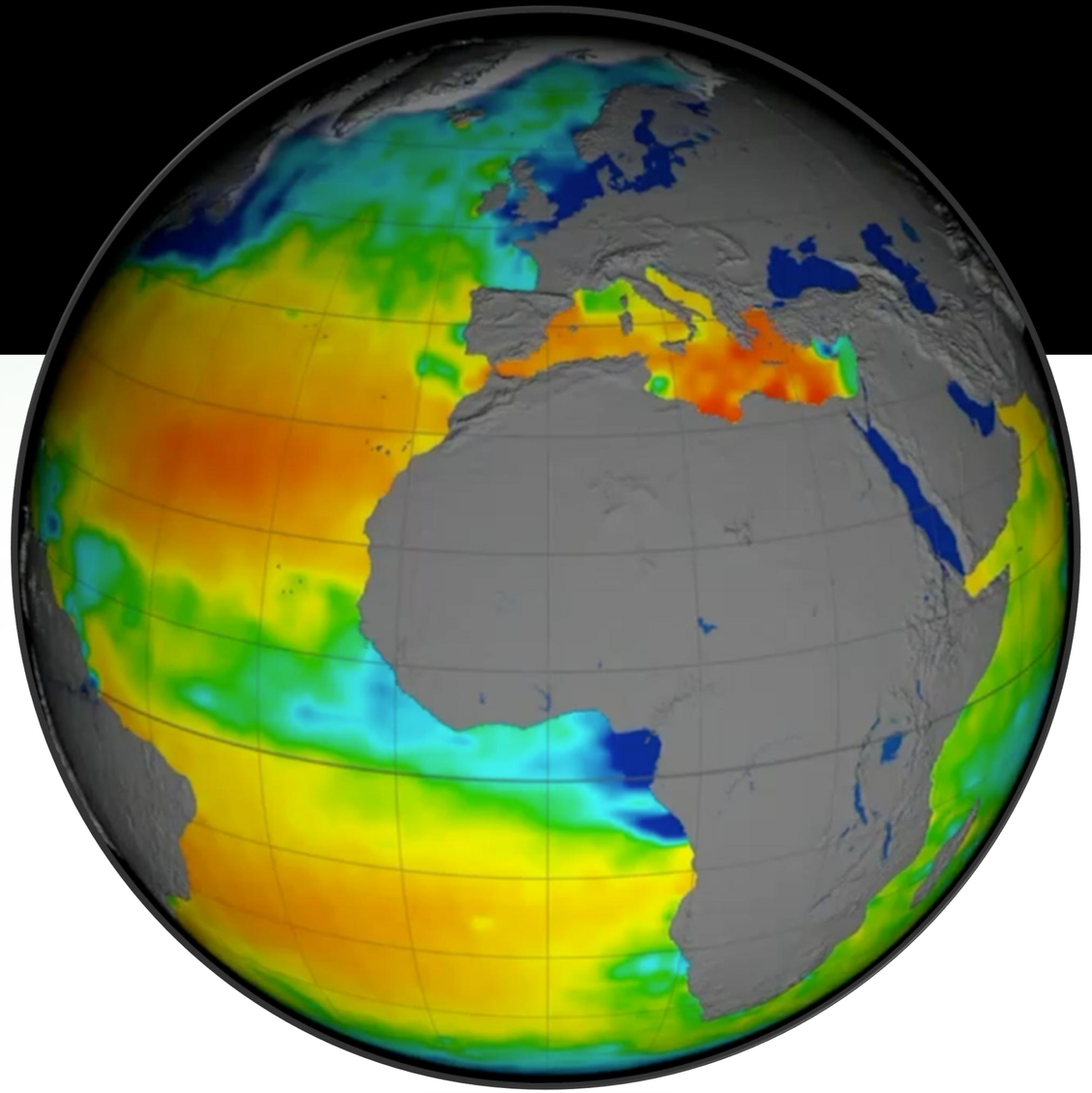
https://icesat-2.gsfc.nasa.gov/

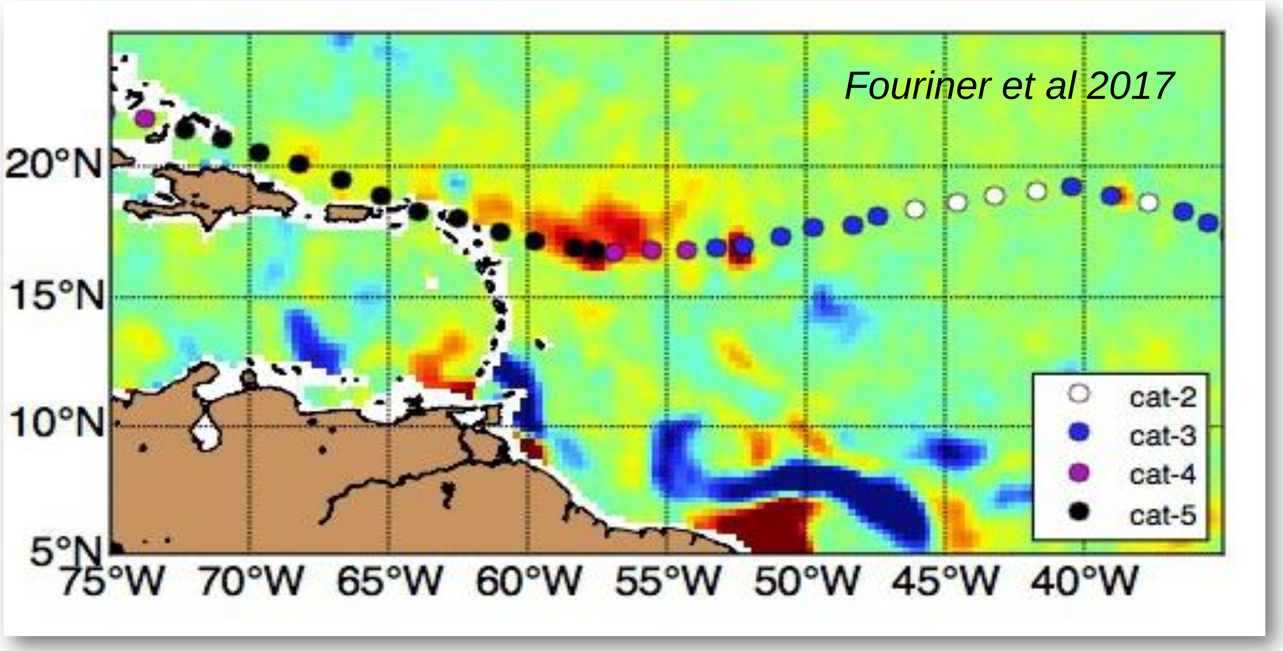


Fasullo & Nerem (2018) PNAS

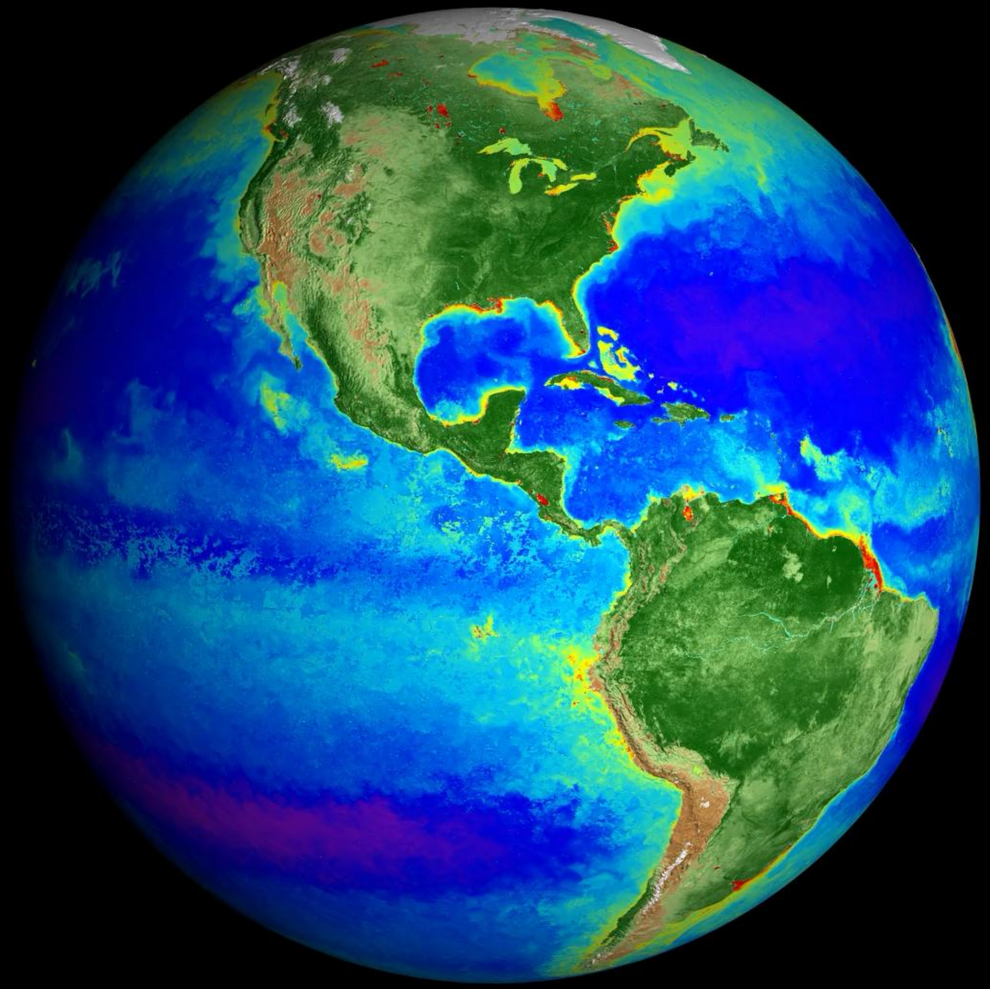

SWOT
Data start: 2023-08-11T02:19:14
end: 2023-08-31T23:01:48
Sea Surface Height Anomaly (SSHA)
-35
0
35 [cm]
SWOT Sea Surface Height Anomaly - A full 21-day cycle

Changes in ocean conditions Sea surface salinity



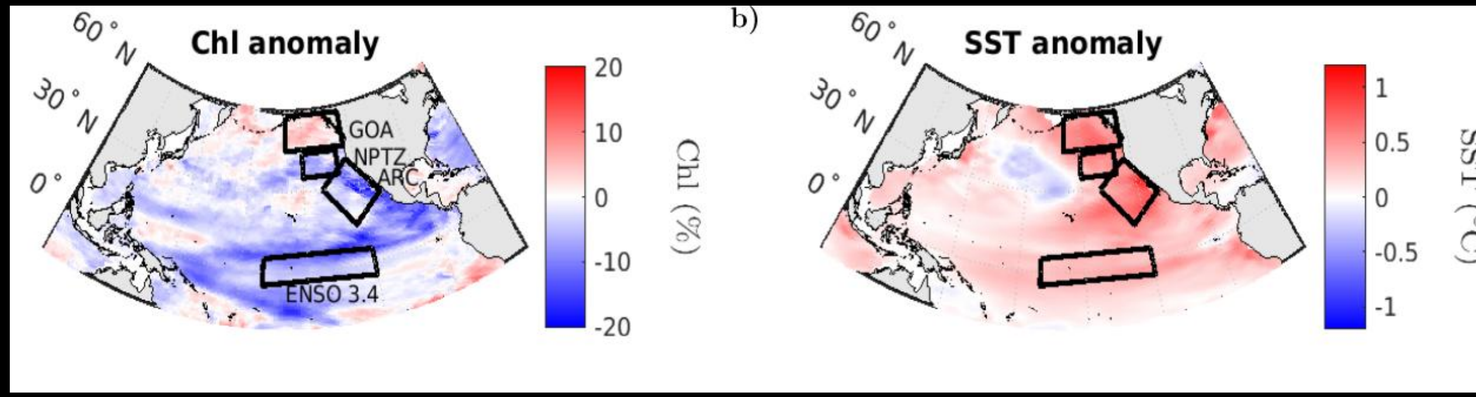


Changes in ocean conditions



Ocean Color

https://oceancolor.gsfc.nasa.gov/



Arteaga et al., 2023

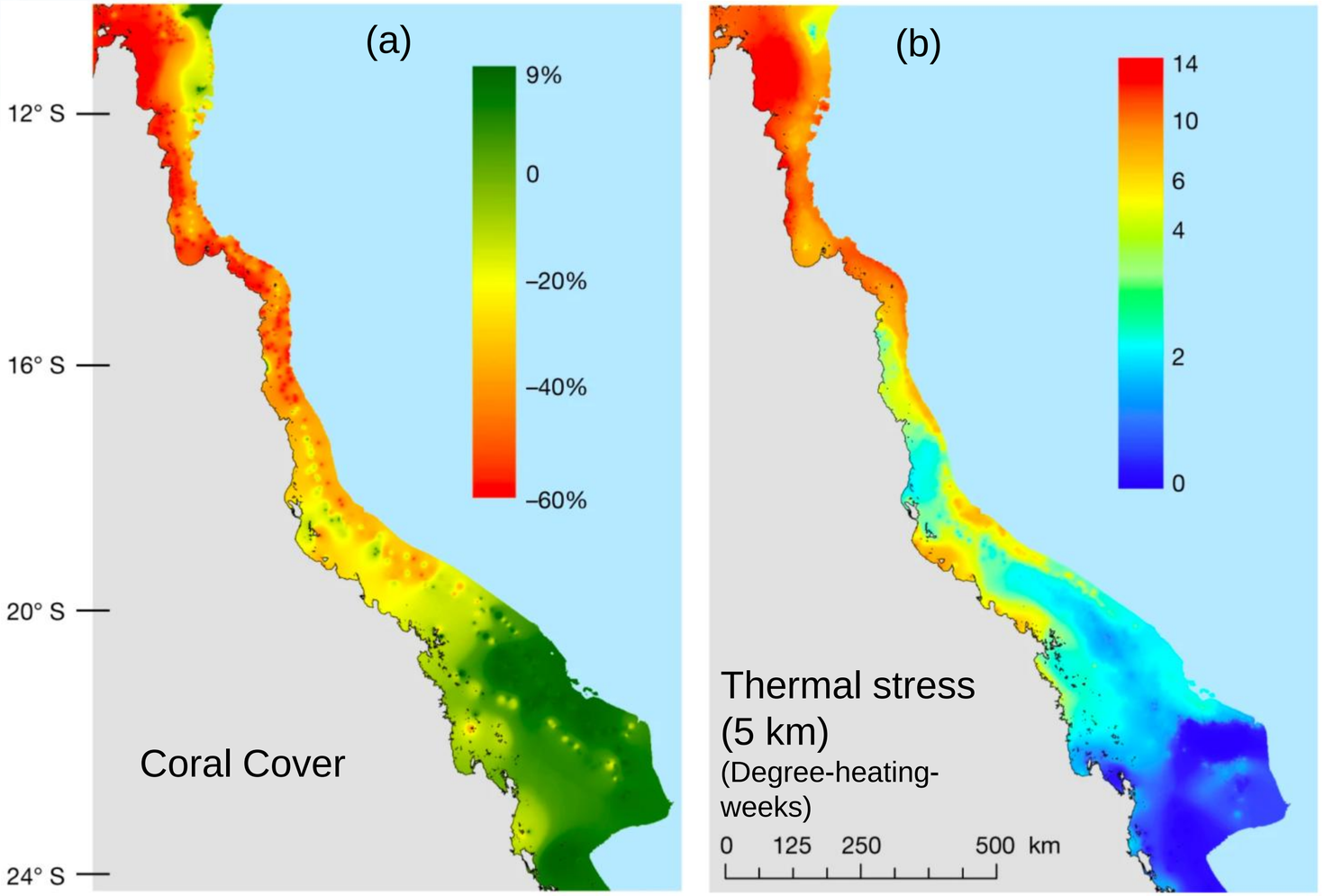
Impact of Spatially and Temporally Varying Thermal Stress on Reef Functional Diversity (*PI: Michelle Gierach, JPL*)

Increasing frequency of marine heatwaves and local hotspots due to climate change

Characterize the impacts of variable thermal stress on reef functional diversity

Data: Benthic functional types derived from CORAL PRISM and DESIS data; thermal stress metrics from Coral Reef Watch and derived from MUR SST; sea surface temperature from HyTES, ECOSTRESS, and Landsat-8.

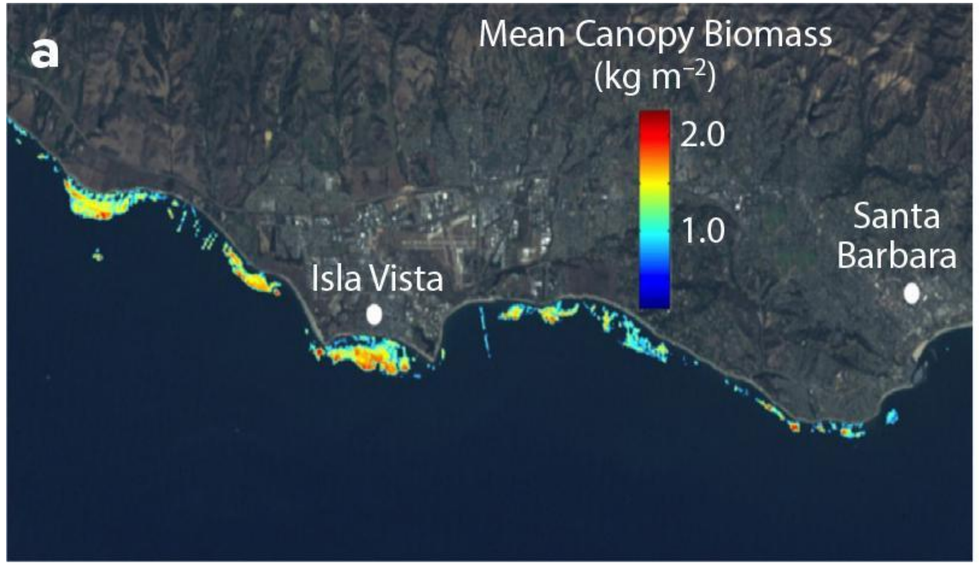
Great Barrier Reef from 2016-2020



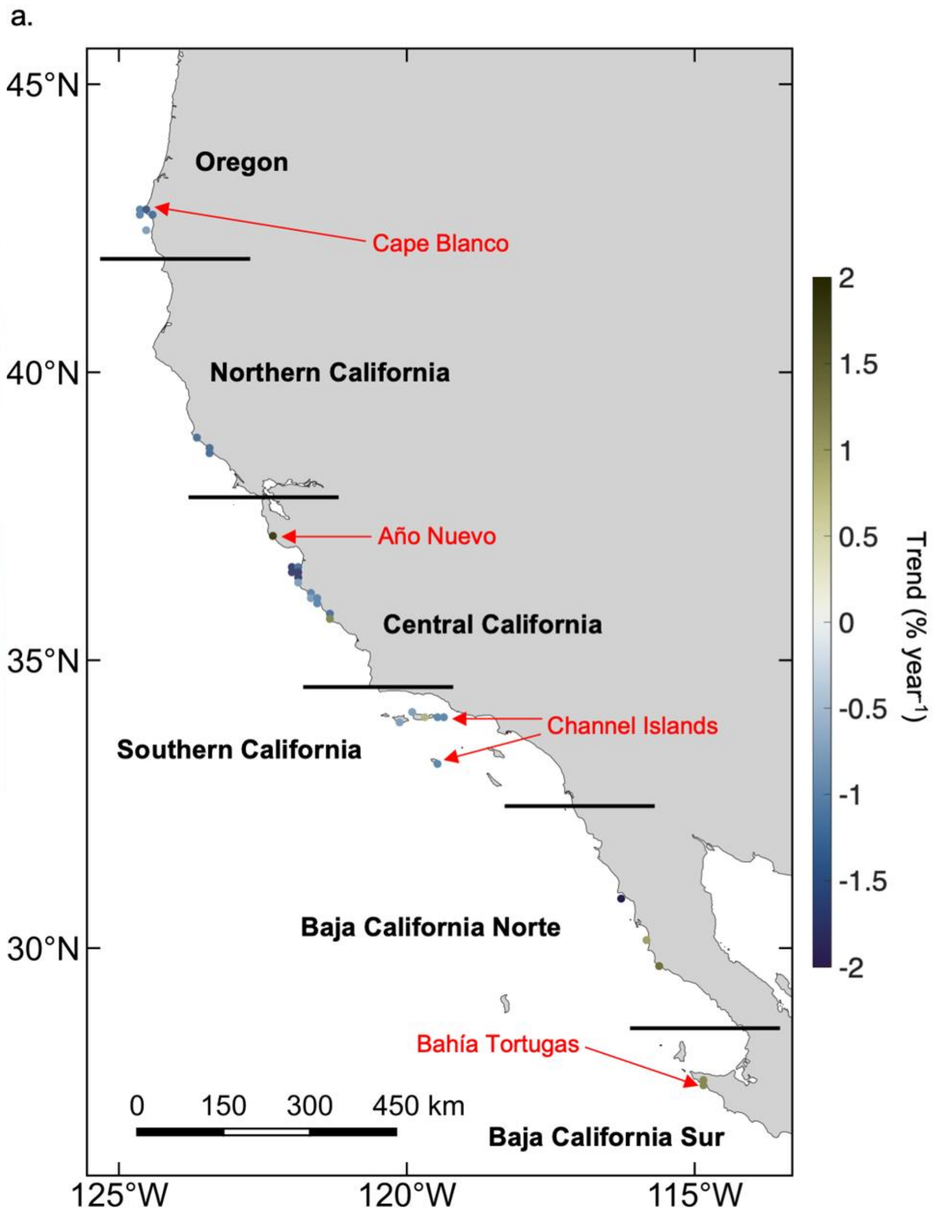
from Hughes et al., 2018

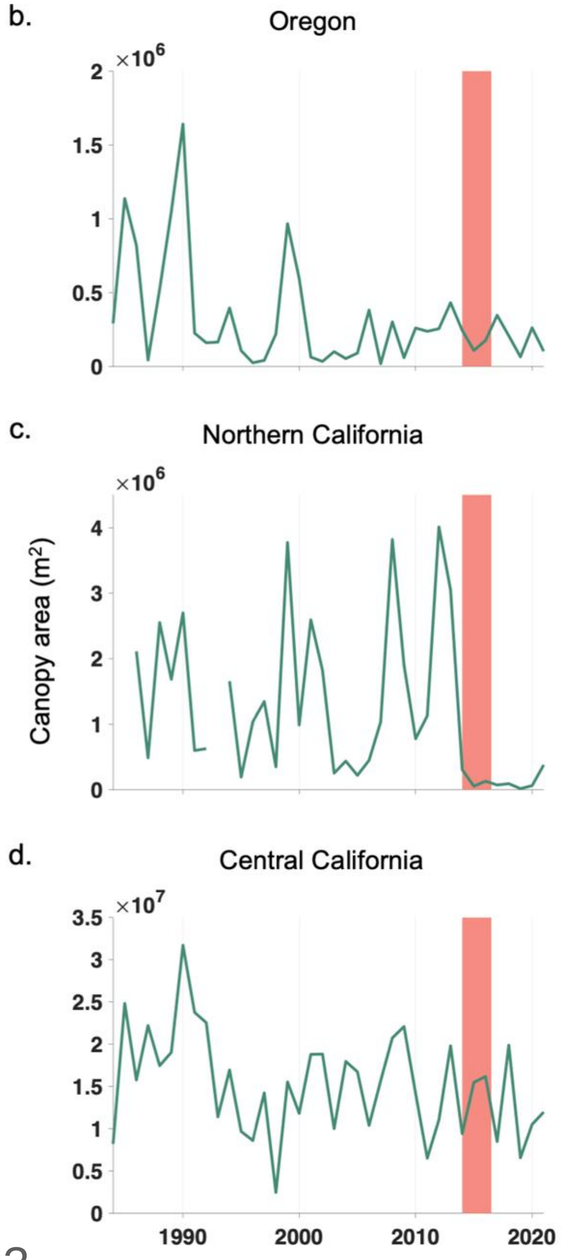
Kelpwatch: A tool exploring kelp canopy response to and recovery from marine heatwaves

Landsat sensors



From Kavanaugh et al., 2021

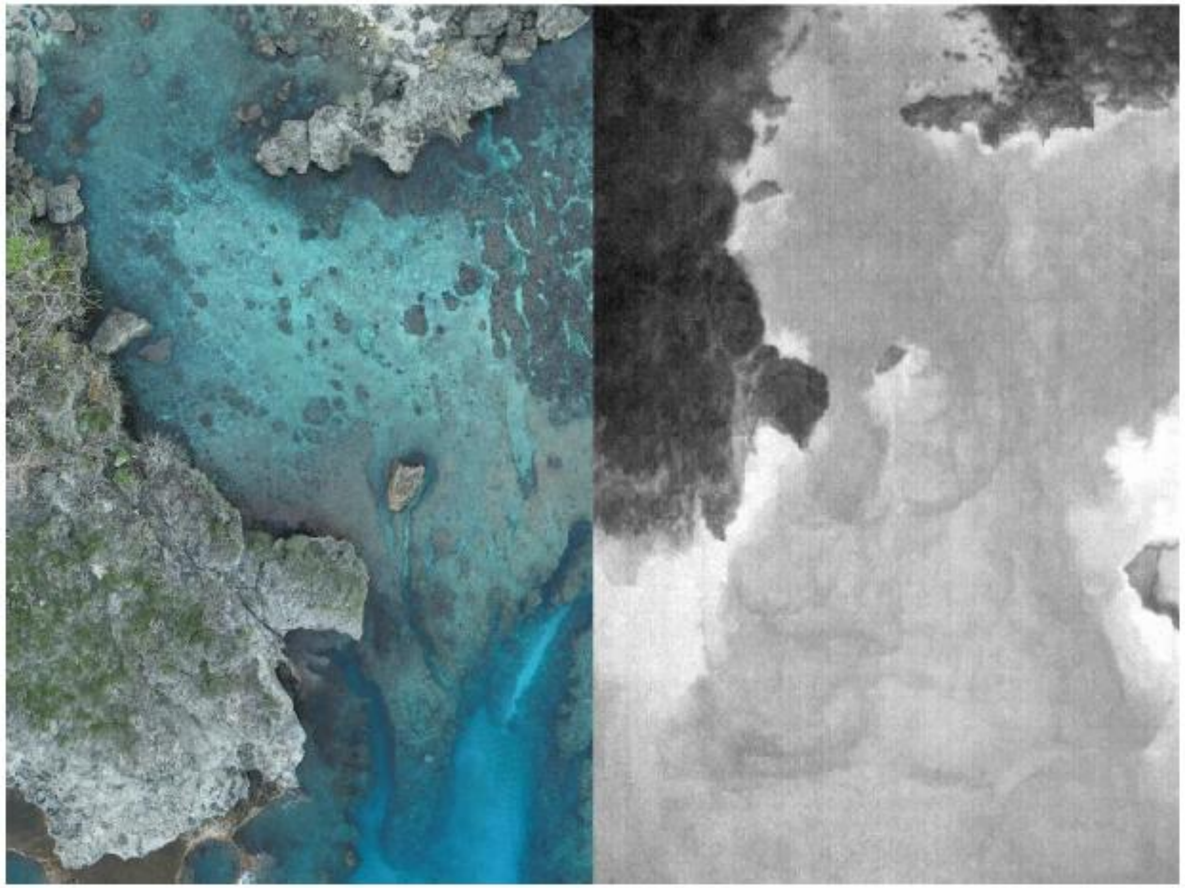




From Bell et al., 2023

Study of coastal freshwater discharge hydrology and near-shore and coral reef ecology using geospatial analytical techniques in Guam.
PI Romina King

Pilot capacity building team in Guam.
Drones with hyperspectral cameras
Image courtesy of Dr. Chirayath



Drone images (thermal infrared and normal view) showing water flow leading out of Ague Cove in northwestern Guam.
Image courtesy of Dr. King

NeMO-Net (The Neural Multi-Modal Observation and Training Network for Global Coral Reef Assessment) – Juan Luis Torres-Perez and Ved Chirayath

NeMO-Net Objectives:

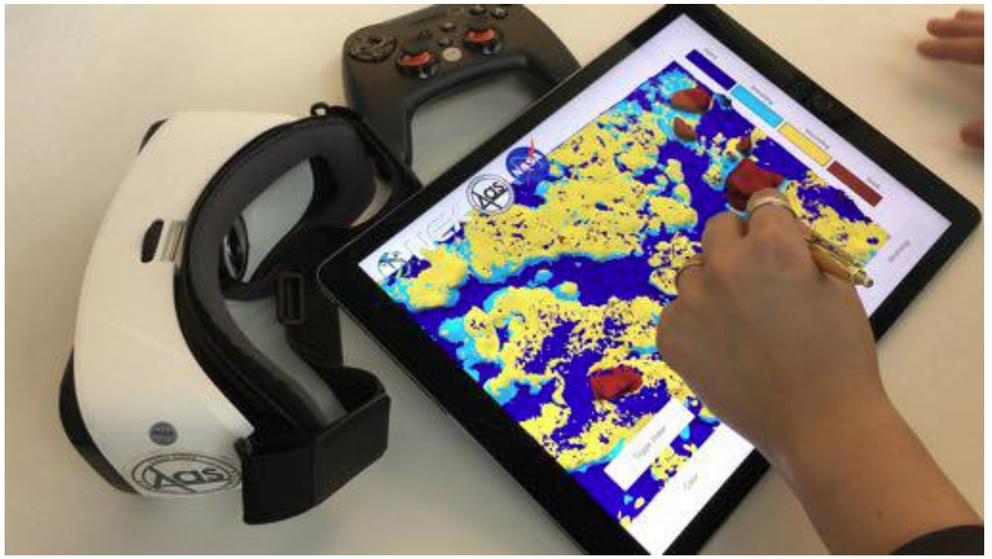
1. Identify reef organisms and benthic substrates from diverse remote sensing sources and scales
2. Utilize advanced computational tools to train computers to assess coral reef status and change.

Includes a free NeMO-Net Active Learning Citizen Science App
It is an educational and training tool for reef characterization.

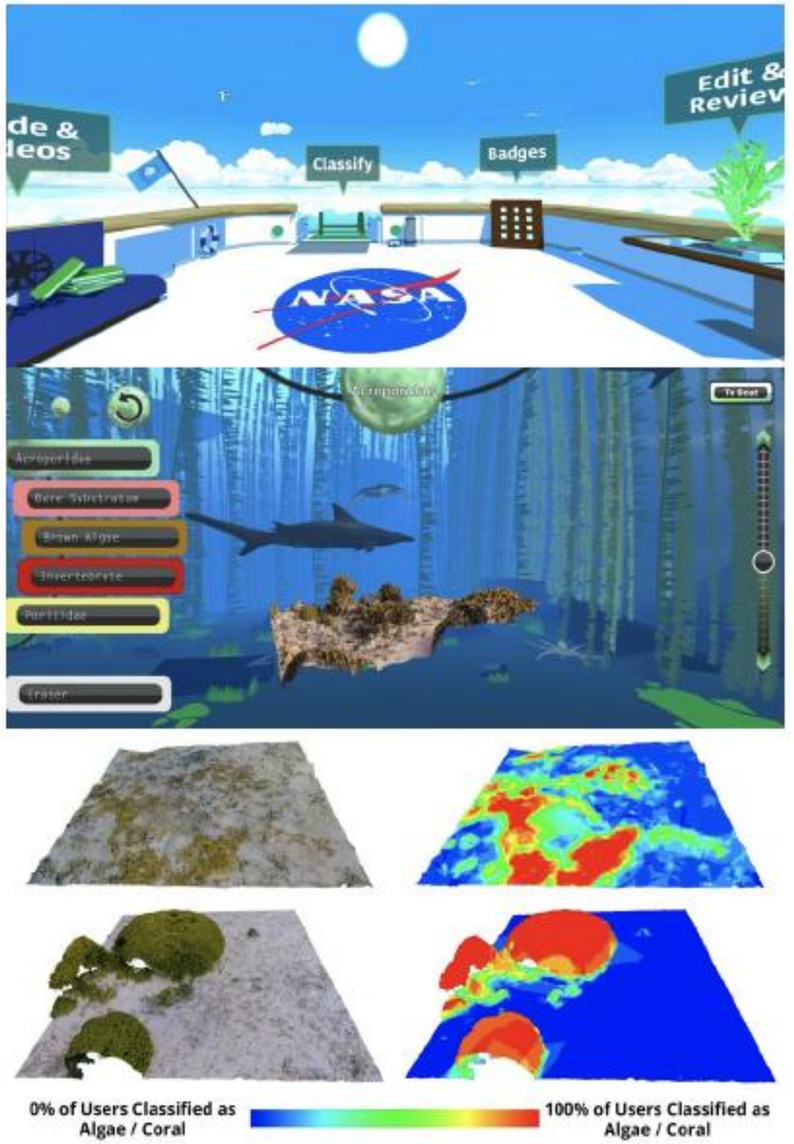
<u>available at the Apple Store!</u>

- App Store rating = 4.9 ☆

http://nemonet.info/



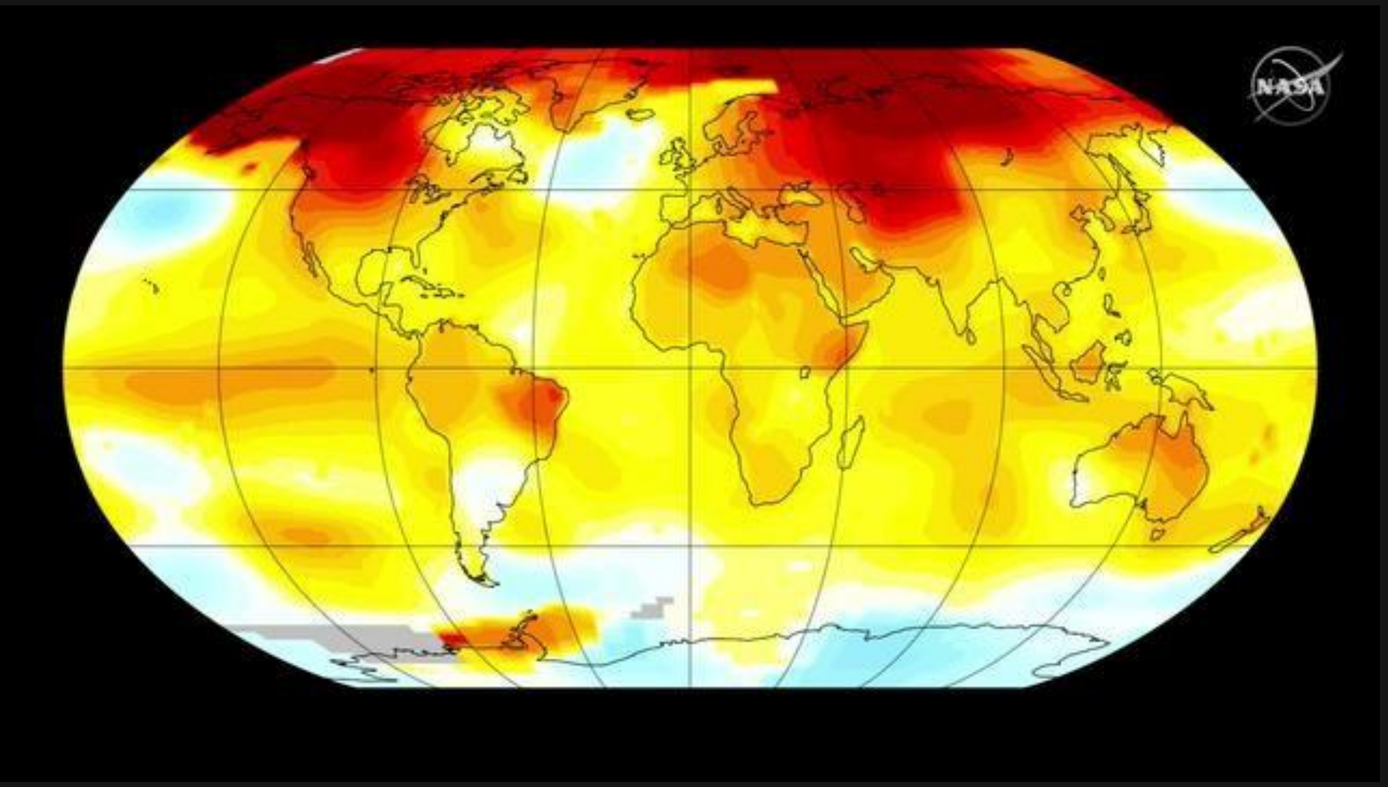
3D painting and labelling interface.

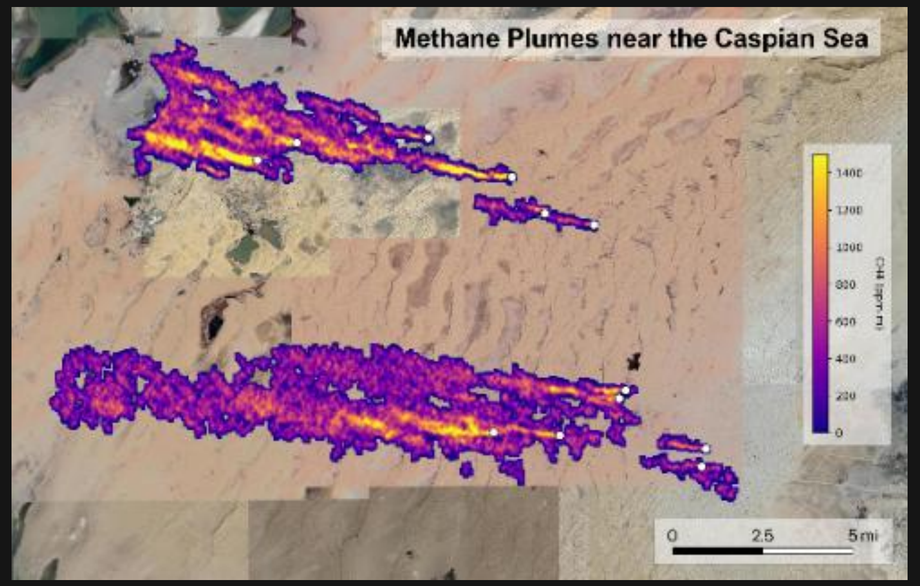


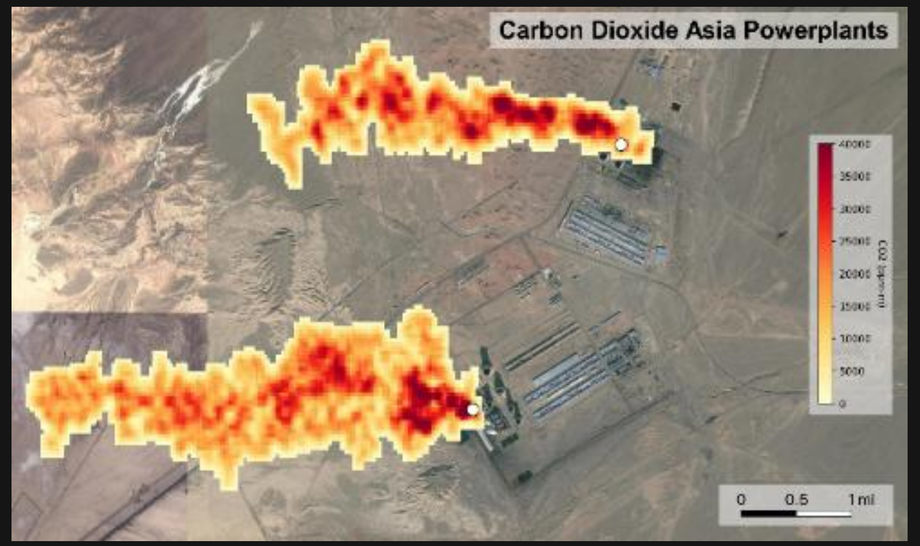
heatmap of user classifications of 3D coral colony

Greenhouse Gas (GHG) Management Program

Global temperature anomalies
1880-2021







https://earth.jpl.nasa.gov/emit/data/data-portal/Greenhouse-Gases/
EMIT Images courtesy of Dr. Robert Green, JPL

Develop Open Science Ecosystem

Shorten the time for a new user to find and use data

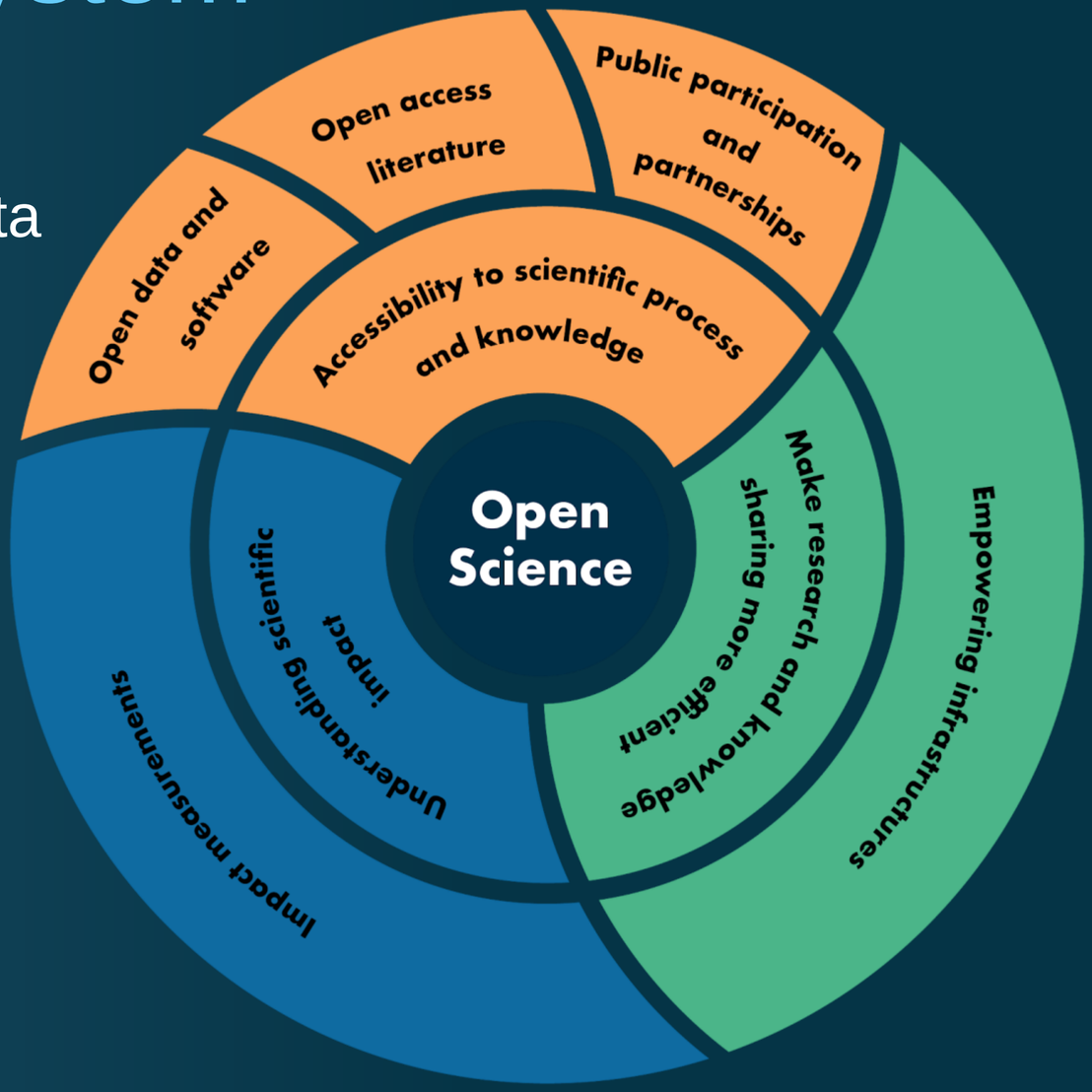
Increase the community contributions

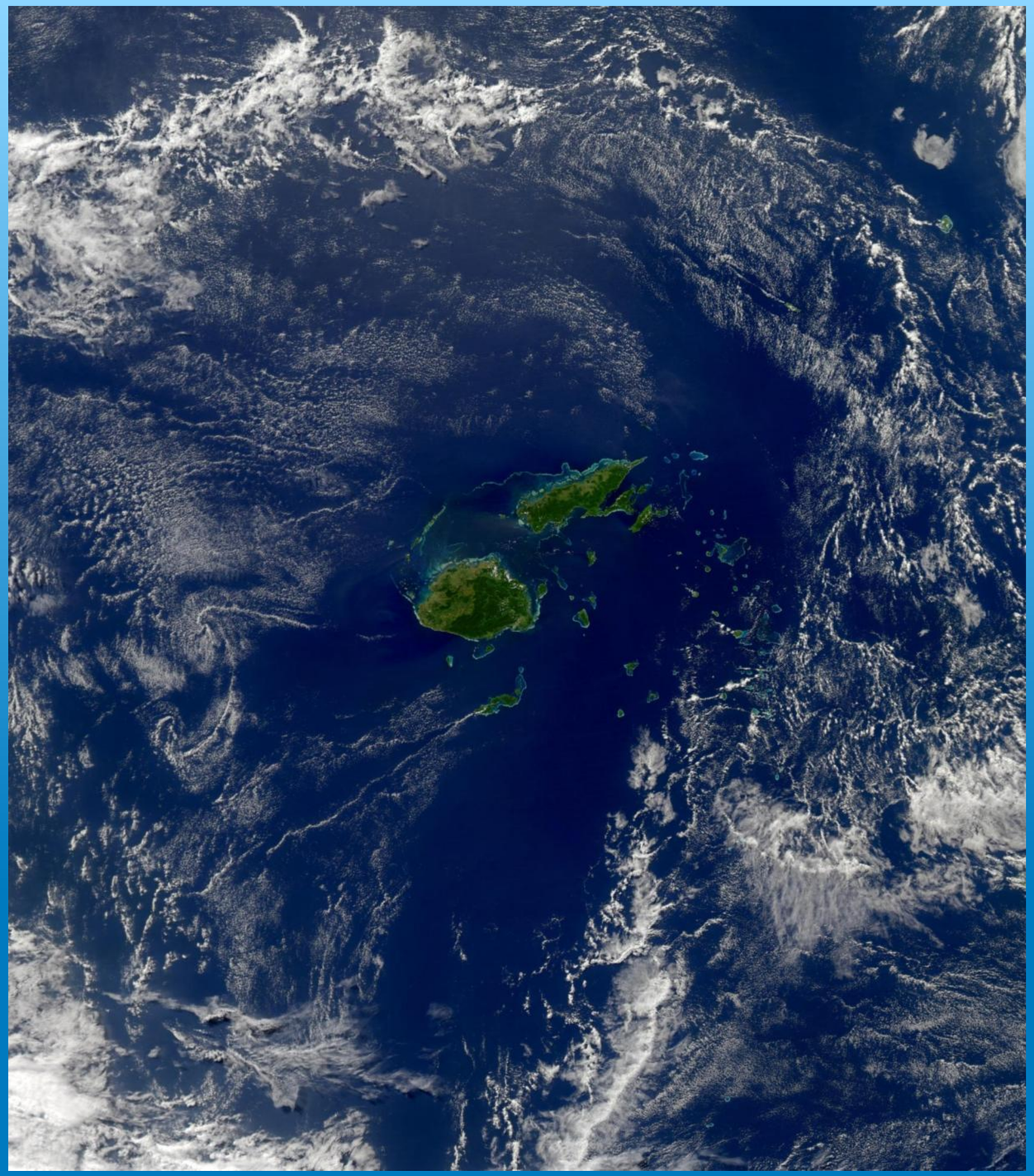
- Open access to and advancement of modeling and simulation code
- To improve models, assimilation, and prediction tools

Explore and exploit data

- Share knowledge and use current informatics and data science tools

Incentivize and energize innovation through prizes and challenges





Vinaka

Thank you

Earth Science Data Repository from diverse observational platforms

https://earthdata.nasa.gov

https://open.nasa.gov

https://data.nasa.gov/