

# Understanding a Changing World through Open Datasets

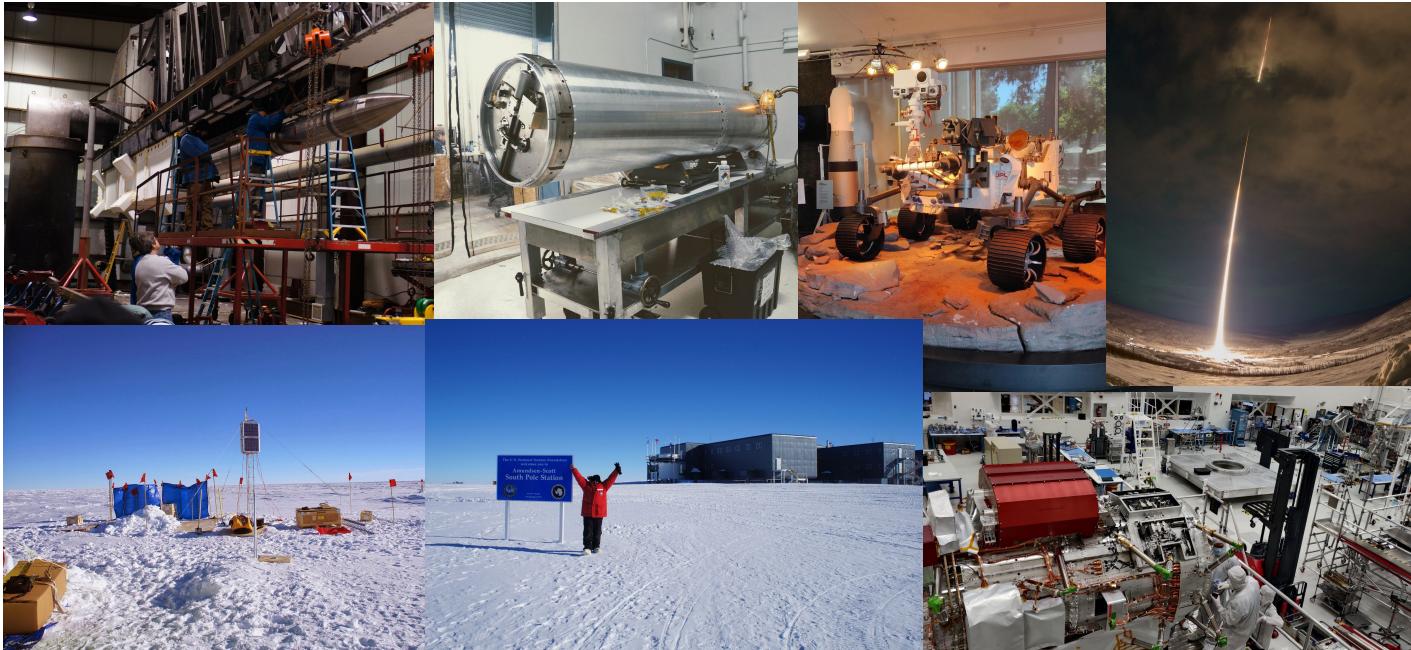
Karthik Venkataramani

06/19/2024

CIVIL & ENVIRONMENTAL ENGINEERING  
UNIVERSITY of WASHINGTON



# About myself



# Overview

- > Remote Sensing
- > Datasets
- > Code Demo

*Watch out for breadcrumbs!*

# Temperature check

Show of hands - who here has worked with satellite data?

**"Remote sensing is the process of detecting and monitoring the physical characteristics at a distance"**

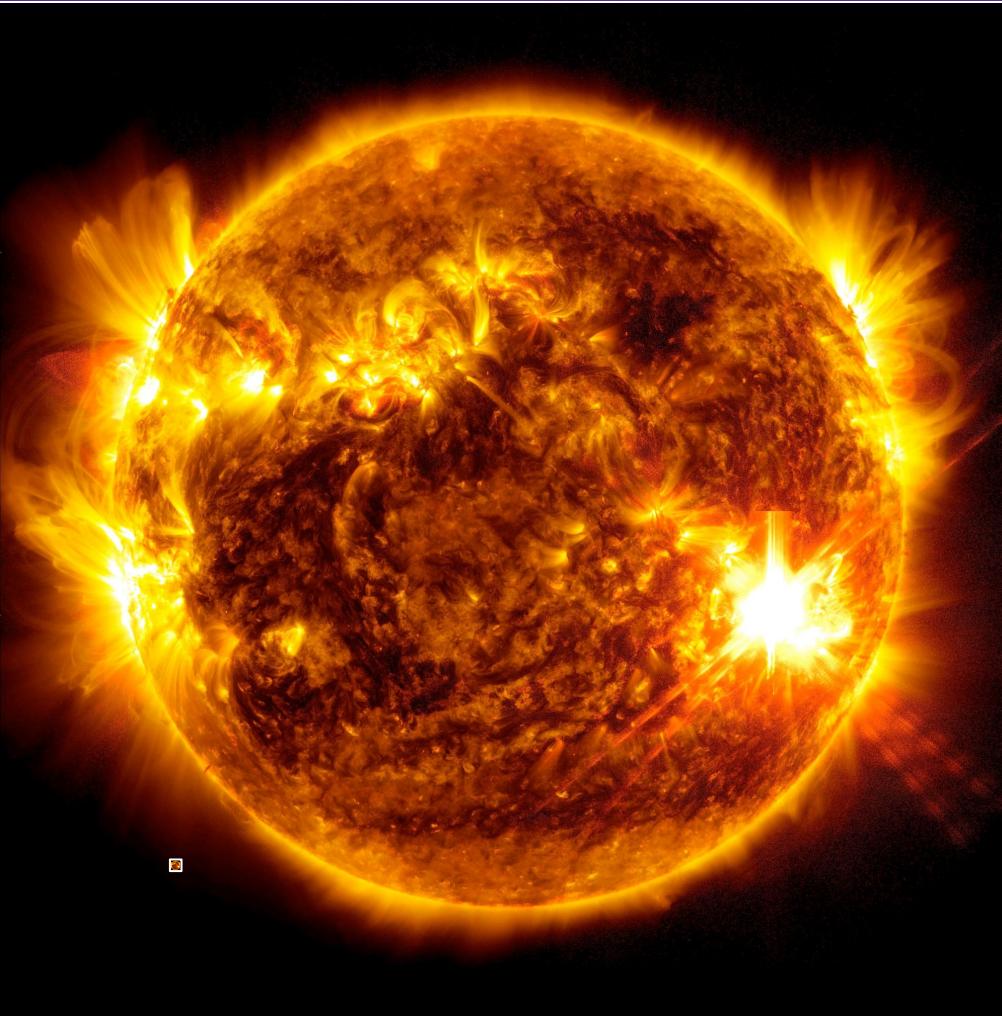
- USGS

# Let's look at examples



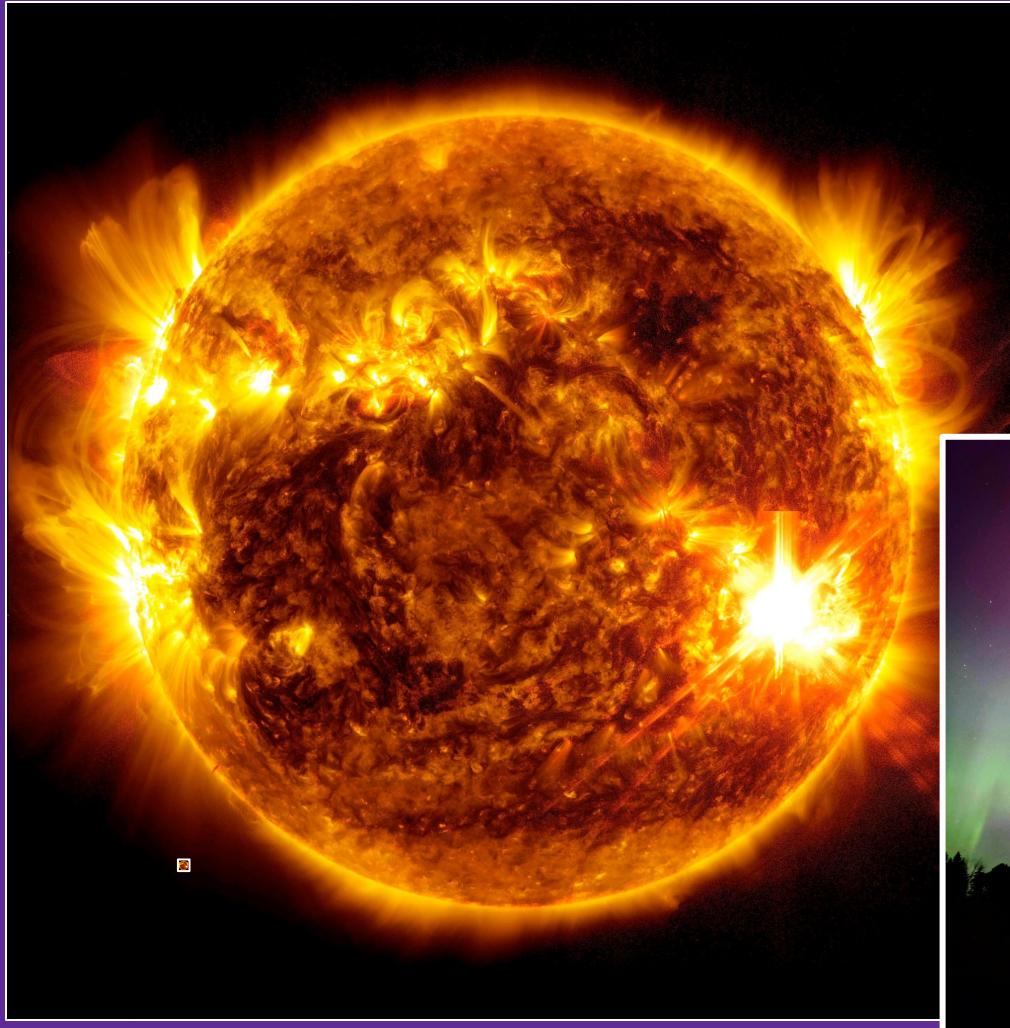
*Sun @ ~ 93M miles*  
NASA, May 10 2024

SDO/HMI Quick-Look Continuum: 20240510\_224500



*Sun @ ~ 93M miles  
X-class flare;  
NASA, May 10 2024*

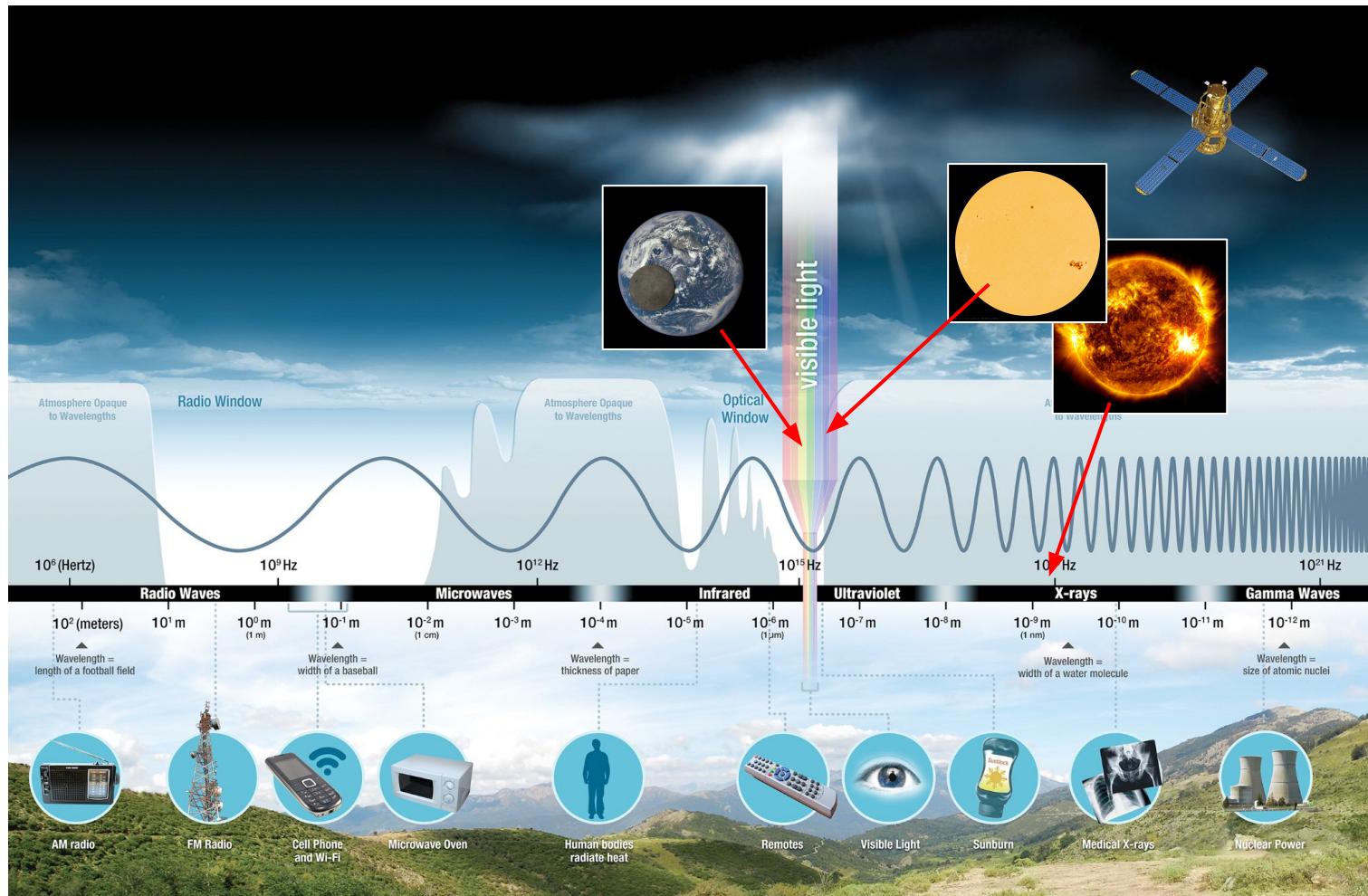
*Sun @ ~ 93M miles  
X-class flare;  
NASA, May 10 2024*



Let's turn our gaze  
back home



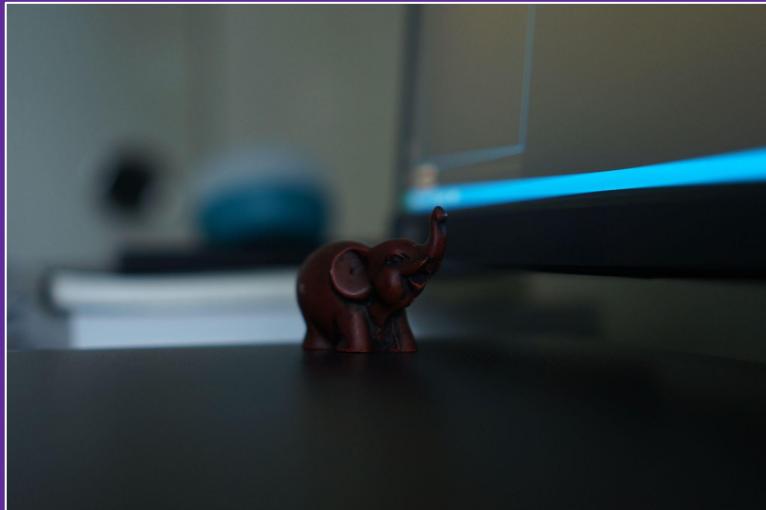
*Earth @ ~ 932k miles  
07/16/2015  
NASA DSCOVR*



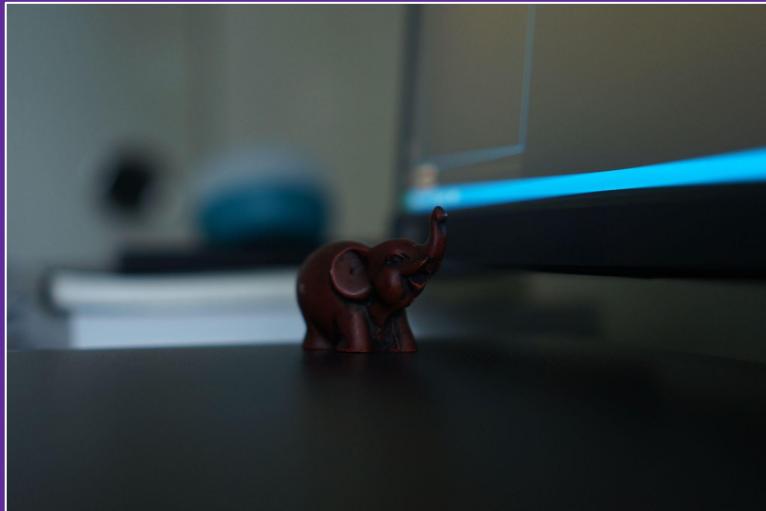
We're always viewing our  
world through 'tinted  
glasses'

There's one more imaging  
possibility to consider

# What is the light source?



# What is the light source?



**Ambient light**  
(Sunlight)



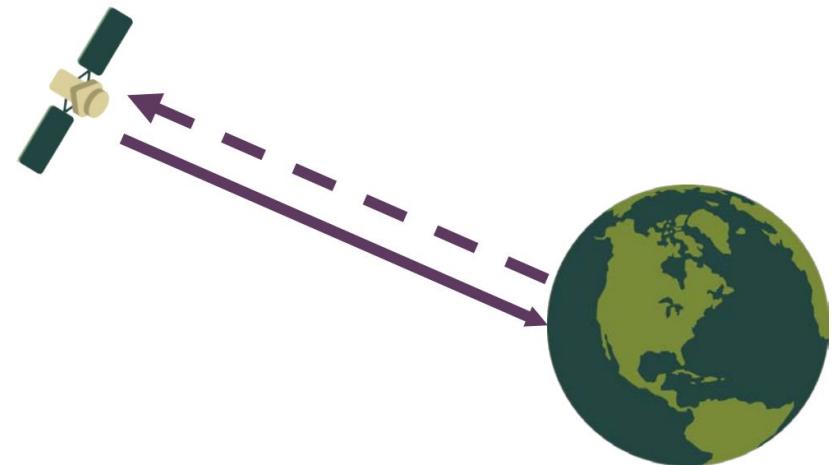
**External light**  
(Camera flash)

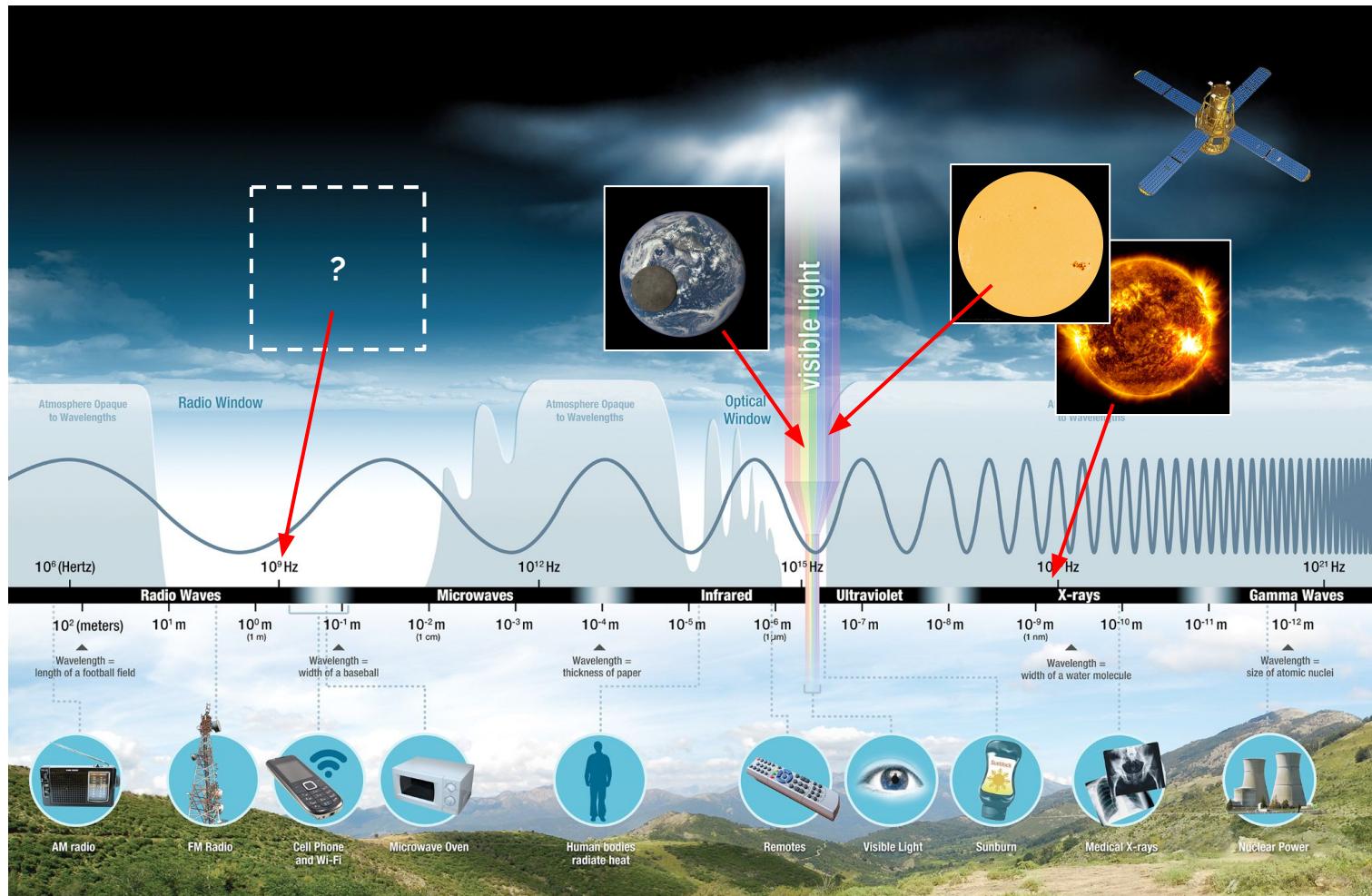
# Sensor types

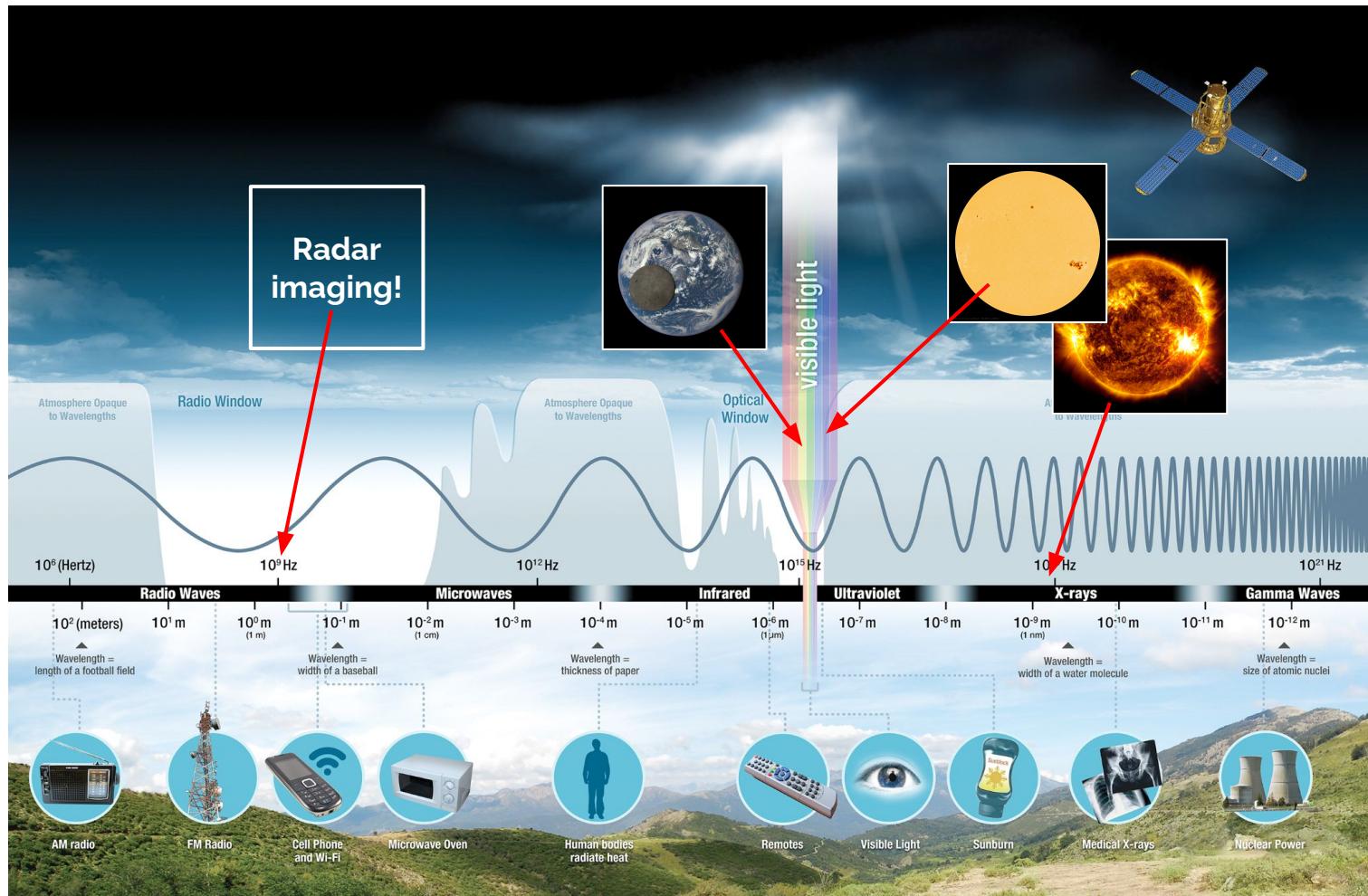
## Passive Sensors



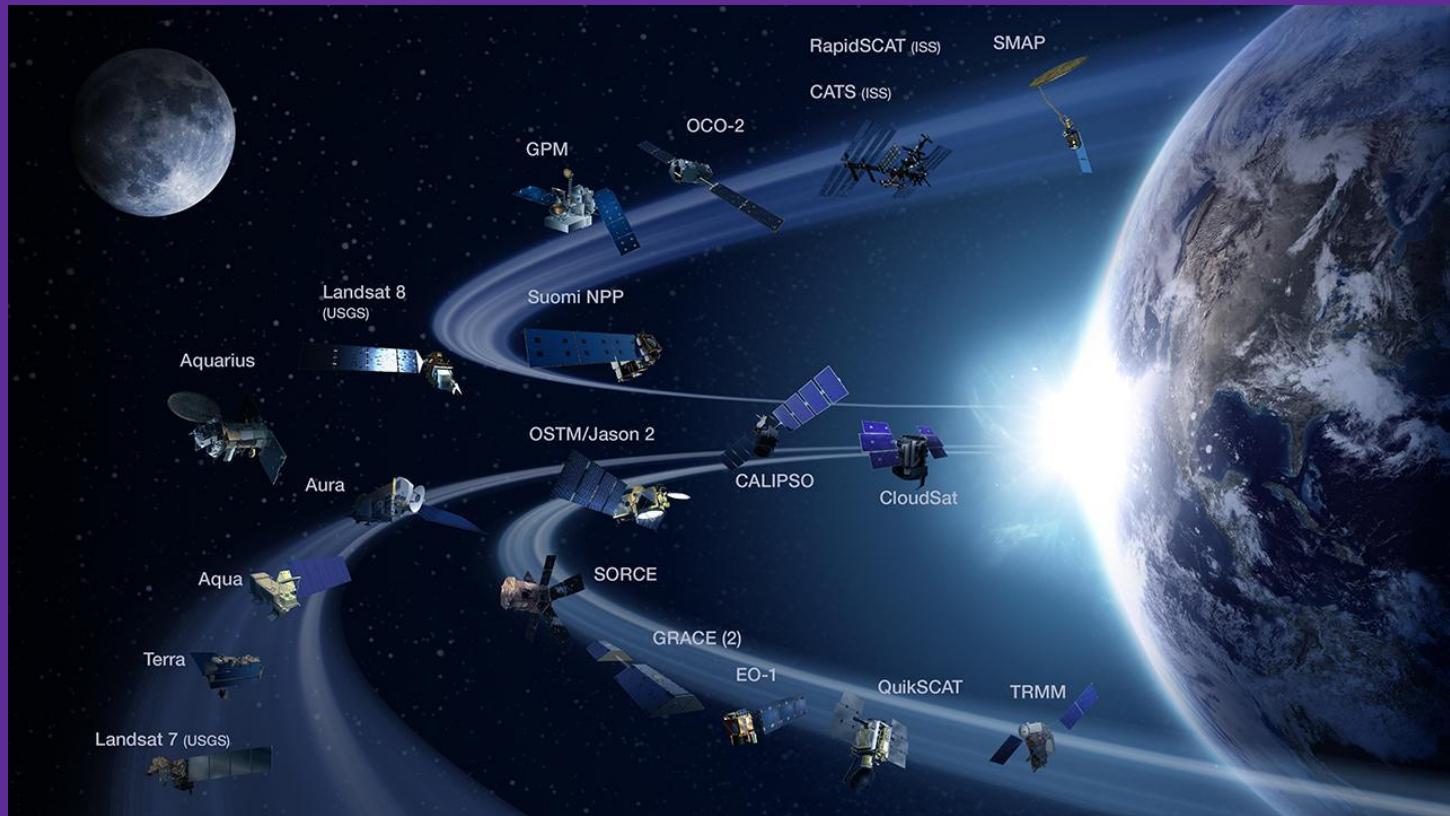
## Active Sensors







# Earth data



Ongoing NASA missions

NASA has >100 PB of earth science data, available for free

The need of the hour is  
not data, but *information*

# OPERA

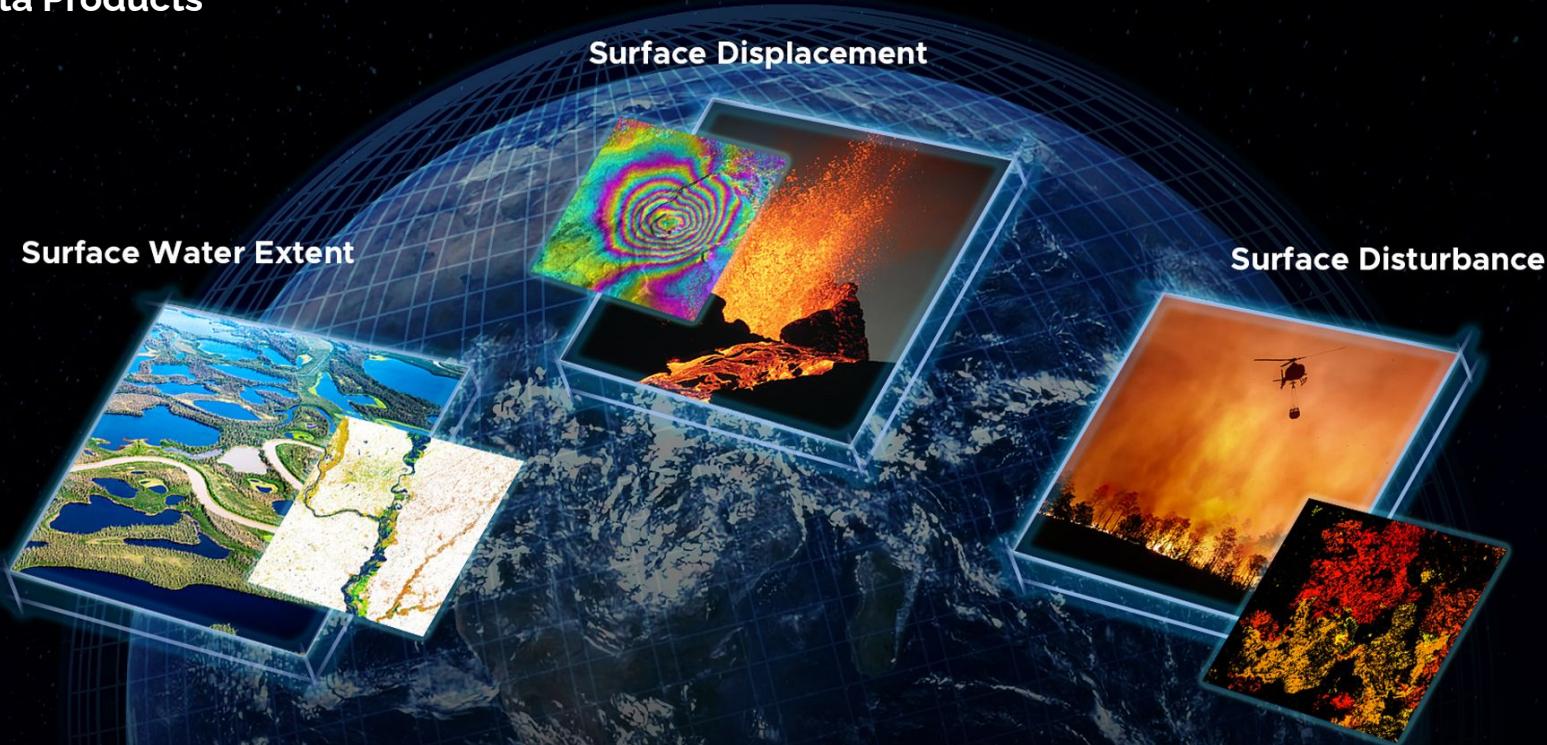
## Semantic Segmentation



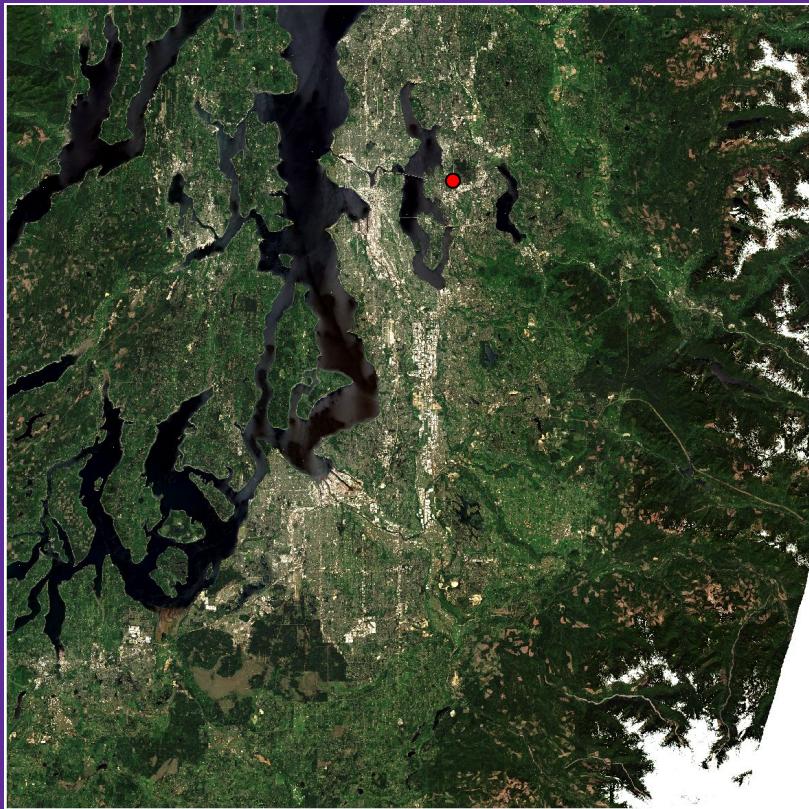
Raw Data

"Information"

**OPERA**  
"analysis-ready"  
Data Products

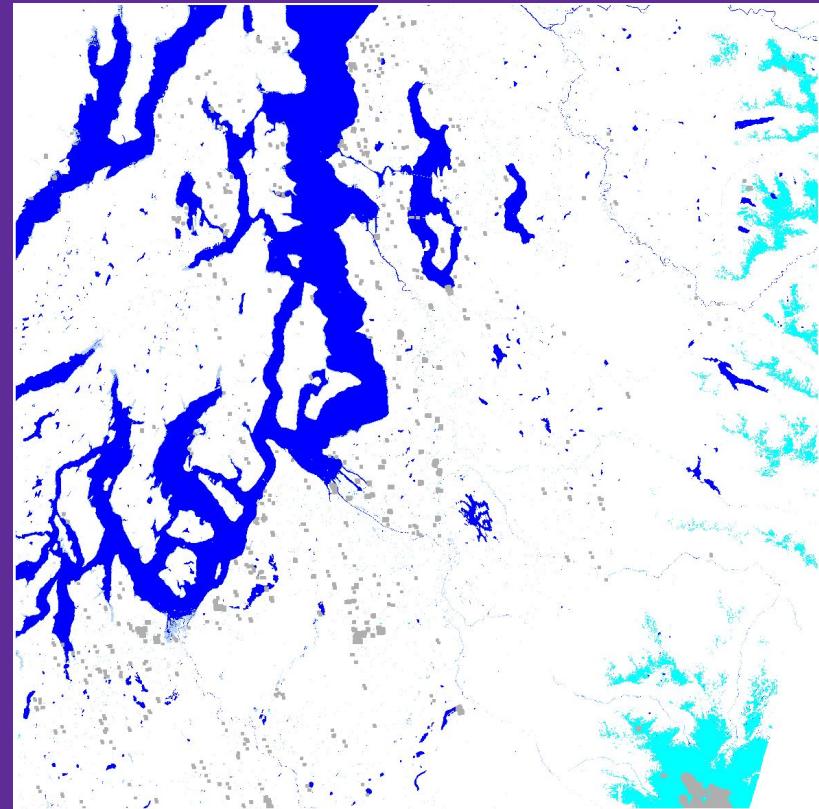


Observational Products for End users from Remote sensing Analysis



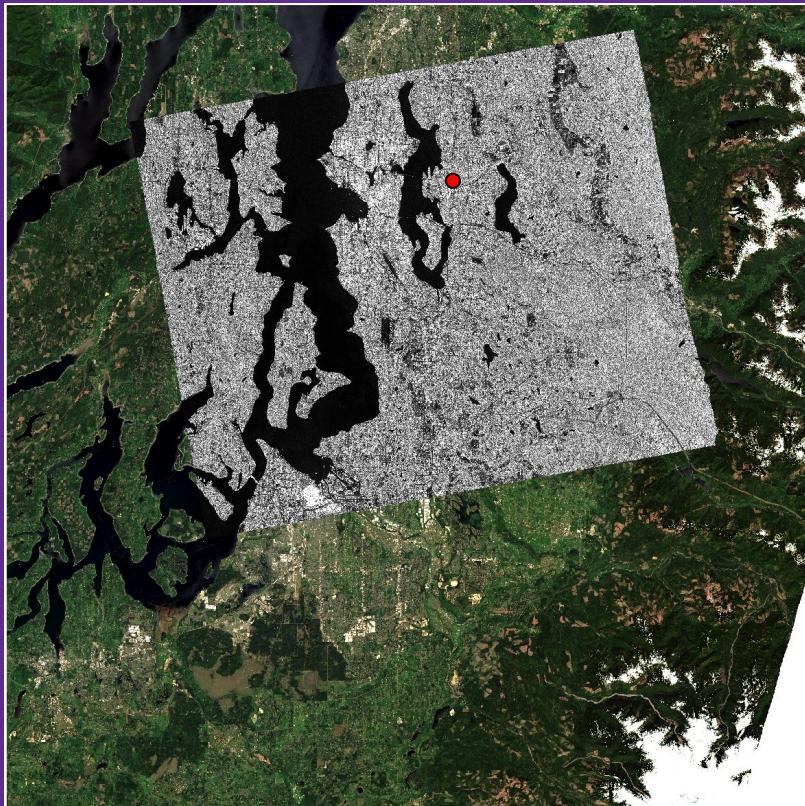
**Raw Data**

NASA HLS + OPERA DSWx data



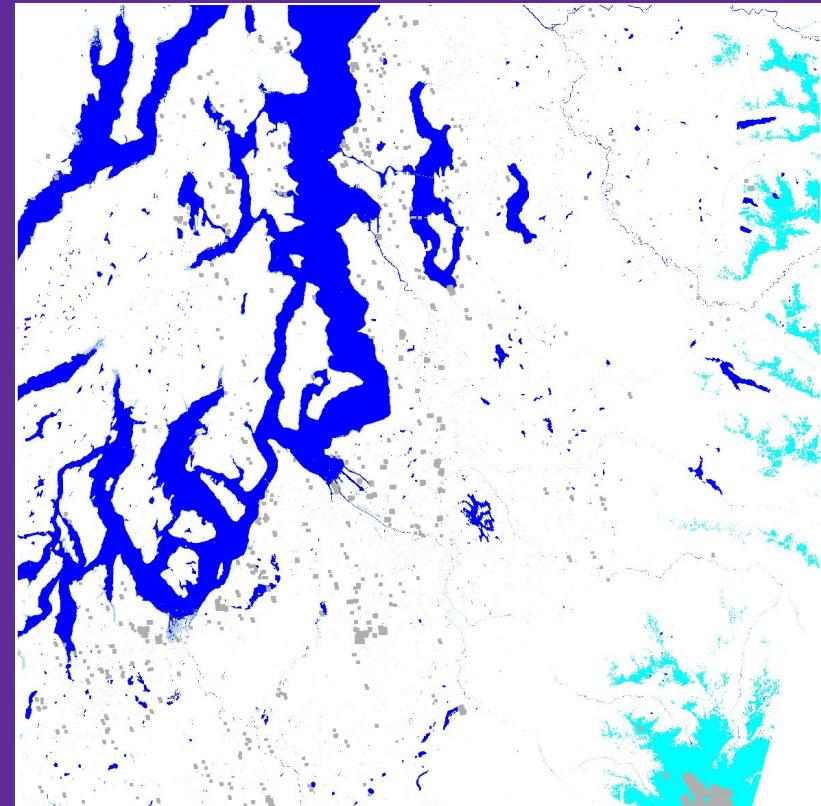
**"Information"**

*Earth @ ~ 430 miles  
05/09/2024  
USGS LandSat/ESA Sentinel-1*



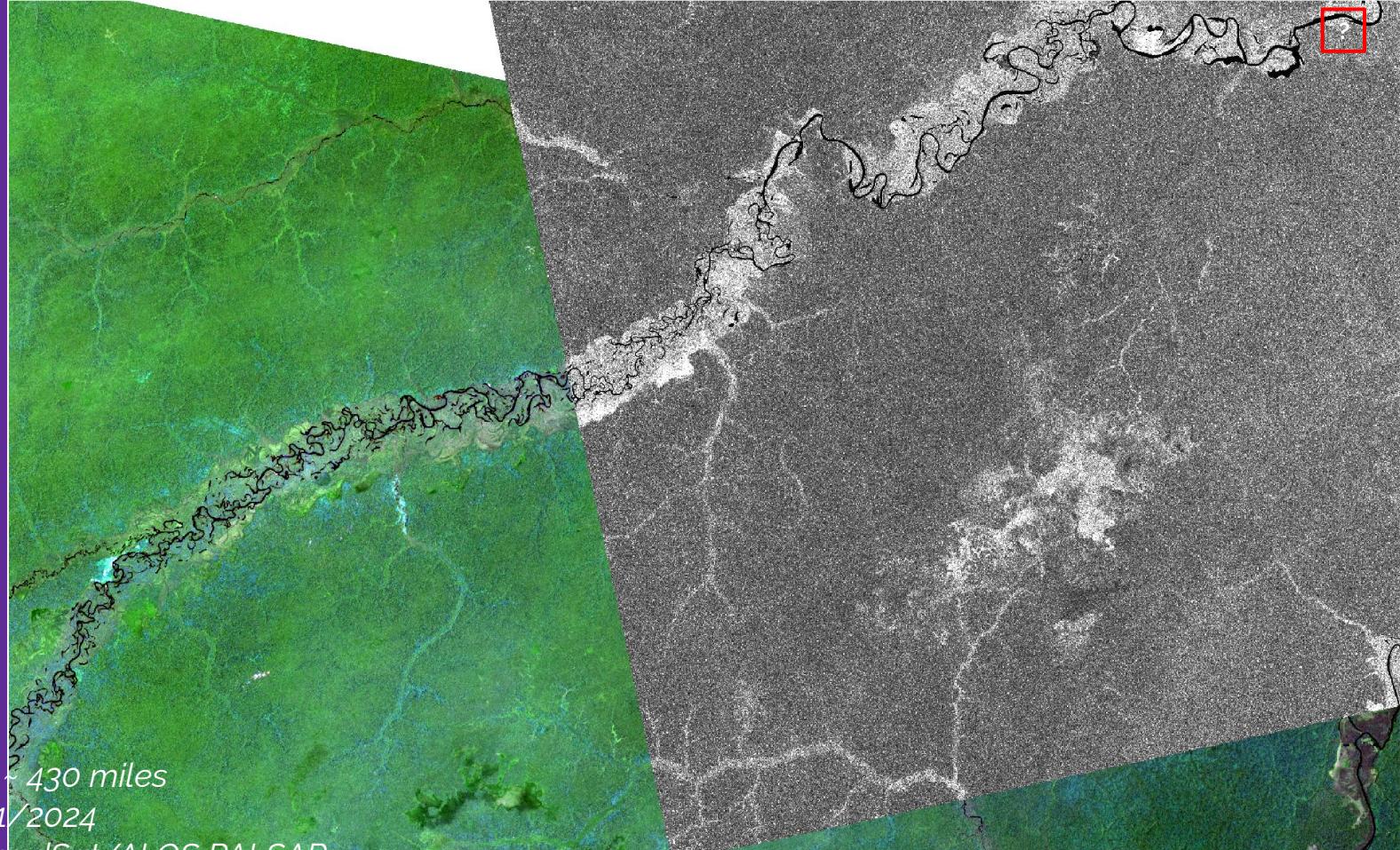
**Raw Data**

*Earth @ ~ 430 miles  
05/09/2024  
USGS LandSat/ESA Sentinel-1*



**"Information"**

# Data Harmonization!



Earth @ ~430 miles  
Feb 2011/2024  
USGS LandSat/ALOS PALSAR

Jau River, Brazil

# Code demo

# NASA Earthdata

dynamic surface water extent

Search Results (10 Collections)

### OPERA Dynamic Surface Water Extent from Harmonized Landsat Sentinel-2 product (Version 1)

Showing 2,460 of 76,298 matching granules

Granule

L4G2041180\_01\_L2\_24B\_3U\_V1.0

OPERA\_L3\_DSWx-HLS\_T14QML\_20240129T171549Z\_20  
240203133467Z\_S2B\_30\_v1.0OPERA\_L3\_DSWx-HLS\_T13RHH\_20240129T171549Z\_20  
240204118590Z\_S2B\_30\_v1.0OPERA\_L3\_DSWx-HLS\_T14RKN\_20240129T171549Z\_20  
4020317234807Z\_S2B\_30\_v1.0OPERA\_L3\_DSWx-HLS\_T14QNL\_20240129T171549Z\_20  
2402031334800Z\_S2B\_30\_v1.0OPERA\_L3\_DSWx-HLS\_T14RLN\_20240129T171549Z\_20  
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4020317234854Z\_S2B\_30\_v1.0

OPERA\_L3\_DSWx-HLS\_T14RLQ\_20240129T171549Z\_20

# Thanks!

Slides and code available on GitHub

 <https://github.com/kvenkman/pydata-seattle-2024>

 SciPy session: Determining Climate Risks with NASA Earthdata Cloud  
- 8 am on July 8, 2024



<https://nasa.github.io/Transform-to-Open-Science/>



<https://github.com/kvenkman/pydata-seattle-2024>

# Breadcrumbs

**Slide 9.** The tiny square on the bottom left is the approximate size of Earth relative to the Sun. Even features on the Sun are many times the size of the Earth!

**Slide 30.** The bright features along the river are actually standing water at the base of trees - specific types of radar measurements can detect this flooding!

**Slide 33.** There isn't any data near the poles in winter because there isn't enough sunlight to reflect back into the sensor - the classification can be error prone.