Welcome! Please open the following link:

gitlab.cicsnc.org/workshop-development/ams-short-course

North Carolina Institute for Climate Studies

GOES-R & JPSS in the Cloud

An AMS Short Course + Hands-On Case Study

Presented by:

Mya Sears, NCICS / CISESS

With support from Denis Willett, Jenny Dissen, Nicholas Shanahan, Liz Cox, and Kate Szura

on:

Sunday, January 28th, 2024

NC STATE UNIVERSITY

Thank you for being here!

- **Intent:** teach the foundations of cloud analysis using NOAA data and Jupyter Notebooks. Provide tools that scientists can use beyond the workshop.
- **Audience:** anyone interested in performing a Python analysis of NOAA data using the AWS, Azure, or Google clouds.

Agenda	
Module 1: The Cloud	**Accessing NOAA data from AWS, Azure, and Google.**
Module 2: GOES-R	**Accessing and visualizing GOES-R data** (Hurricane Idalia).
Module 3: JPSS	**Accessing and visualizing JPSS data** (Canada Wildfires).

The Cloud!

… is a network of servers, often hosted in data centers around the world, that provide you with data storage and computing power.

NOAA data → Different product availability.

Accessible using Python → Using different code.

To Binder →

01_finding_products.ipynb

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GOES!

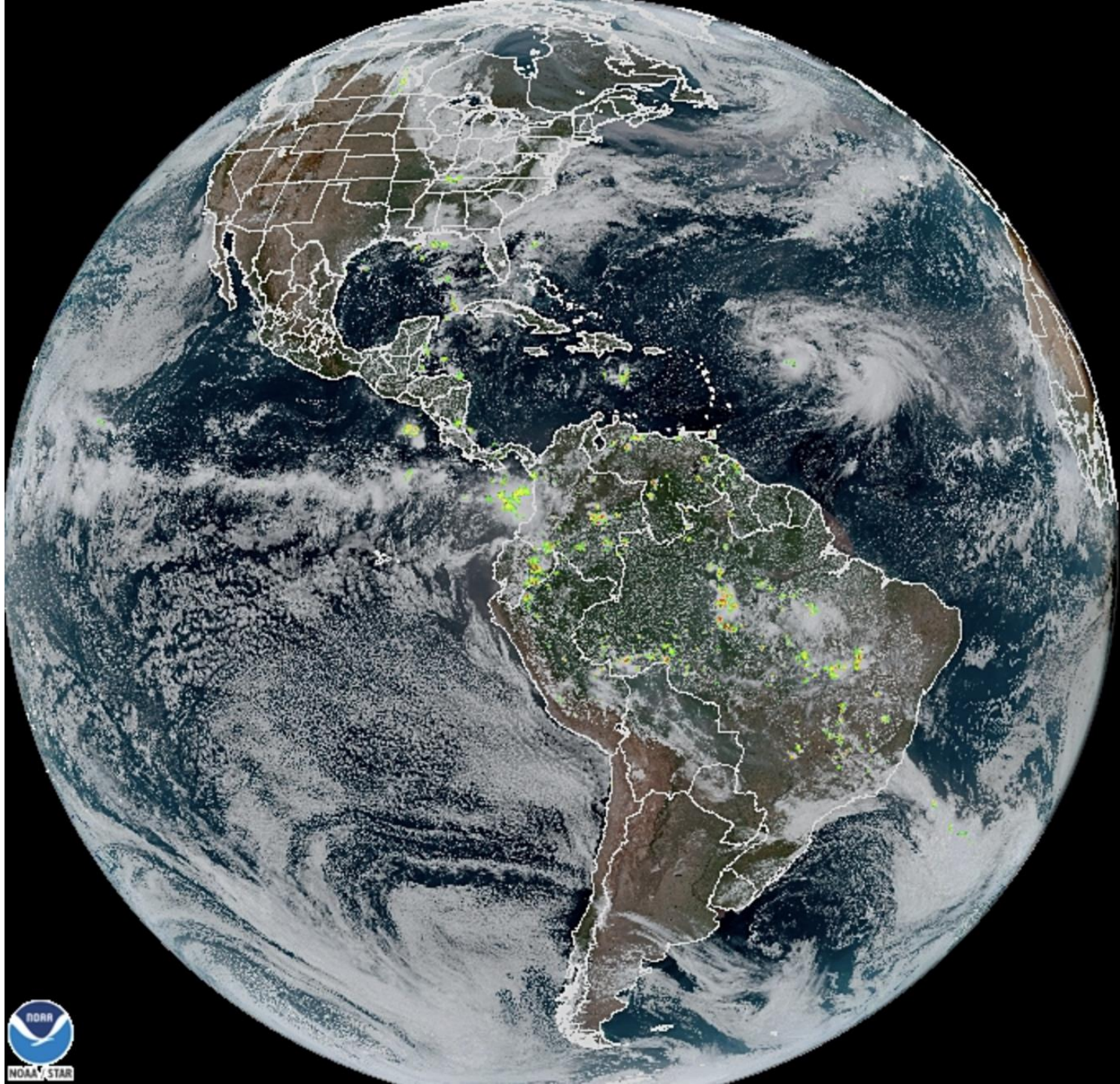
GOES-East

GOES-16

(Operationally GOES-East 12/18/17 – current)

Earth-facing instruments:

- **Advanced Baseline Imager (ABI)**
- **Geostationary Lightning Mapper (GLM)**



GOES-West

GOES-17

(Operationally GOES-West 2/12/19 – 1/3/23)

GOES-18

(Operationally GOES-West 1/3/23 – current)

Earth-facing instruments:

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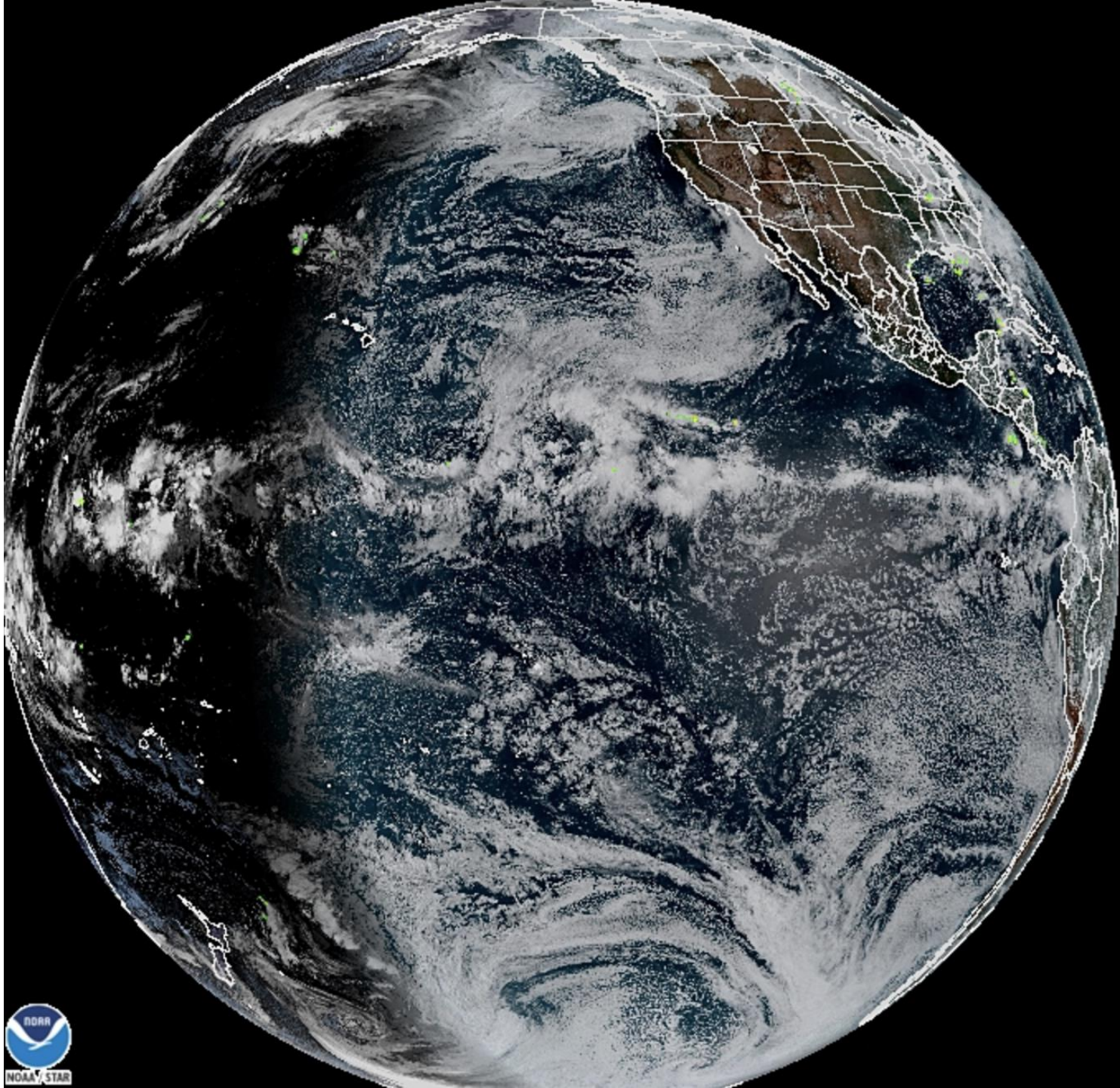
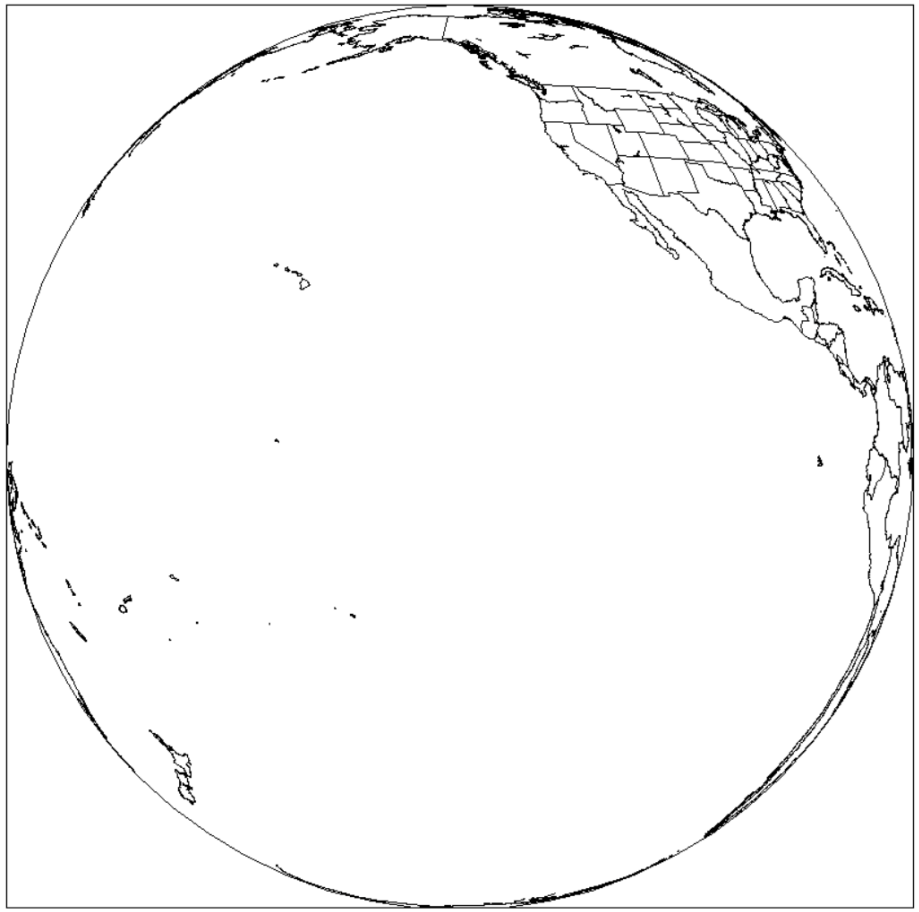
- **Geostationary Lightning Mapper (GLM)**



New image every ~10 mins

Full Disk scan:

- Circular image depicting nearly full coverage of the hemisphere (East/West).
- Spatial resolution of 0.5 to 2km



GOES-West (PACUS)

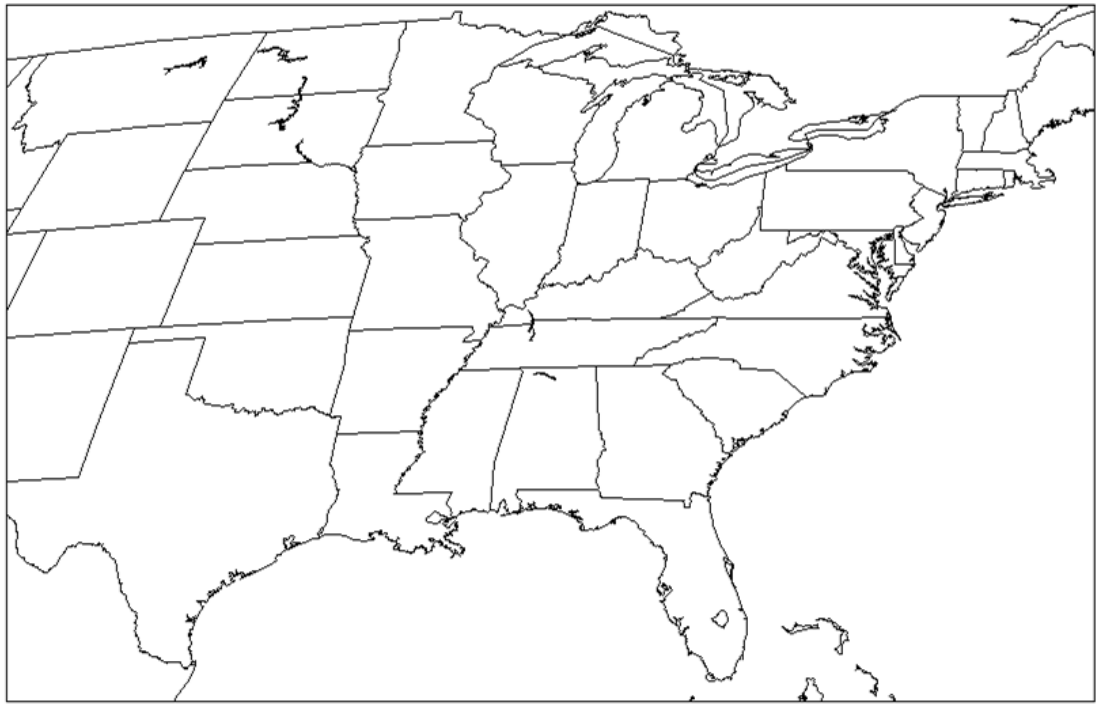
GOES-East (CONUS)

New image every ~5 mins

CONUS/PACUS scan:

- 3,000 (lat) x 5,000 (lon) km rectangular image depicting CONUS (GOES-East) or the Pacific Ocean + Hawai‘i (GOES-West)
- Spatial resolution of 0.5 to 2km

GOES-West (PACUS)

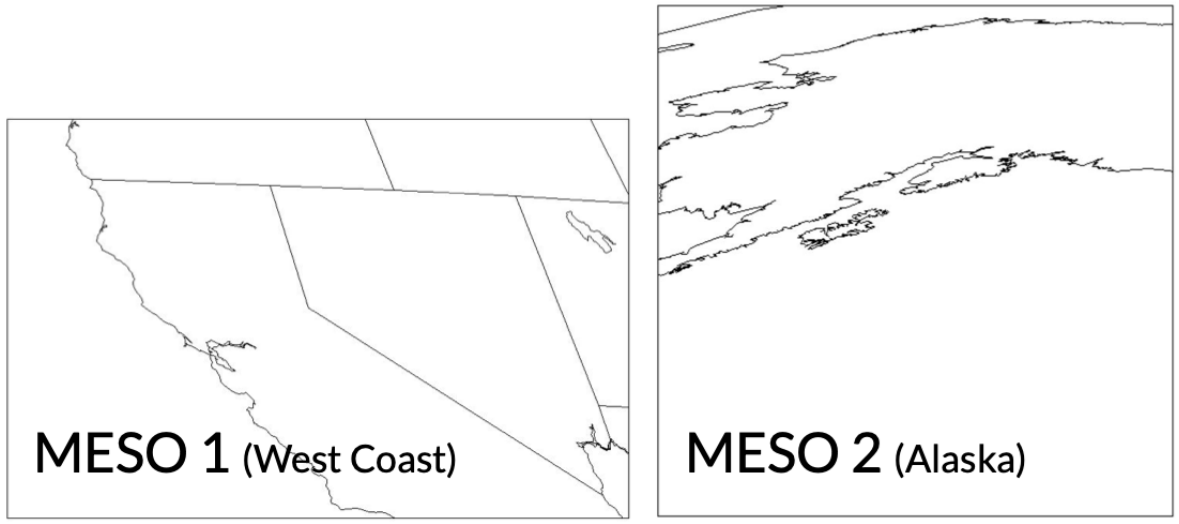


GOES-East (CONUS)

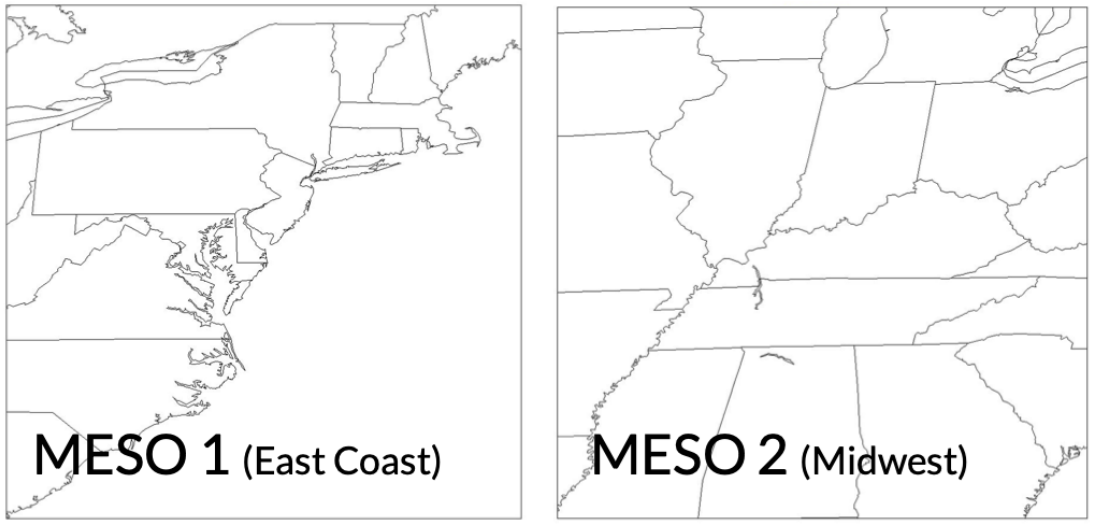
New image every ~60 secs

Mesoscale scan:

- 1,000 x 1,000 km moveable rectangle regions.
- Typically in default sector, but can be moved anywhere per NWS request.
- Spatial resolution of 0.5 to 2km



GOES-West default scan sectors

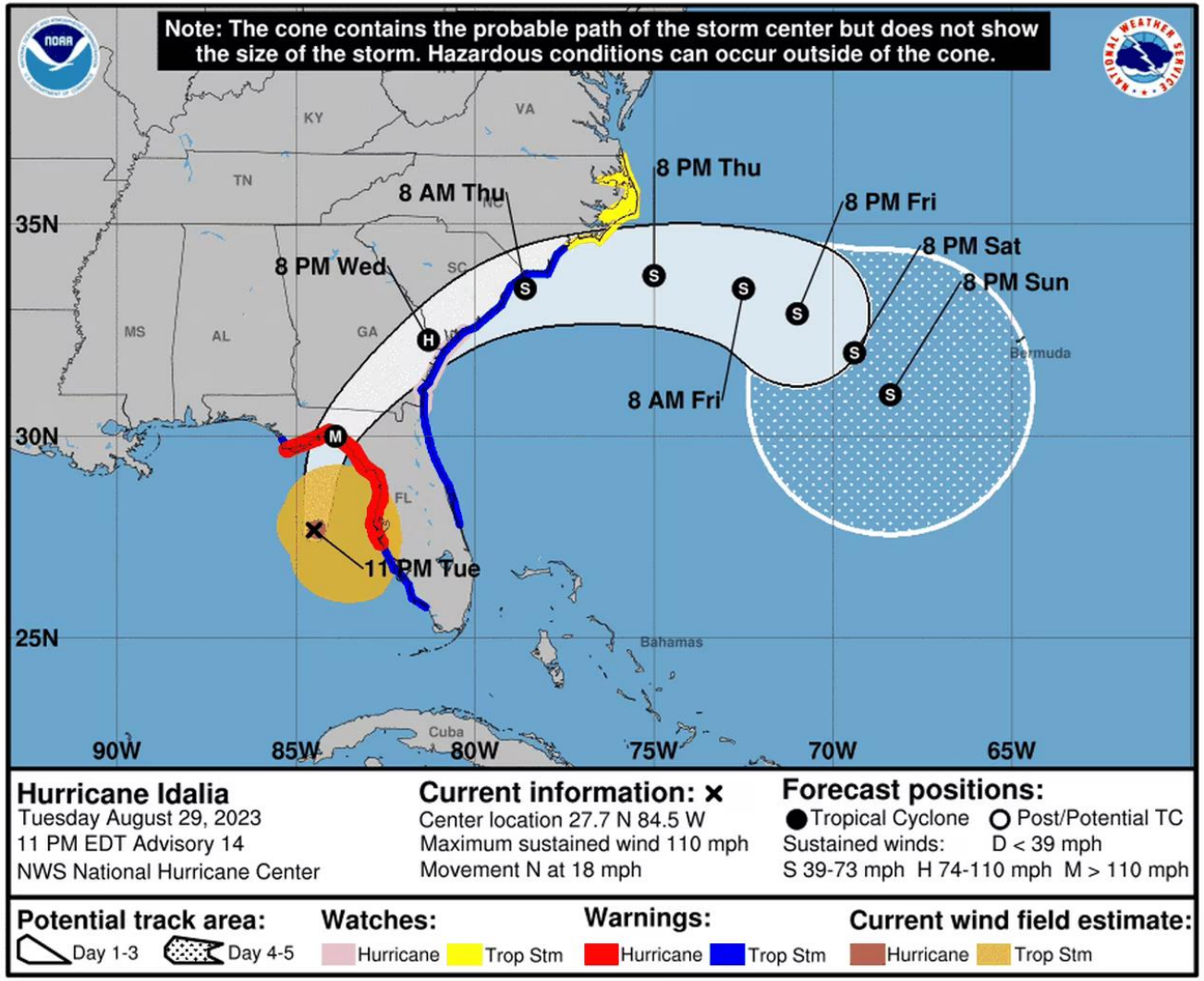


GOES-East default scan sectors

Hurricane Idalia

Case study!

- Hurricane Idalia made landfall as a category 3 hurricane on August 30th, 2023
- Interesting products + lightning!
- Produce a GIF of Idalia



To Binder →

02_GOES_aws_classroom.ipynb

Recommended GOES exploration!

May 31, 2023
Midwest Tornado Outbreak

Satellite: GOES-16 (East)

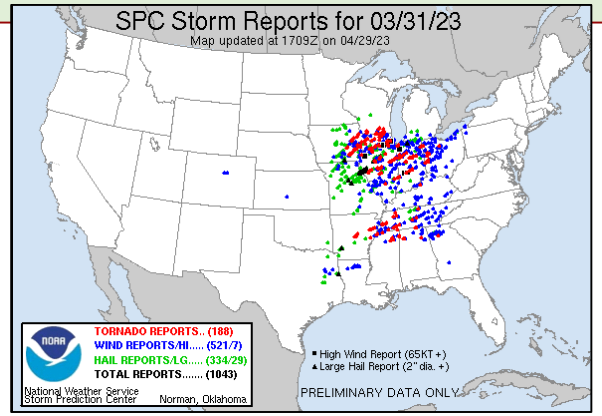
Product: Lightning Detection

Scan: MESO 2

Year: 2023

Day: 90

Time: 23:00 – 23:05



December 22-23, 2022
NA Winter Storm

Satellite: GOES-16 (East)

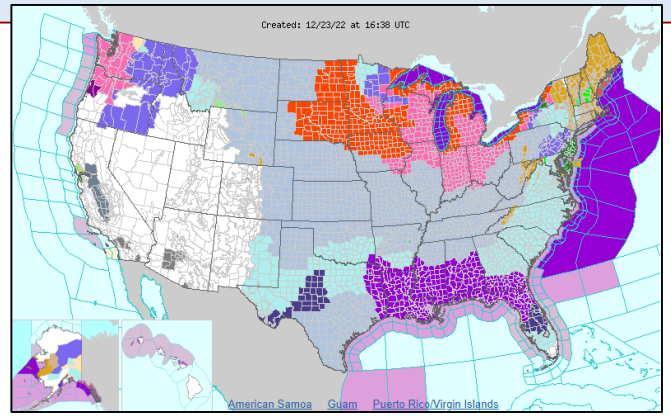
Product: Cloud Top Temperature

Scan: CONUS/PACUS

Year: 2022

Day: 357

Time: 00:00 – 20:00



July 2021
West Coast Fires

Satellite: GOES-17 (Retired West)

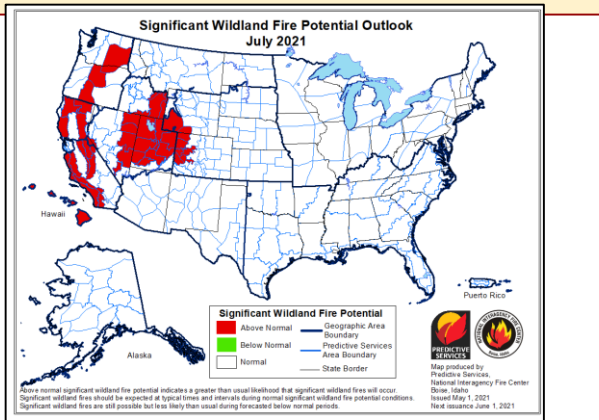
Product: Aerosol Detection

Scan: MESO 1

Year: 2021

Day: 198

Time: 16:00 – 17:00



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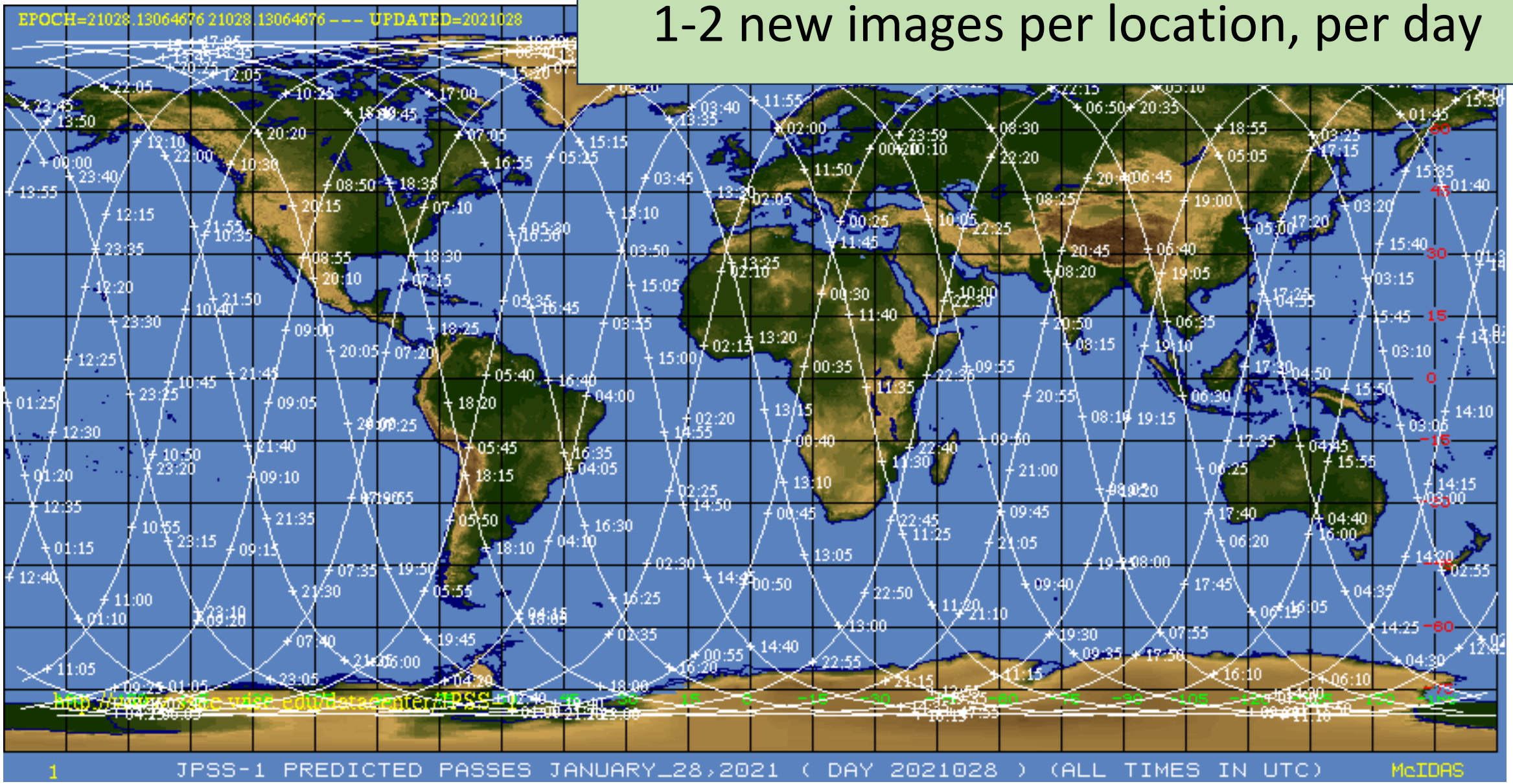
JPSS!

JPSS scan:

- Swath of data along orbit path.

1-2 new images per location, per day



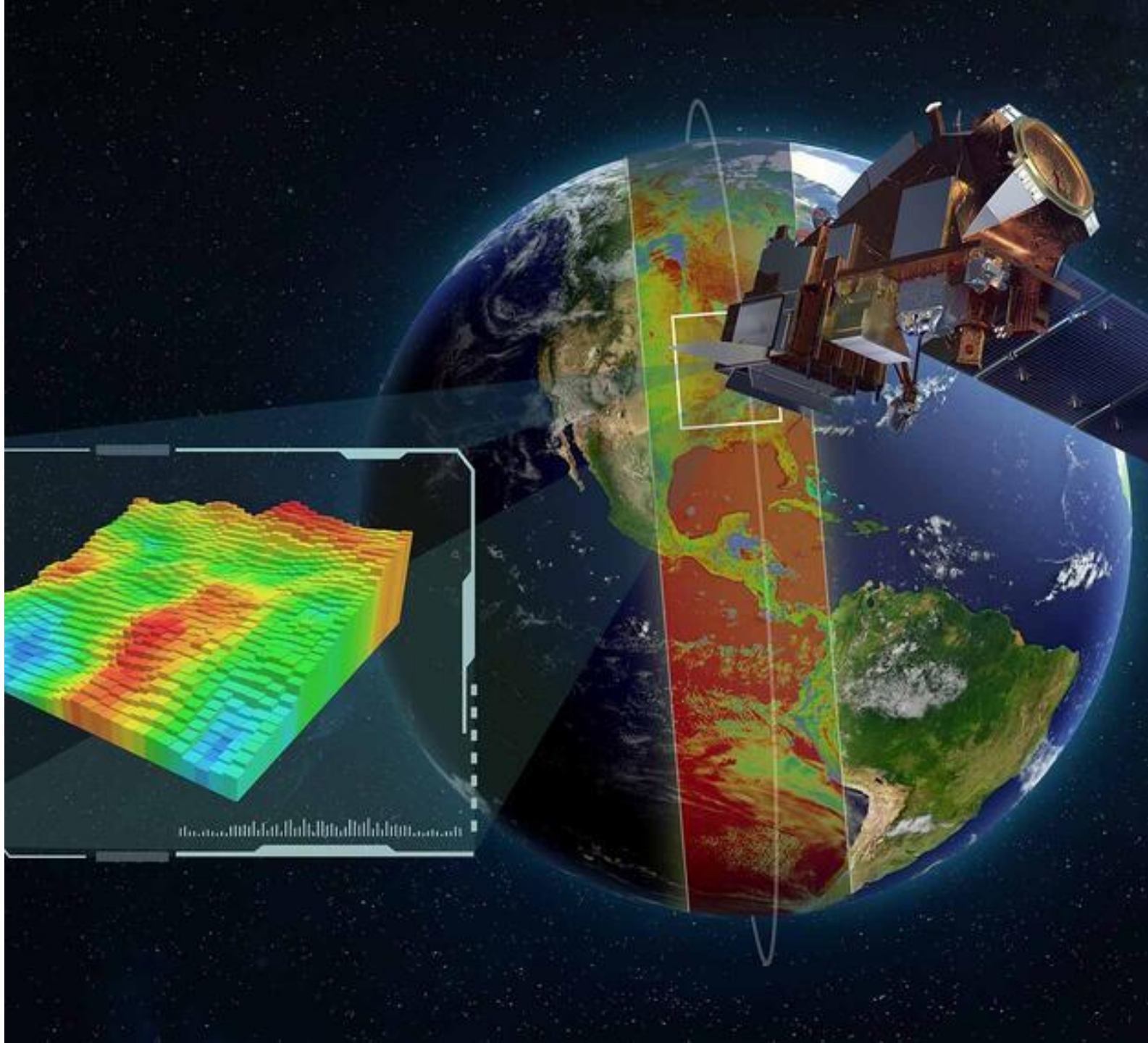
Satellites

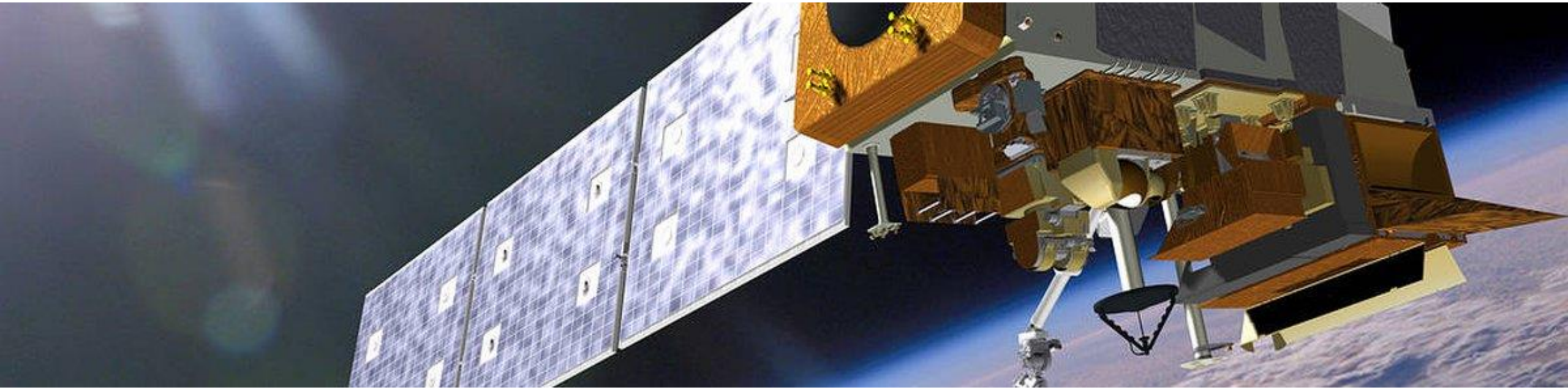
NOAA/NASA Suomi National Polar-orbiting Partnership (Suomi NPP)
(10/28/11 – current)

NOAA-20 (JPSS-1)
(11/18/17 – current)

NOAA-21 (JPSS-2)*
(11/10/22 – current)

*Primary satellite





Instruments:

- **Advanced Technology Microwave Sounder (ATMS)**
- **Cross-track Infrared Sounder (CrIS)**
- **Ozone Mapping and Profiler Suite (OMPS)**
- **Visible Infrared Imaging Radiometer Suite (VIIRS)**
- **Clouds and the Earth's Radiant Energy System (CERES)***

* SNPP and NOAA-20 only

Case study!

- Wildfires in Canada caused record-breaking air quality levels on June 7th, 2023
- JPSS satellites (SNPP, NOAA20) cover this day
- Aerosol detection + active fires

2023 Canada Wildfires

To Binder →

03_JPSS_aws_classroom.ipynb

Recommended JPSS exploration!

November 29, 2023
HI Kona Low

Satellite: NOAA-21

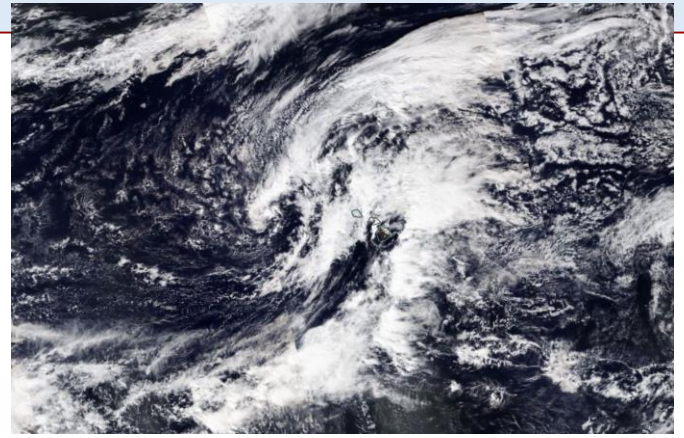
Product: Cloud Top Temperature

Year: 2023

Month: November

Day: 29

Time: 23:48 – 23:53



June 2023
Canada Fires

Satellite: NOAA-20

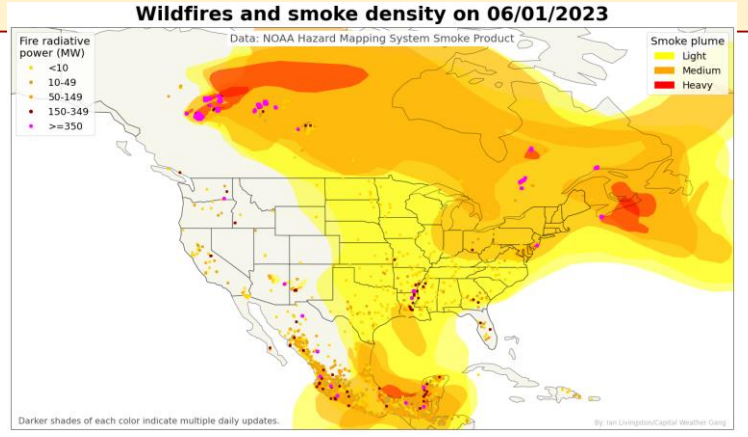
Product: Active Fire

Year: 2023

Month: June

Day: 6

Time: 20:10 – 20:17



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Next steps:

- At home, run your script of interest from the take_home_materials folder.
- Alter the parameters to request a selected data point, then visualize it using the definitions in the code.
- Write your own definition to analyze your requested dataset.

Resources & References

NOAA Open Data Dissemination: https://www.noaa.gov/information-technology/open-data-dissemination

JPSS

- https://www.star.nesdis.noaa.gov/jpss/JPSS_products.php (Product description)
- https://www.ospo.noaa.gov/Products/Suites/jpss-rr/count_JRR_product.html?product=aerosol (JRR product visualization)
- https://www.nesdis.noaa.gov/our-satellites/currently-flying/joint-polar-satellite-system/jpss-satellite-and-instruments (About the satellites)
- https://rammb2.cira.colostate.edu/training/visit/jpss-imagery-for-users/ (Data visualization)
- https://weather.ndc.nasa.gov/sport/jpsspg/viirs.html (Real-time product visualization)

GOES

- https://www.goes-r.gov/products/overview.html (Broad explanation of all products)
- https://www.star.nesdis.noaa.gov/goesr/ (Algorithm & product description)
- http://cimss.ssec.wisc.edu/goes/OCLOFactSheetPDFs/ (Quick guides)
- https://github.com/awslabs/open-data-docs/blob/main/docs/noaa/noaa-goes16/README.md (Variables & product names)
- https://www.goes-r.gov/products/docs/PUG-L2+-vol5.pdf (Technical explanation of each product and variable)

Thank you!

Email: mjsears@ncsu.edu

Gitlab repository: https://gitlab.cicsnc.org/workshop-development/ams-short-course/