

Exploring Air Quality from Geostationary Satellites Using NOAA Aerosol Watch

Carl Malings, Melanie Follette-Cook, Pawan Gupta, Sarah Strode

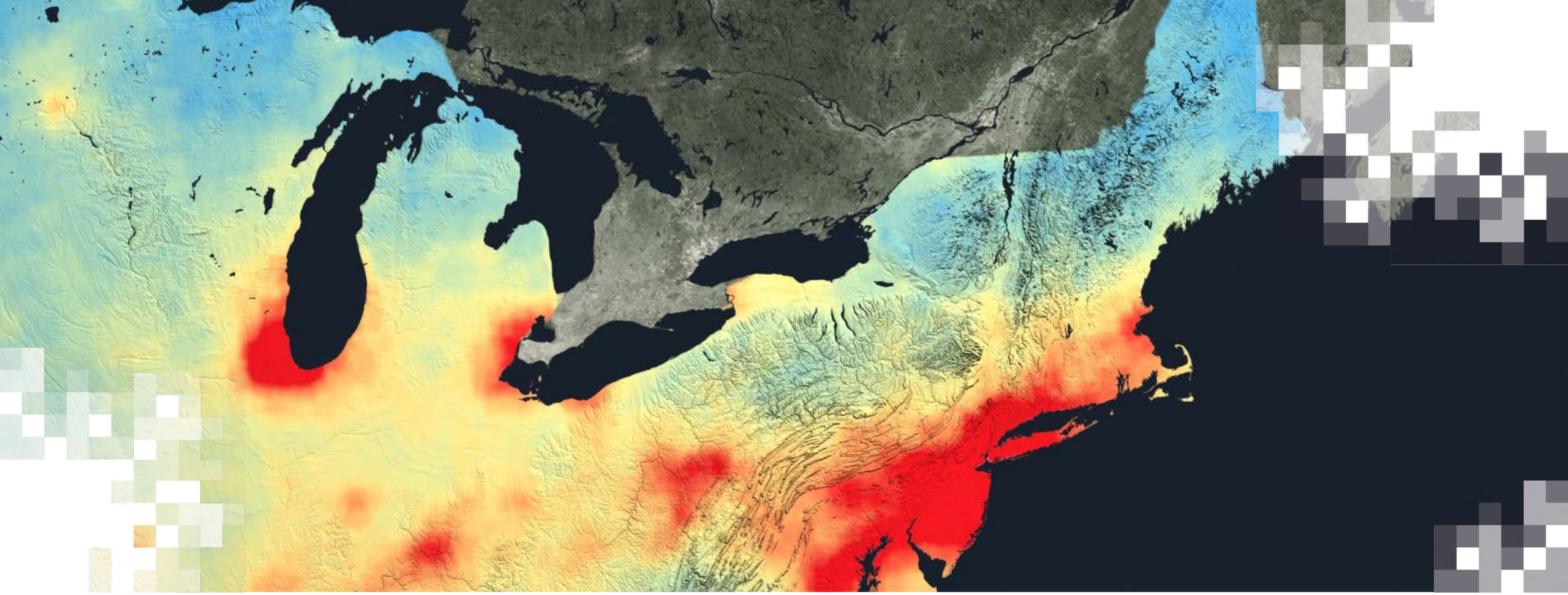
NASA Air Quality Remote Sensing Training, US EPA, Raleigh, NC, March 21-23, 2023



Objectives

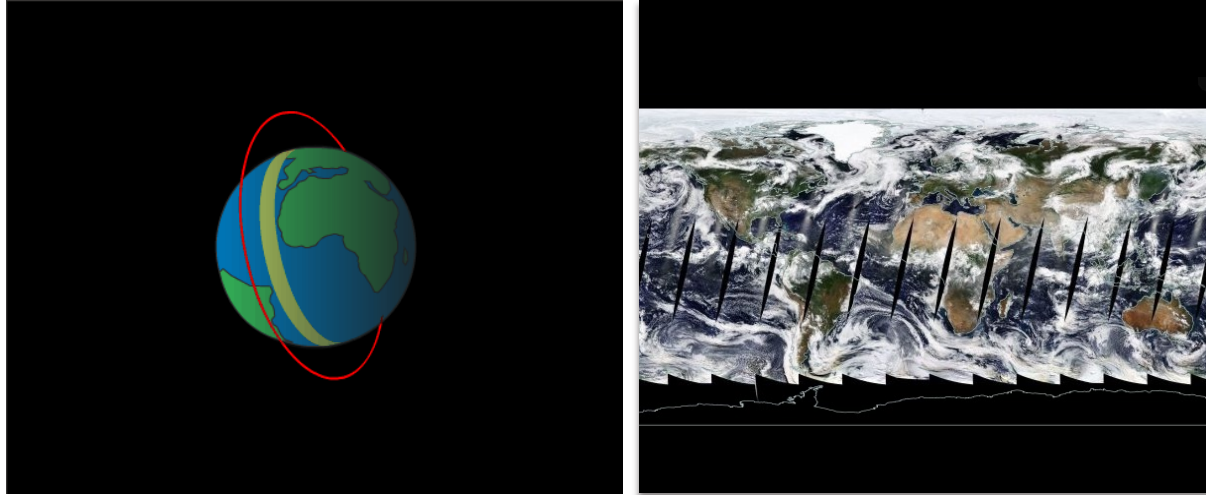
1. Learn the basics of geostationary satellites & sensors
2. Gain knowledge of and ability to visualize available products from geostationary sensors using NOAA Aerosol Watch





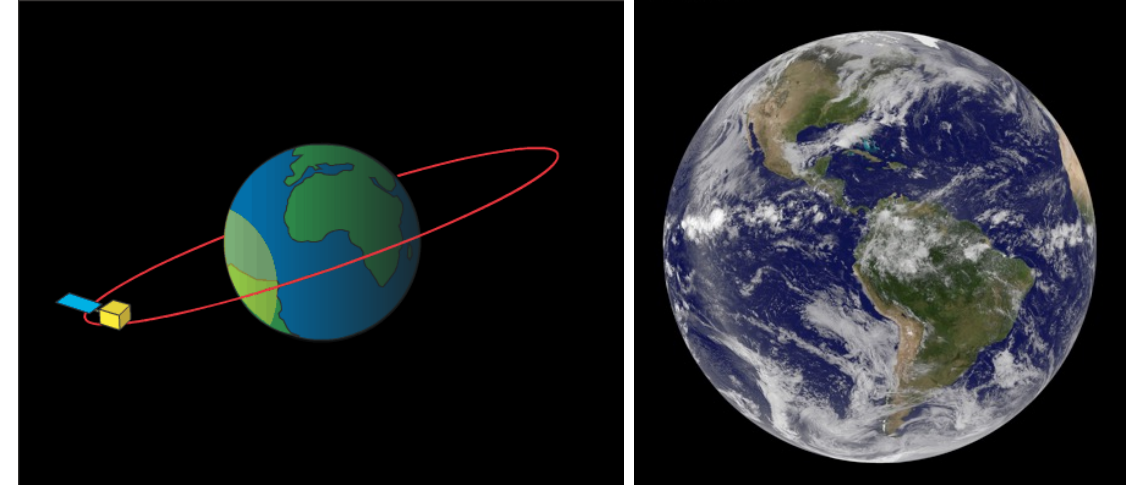
Introduction to Geostationary Satellites

Common Orbit Types



Polar Orbit (LEO)

- Fixed, circular orbit above Earth
- Sun synchronous orbit ~600-1,000 km above Earth with orbital passes at about the same **local solar time** each day



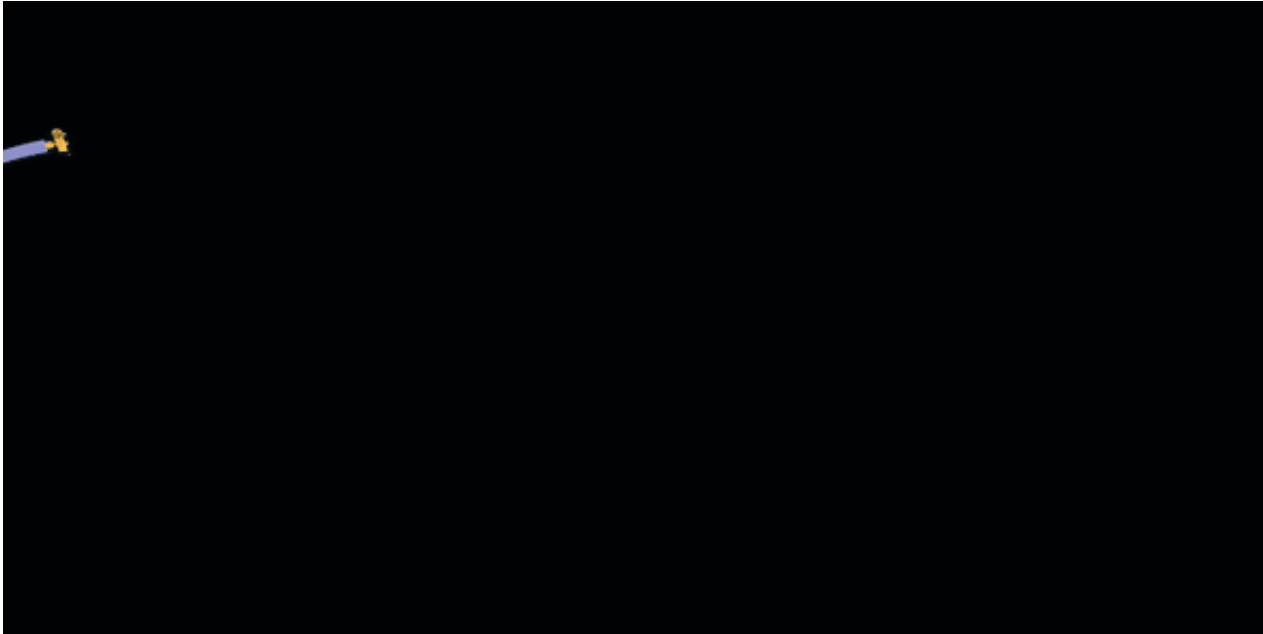
Geostationary Orbit (GEO)

- Has the same rotational period as Earth
- Appears 'fixed' above Earth
- Orbits ~36,000 km above the Equator

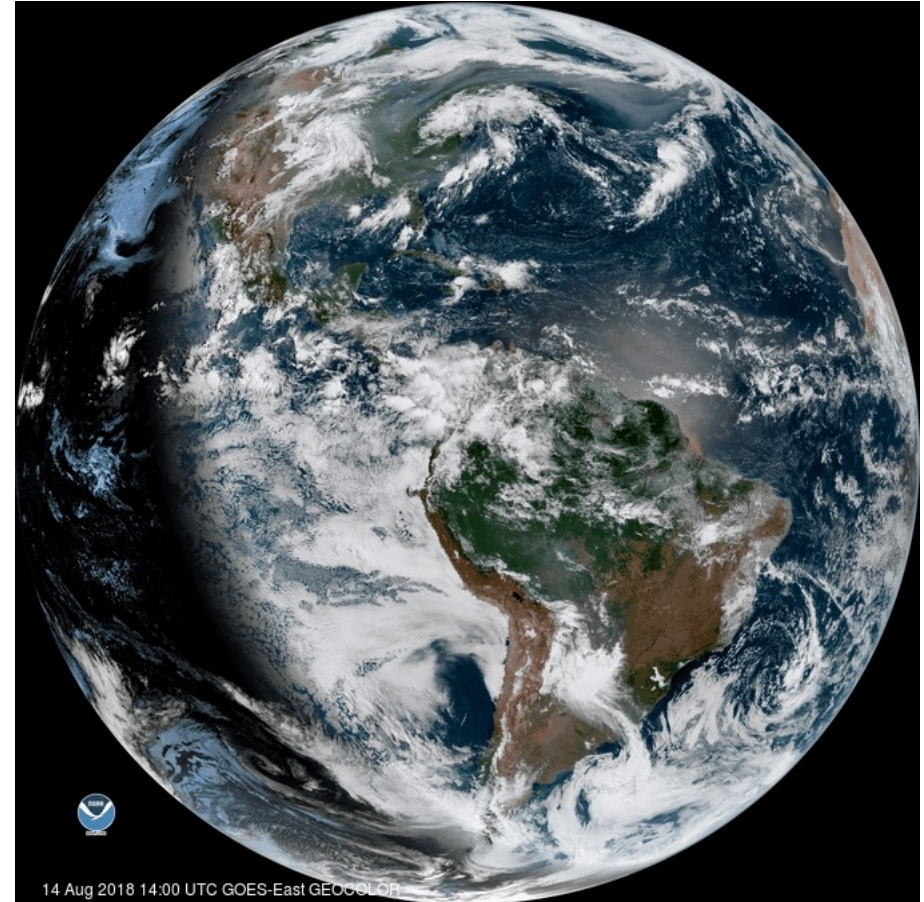


Low Earth Orbit (LEO) & Geostationary (GEO) Satellites

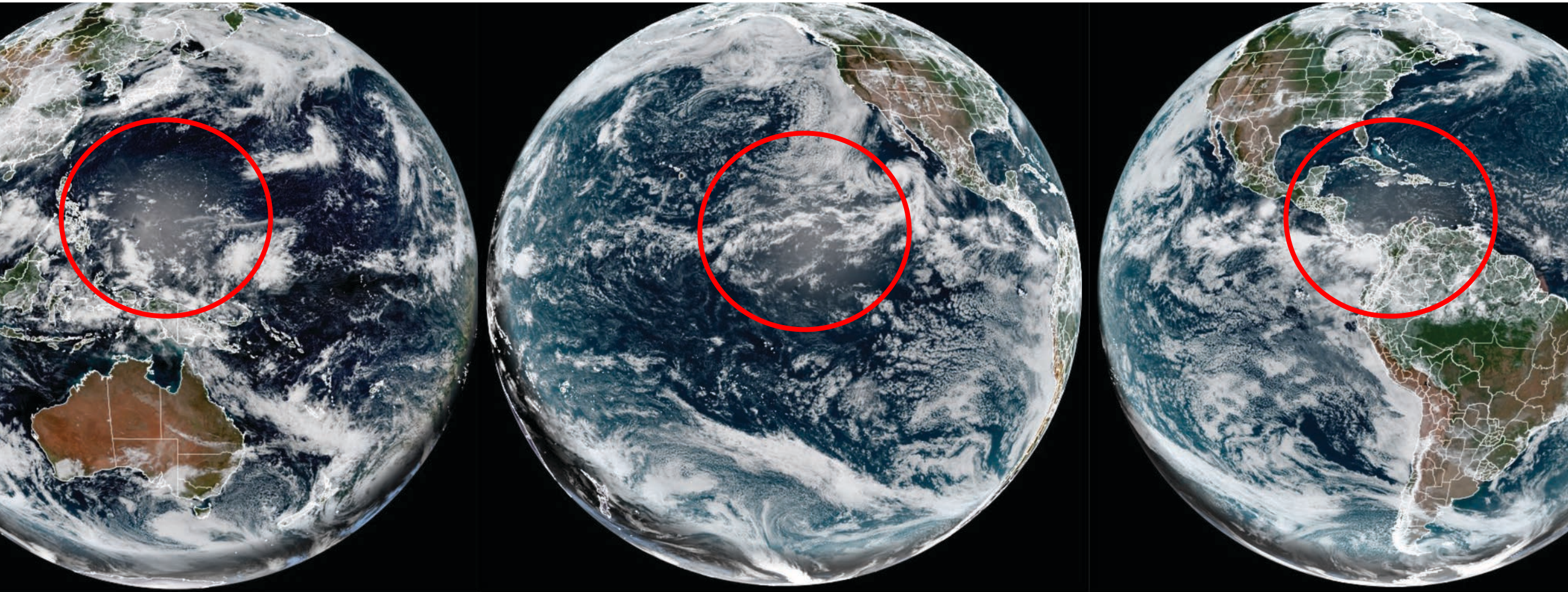
LEO Orbit



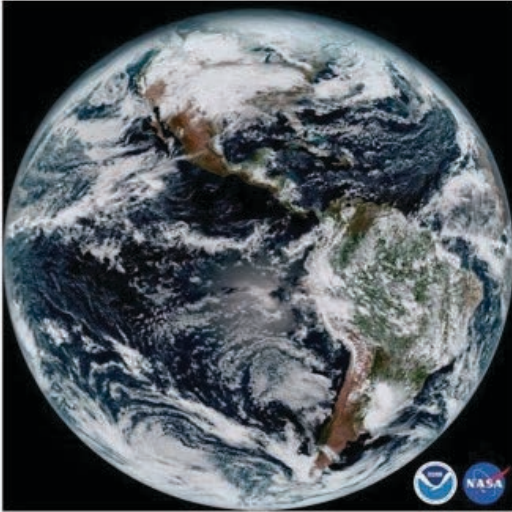
GEO Orbit



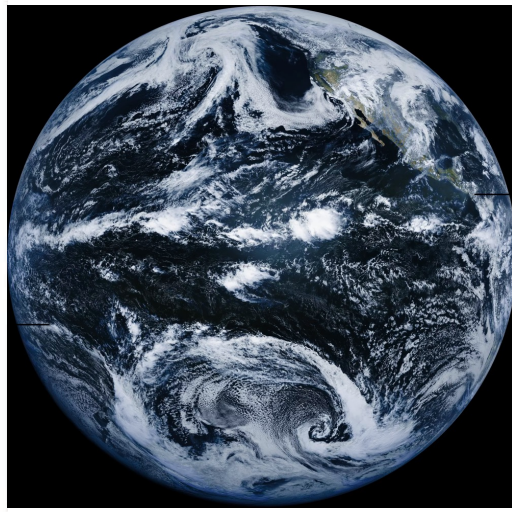
Glint



Satellite Coverage - GEO



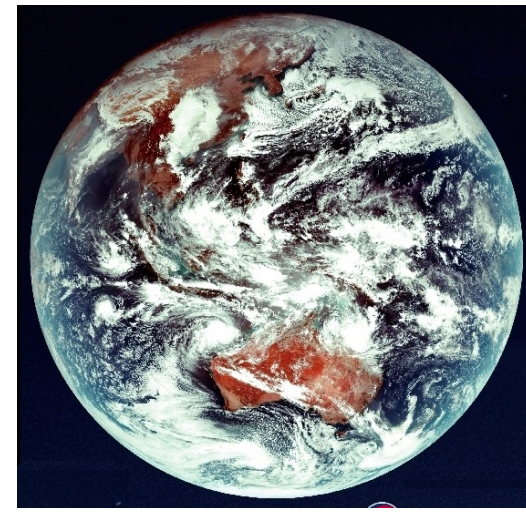
GOES-R/16/East



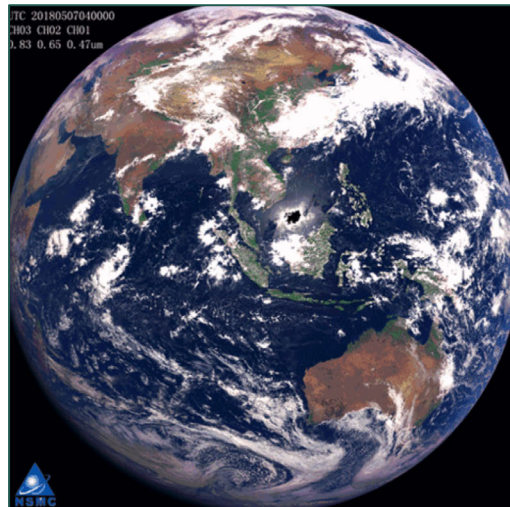
**GOES-S/17/West
GOES-T/18/West**



Himawari -8/9



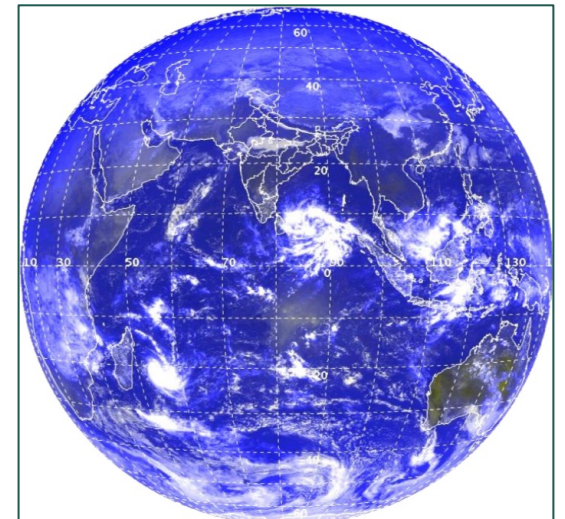
GK-2A (AMI)



Fengyun-4



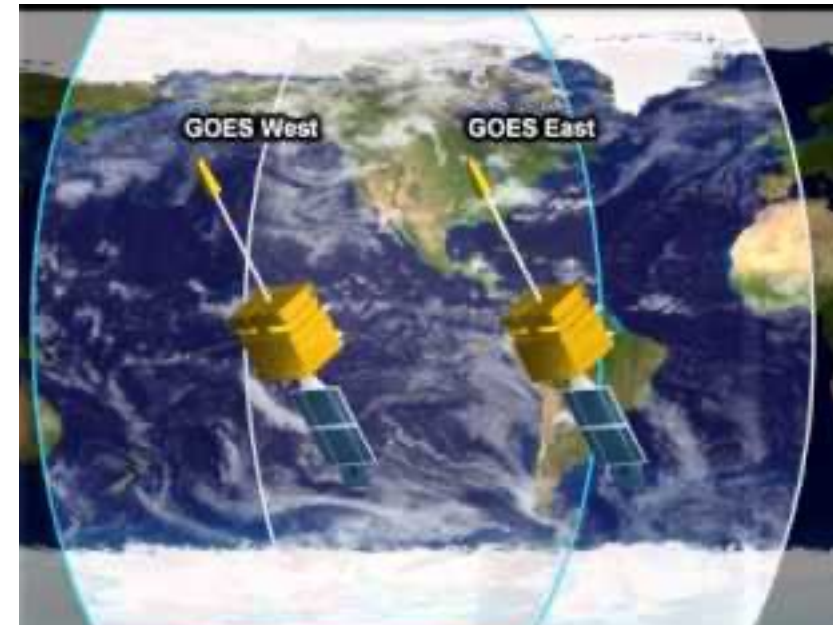
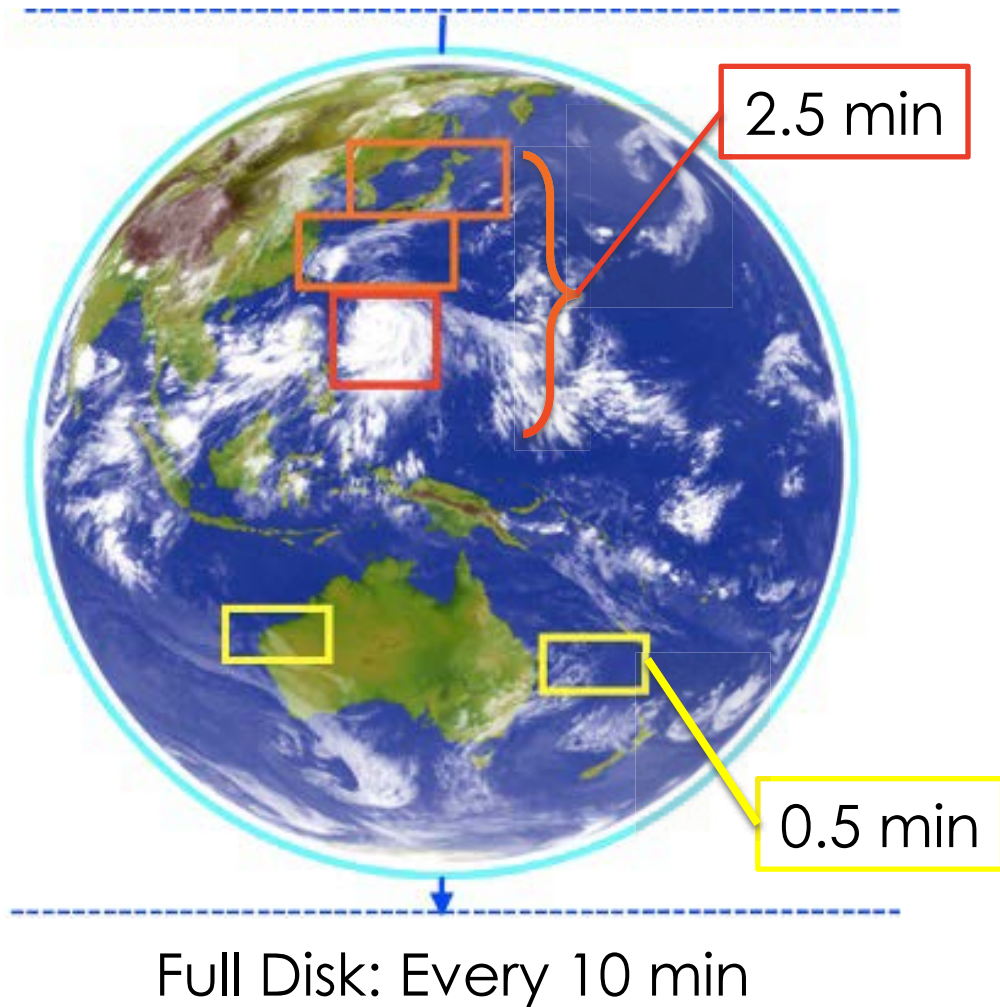
Meteosat (FCI)



INSAT/GSAT



Advanced Himawari Imager (AHI) & Advanced Baseline Imager (ABI): Spatial Coverage and Temporal Resolution



Full Disk: Every 10 min
CONUS: Every 5 min
Mesoscale: Every 0.5 min



GOES-16: Smoke Transport over the Northwest

Fast changing air quality due to smoke transport can be captured by GEO sensors.

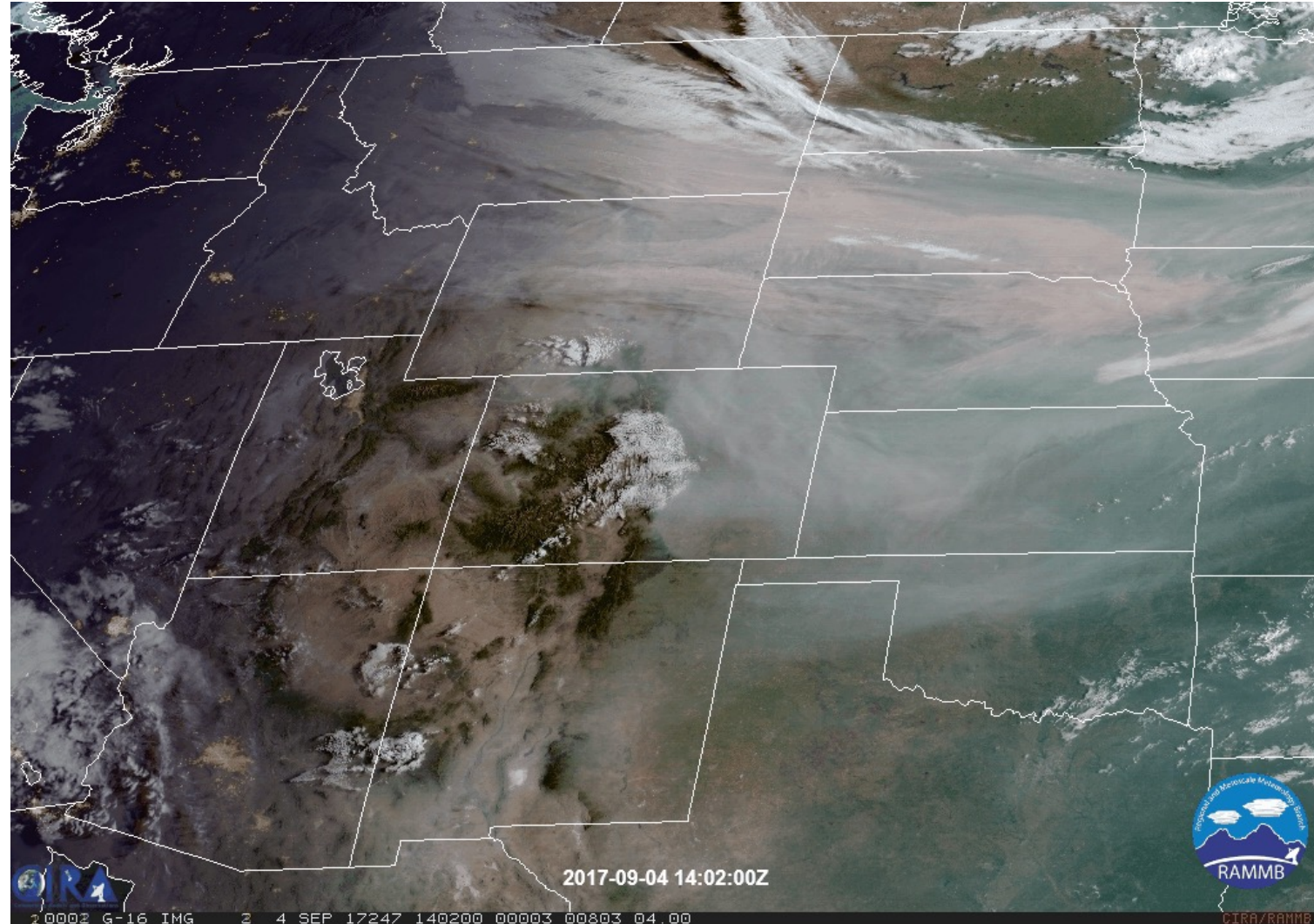


Image: [RAMMB](#)



GOES-16 Loop: Dust

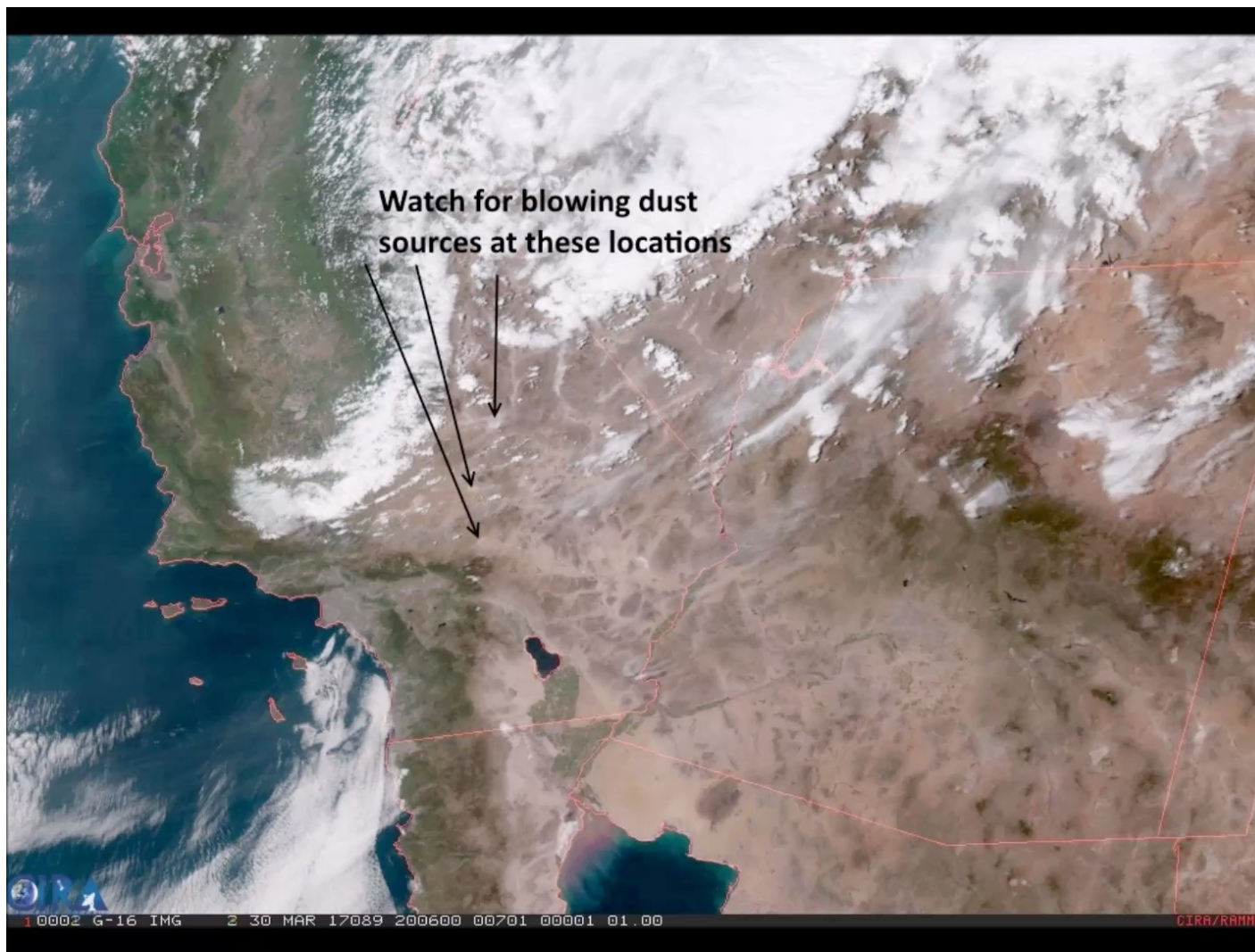


Image: [RMMB](#)



GOES-16 Loop: Smoke Over the Southeast U.S.

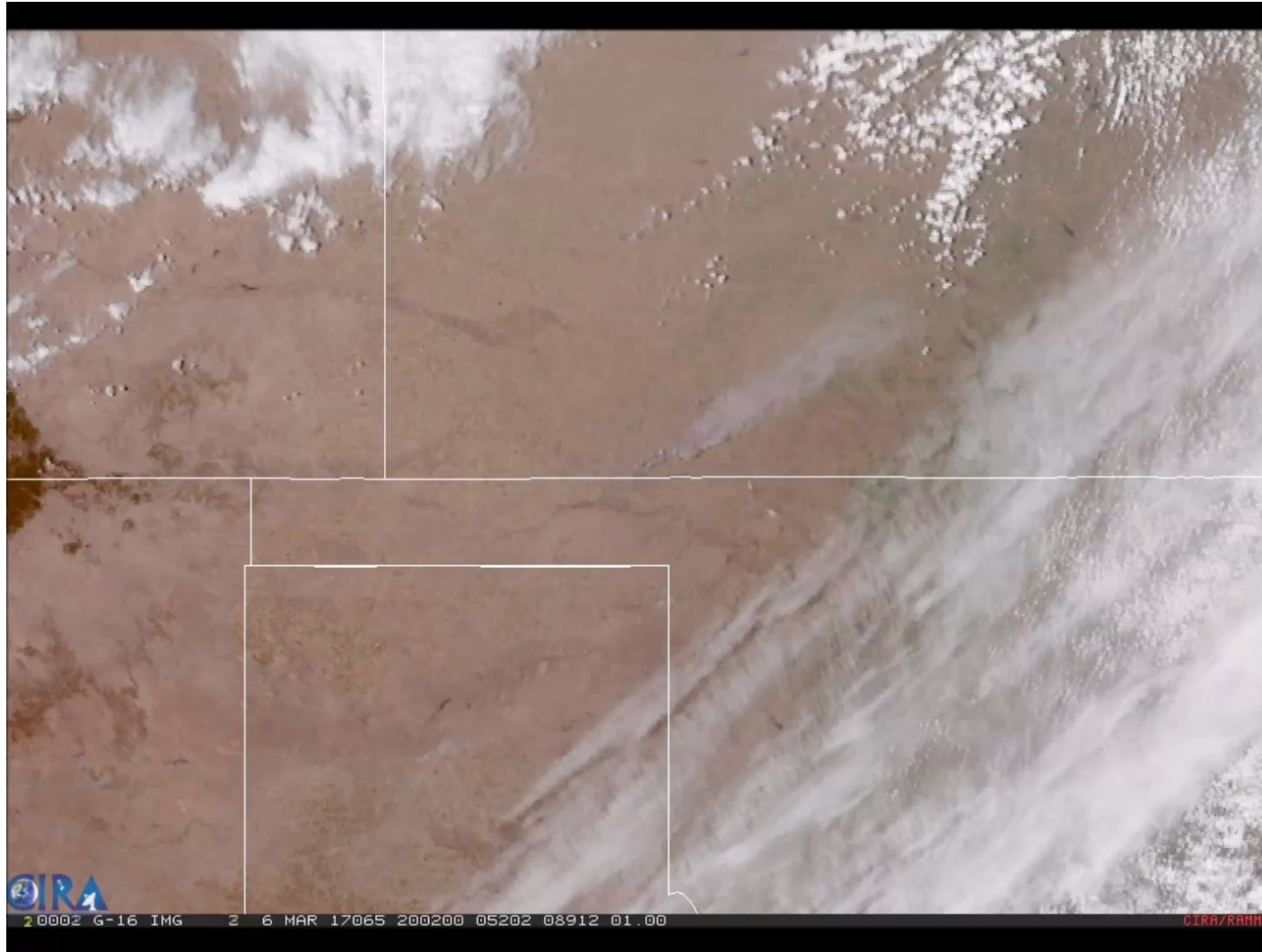
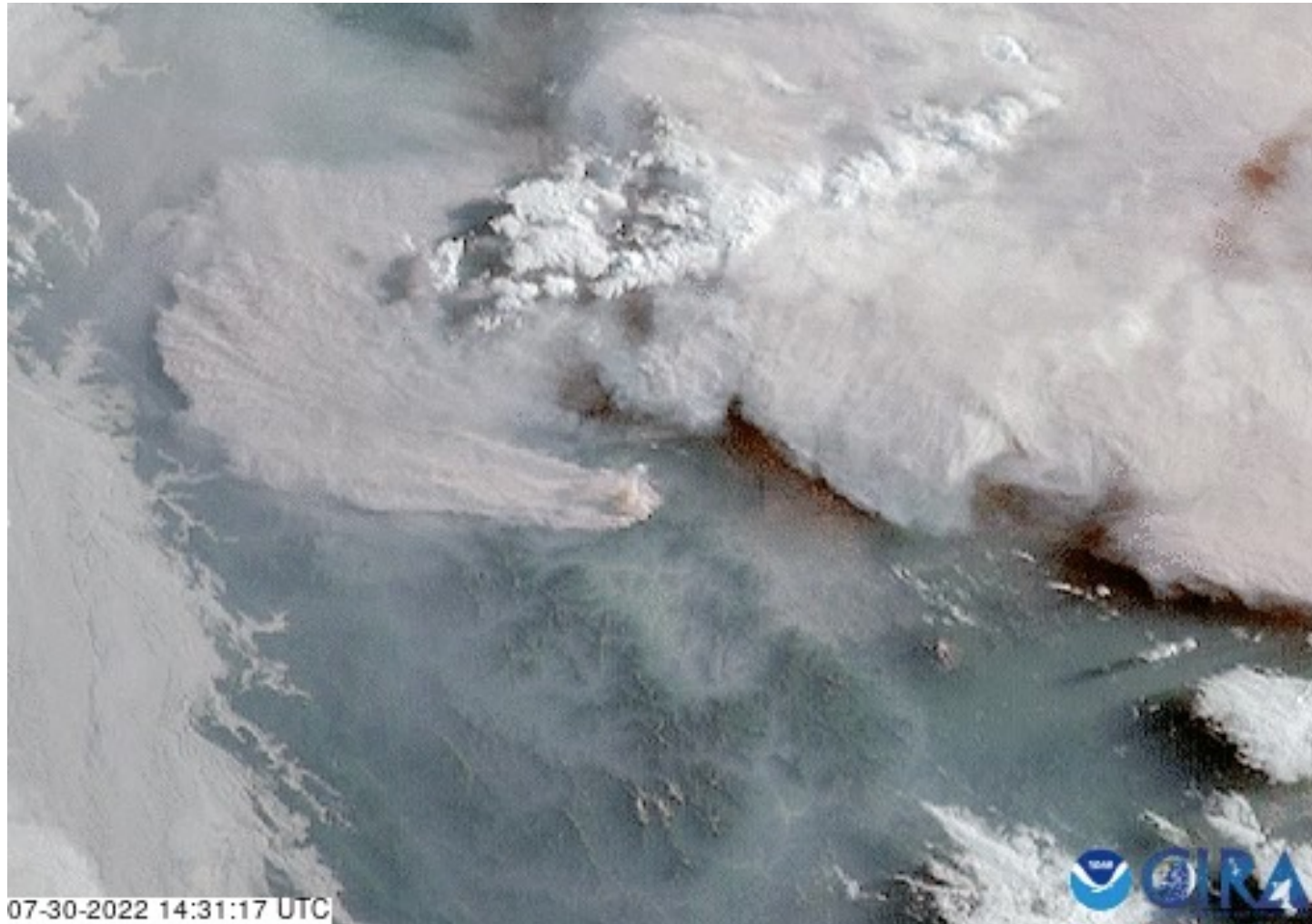


Image: [RMMB](#)



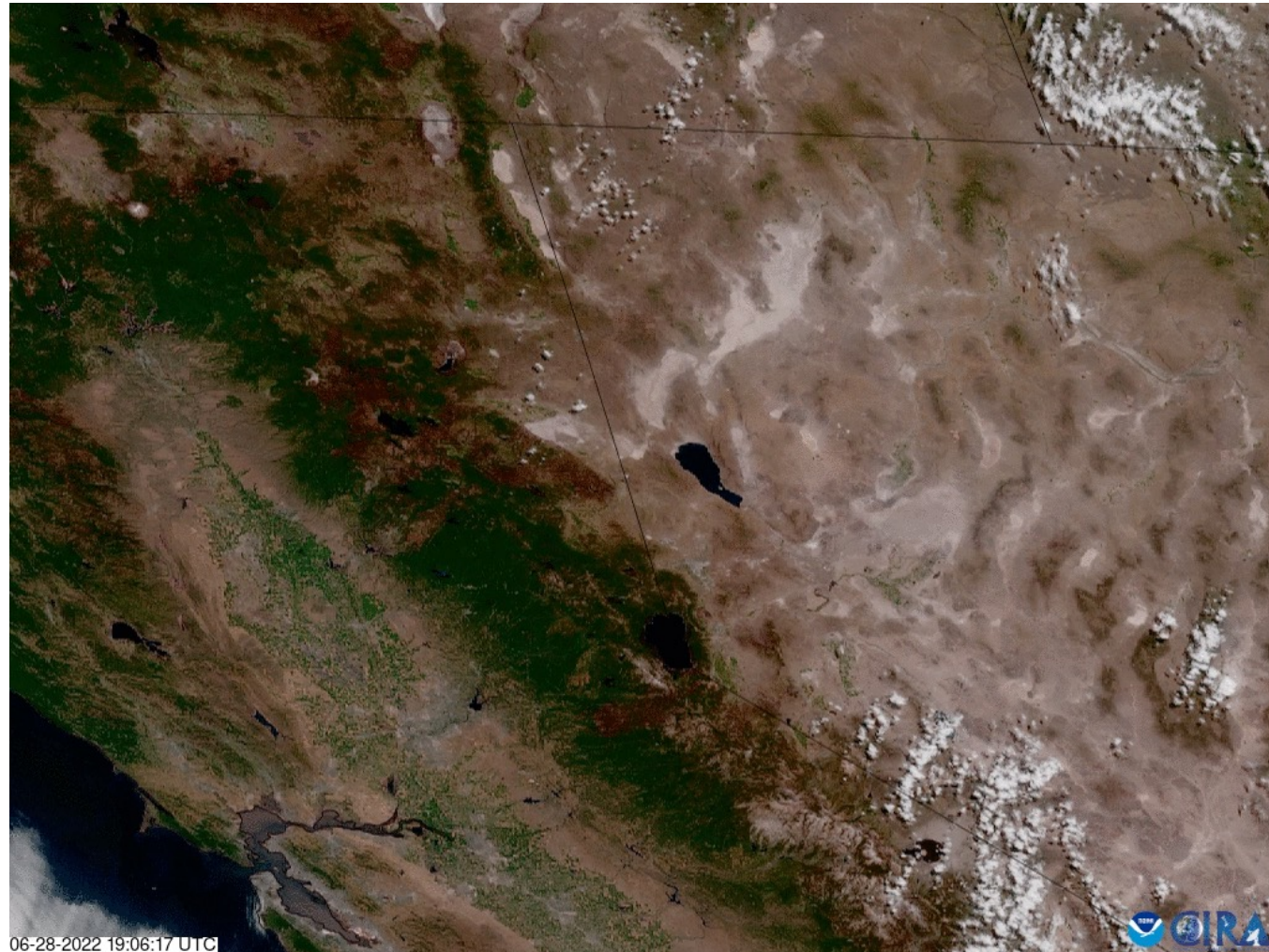
GOES-17 (GeoColor): McKinney Fire (US)



https://rammb.cira.colostate.edu/ramsdis/online/loop_of_the_day/



GOES-17 (GeoColor): Rices Fire (US)

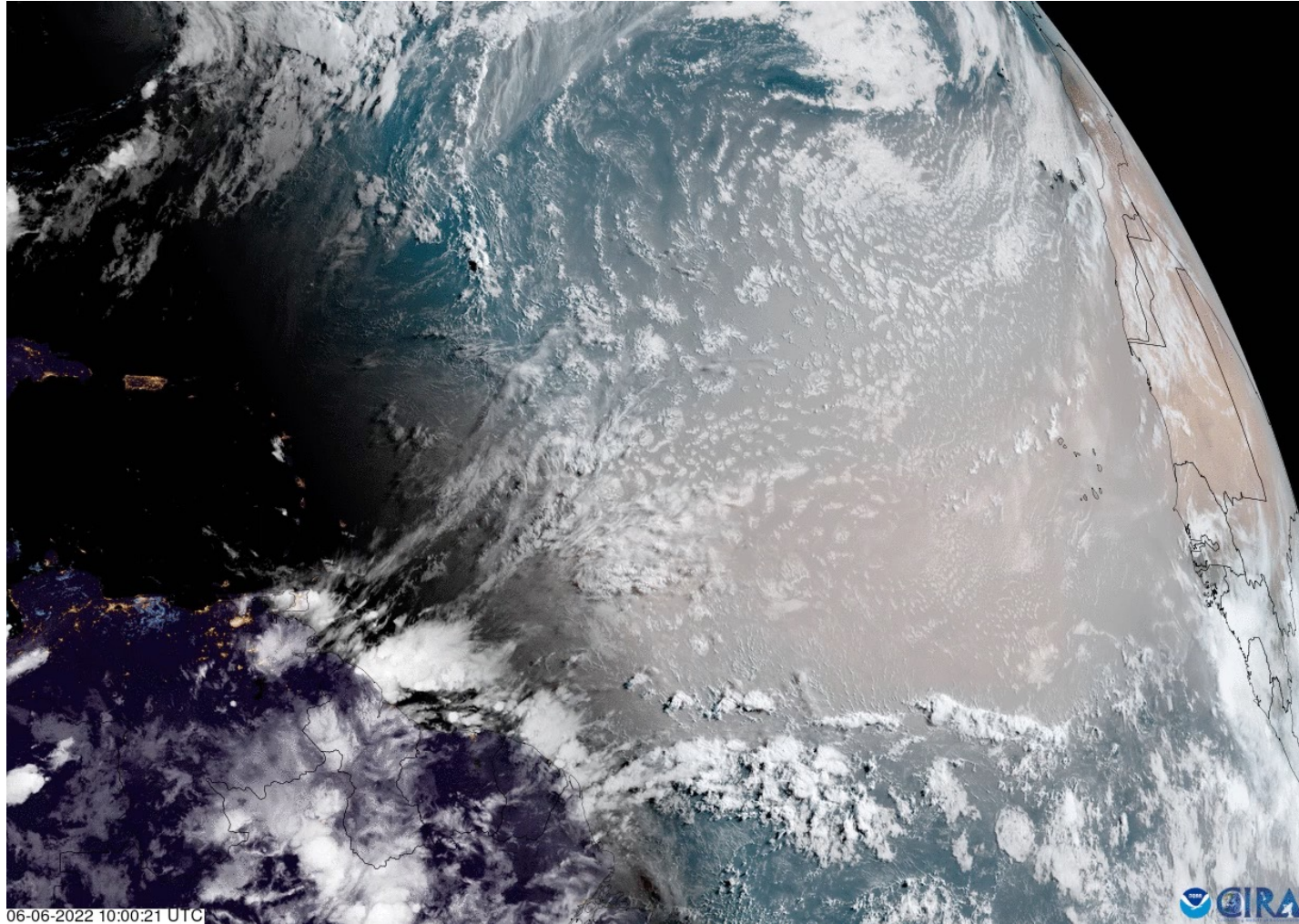


06-28-2022 19:06:17 UTC

https://rammb.cira.colostate.edu/ramsd/online/loop_of_the_day/



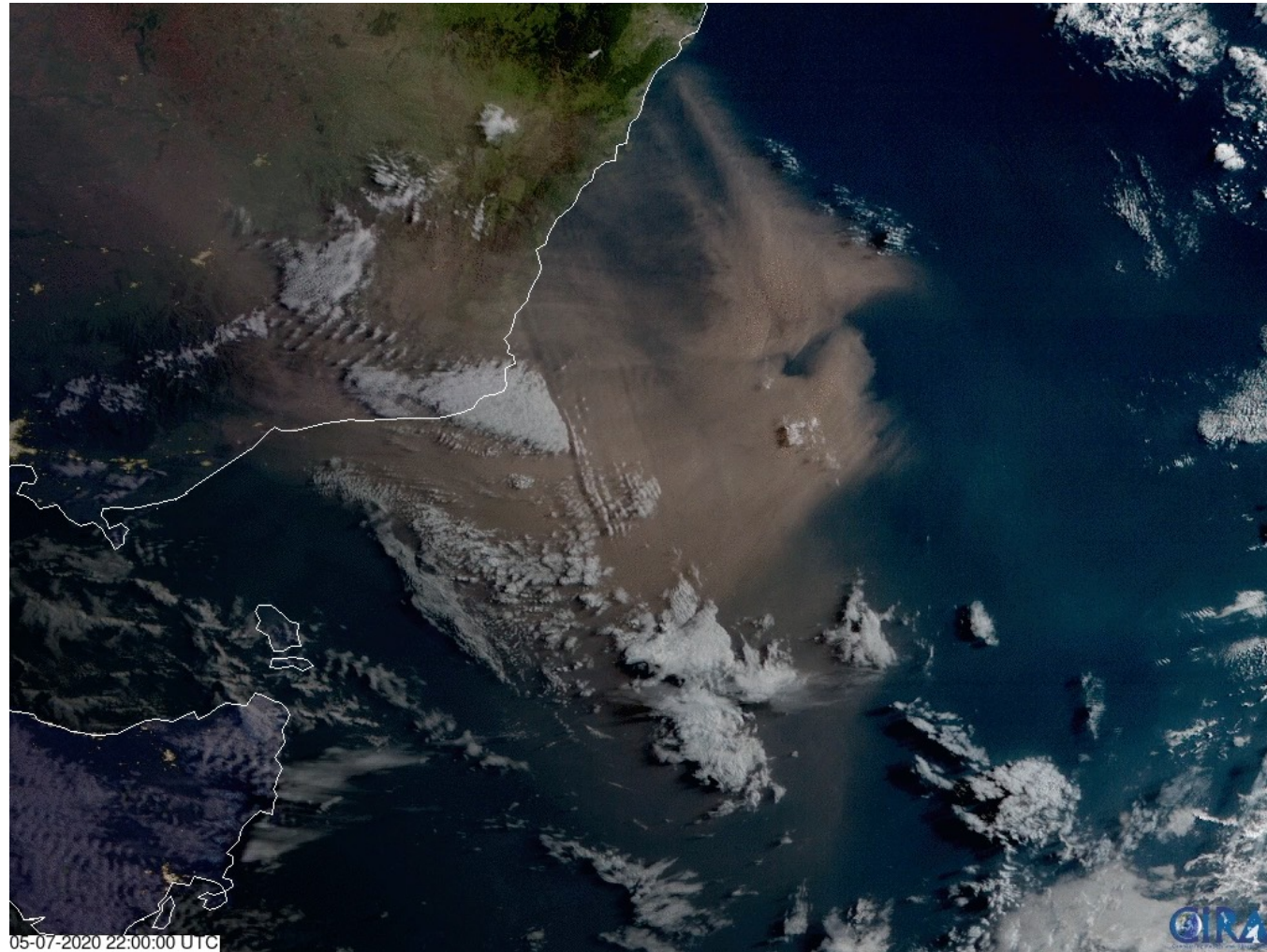
GOES-East: Dust over the Atlantic



https://rammb.cira.colostate.edu/ramsd/online/loop_of_the_day/

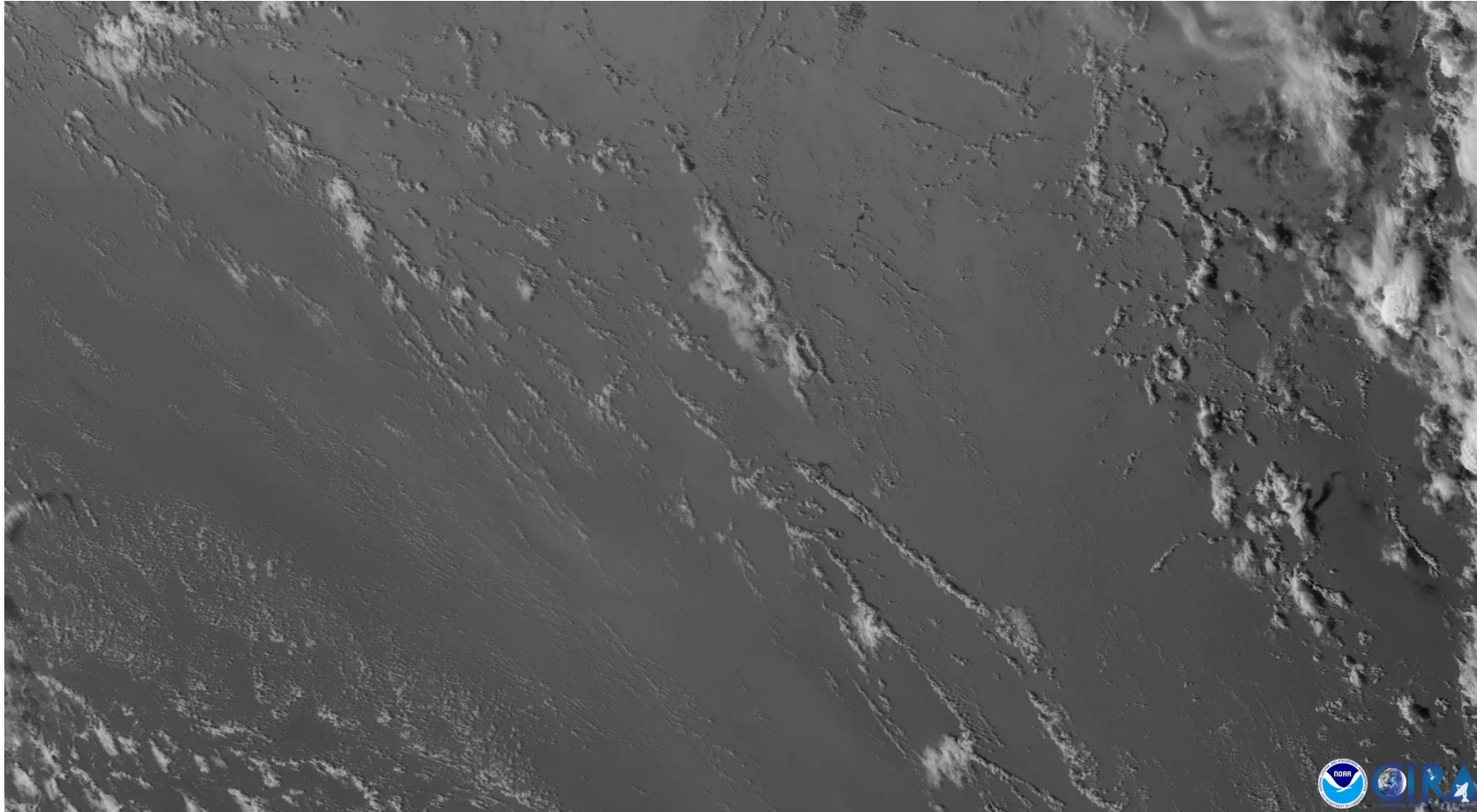


Himawari-08 (AHI): Dust over Australia (May 8th, 2020)



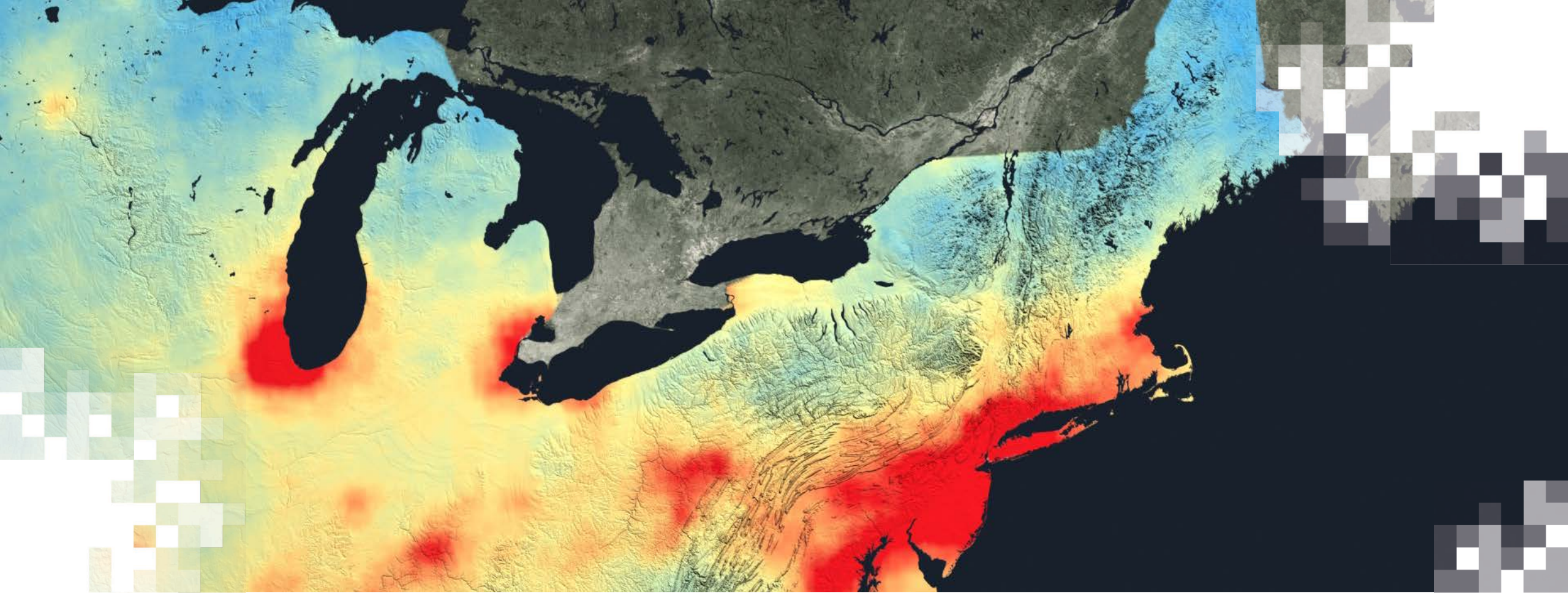
GOES-17: Hunga Tonga-Hunga Ha'apai's Eruption

January 15th, 2022, in the South Pacific



01-15-2022 | 03:10:32 UTC | GOES-17 | Visible (Band 2)





NOAA Aerosol Watch

NOAA Aerosol Watch

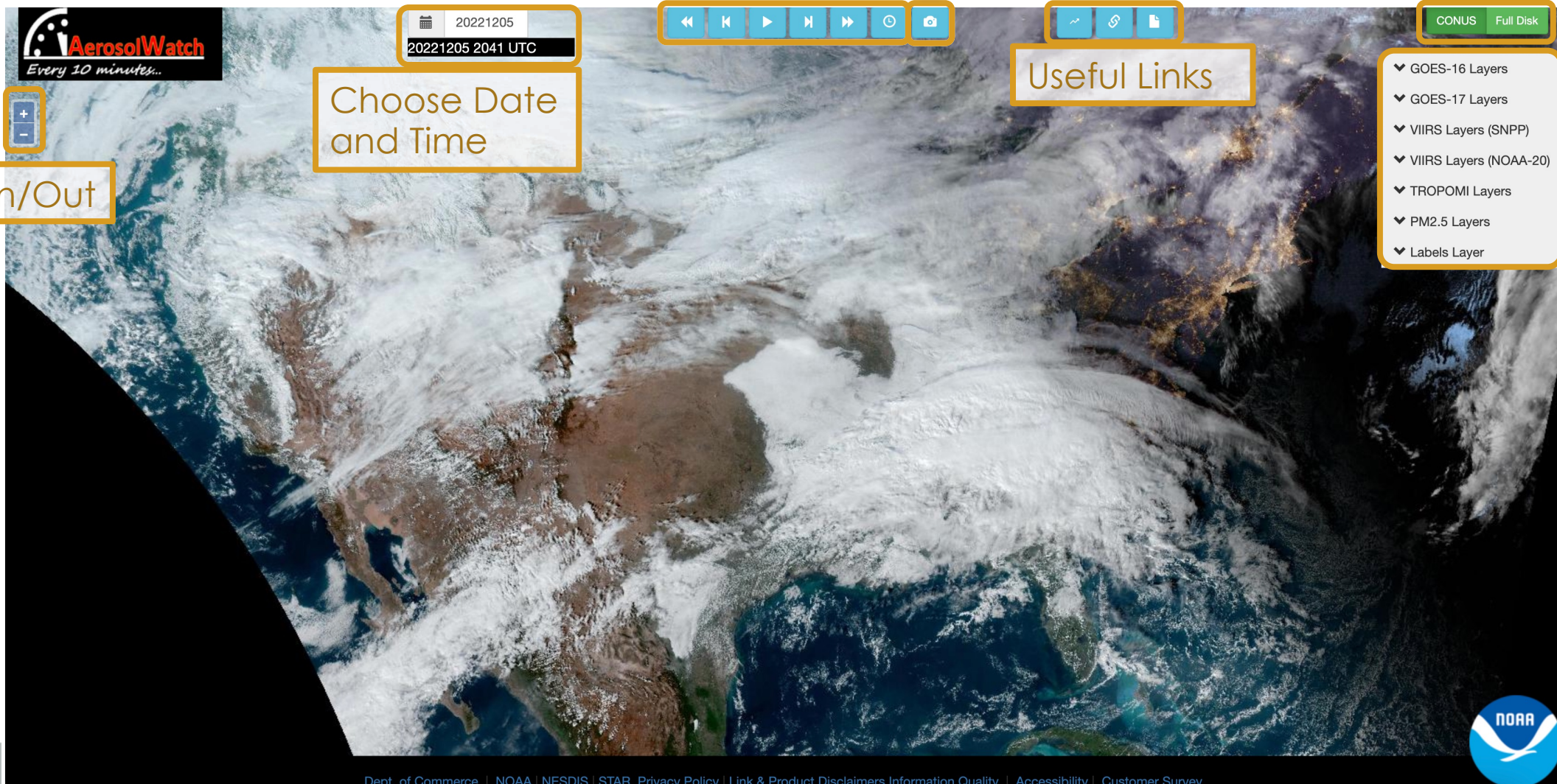
<https://www.star.nesdis.noaa.gov/smcd/spb/aq/AerosolWatch/>

The screenshot displays the NOAA Aerosol Watch interface. At the top left, the logo reads "AerosolWatch Every 10 minutes...". The main display is a satellite view of Earth with various aerosol layers overlaid. The interface includes a date selector showing "20221205" and a time selector showing "20221205 2041 UTC". Navigation controls (back, forward, home, search) are visible at the top. A layer selection menu on the right lists the following layers: GOES-16 Layers, GOES-17 Layers, VIIRS Layers (SNPP), VIIRS Layers (NOAA-20), TROPOMI Layers, PM2.5 Layers, and Labels Layer. The NOAA logo is in the bottom right corner of the interface.

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NOAA Aerosol Watch



Zoom In/Out

Choose Date and Time

Animation Controls

Take a Snapshot

Useful Links

View

Layers

- ▼ GOES-16 Layers
- ▼ GOES-17 Layers
- ▼ VIIRS Layers (SNPP)
- ▼ VIIRS Layers (NOAA-20)
- ▼ TROPOMI Layers
- ▼ PM2.5 Layers
- ▼ Labels Layer



Full Disk Image

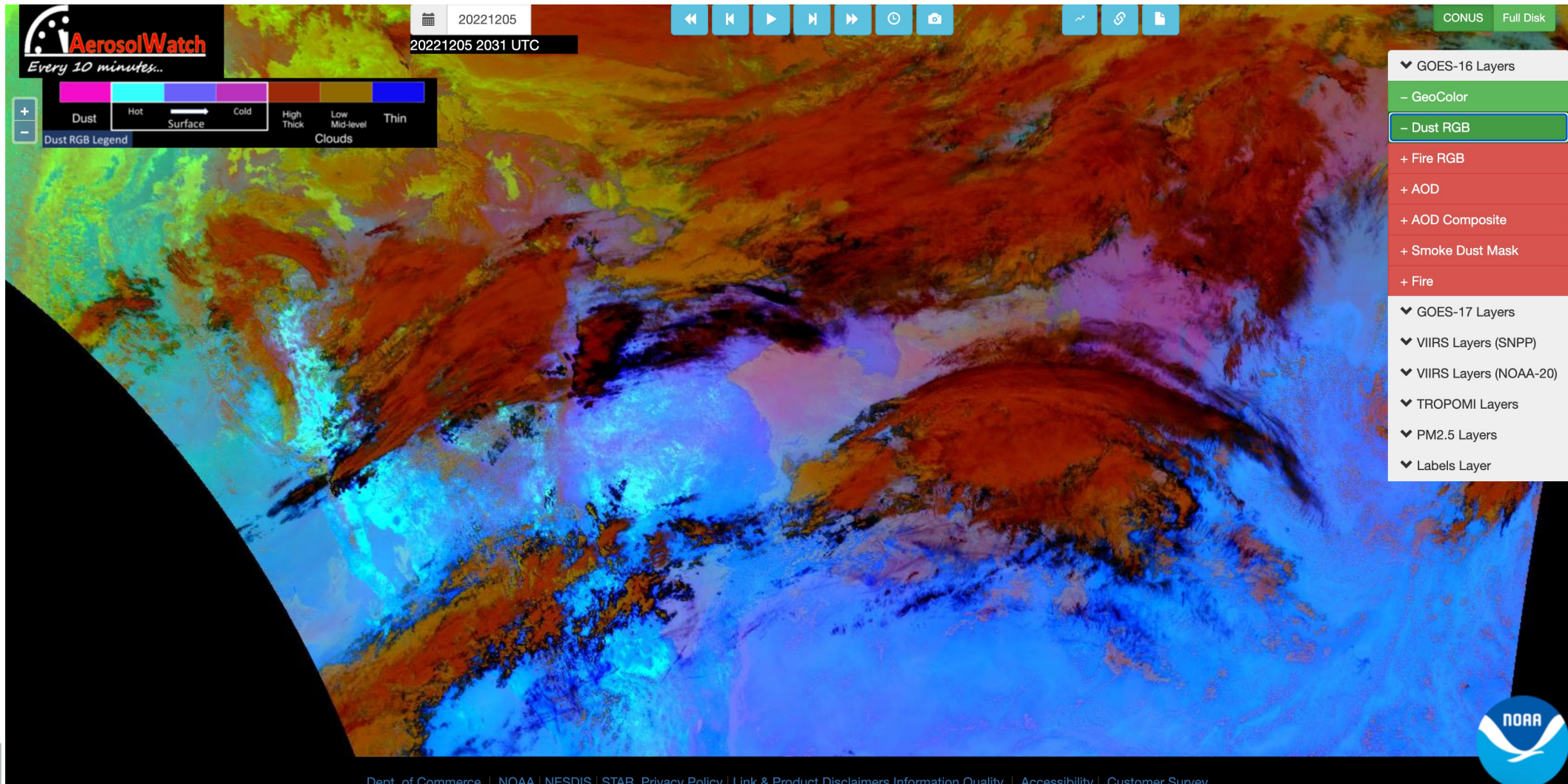
<https://www.star.nesdis.noaa.gov/smcd/spb/aq/AerosolWatch/>

The screenshot displays the AerosolWatch web interface. At the top left is the logo for AerosolWatch with the tagline "Every 10 minutes...". The main content area features a large, high-resolution satellite image of Earth, showing the Americas and surrounding oceans. Above the image is a navigation bar with a calendar icon, a date selector set to "20221205", and a time range "20221205 2030 UTC". To the right of the image are several control icons: a play button, a stop button, a refresh button, a camera icon, and a share icon. In the top right corner, there are two buttons: "CONUS" and "Full Disk", with "Full Disk" currently selected. Below these buttons is a dropdown menu labeled "GOES-16 Layers". At the bottom of the interface, there is a NOAA logo and a footer containing the text: "Dept. of Commerce | NOAA | NESDIS | STAR | Privacy Policy | Link & Product Disclaimers | Information Quality | Accessibility | Customer Survey".



Dust Layer

<https://www.star.nesdis.noaa.gov/smcd/spb/aq/AerosolWatch/>

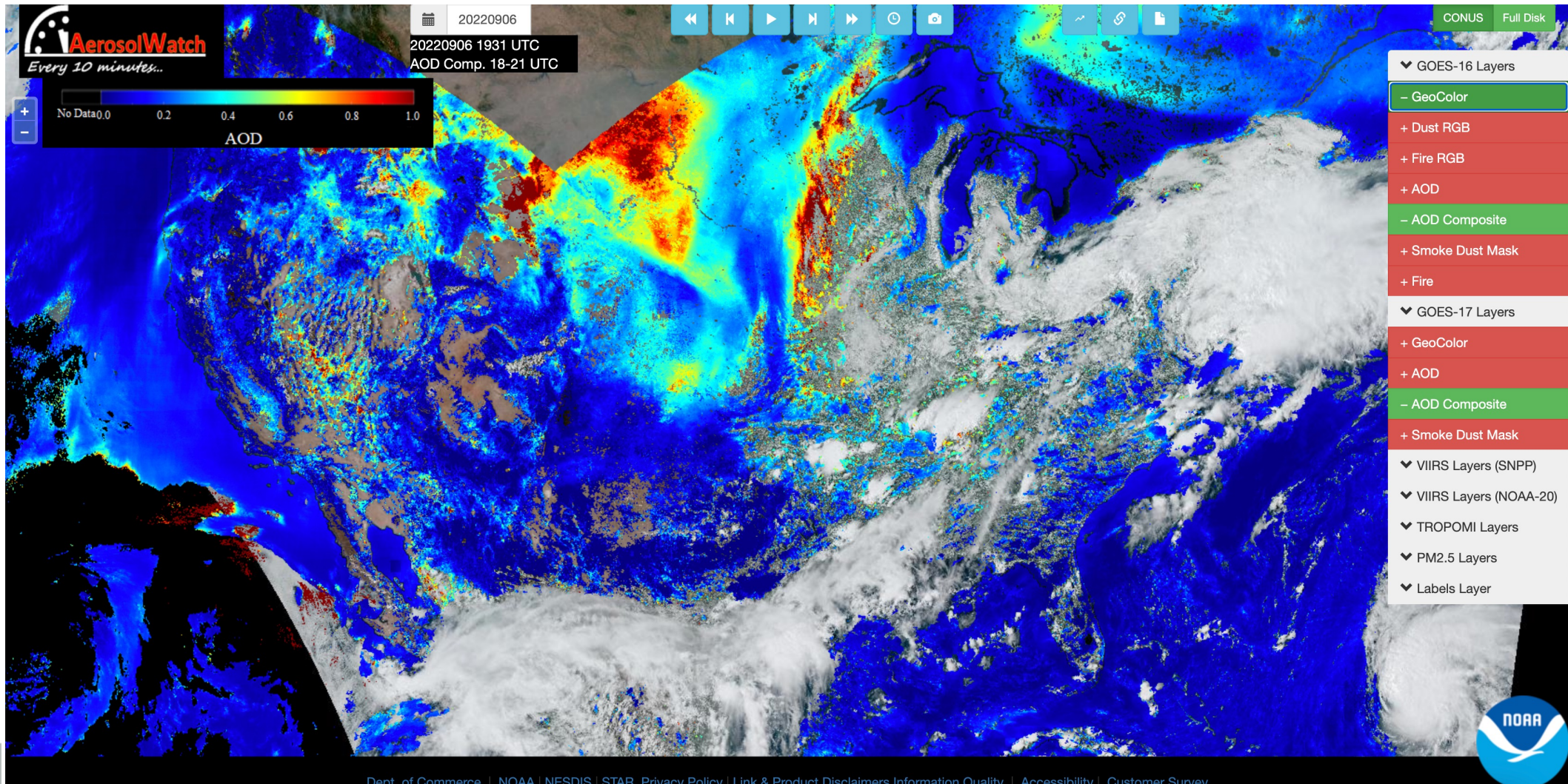


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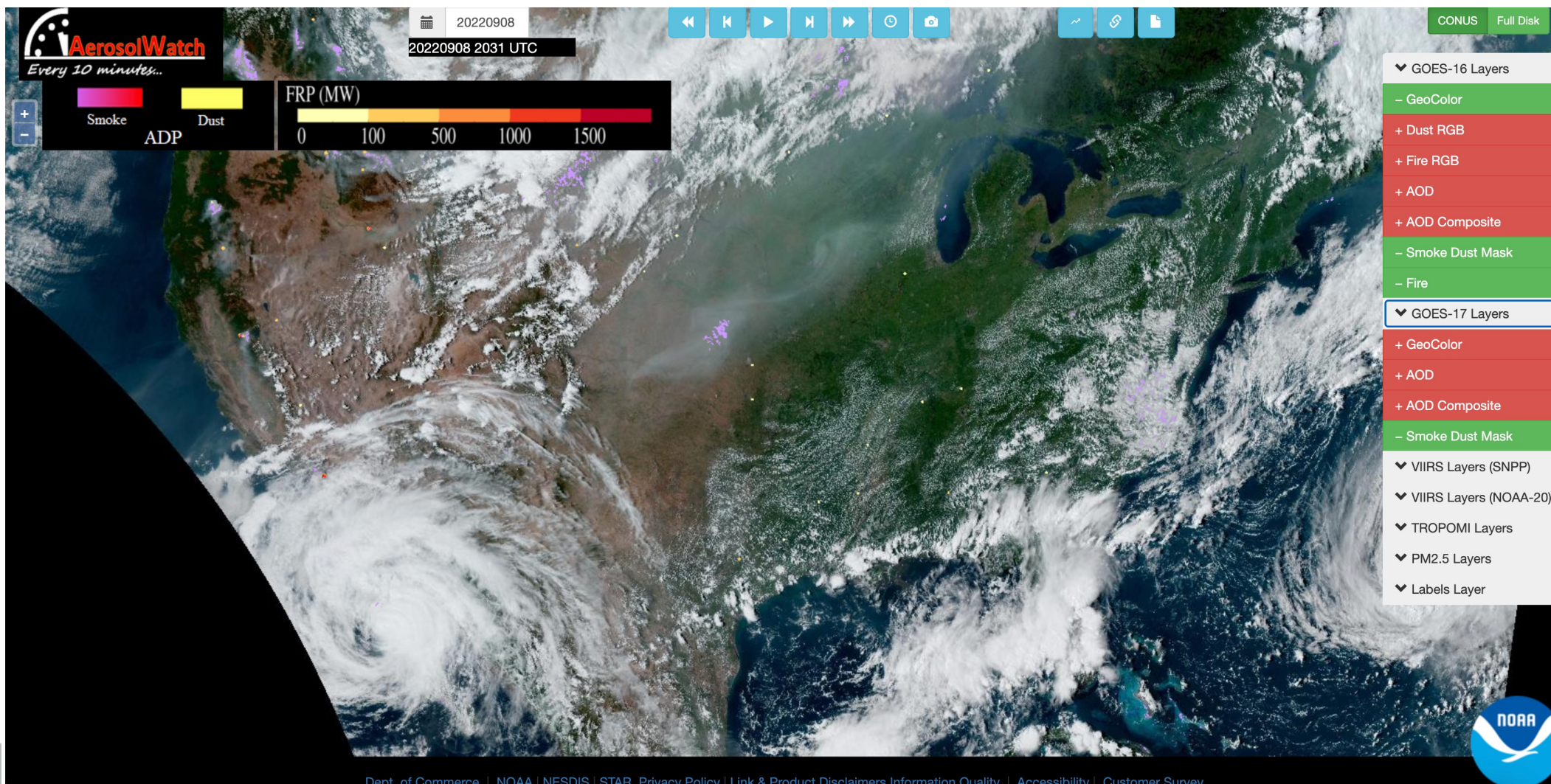
Geostationary AOD & Composite (3-hr-Average) AOD

<https://www.star.nesdis.noaa.gov/smcd/spb/aq/AerosolWatch/>



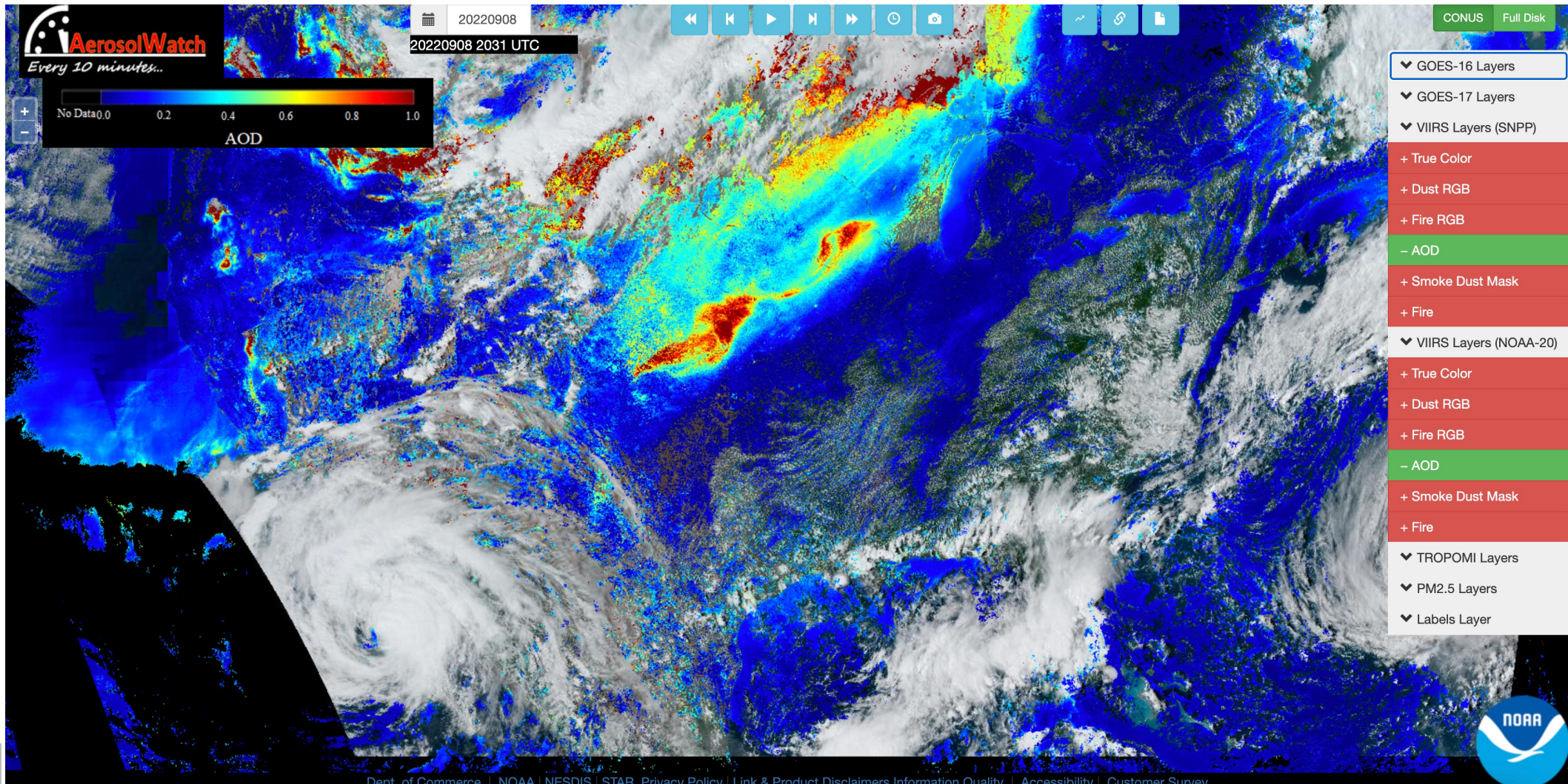
Fires, Smoke & Dust Mask

<https://www.star.nesdis.noaa.gov/smcd/spb/aq/AerosolWatch/>



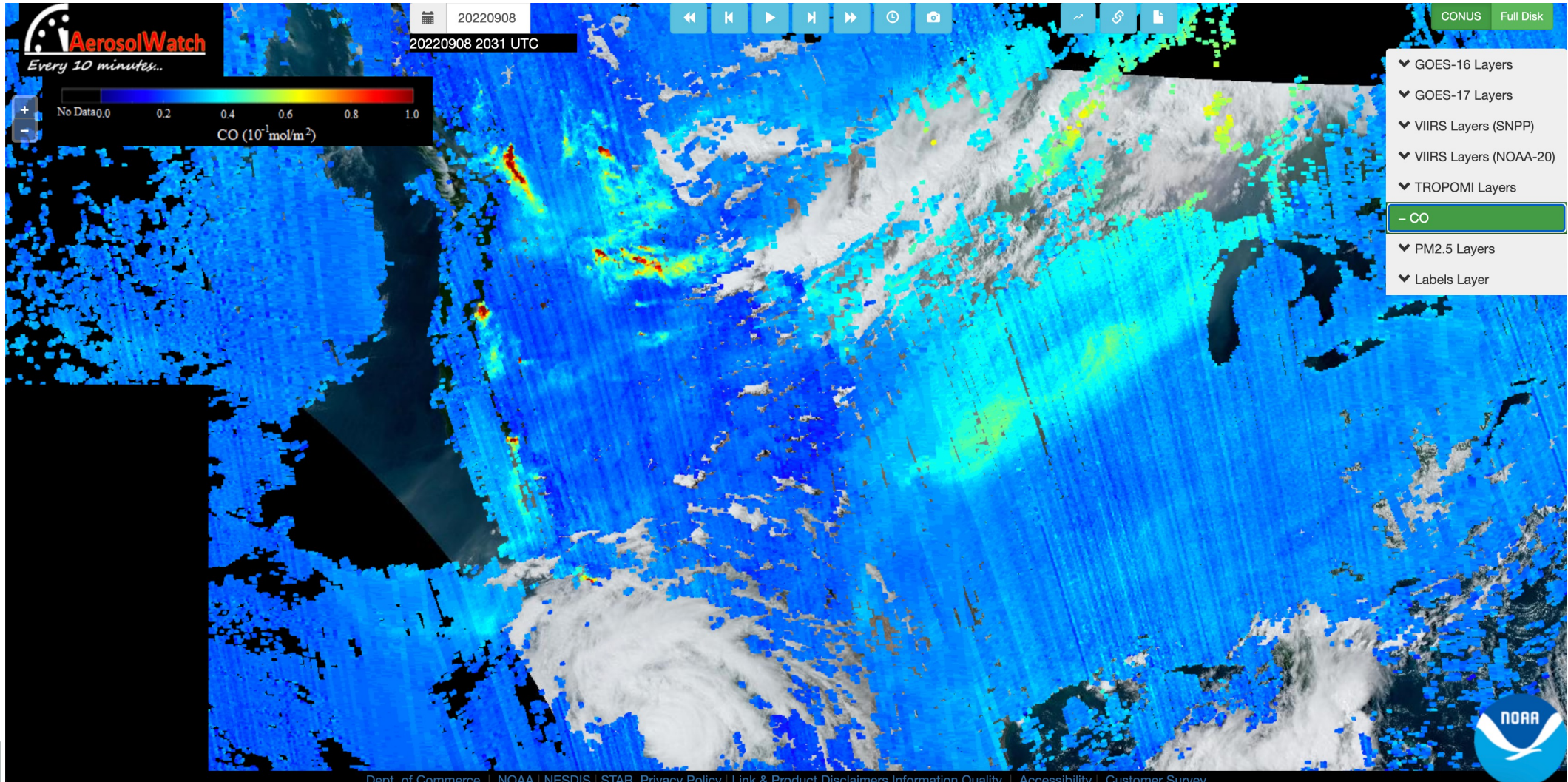
VIIRS Polar Orbit AOD

<https://www.star.nesdis.noaa.gov/smcd/spb/aq/AerosolWatch/>



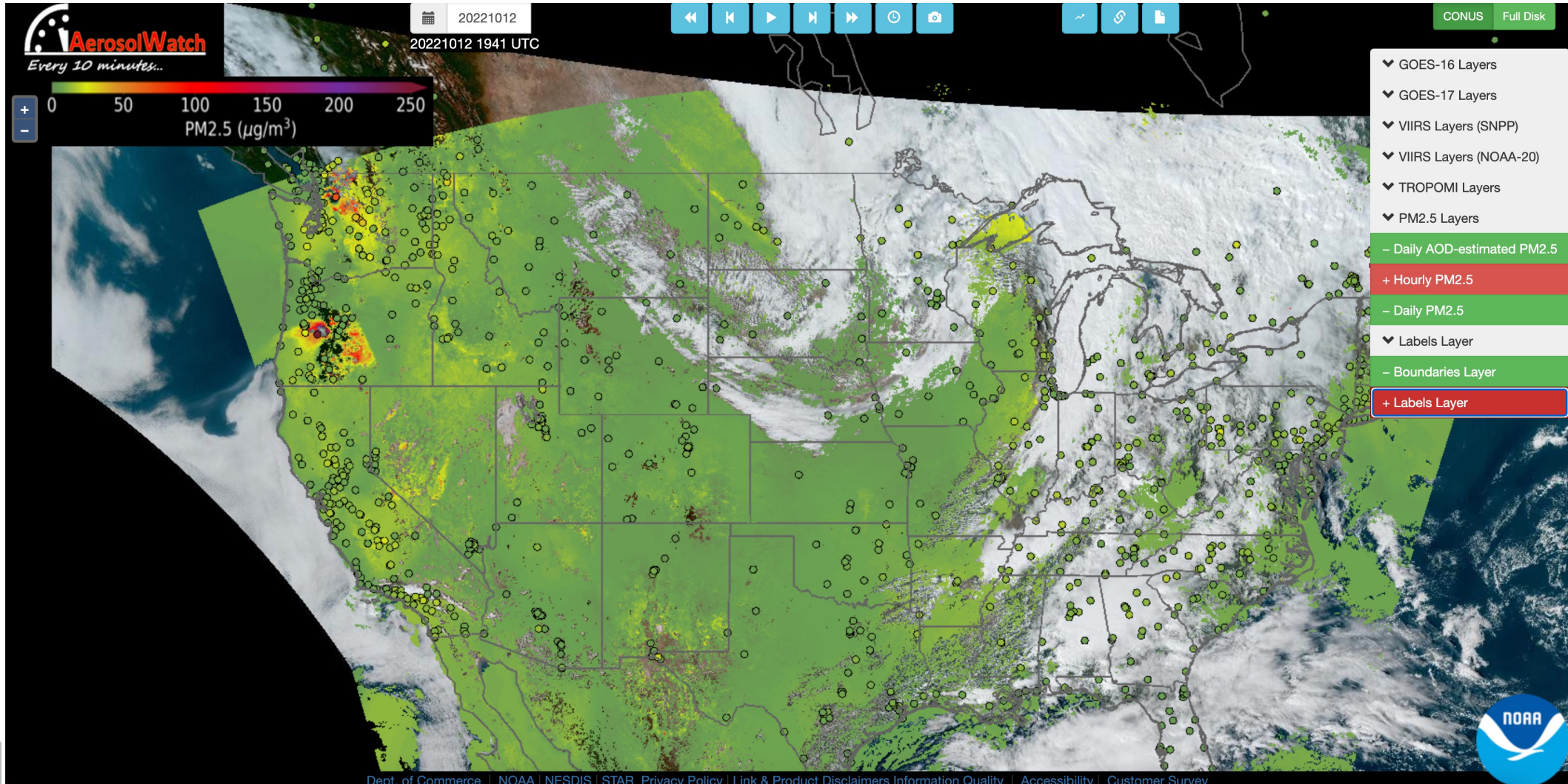
TROPOMI CO

<https://www.star.nesdis.noaa.gov/smcd/spb/aq/AerosolWatch/>



Surface PM_{2.5} (Including Estimate from AOD)

<https://www.star.nesdis.noaa.gov/smcd/spb/aq/AerosolWatch/>



Additional Resources

RAMMB-CIRA Satellite Library - <https://satlib.cira.colostate.edu/>

The screenshot displays the RAMMB-CIRA Satellite Library interface. On the left is a blue navigation sidebar with icons and text for 'Menu', 'Home', 'Events', 'Archive', 'Daily', and 'info'. The main content area features a satellite image of Chile with a red and white overlay indicating wildfire activity. A text box on the left of the image reads: **Chile Wildfires**
Hundreds wildfires have erupted in Chile amid a scorching heatwave. The top of the page includes the RAMMB logo, the title 'RAMMB-CIRA Satellite Library', and the CIRA logo with the tagline 'Connecting Models and Observations'. A play button icon is visible in the top right corner of the image area.



Additional Resources

RAMMB-CIRA Slider - <https://rammb-slider.cira.colostate.edu/>

The screenshot displays the RAMMB-CIRA Slider interface. The main window shows a satellite view of Earth centered on the Americas. The left sidebar contains the following controls:

- 2023-02-10 16:50:20 UTC** (Timestamp)
- Play (space) button
- Buttons: (L)oop, (R)ock, Re(v)
- Speed (↑/↓) slider
- Zoom (+), Zoom (-), Max (Z)oom buttons
- Temperature: 0° with Slid(e)r
- (S)atellite: GOES-16 (East,...
- Se(c)tor: Full Disk
- (P)roduct: GeoColor (CIRA)
- Add (O)verlay: Add (O)verlay
- # of (I)mages: 12
- (T)ime Step: 10 min
- GeoColor (CIRA) panel with Hide and Info buttons
- Add (M)ap and Lat/Lon(n) buttons
- Default Borders panel with White color and Hide button
- (A)rchived Imagery checkbox
- (B)egin D... B... Begin Ti... and End Date... E... End Tim... dropdowns
- Home (y), Share (U)RL, Help (?) buttons
- (Q)uery Lat/Lon and (D)ownload buttons
- Mouse Dra(w) and Clear Drawin(g)s buttons

The bottom of the interface shows the timestamp **2023-02-10 16:50:20 UTC** and logos for CIRA (Connecting Models and Observations) and RAMMB (Remote Sensing and Modeling Branch).



Additional Resources

JAXA Himawari Monitor - <https://www.eorc.jaxa.jp/ptree/>

JAXA Himawari Monitor
P-Tree System

日本語 Last Update: 10 Feb 2023 17:02:05 UTC

2023 / 2 / 9 03:20~29 UTC Search

-01mon -01day -01hour -10min Latest +10min +01hour +01day +01mon

JAXA Products:

If the product display is slow, change the background map to something other than himawari RGB.

- Sea Surface Temperature
- Sea Surface Temperature (Night Mode)
- Ocean Weather Forecast (SST Model)
- Aerosol Optical Thickness**
- Aerosol Model Product
- Short Wave Radiation
- Chlorophyll-a
- Wild Fire
- Cloud Optical Thickness
- Cloud Type (ISCCP)

Observation Period:

10min. Hourly Daily Monthly

What's New close

Feb./03/23

We have reprocessed the aerosol property and cloud property products during the period, Jan. 4 to 31, 2023. Erroneous files have been replaced with the reprocessed files.

Jan./31/23

Aerosol property and cloud property products have not been generated on

Overlayer Opacity Control

Opacity: [Slider]

Basemap Select

Himawari VNR

Geographic layers

Coast 1:50m Coast 1:10m

Lat/Lon (5deg) River

Other Functions 出典

none

Opacity: [Slider]

Location change

Longitude: 0.63

Latitude: 118.28

Zoom: 3

Move Center

Save Location to Cookie

Clear cookie

Share of display (url)



Additional Resources

NASA Worldview Geostationary Layers - <https://worldview.earthdata.nasa.gov/>

