

# How We Observe the Earth

NASA / NOAA Joint Polar Satellite System  
Common Ground System  
Mission Services

Shawn Cochran

7 October 2017

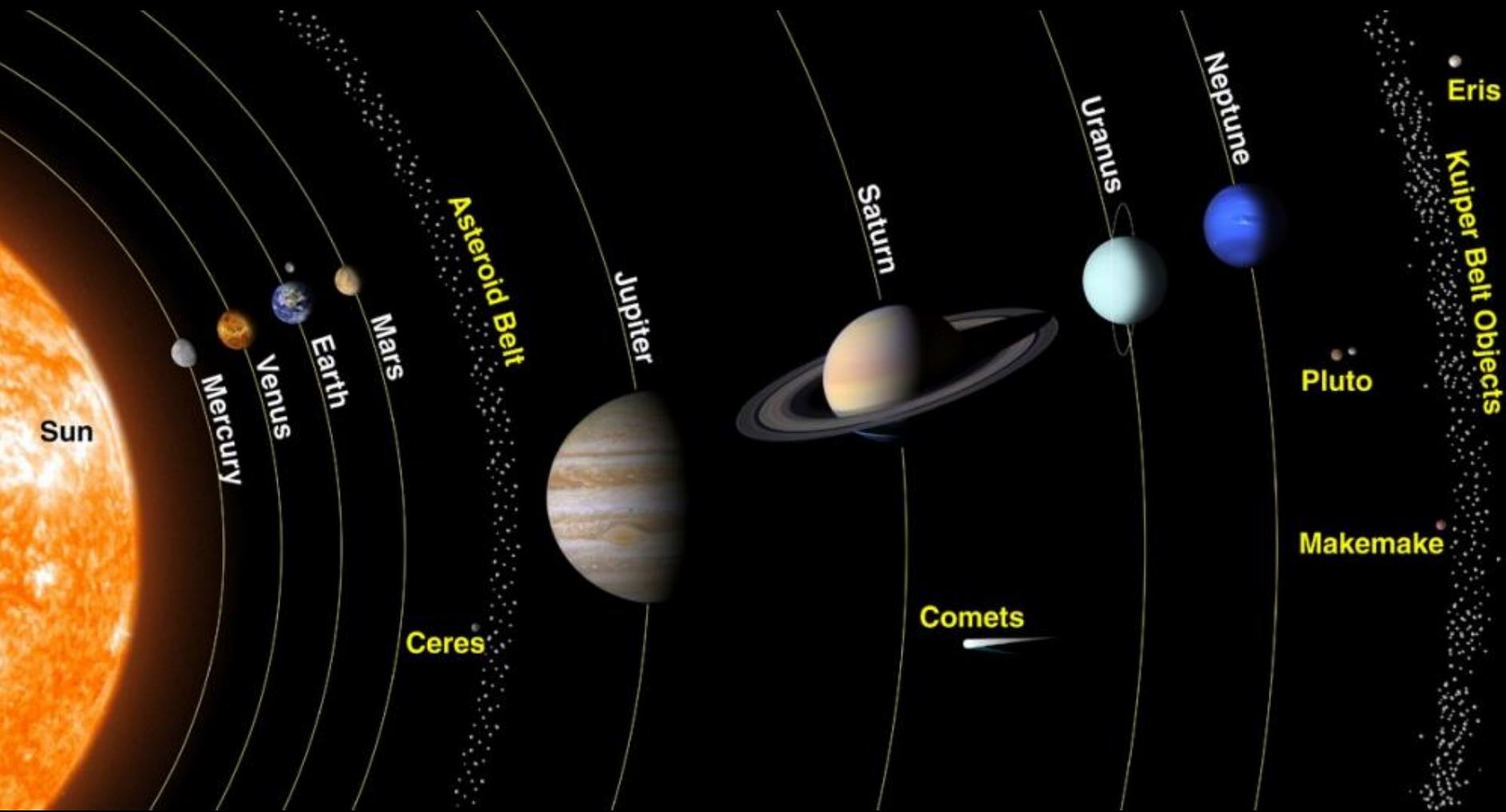




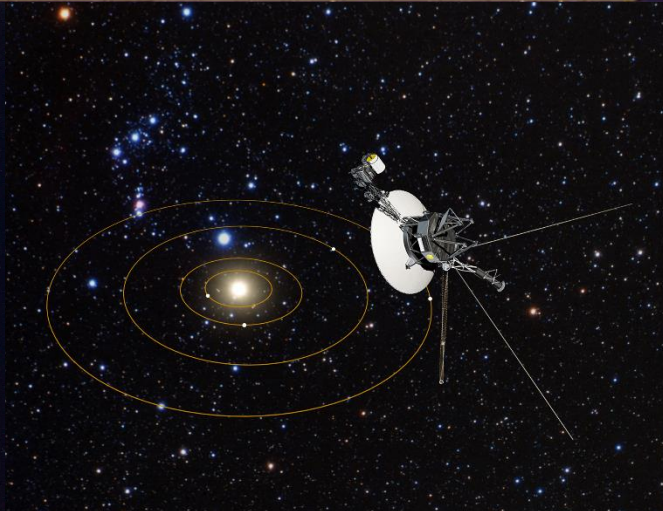
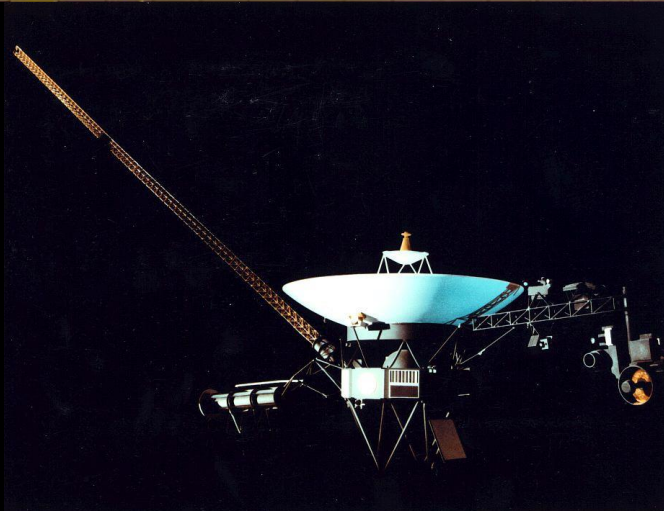
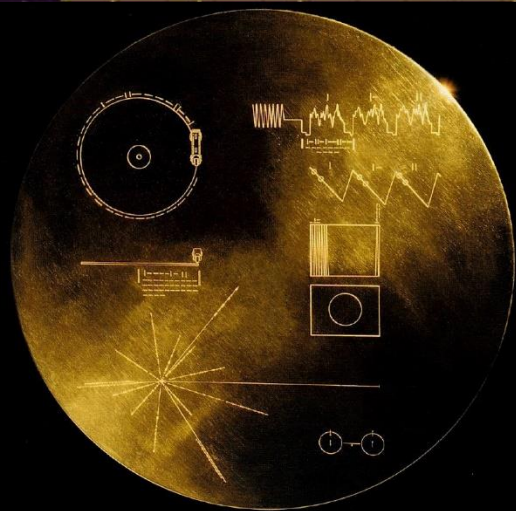
# MILKY WAY GALAXY

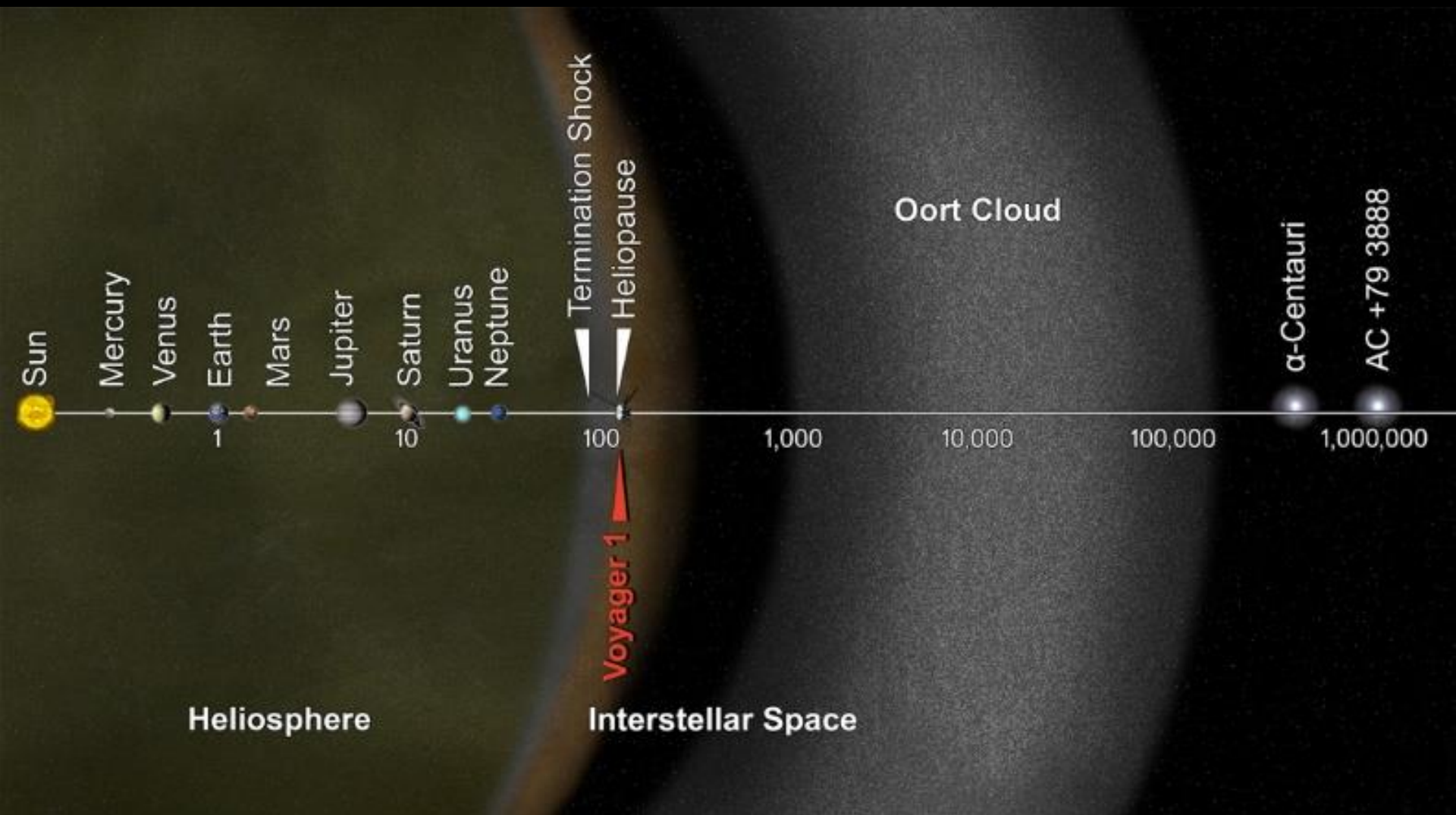
**You are here**







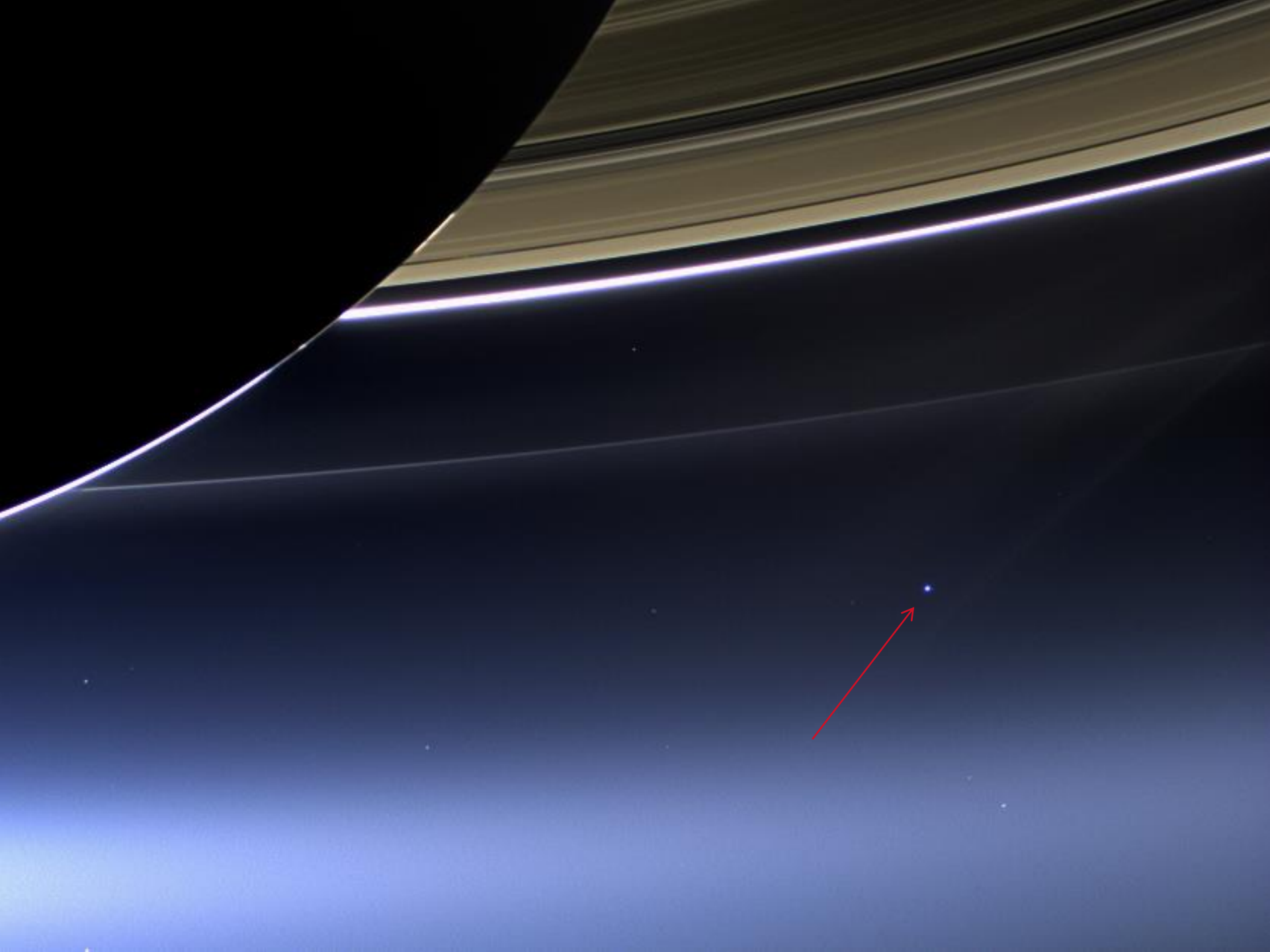




The heliopause is **about 123 astronomical units (AU)**  
or **11 billion miles** from the Sun.







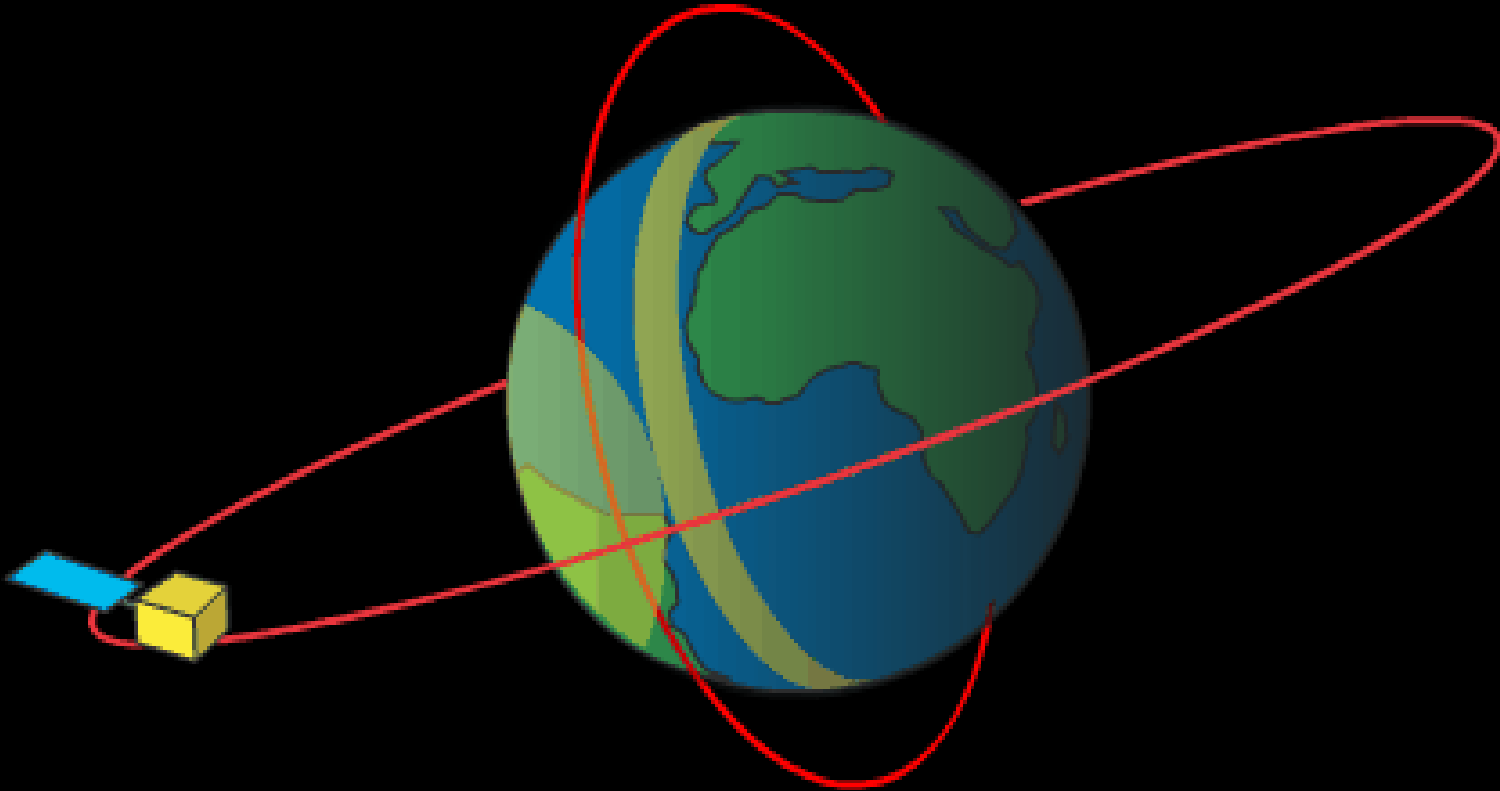




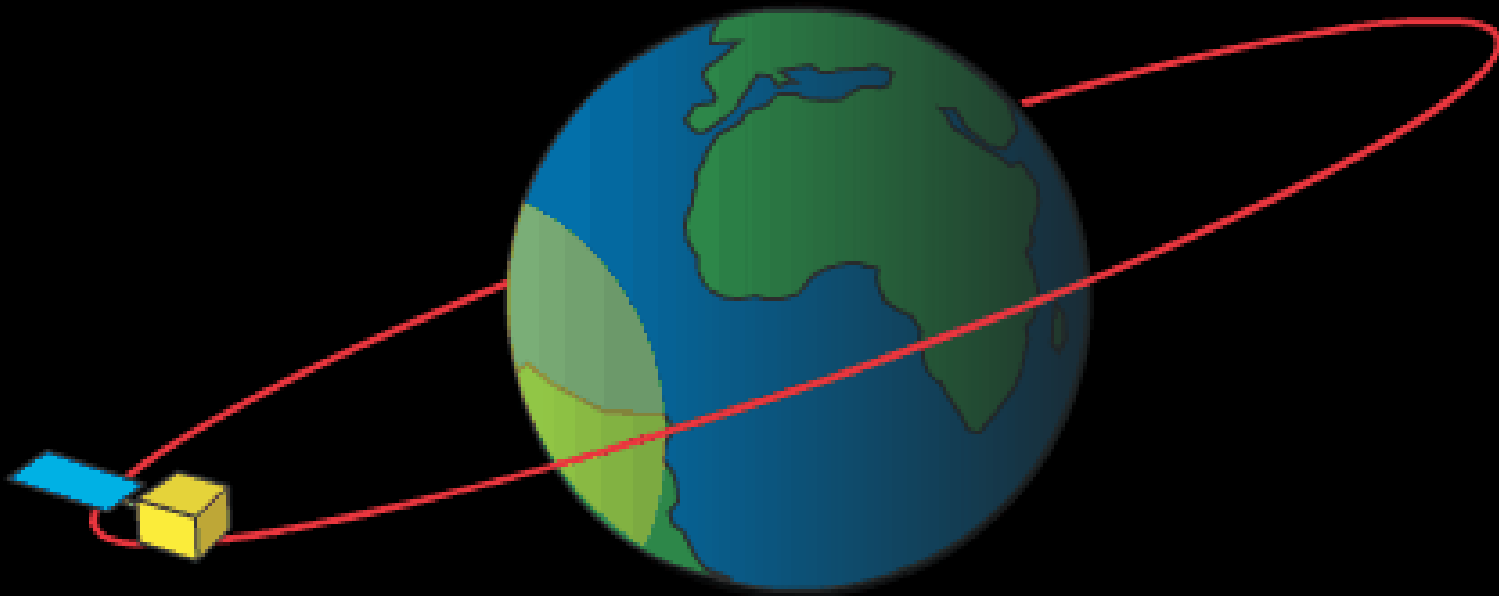




# How do we observe the Earth?

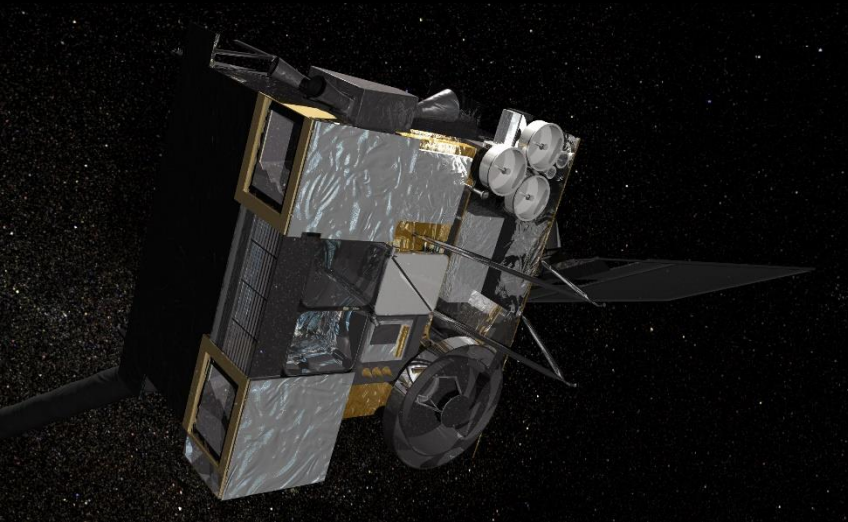


# Geostationary satellite (GEO)



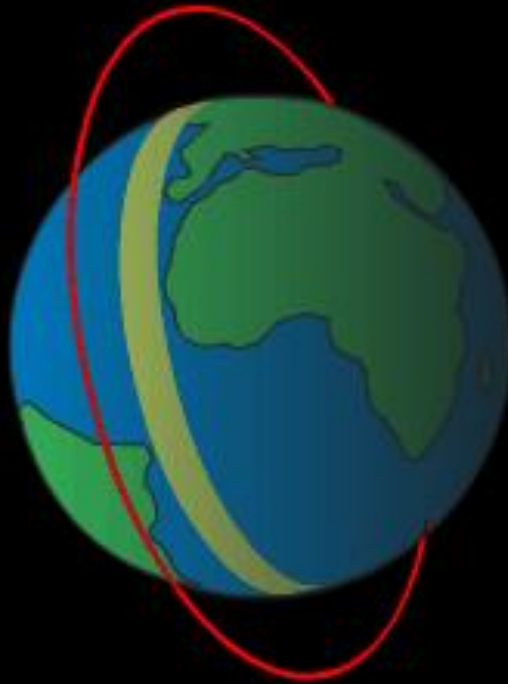


# GOES Weather Satellites... (GOES 15/16)



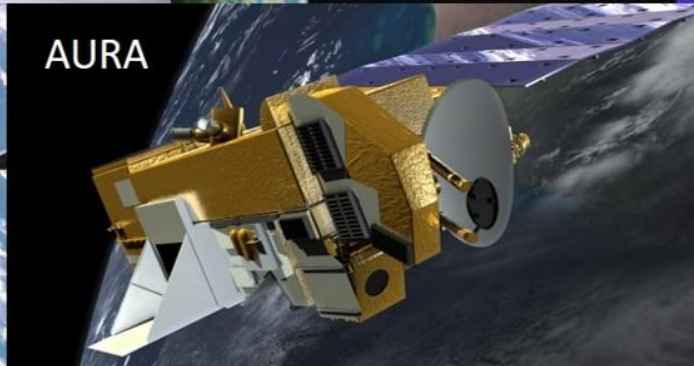
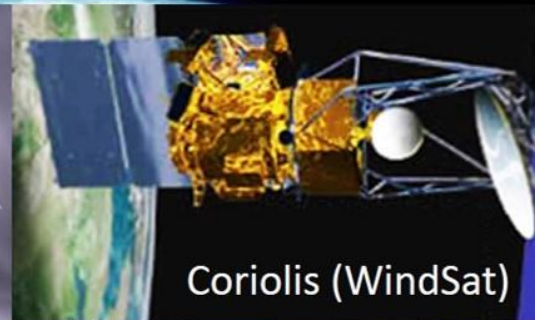
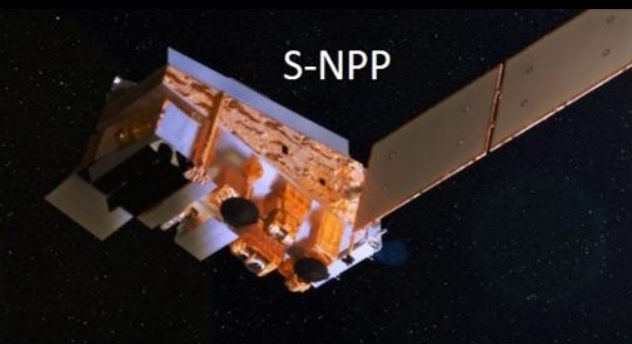
# Polar Orbiting satellite (LEO)

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# Polar Orbiting Weather Satellites



# Why the Joint Polar Satellite System (JPSS)?

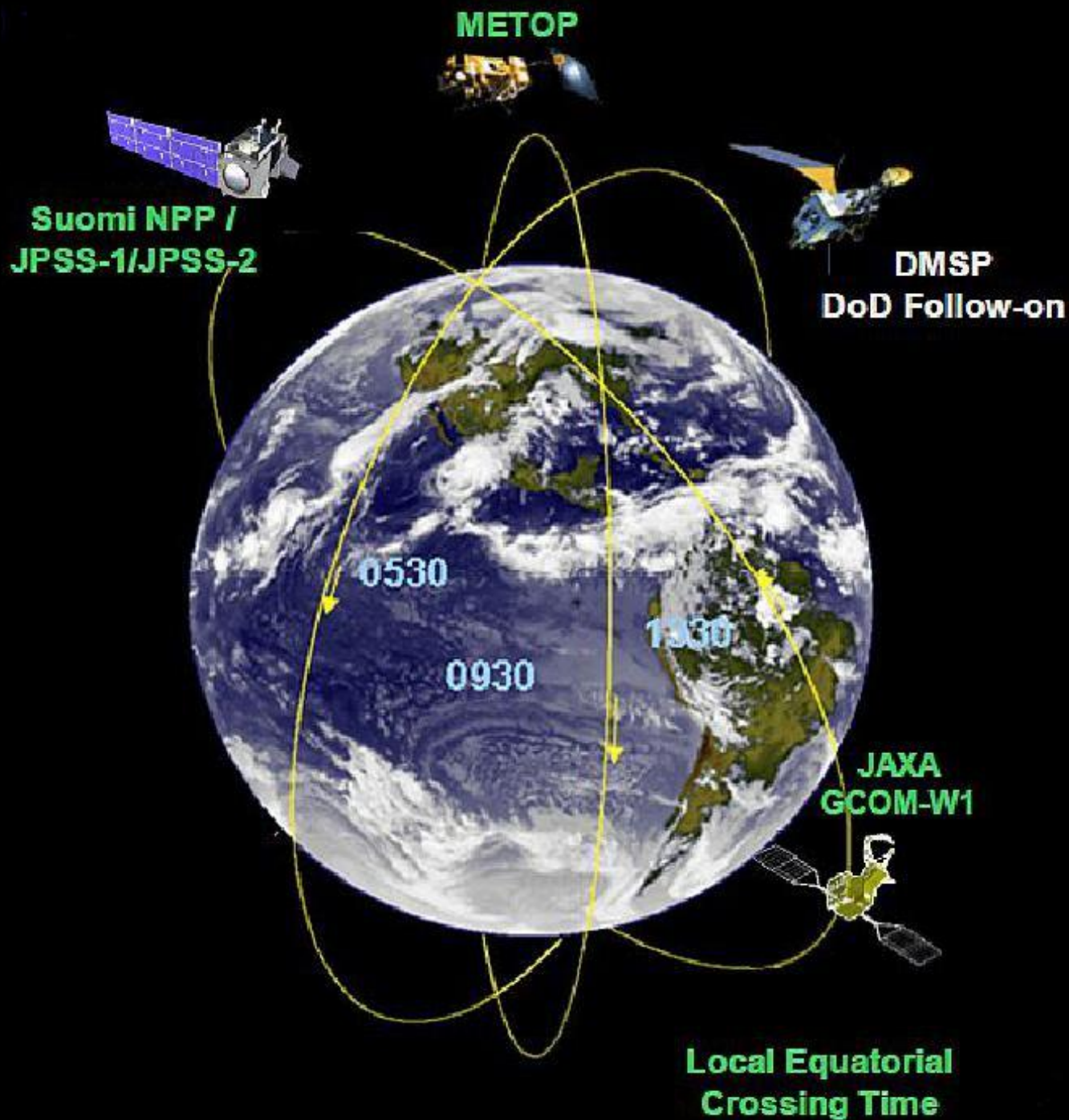
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Information about our planet is vital for the ability to plan, predict, respond and *protect our Nation's lives and property*. JPSS Science is critical to accomplishing this primary goal.

The Joint Polar Satellite System (JPSS) Science Goals include:

- Producing and delivering new satellite data, imagery and products to *increase the accuracy and reliability of weather forecasting* capabilities for severe weather events and phenomena—such as *tropical cyclones— i.e., Hurricanes*;
- Improving our Earth's *ocean and coastal applications*' use of polar-orbiting satellite data;
- Continuing the enhancement of our long-term *environmental data* sets to facilitate long-term climate monitoring and prediction; and
- Developing our *land applications*



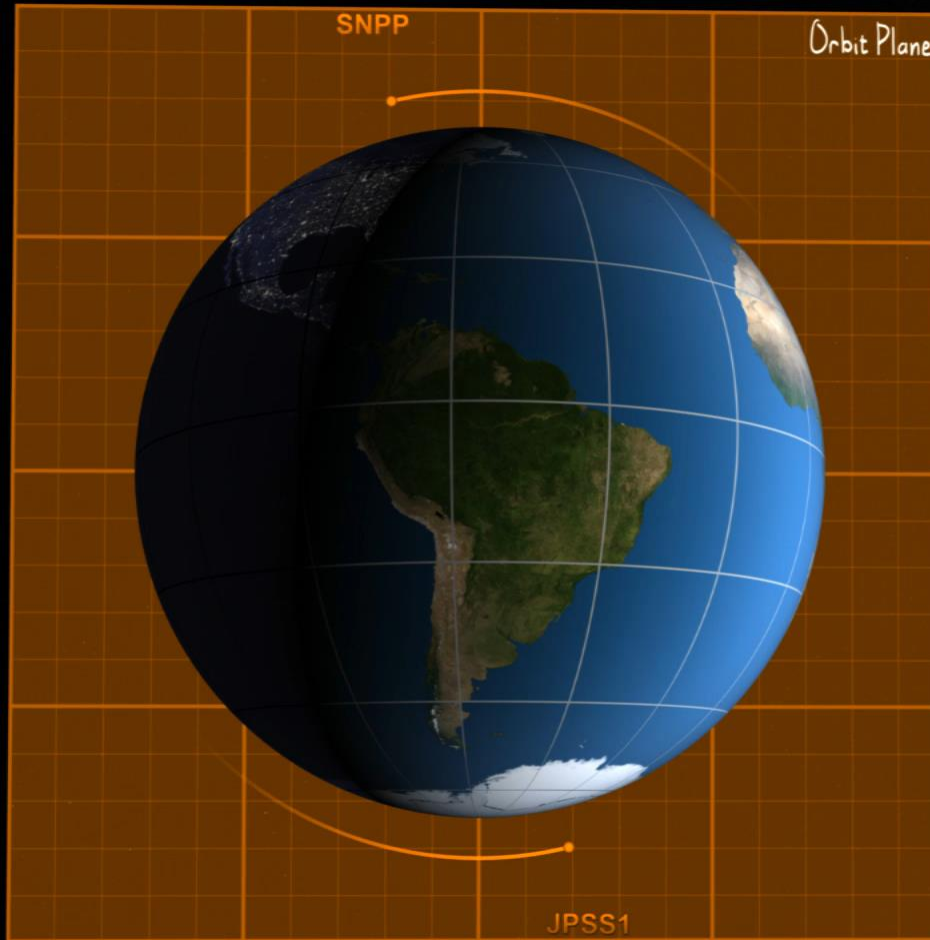


**LTAN =  
local time  
ascending  
node**

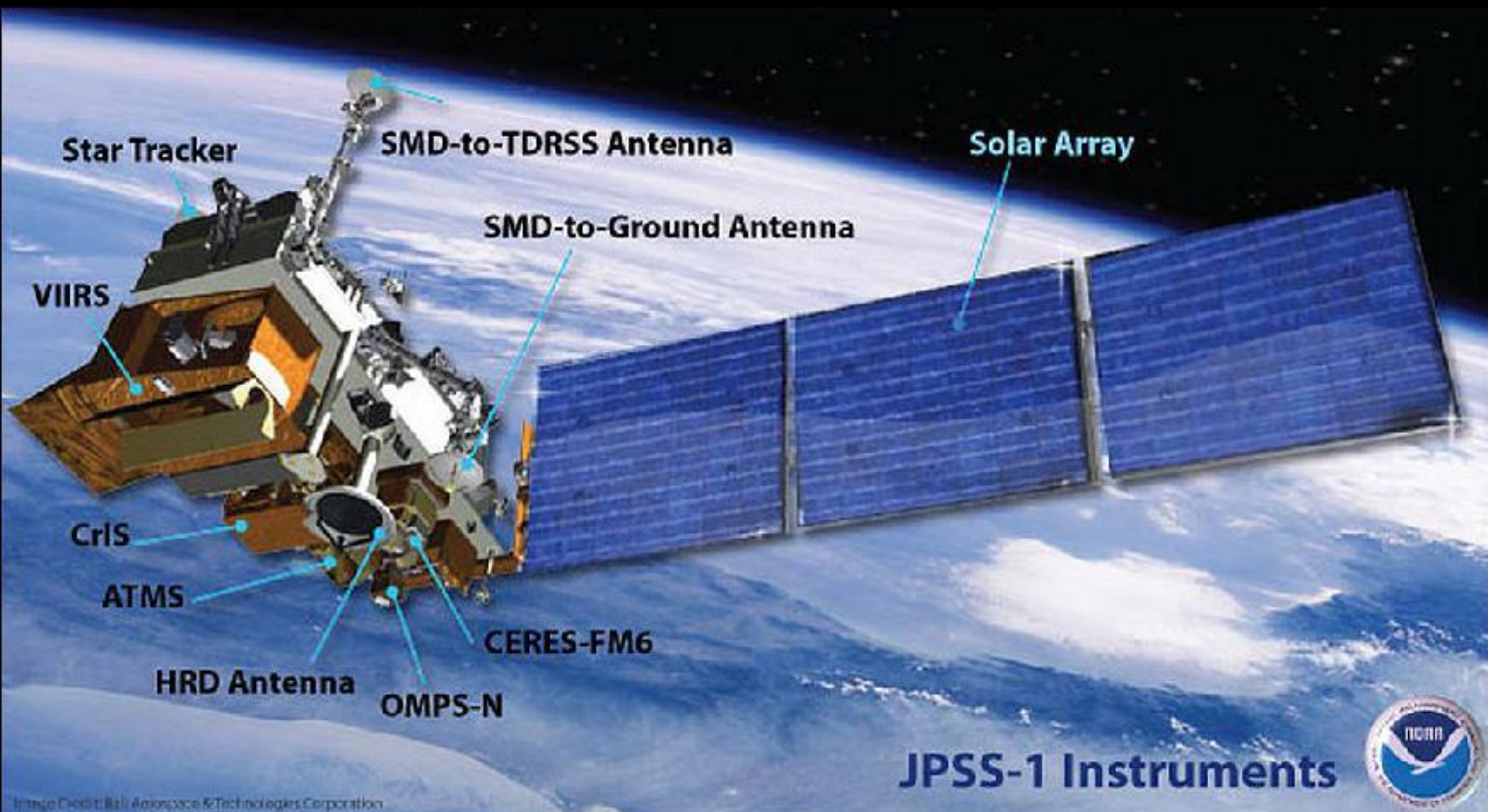
# Polar orbiting constellation



# S-NPP and JPSS-1



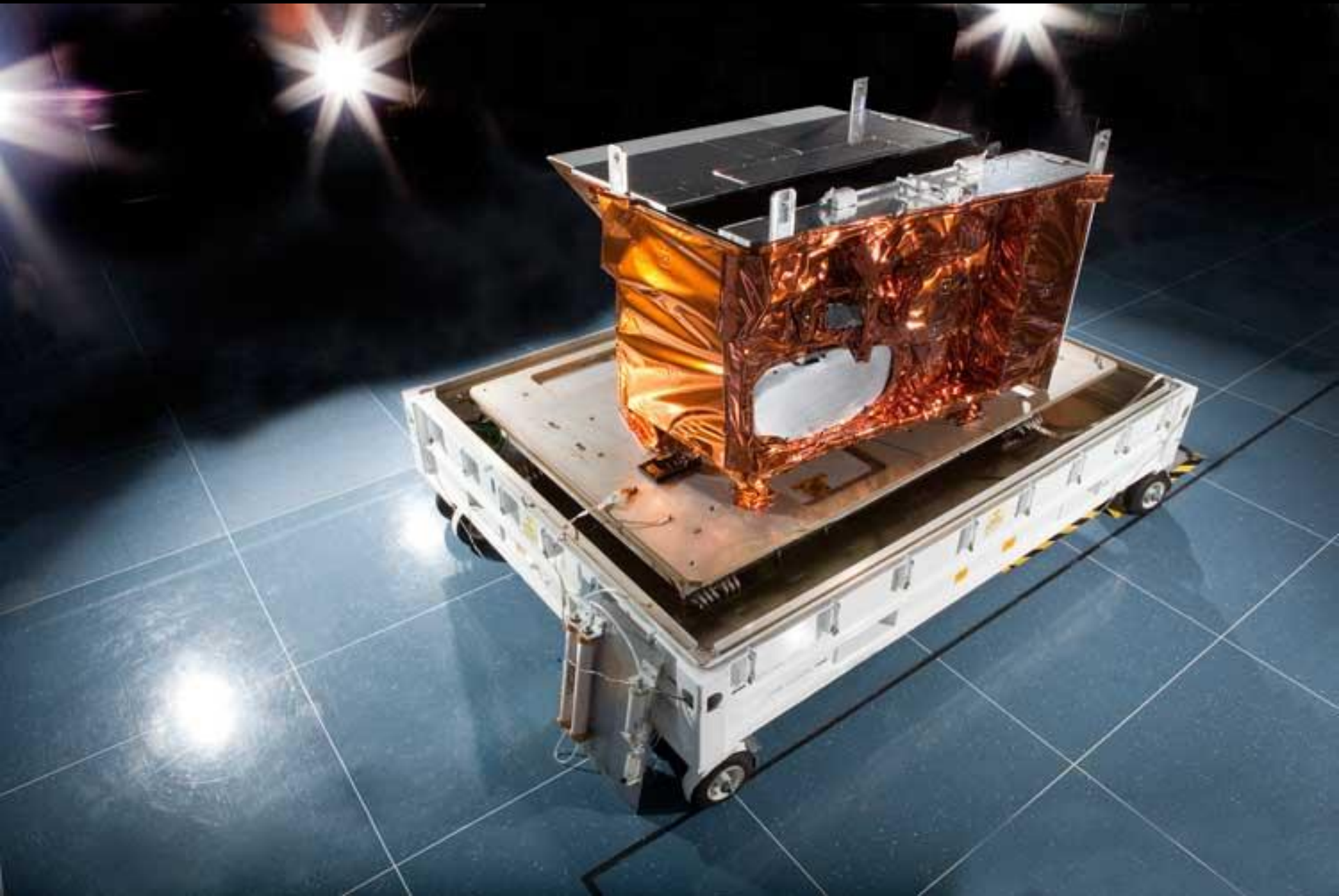




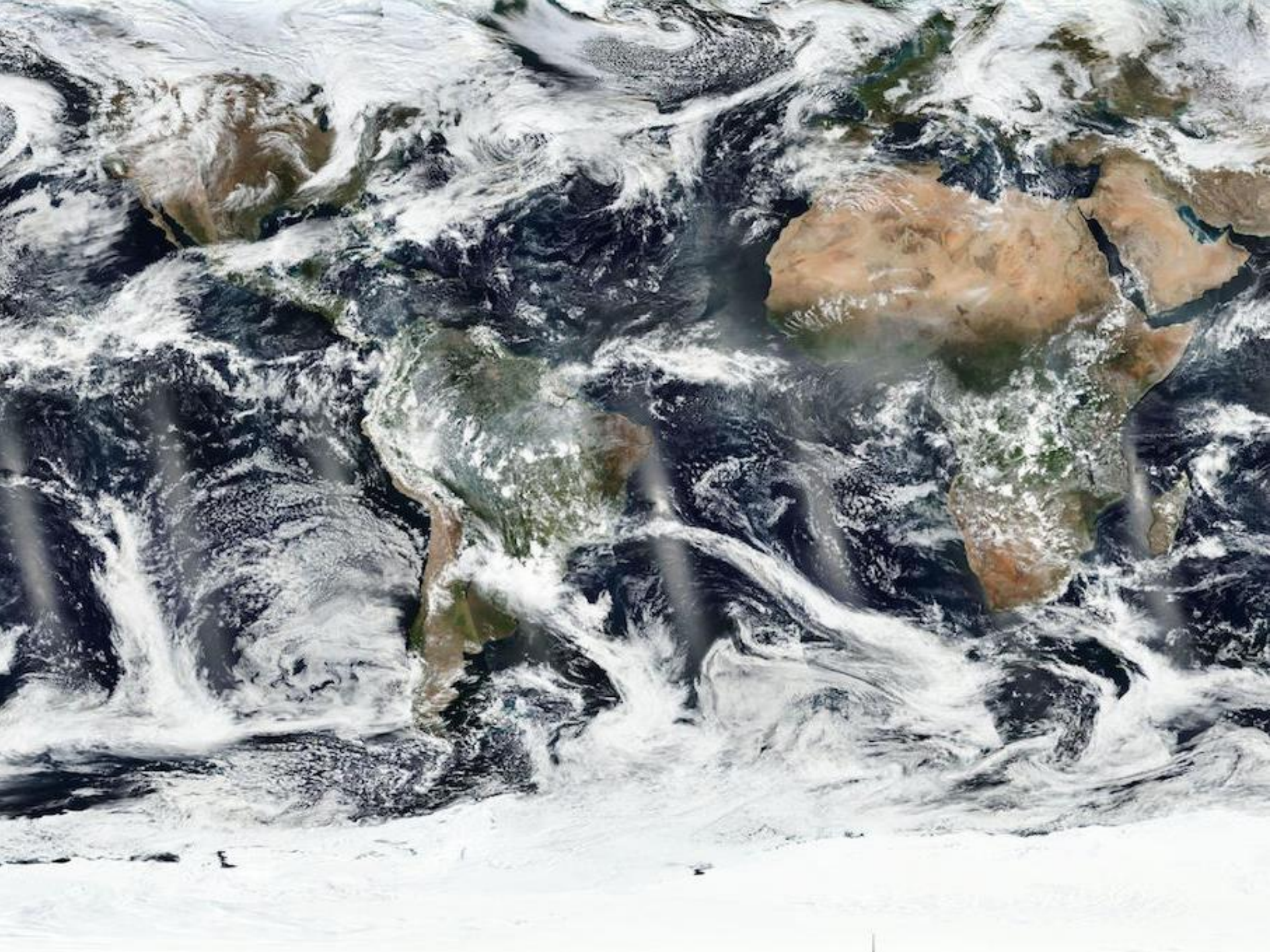
## JPSS-1 Instruments



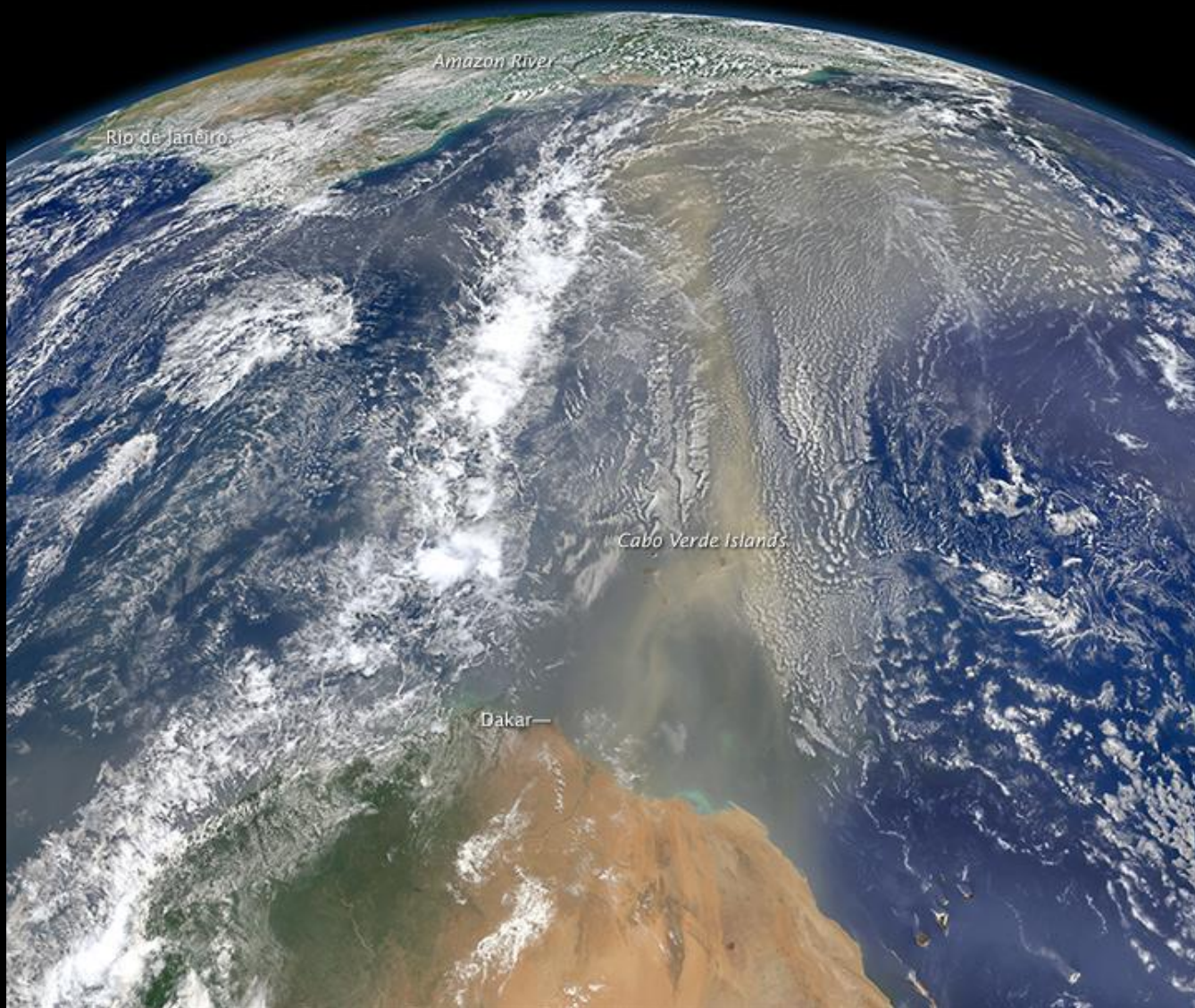
# Visible Infrared Imaging Radiometer Suite (VIIRS)







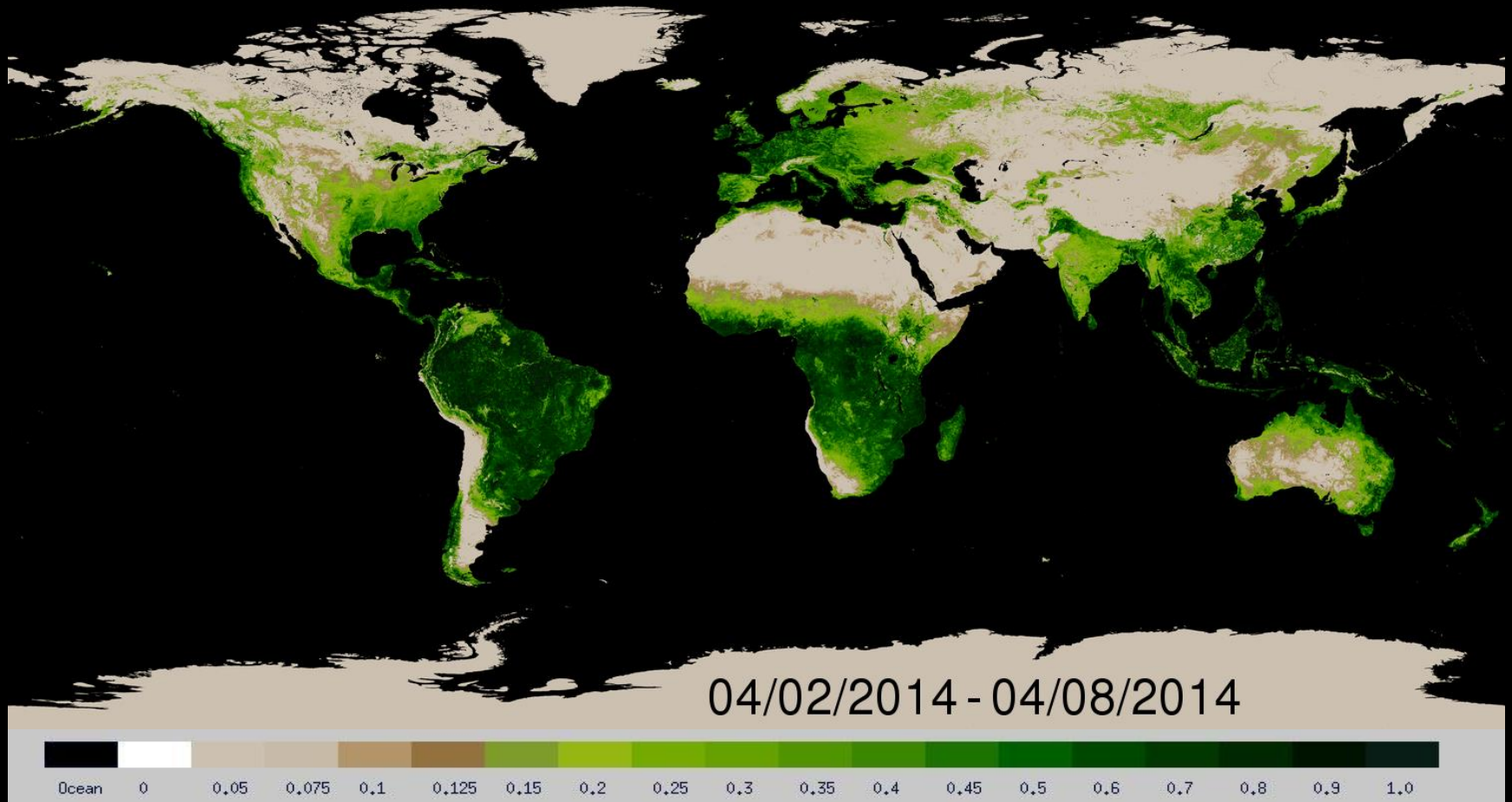




**On June 23 2014, a lengthy river of dust from western Africa began to push across the Atlantic Ocean on easterly winds. A week later, the influx of dust was affecting air quality as far away as the southeastern United States. This composite image, made with data from the Visible Infrared Imaging Radiometer Suite (VIIRS) on Suomi NPP, shows dust heading west toward South America and the Gulf of Mexico on June 25, 2014**

# Green Vegetation Fraction

Weekly GVF from Apr 8 2014 to Oct 28 2014





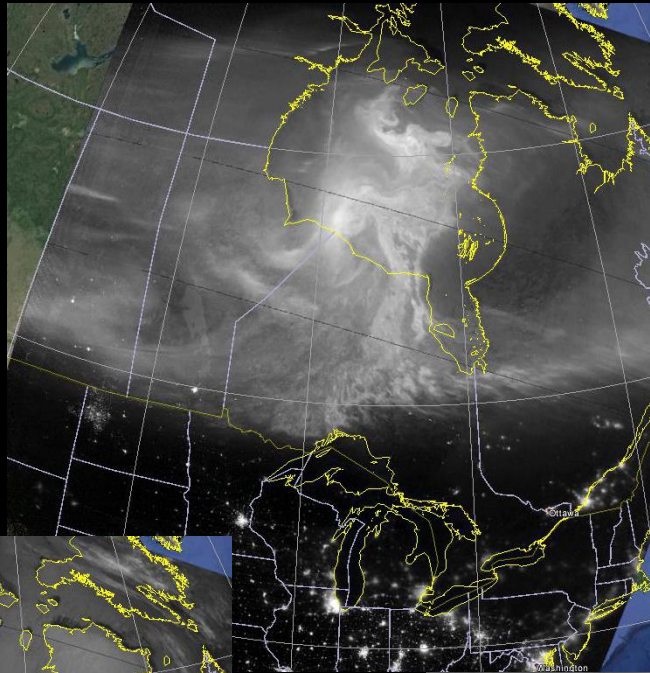




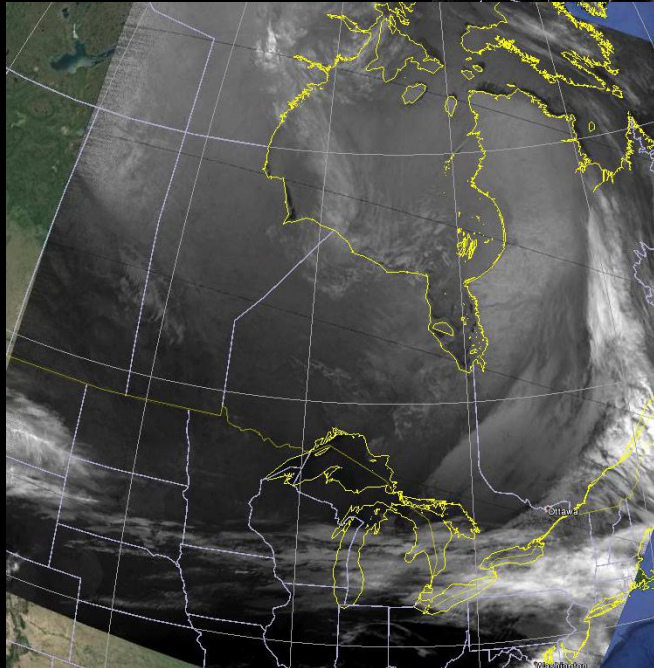
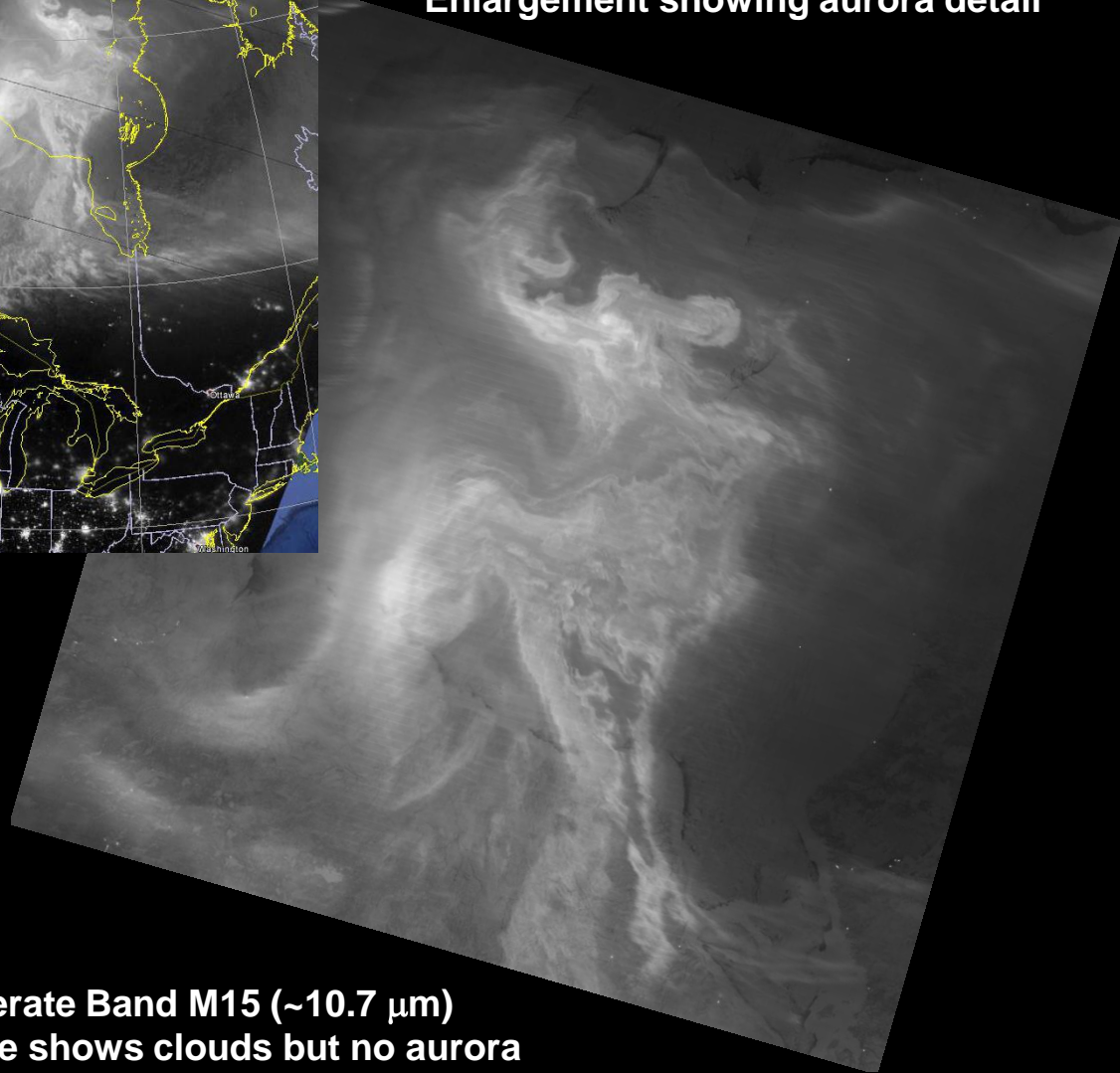
# Aurora imaged by S-NPP during Geomagnetic Storm

## 17 March 2015 ~0800 GMT

**Day-Night Band M15 (0.5 – 0.9  $\mu\text{m}$ ) Image shows portion of auroral oval**

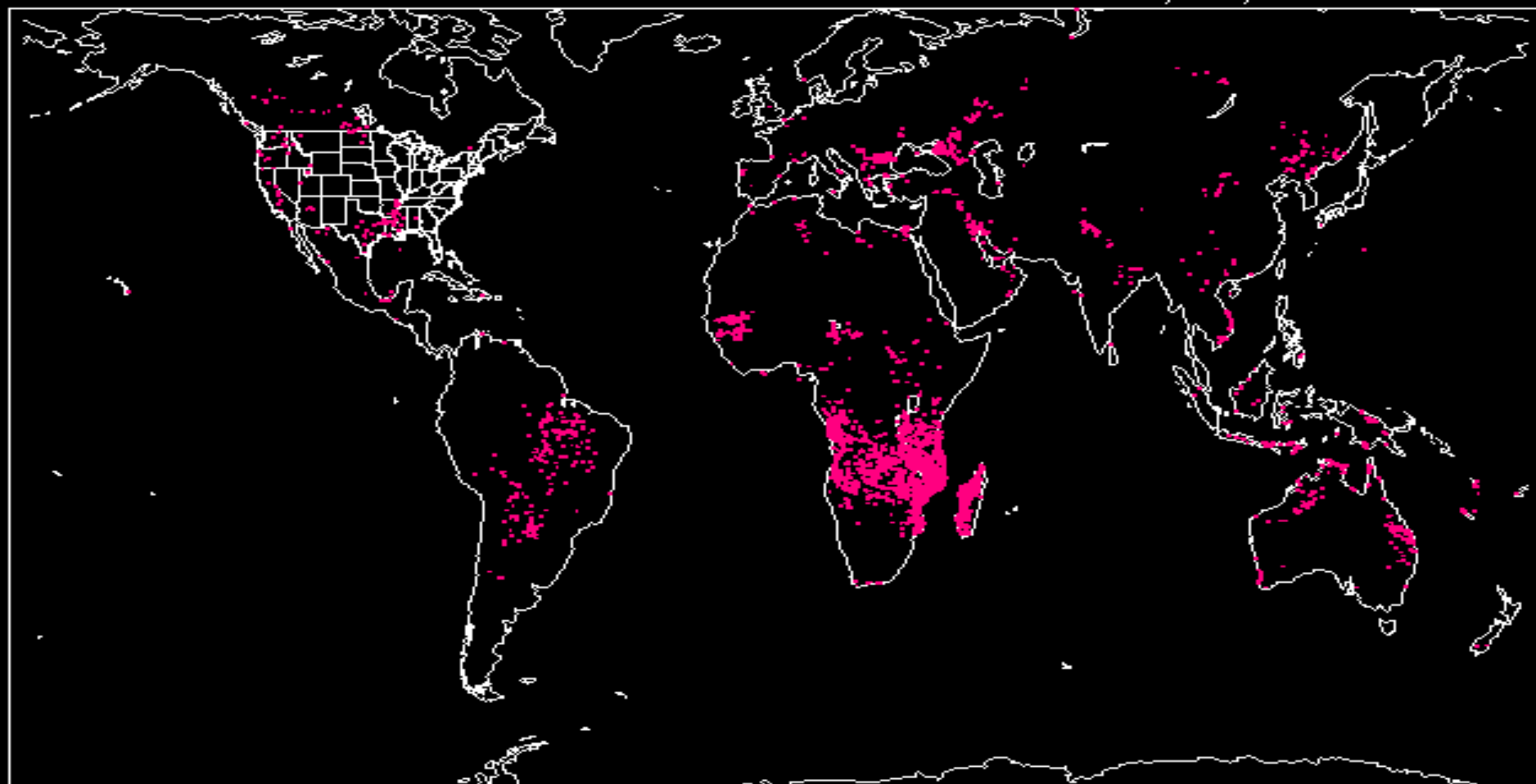


**Day-Night Band M15 (0.5 – 0.9  $\mu\text{m}$ ) Image Enlargement showing aurora detail**



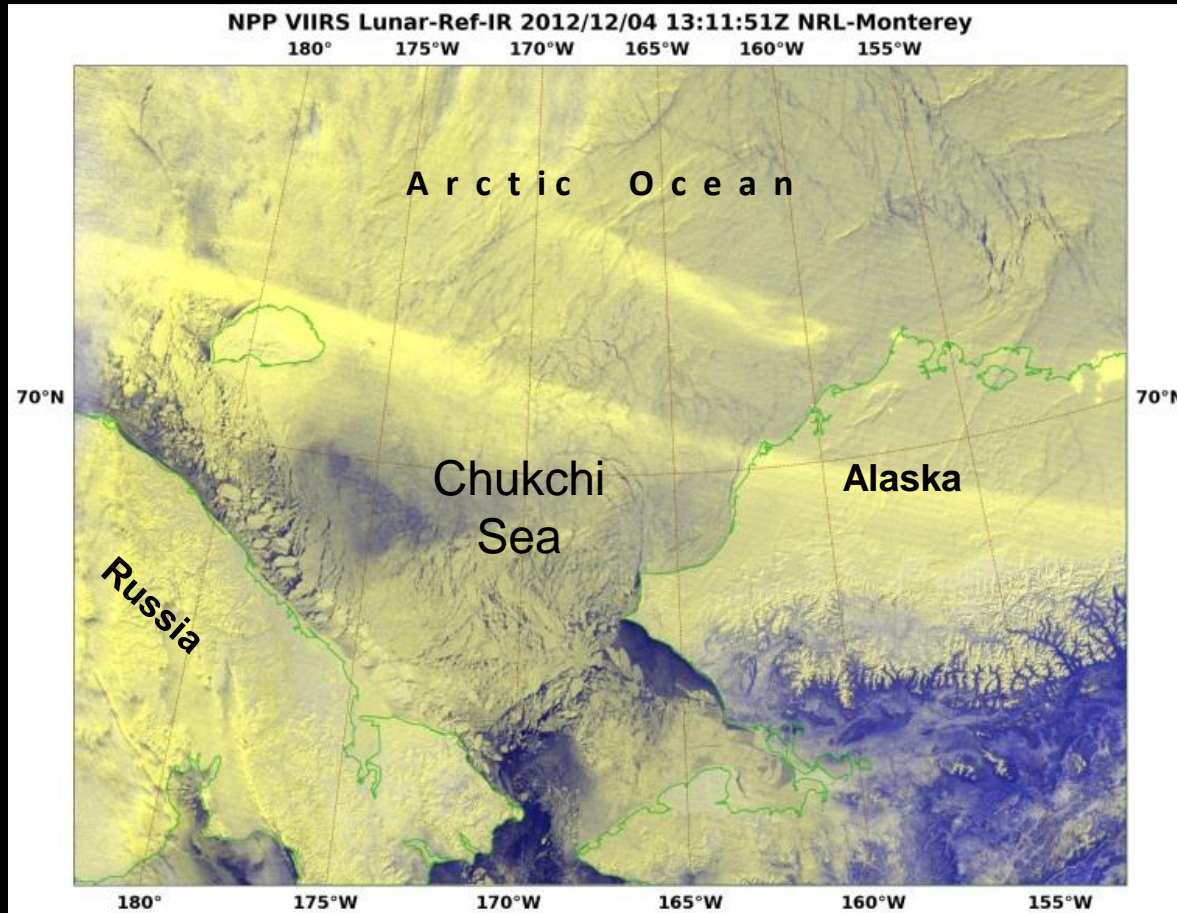
**Moderate Band M15 (~10.7  $\mu\text{m}$ ) Image shows clouds but no aurora**

VIIRS M-Band Fire Positions Received 24 Hrs Before 10/05/2017 1621 Z



# Nighttime Sea Ice Monitoring

11/27 – 12/04, Lunar cycle  $> 3/4$

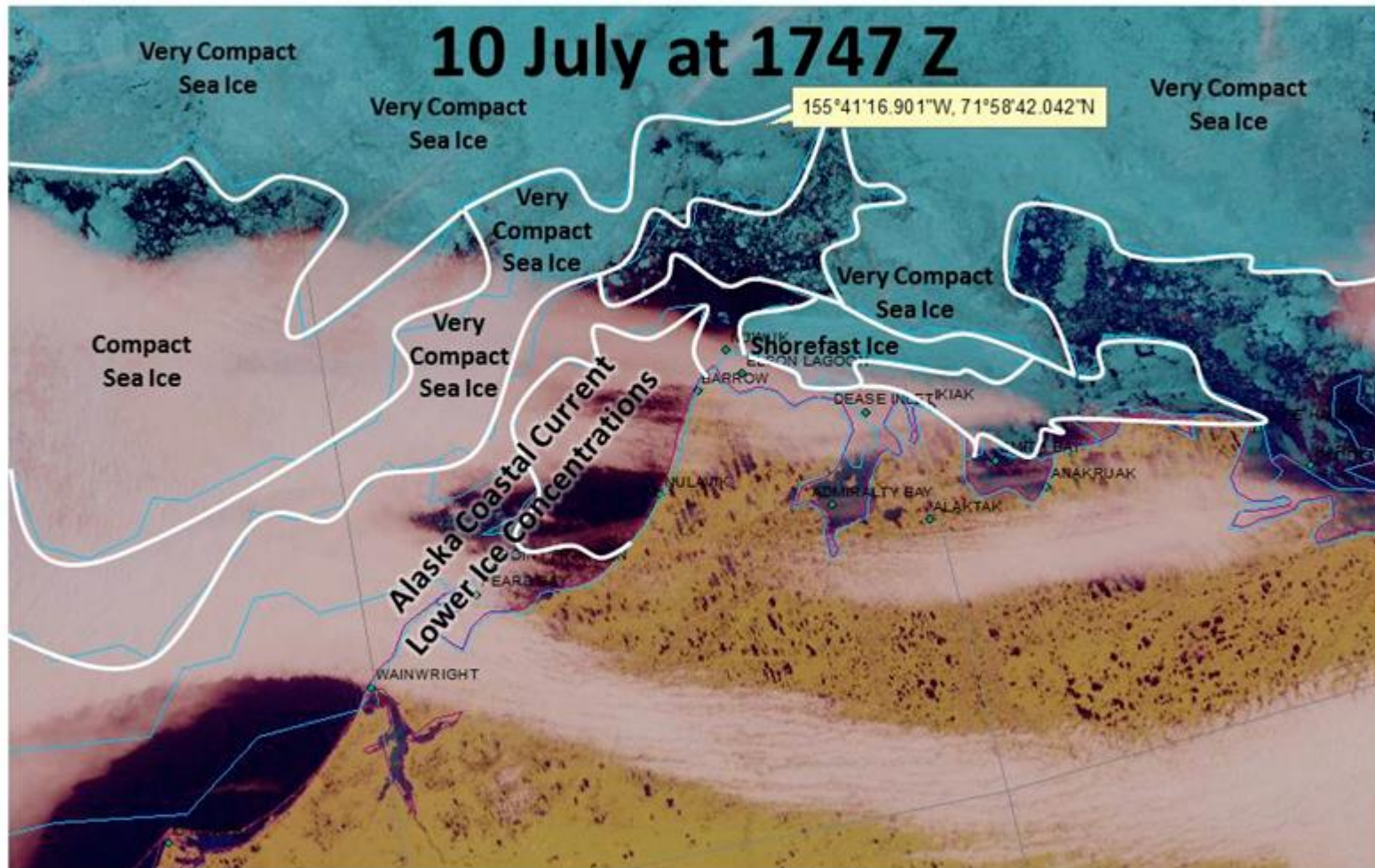


DNB (low light visible) - Nighttime during Full Moon



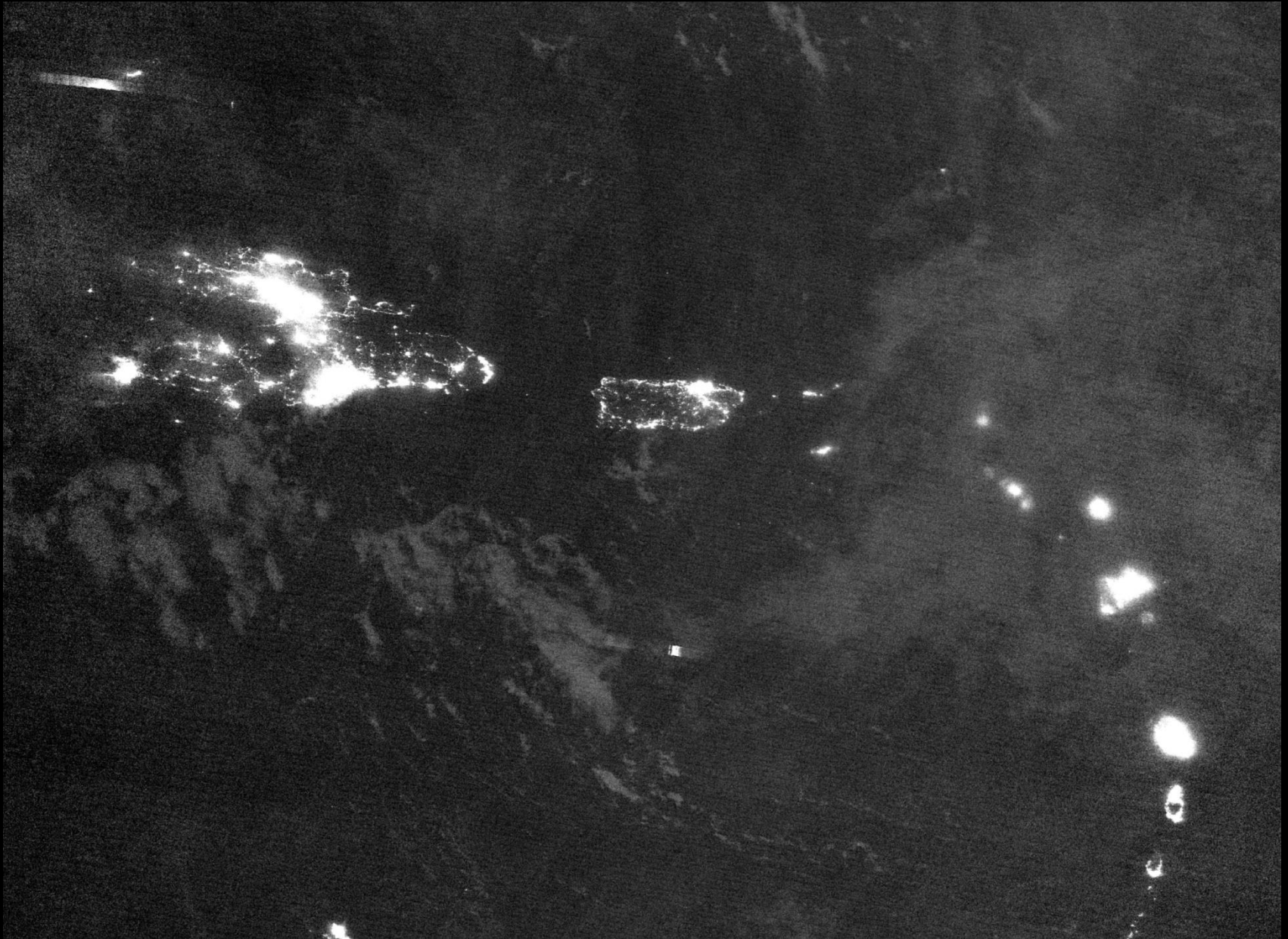
# Rescue of Sailboat in Bering Sea

## Suomi NPP False Color Satellite Image



Used by AK Ice Desk to help Coast Guard respond to mayday call received

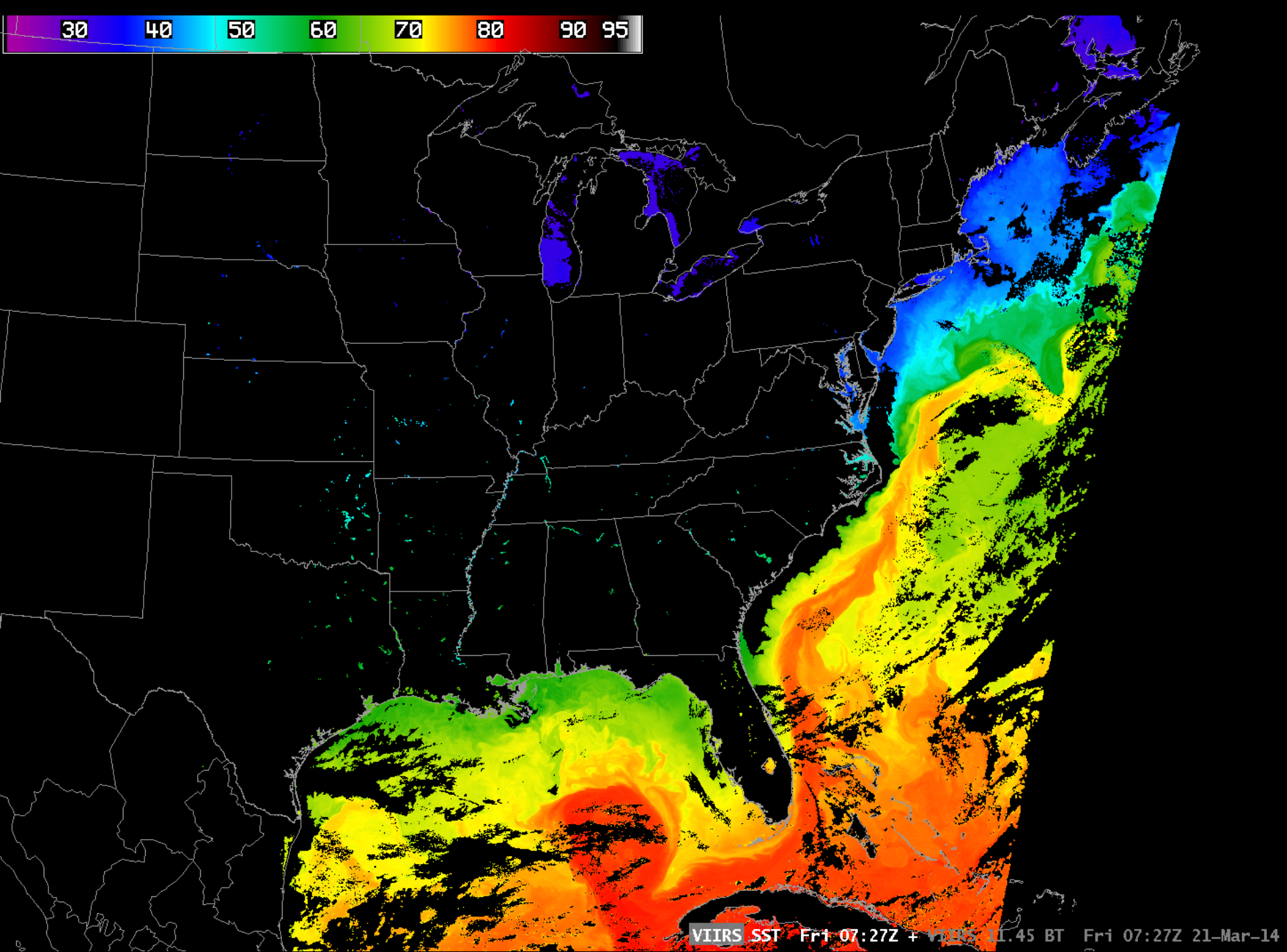
**Hurricane Maria**  
**Impact (via light) in Puerto Rico [VIIRS DNB]**



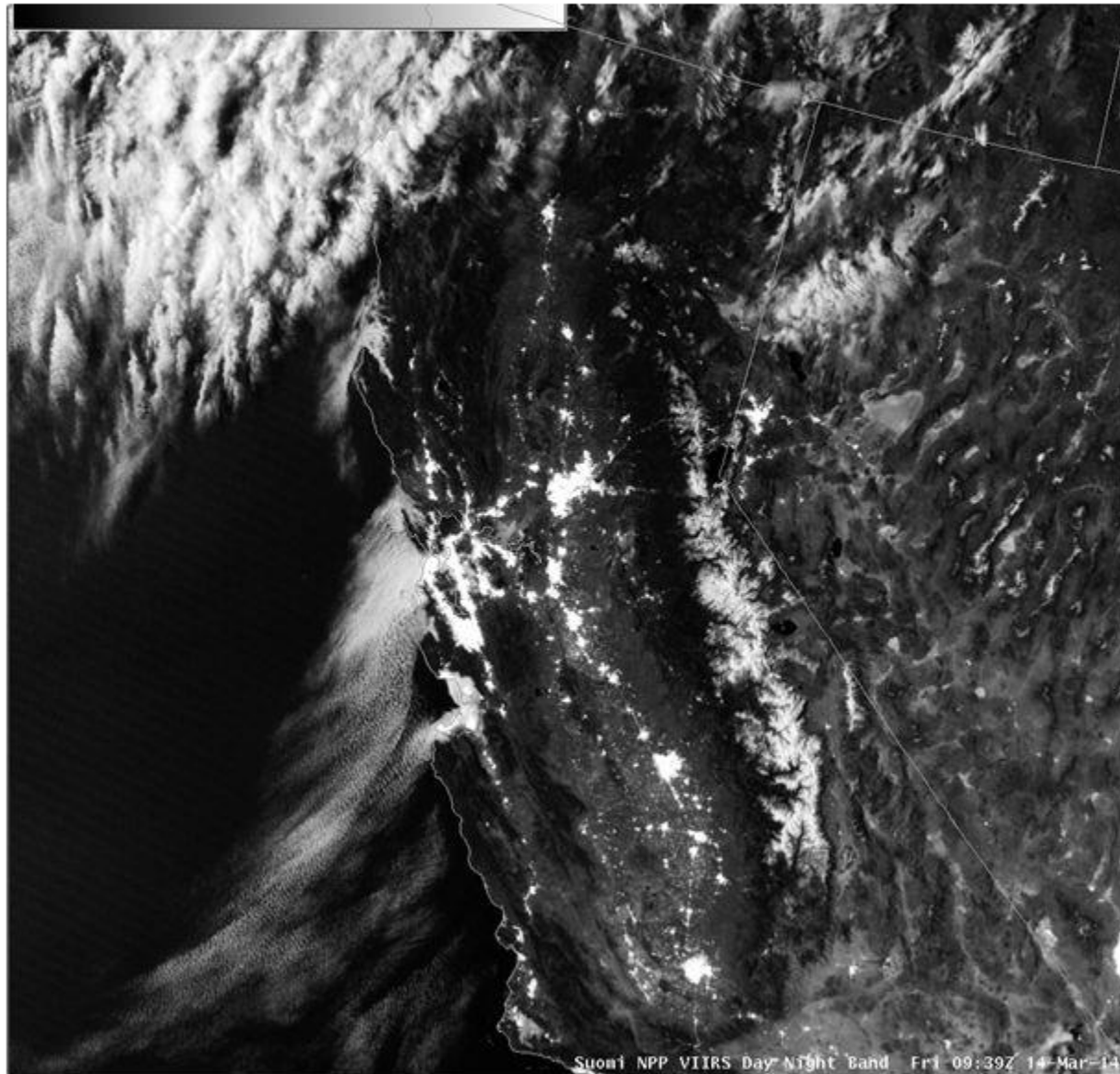








# Low Cloud/ Fog Seen by VIIRS DNB at Night

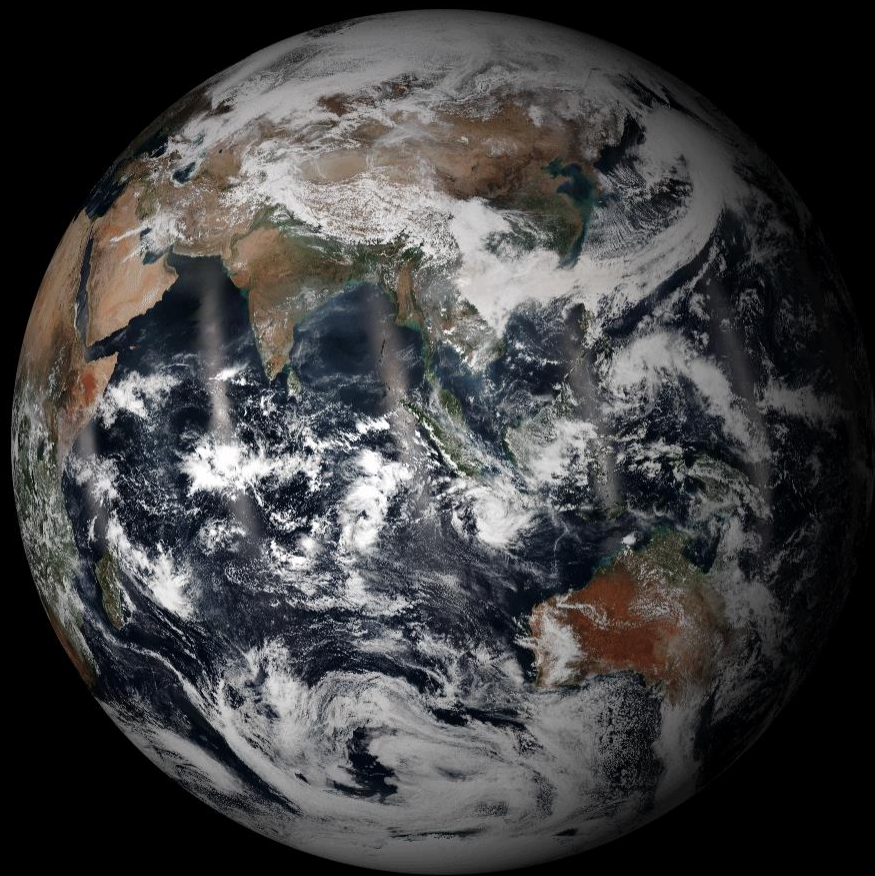


AREA FORECAST DISCUSSION  
NATIONAL WEATHER SERVICE SAN  
FRANCISCO BAY AREA  
443 AM PDT FRI MAR 14 2014

.DISCUSSION...AS OF 4:10 AM PDT FRIDAY...THE DRY TAIL END OF A WEATHER SYSTEM MOVING IN TO THE PACIFIC NORTHWEST IS APPROACHING OUR DISTRICT...AND RESULTING IN ENHANCEMENT OF THE MARINE LAYER AND **A RETURN OF THE MARINE STRATUS. LATEST GOES FOG PRODUCT IMAGERY...AND IN RATHER SPECTACULAR DETAIL JUST REC'D SUOMI VIIRS NIGHTTIME HIGH RES VISUAL IMAGE...SHOW COVERAGE ALONG MUCH OF THE COAST FROM PT REYES SOUTH TO THE VICINITY OF THE MONTEREY PENINSULA...AND A BROAD SWATH EXTENDING INLAND ACROSS SAN FRANCISCO AND THROUGH THE GOLDEN GATE TO THE EAST BAY.** LATEST BODEGA BAY AND FT ORD PROFILER DATA INDICATE A MARINE LAYER DEPTH OF ABOUT 1300 FT. SOME THIN HIGH CLOUDS ARE ALSO PASSING THROUGH ABOVE.









# What is the Science Behind JPSS?

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The JPSS Science goals directly support NOAA's mission to secure a more **'Weather Ready Nation.'**

As a result, JPSS Science aligns with the overall focus of the JPSS Program, which is to utilize polar-orbiting satellite data products to feed NOAA's National Weather Service's (NWS) Numerical Weather Prediction (NWP) models.

These NWP models help National Weather Service (NWS) forecasters more accurately **predict severe weather phenomena** in longer periods of time, thus providing advanced notice and warnings to the public-at-large, emergency makers and political leaders.

**"The goal of weather prediction is to provide information people and organizations can use to reduce weather-related losses and enhance societal benefits, including protection of life and property, public health and safety, and support of economic prosperity and quality of life."**

*- Board on Atmospheric Sciences and Climate Committee on Progress and Priorities of U.S. Weather Research and Research-to-Operations Activities - 2010*

# QUESTIONS?

