The Importance of VIIRS to the NWS Mission

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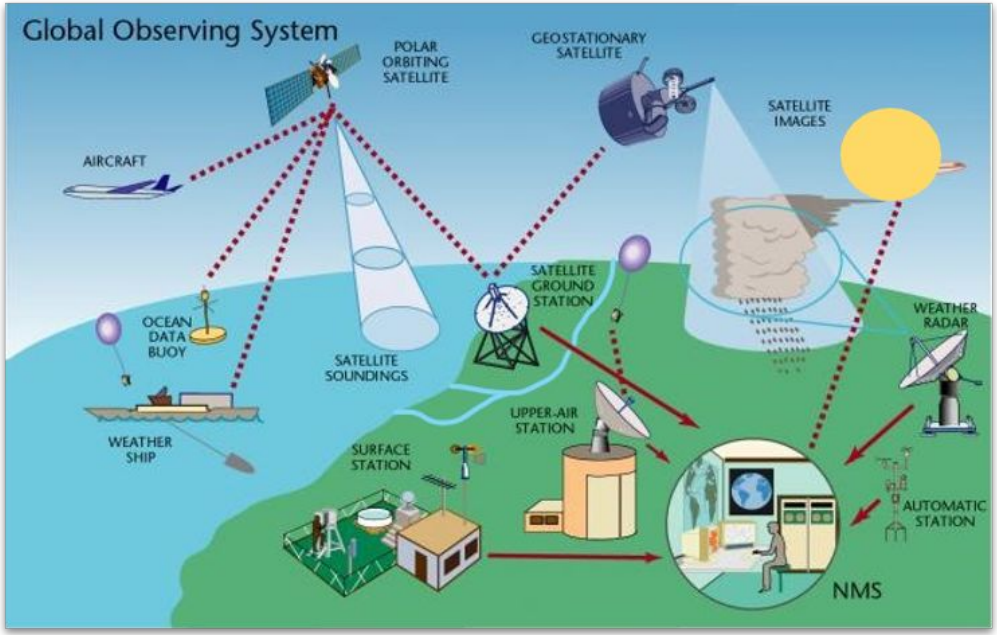
Contributions from John Evans and Scott Lindstrom

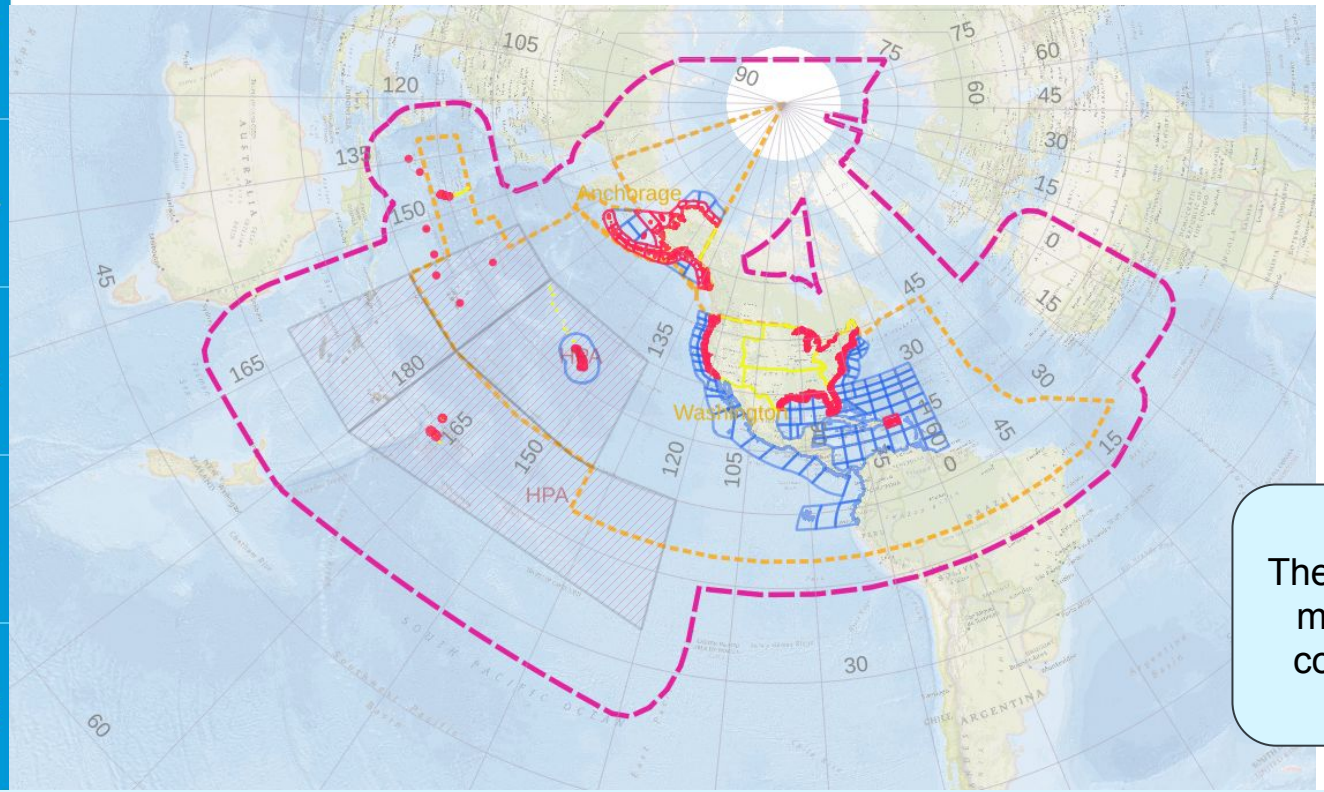
VIIRS User Meeting - Celebrating 10 years of SNPP, 29 June 2022

Extent of the Observations Portfolio



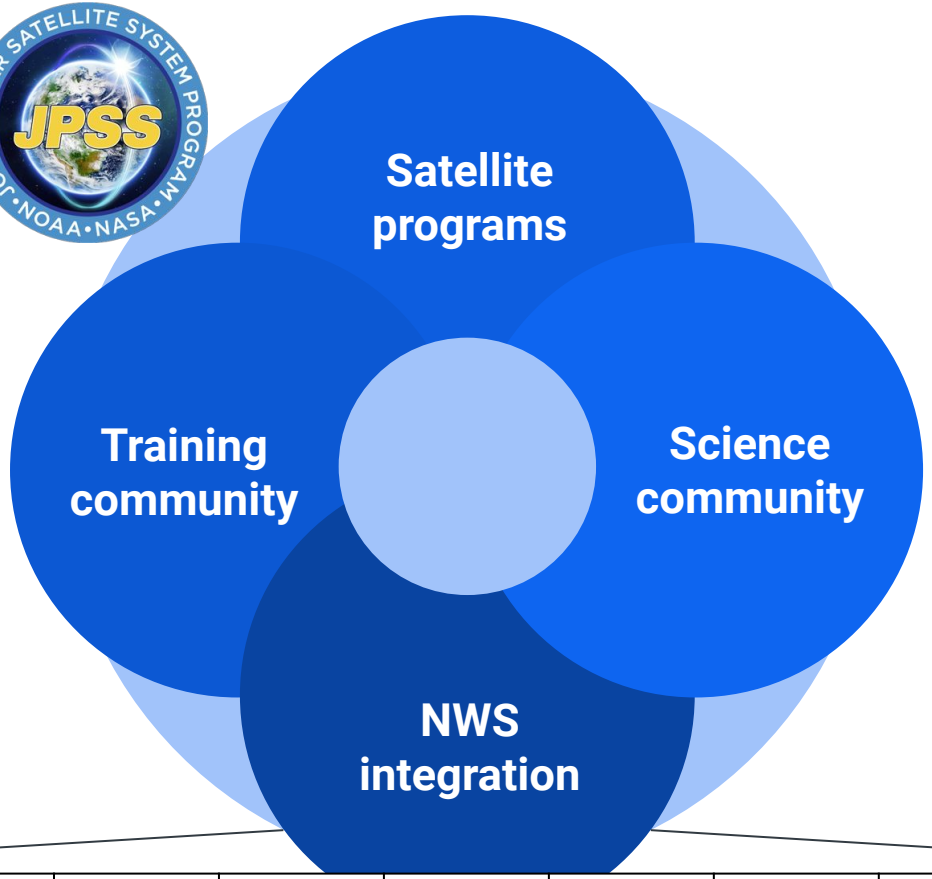
The Office of Observations operates, maintains, leverages, and purchases a broad range of observing platforms, capabilities and data, serving as a key component to the NWS mission

NWS Target for Satellite Spatial Coverage



John Evans

The NWS service area is far more expansive than the contiguous United States



Aviation	Fire	Marine	Public	Severe	Space	Tropical	Winter	Hydro	Climate	Tsunami

Use of VIIRS by NWS meteorologists

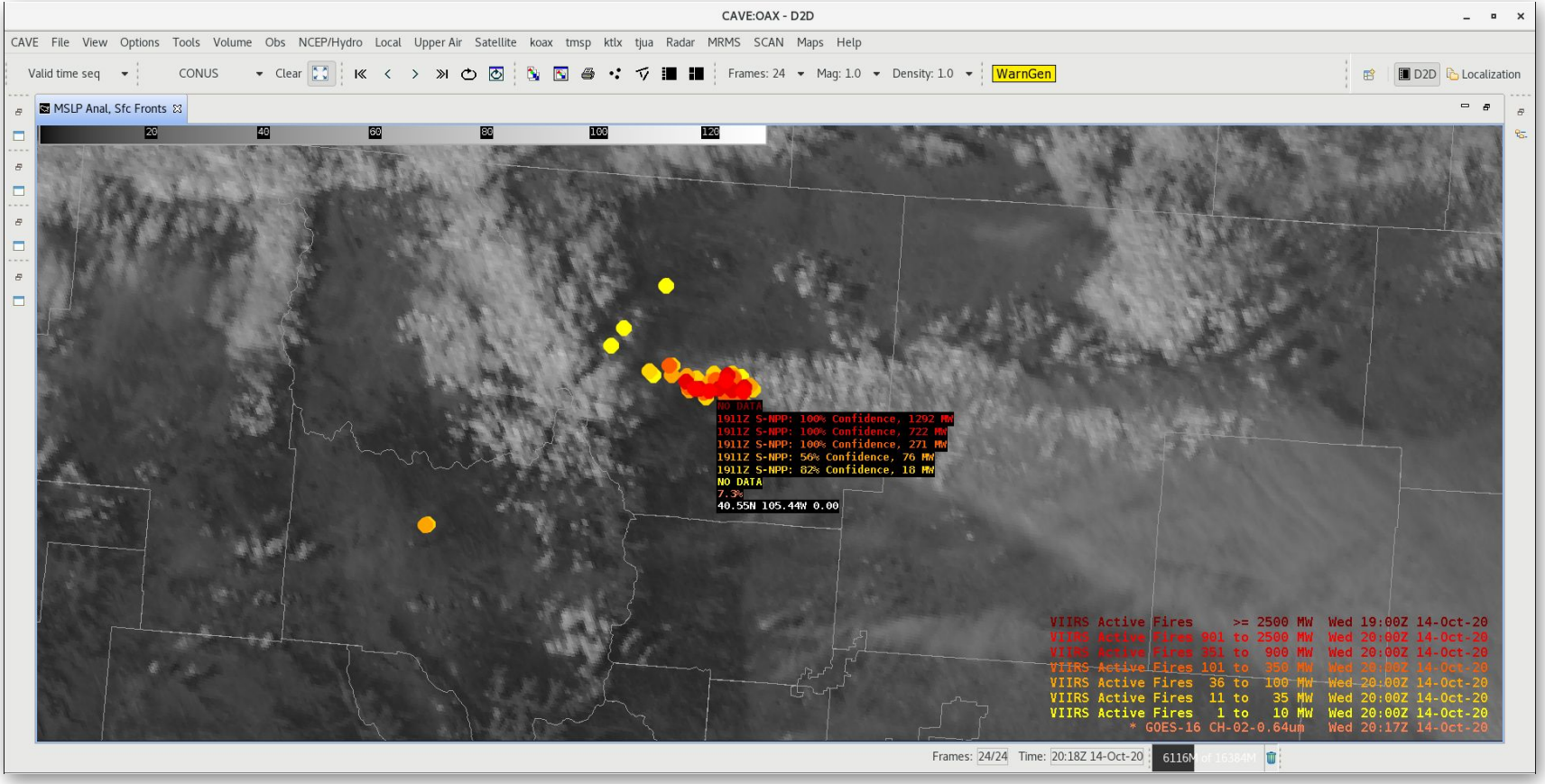
All NWS forecasters receive:

- VIIRS Day-Night Band (DNB) / Near Constant Contrast (NCC) imagery
- VIIRS I-Band Active Fires EDR
- VIIRS Flood Mapping will be available later in CY22

- **NWS Alaska Region** uses several VIIRS imagery bands and L2 products received via Direct Broadcast.
- **NWS Pacific Region** also uses data products from Direct Broadcast.
- **National Centers** use additional data products obtained directly from PDA or Direct Broadcast.

- The latest AWIPS baseline is partially configured for 4 VIIRS EDRs:
  - Ice Concentration
  - Volcanic Ash
  - Aerosol Detection
  - Aerosol Optical Depth

VIIRS I-Band Fires EDR points in AWIPS CAVE

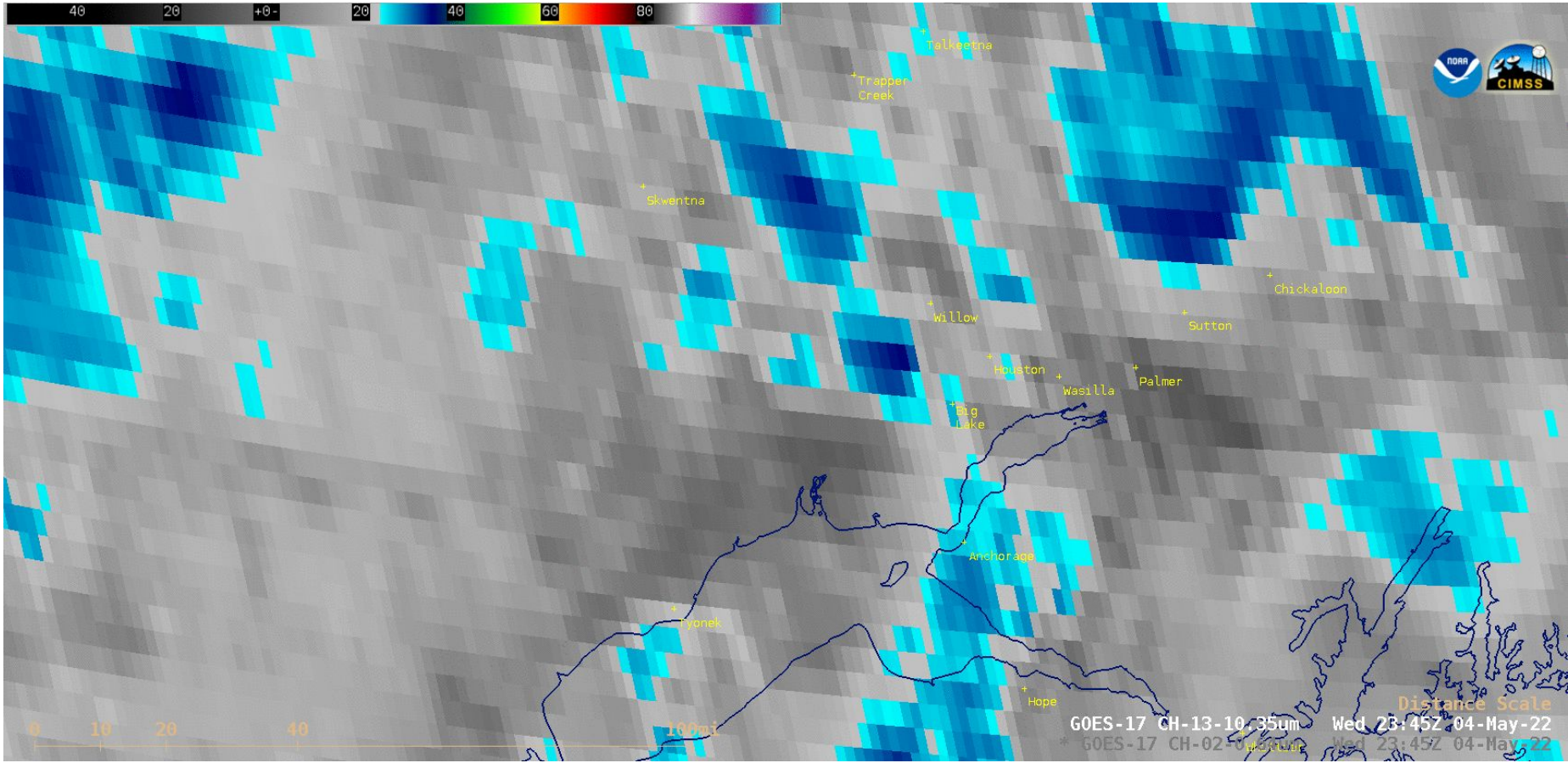


TOWR-S Team

Advantages of VIIRS spatial resolution

- High latitudes, where parallax and pixel size broadening significantly impact quality of imagery

- Pinpointing the boundaries of wildfires, or of flooded areas
  - Also provides precise terrain / parallax correction for surface features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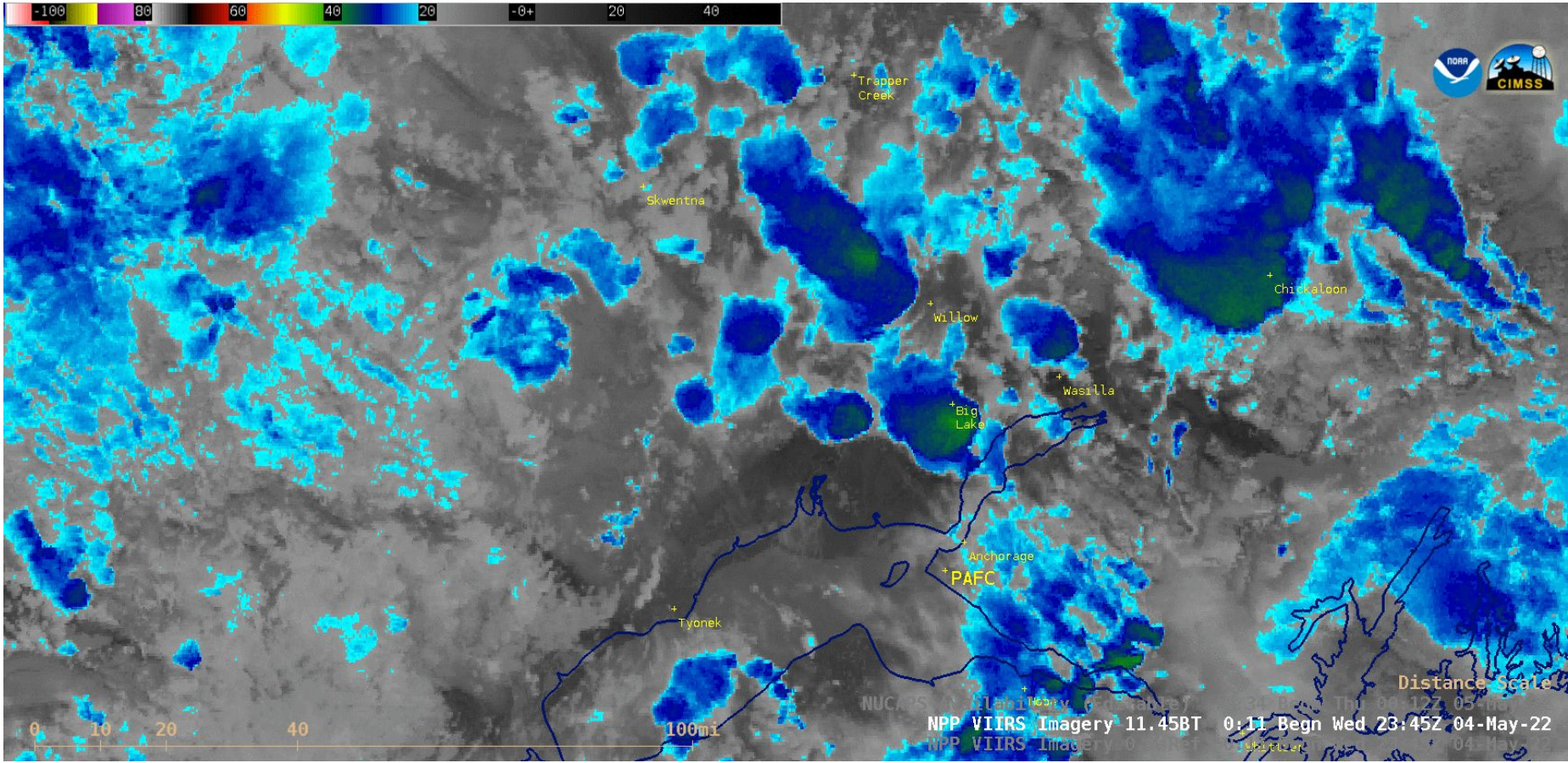
GOES-17 CH-02-0.64um Wed 23:45Z 04-May-22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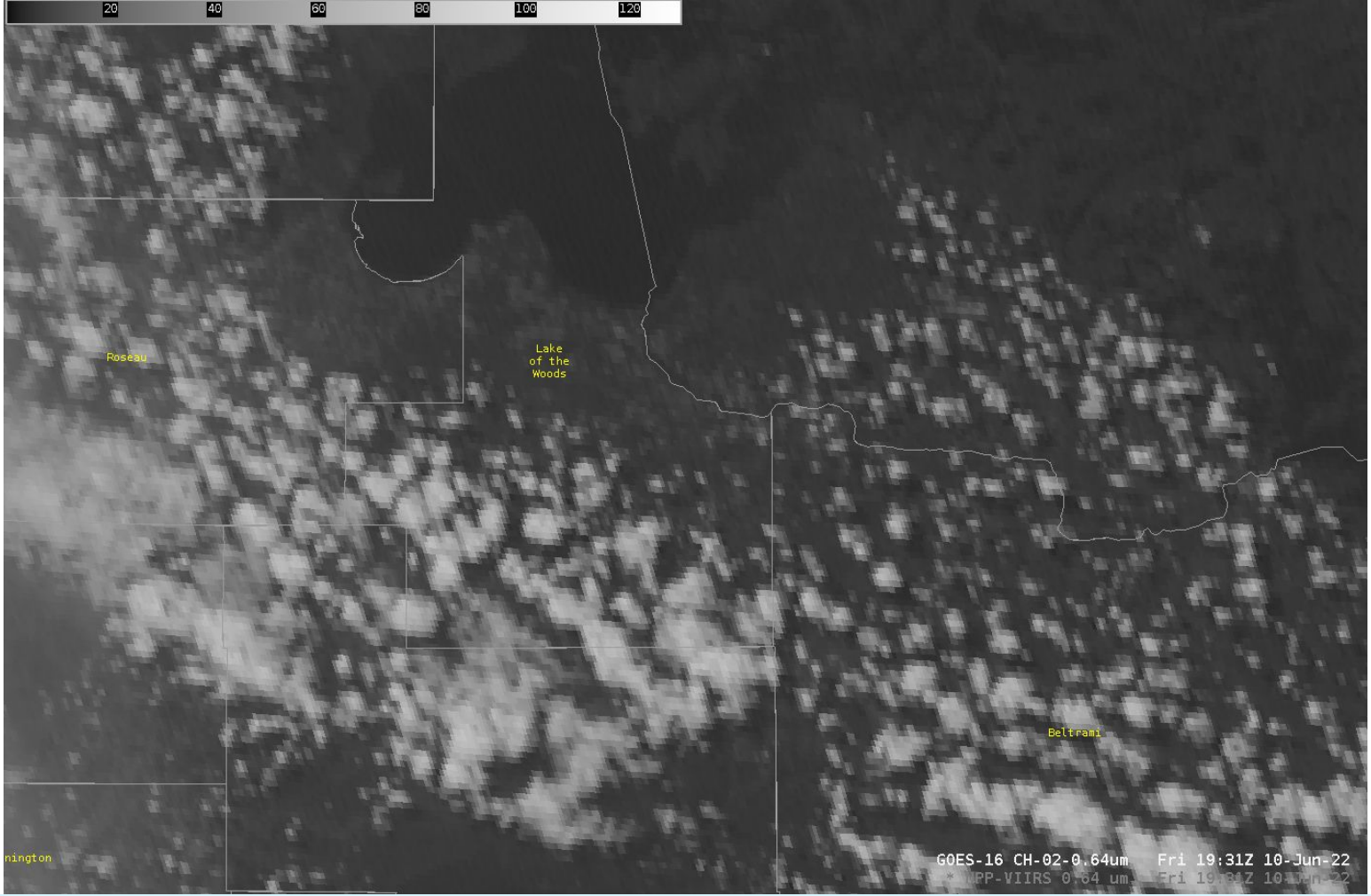
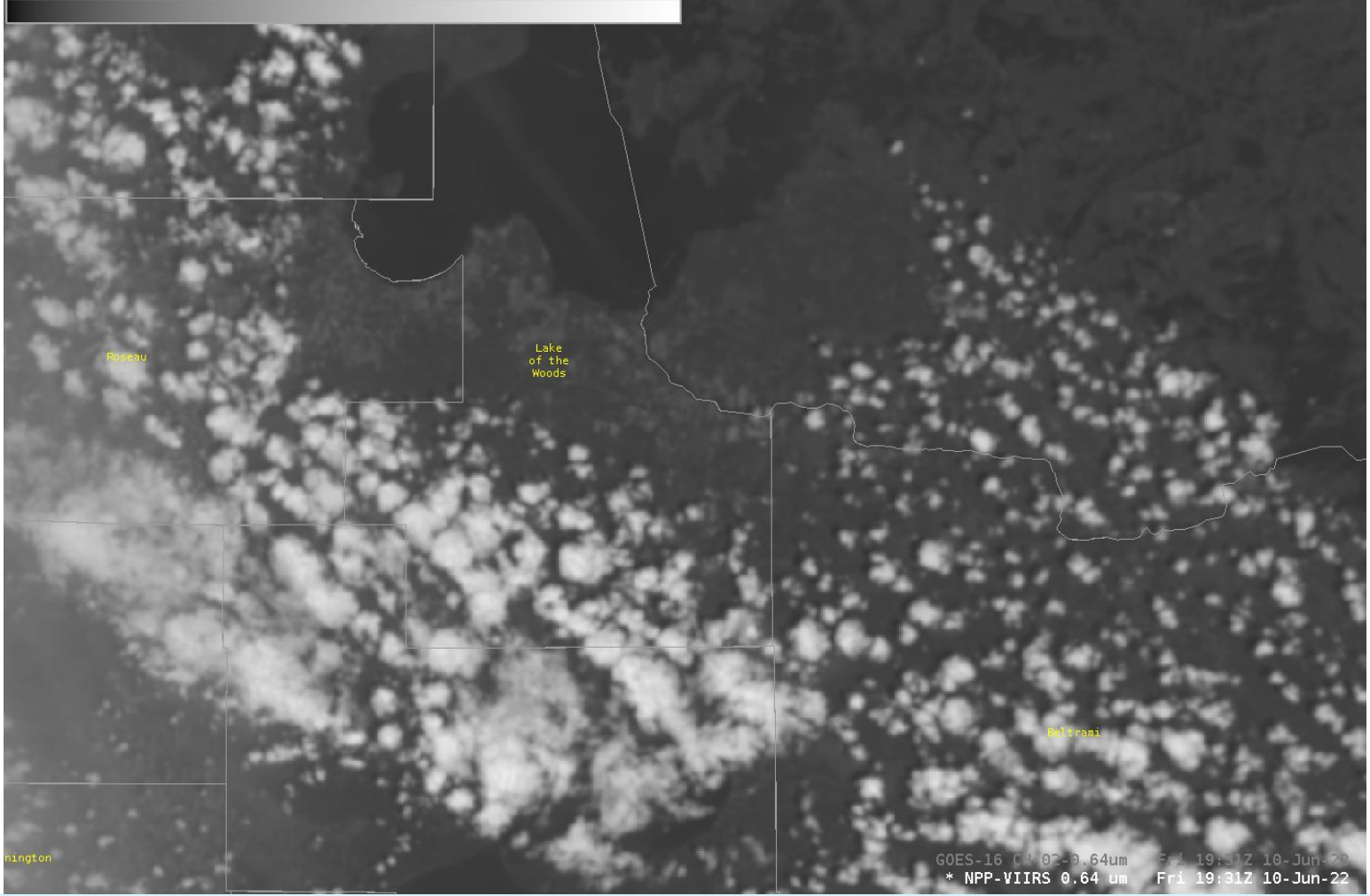
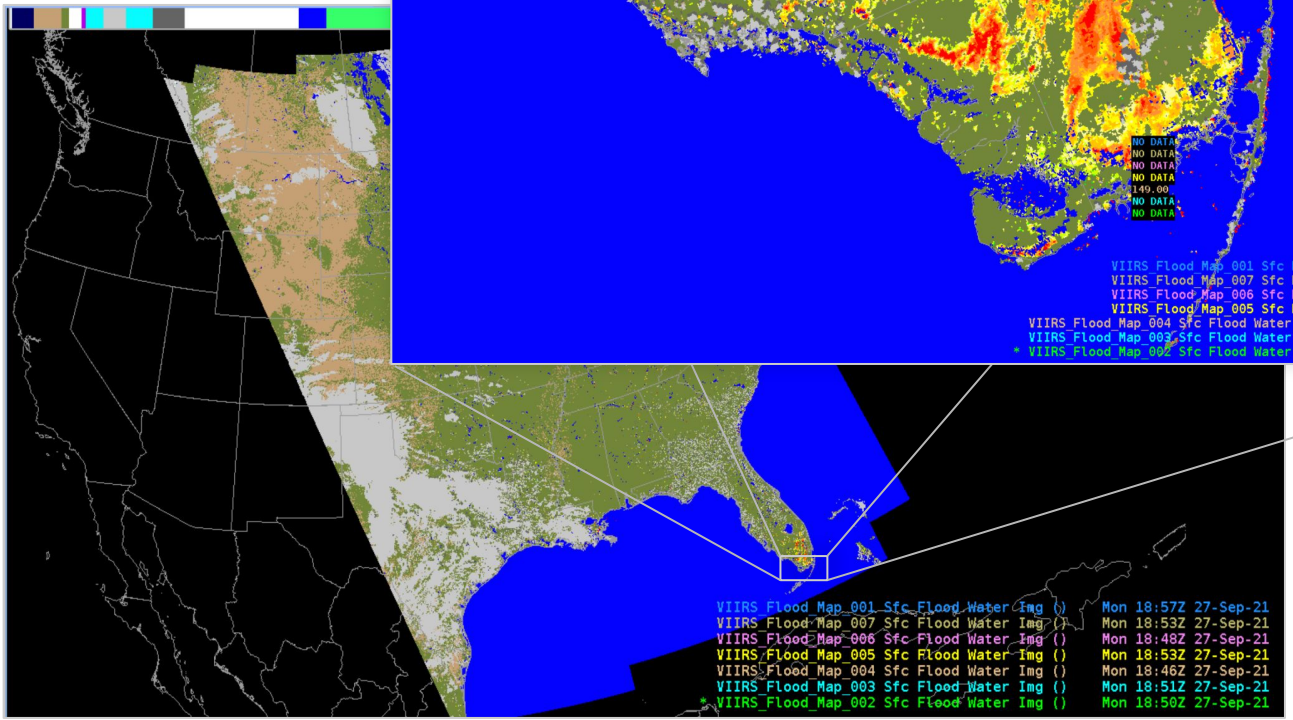


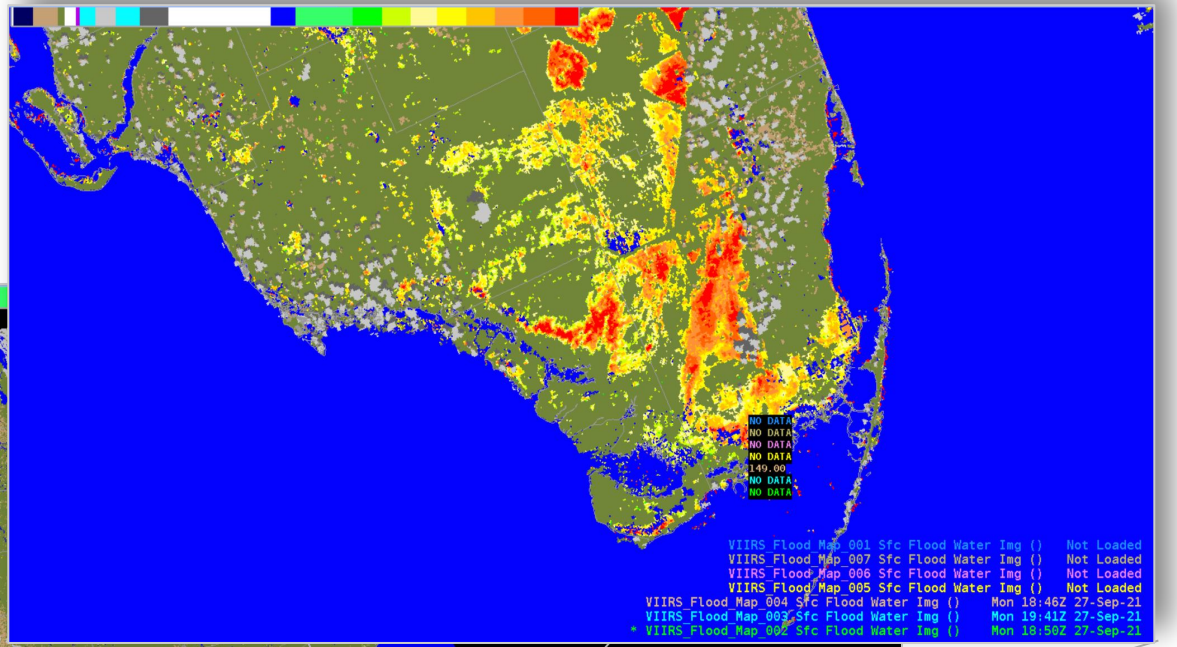
CIMSS Satellite Blog



CIMSS Satellite Blog

VIIRS Flood Map





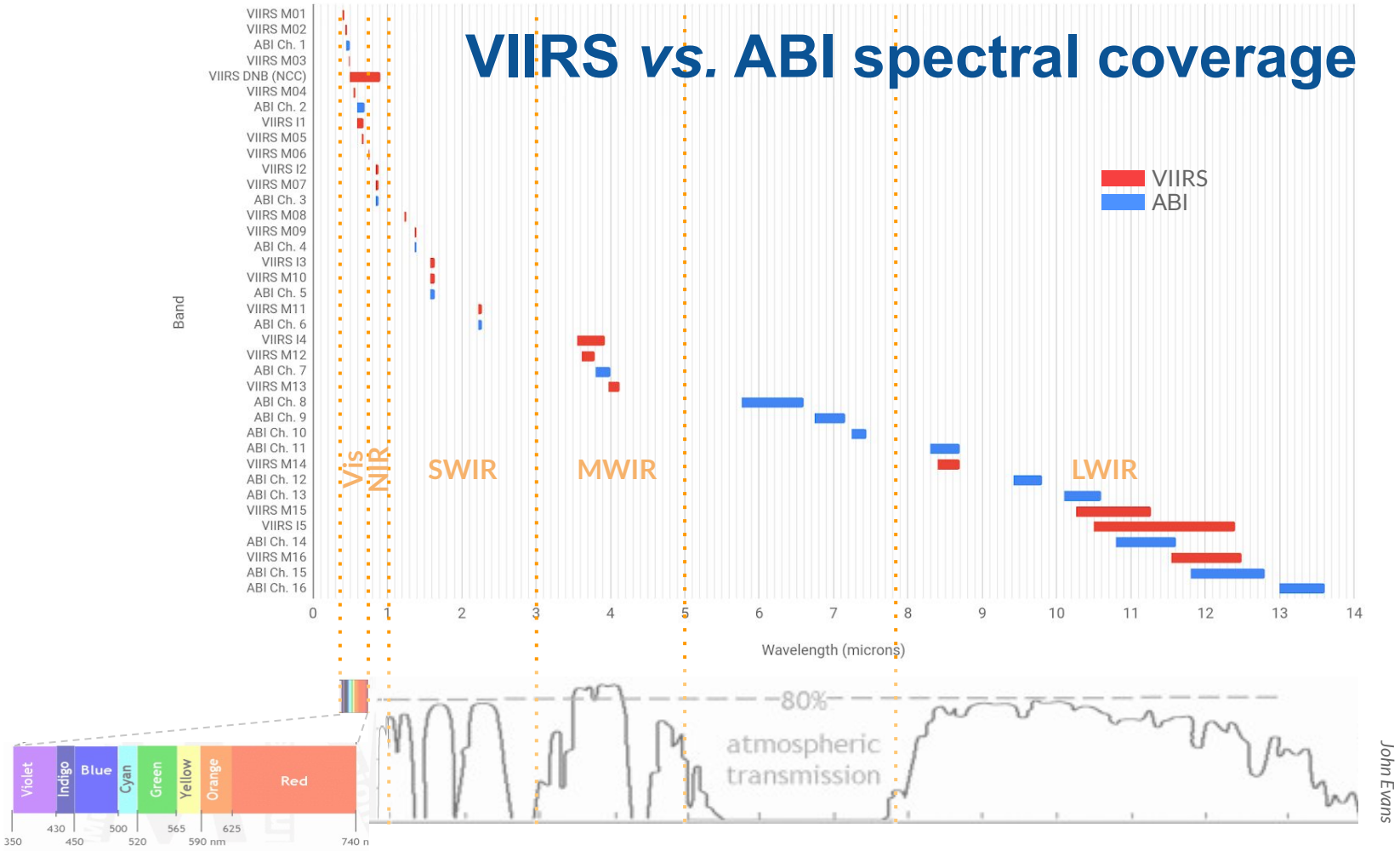
Derek van Pelt

Yellow to red represents greater degree of flooding

Advantages of VIIRS spectral bands

- The panchromatic sensor (DNB) on VIIRS is sensitive to clouds, snow, etc. under low-light conditions
- VIIRS provides greater spectral detail in the visible and near-infrared band (*e.g.*, M01, M04, M06)
- VIIRS provides additional spectral coverage compared to ABI (*e.g.*, M08, useful for detecting snow characteristics)
- VIIRS provides spectral bands for natural color imagery

VIIRS *vs.* ABI spectral coverage



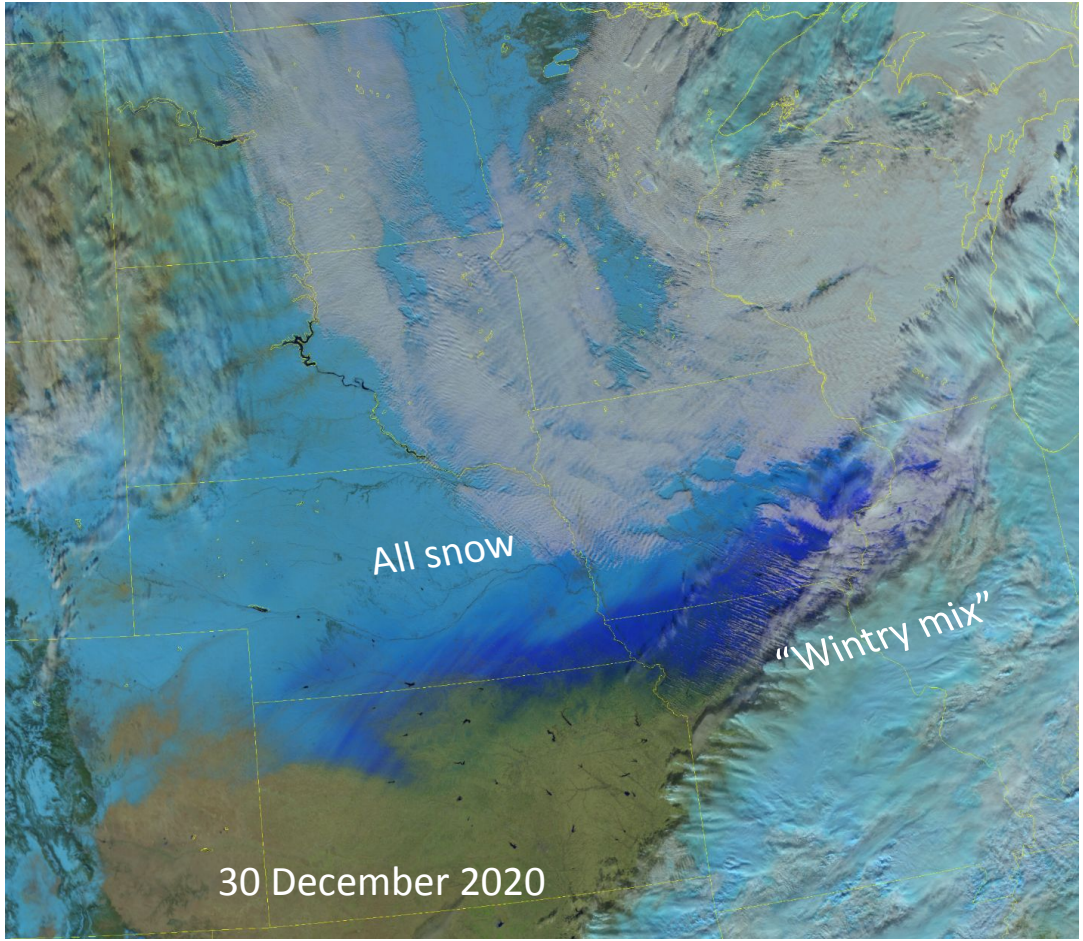
John Evans

The Snowmelt RGB (M5, M8, M10) uses the 1.24 µm to provide surface snow/ice characteristics.

This includes:

- Wet vs. dry snow
- Fresh vs. old snow
- Sleet accumulation
- Freezing rain accumulation

Source: Curtis Seaman, CIRA



Leveraging the strengths of VIIRS

The challenge is to identify circumstances where they can fill a gap -- *i.e.,* supporting forecasting tasks that can benefit from...

- The finer spatial resolution of VIIRS,
- The unique spectral bands of VIIRS, and/or
- The OCONUS, marine, and global coverage of VIIRS

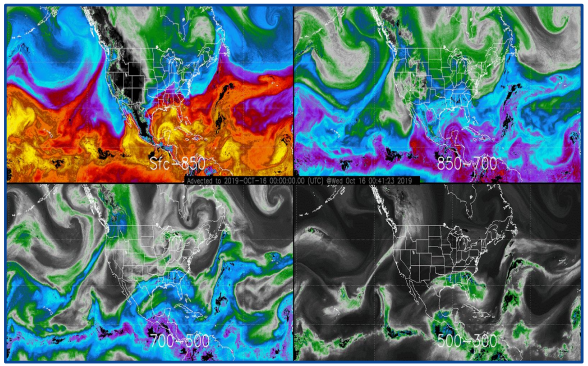
… and where the rapid refresh and low latency of geostationary imagery are not essential or available.

Leveraging the strengths of VIIRS

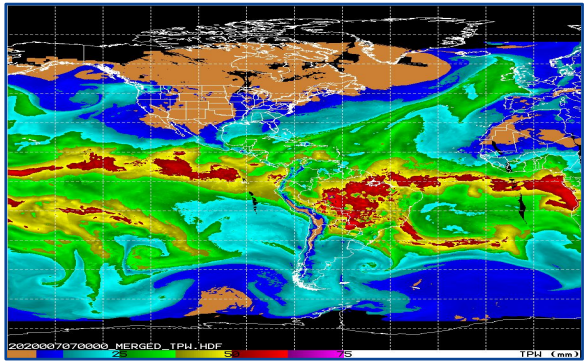
- Direct broadcast (low latency) is largely responsible for elevating the value of VIIRS for operational meteorology.
- The contribution of VIIRS for establishing cloud masks for multi-instrument products is an underappreciated benefit.
- The prospect of three VIIRS in an evenly spaced orbital sequence enhances the likelihood of valuable derived winds.

Examples of Satellite Observations from LEO

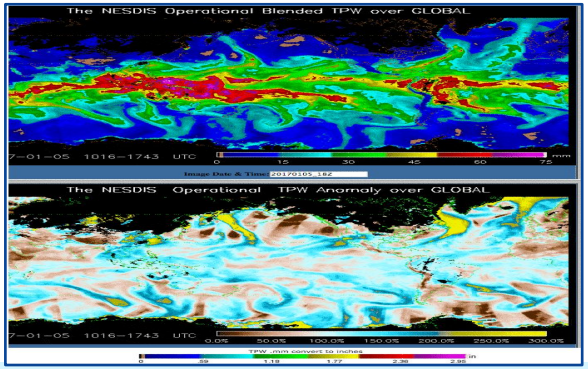
CIRA ALPW



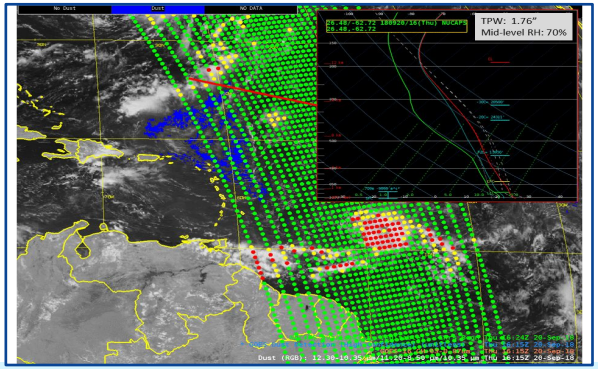
CIRA Merged TPW



Blended TPW



NUCAPS



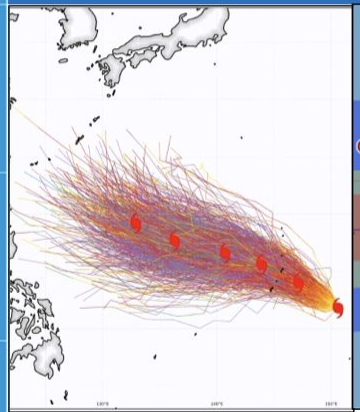
Source:
Andrew Orrison

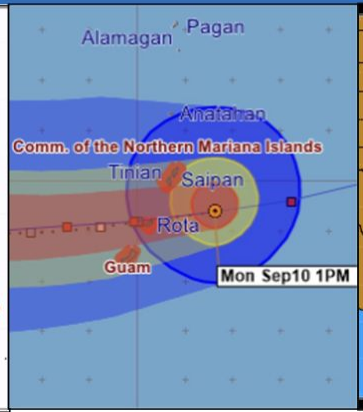
Direct Broadcast Satellite Applications in the US National Weather Service (NWS) Pacific Region

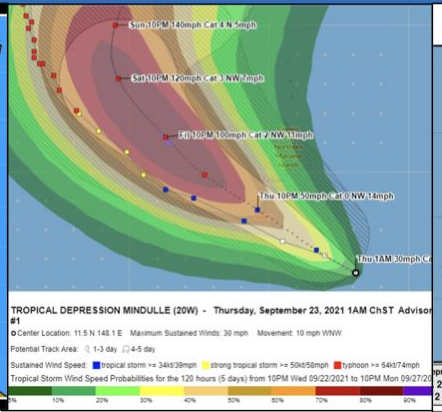
NATIONAL WEATHER SERVICE

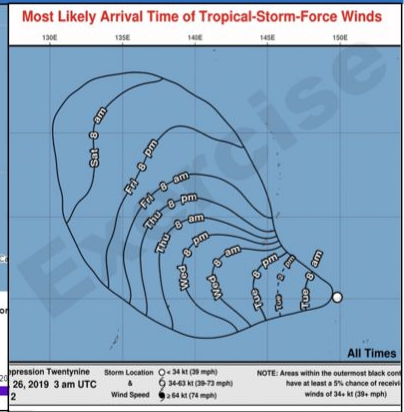
William Brandon Aydlett

Science & Operations Officer
National Weather Service
Tiyan, Guam

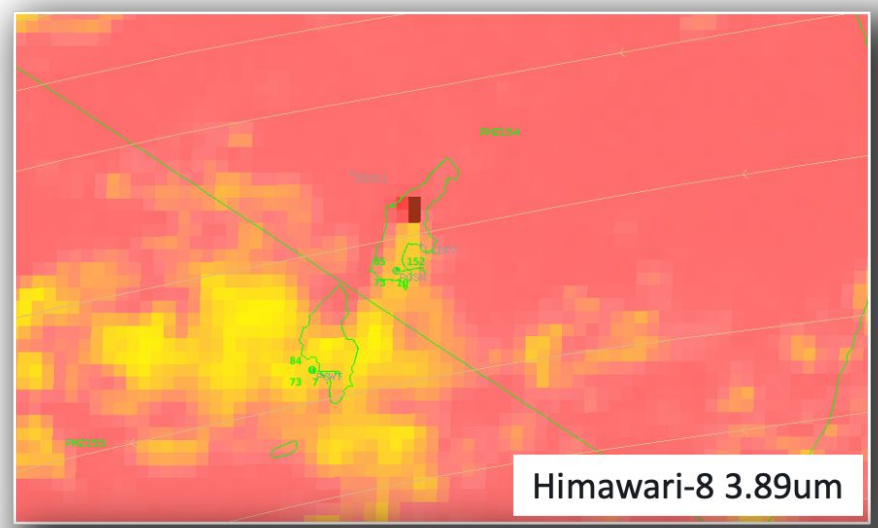


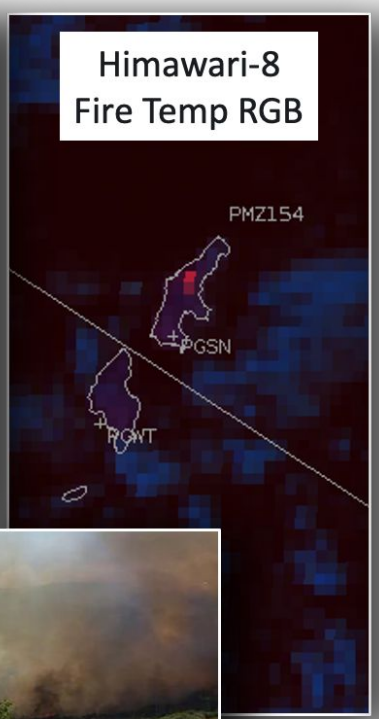


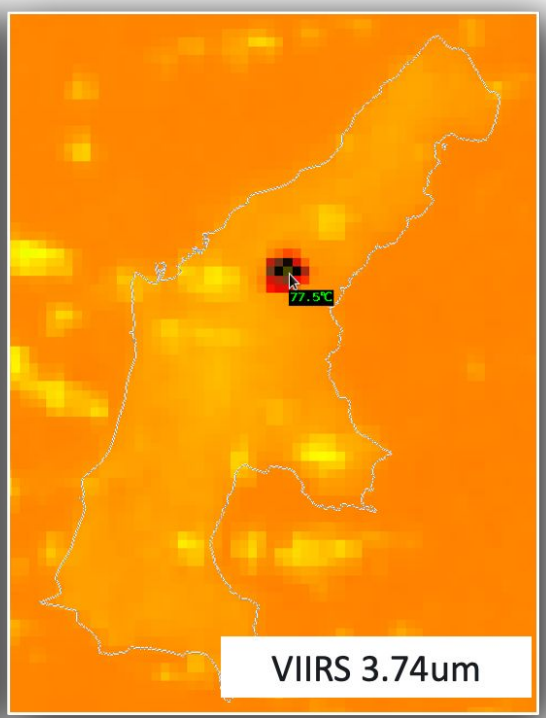




Saipan Wildfires







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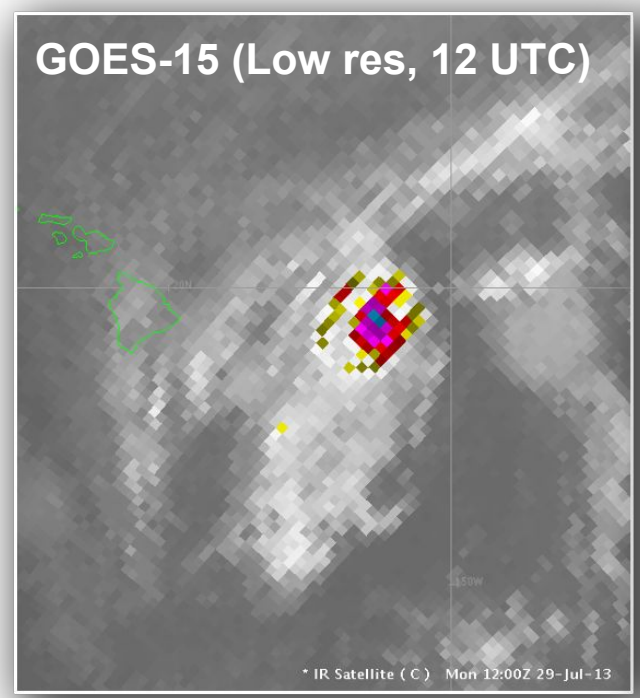
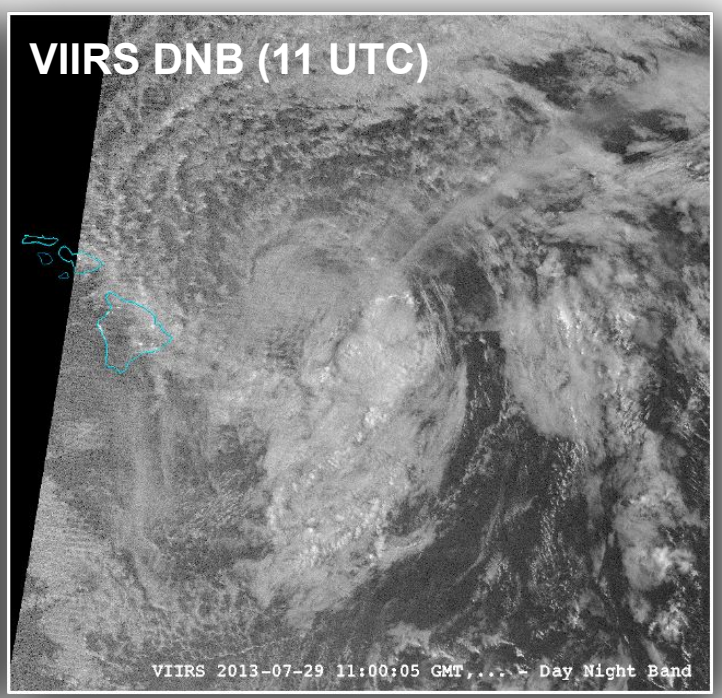
Hawaii Tropical Storm Flossie (40 kt)

29 July 2013





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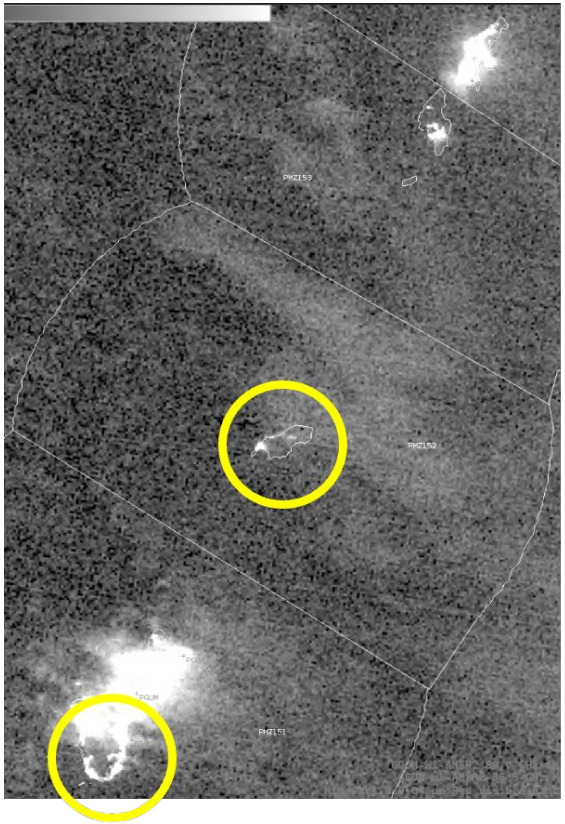
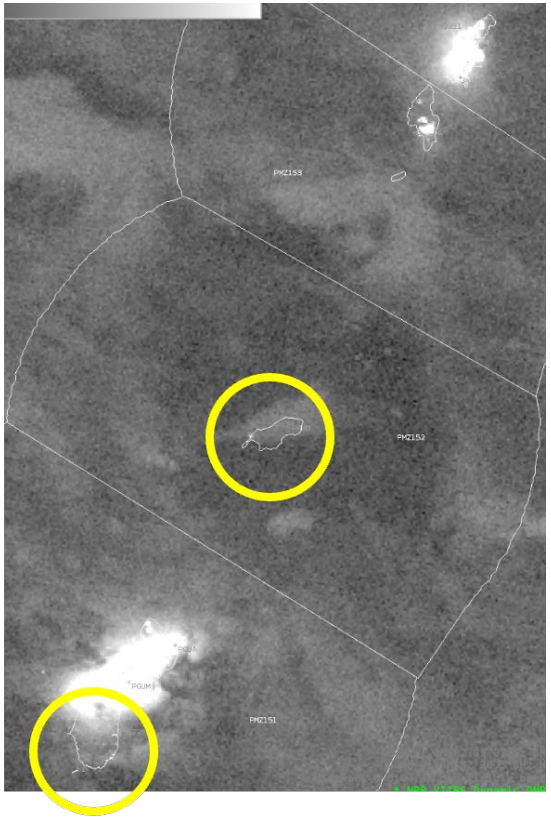
VIIRS DNB: Before & After 2018 Typhoon Mangkhut





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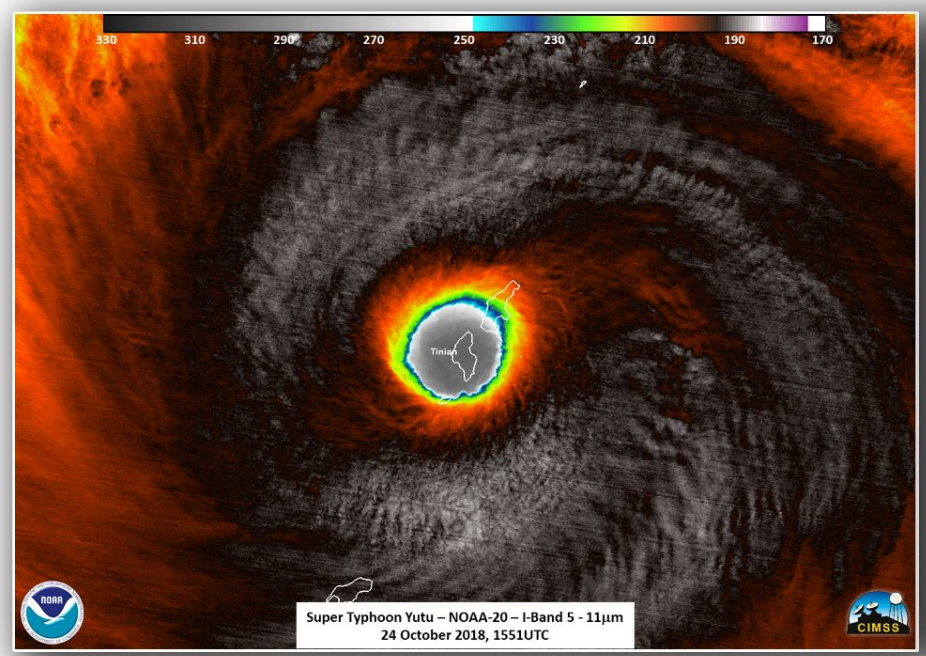
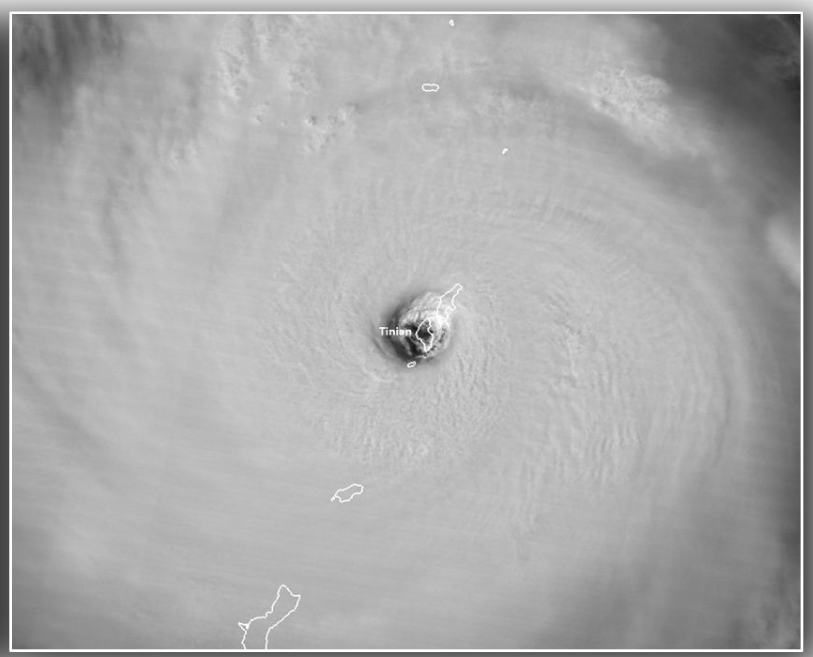
Super Typhoon Yutu in the Mariana Islands

24 October 2018





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The Future

Opportunities for the future

- Meteorologists would benefit from more consistent and reliable satellite observations, which is difficult to attain in the LEO orbit without a critical number of satellites.

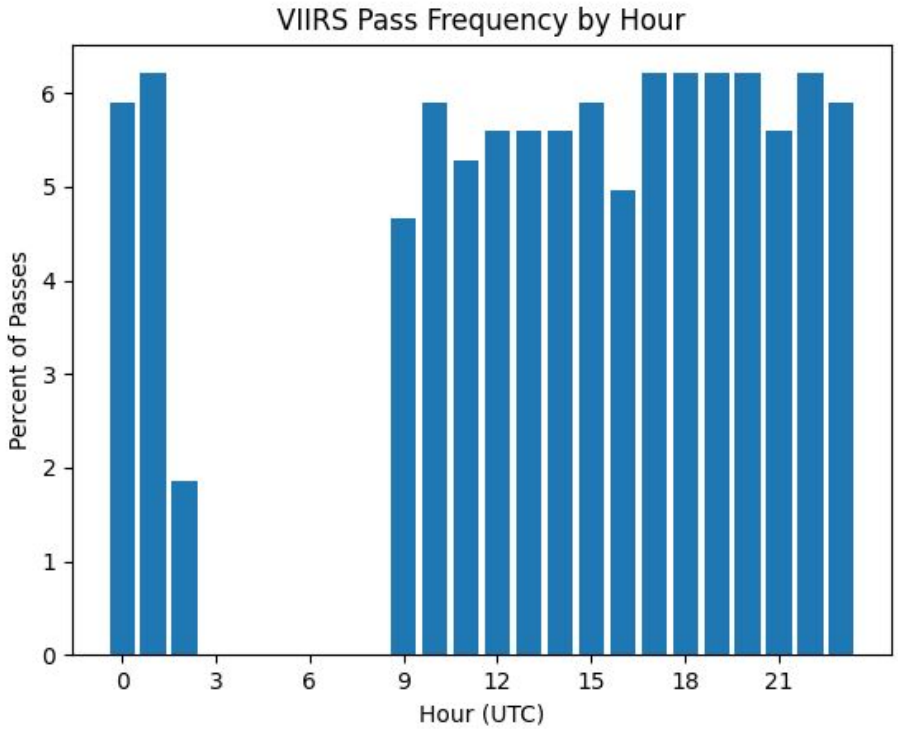
- The NWS continues to emphasize the importance of multi-spectral water vapor imaging in the infrared. Future LEO imagers should not omit mid-wave spectral coverage.

- Unique opportunity for multi-spectral low-light imaging.

VIIRS gap over Alaska (3-8 UTC)

Imagery over Alaska between 3 and 8 UTC is currently provided from NOAA POES. The eventual loss of EOS/MODIS imagery will maximize the gap in imagery.

Source: Carl Dierking, GINA



Summary

- VIIRS provides imagery that has contributed to the quality of the output for some NWS Mission Service Areas, particularly in data sparse regions such as outside of the contiguous United States (OCONUS).
- The NWS is excited to work with the LEO program to continue and advance the JPSS-era capabilities such as VIIRS on next-generation polar-orbiting satellites.
- VIIRS has demonstrated that a more sustained low-light imaging capability has the potential to distinctively advance the NWS mission from the 2030s onward.

Other comments or questions: Jordan.Gerth@noaa.gov