

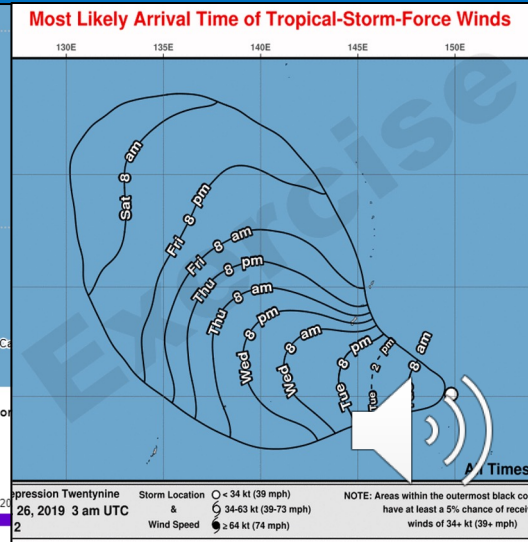
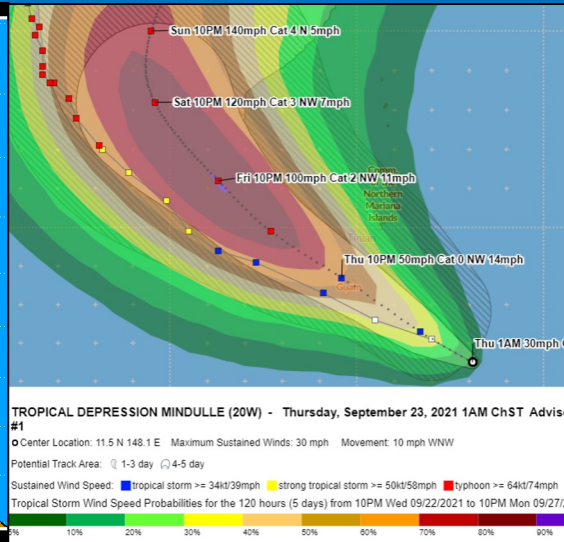
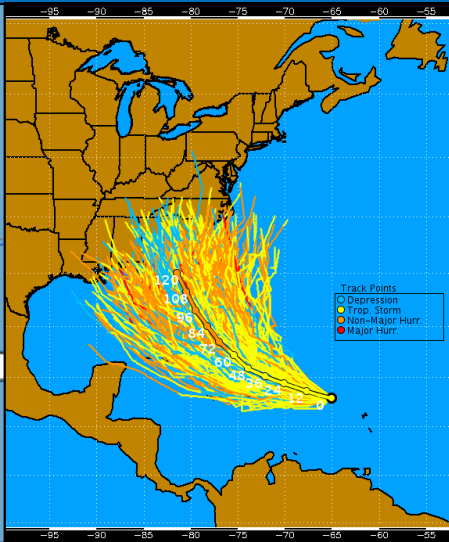
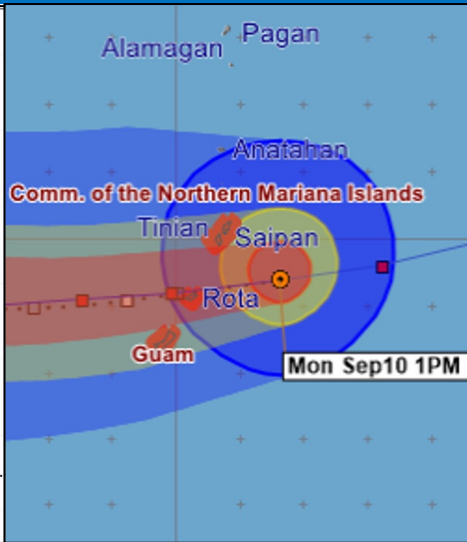
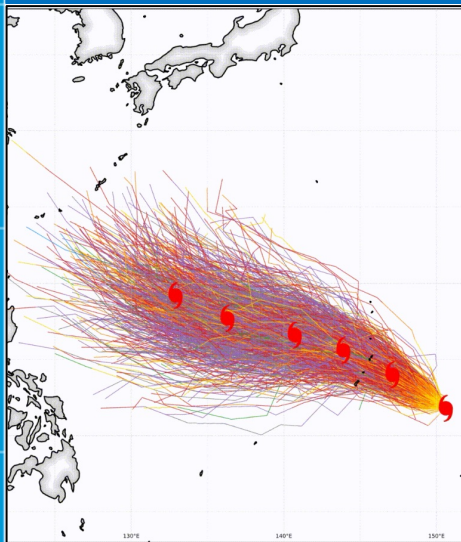


NATIONAL WEATHER SERVICE

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

William Brandon Aydlett

Science & Operations Officer
National Weather Service
Tiyán, Guam

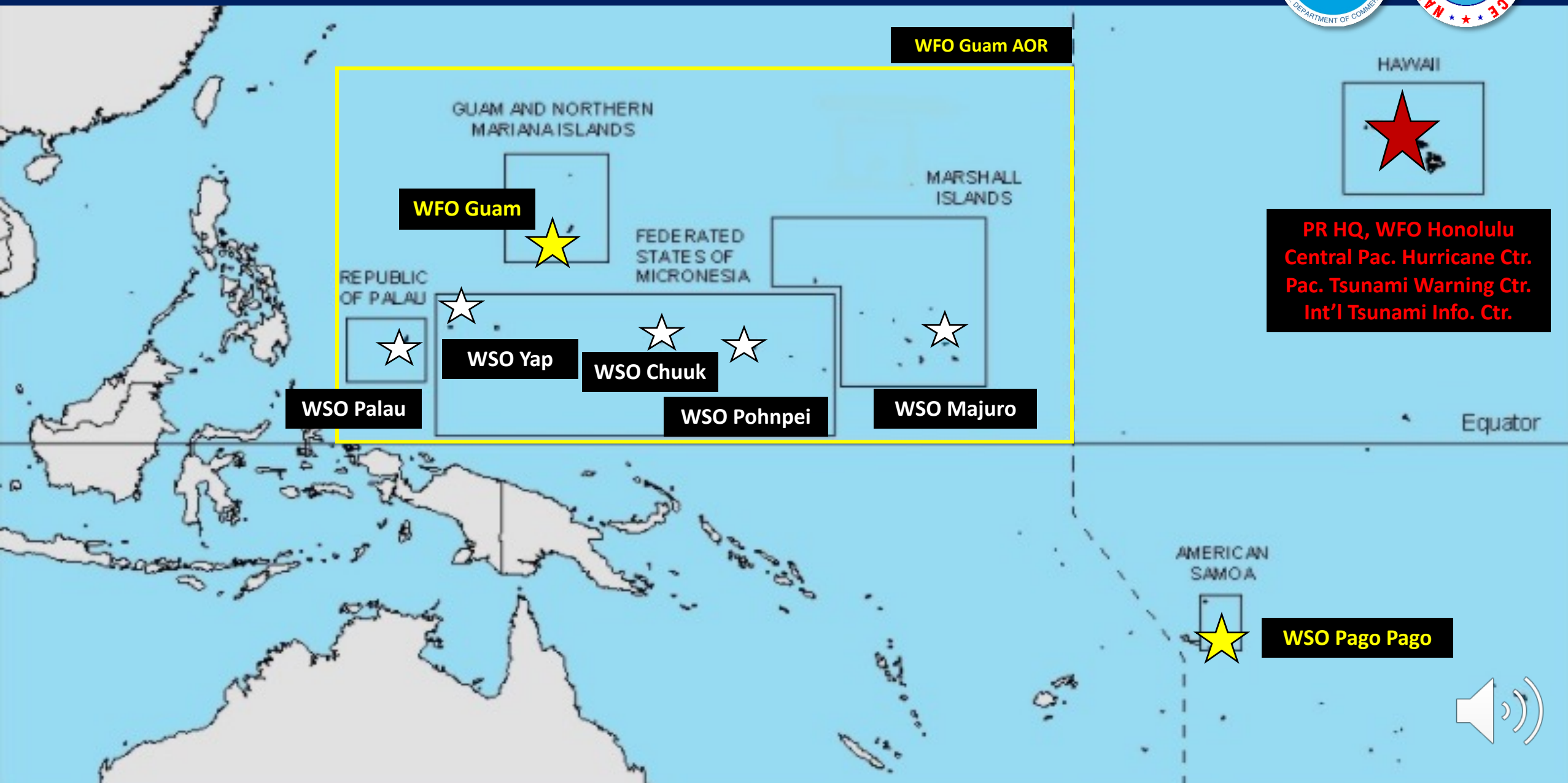




Satellite Capability and Monitoring Across the NWS Pacific Region



WFOs & WSOs of the NWS Pacific Region



WFO Guam AOR

WFO Guam

WSO Palau

WSO Yap

WSO Chuuk

WSO Pohnpei

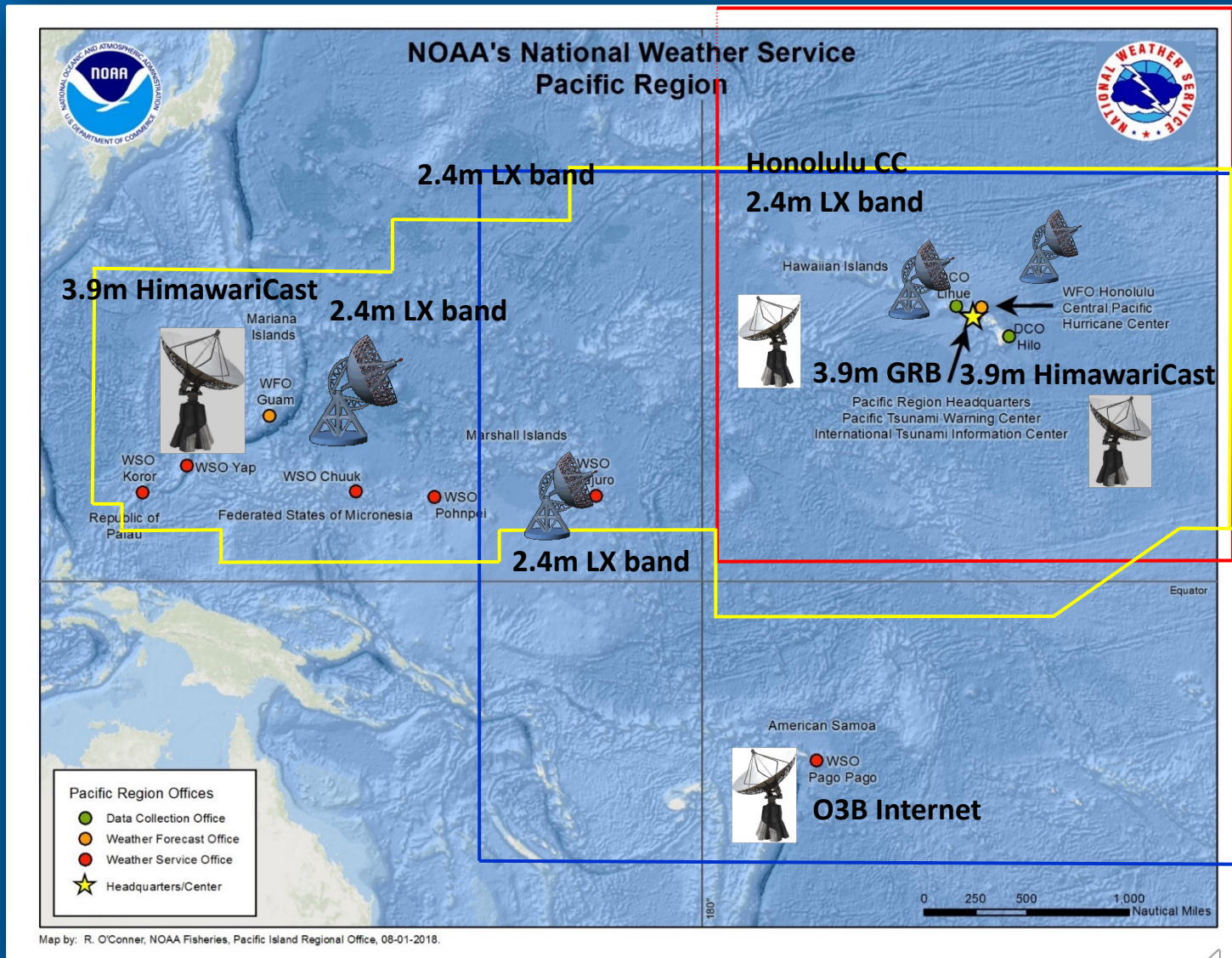
WSO Majuro

**PR HQ, WFO Honolulu
Central Pac. Hurricane Ctr.
Pac. Tsunami Warning Ctr.
Int'l Tsunami Info. Ctr.**

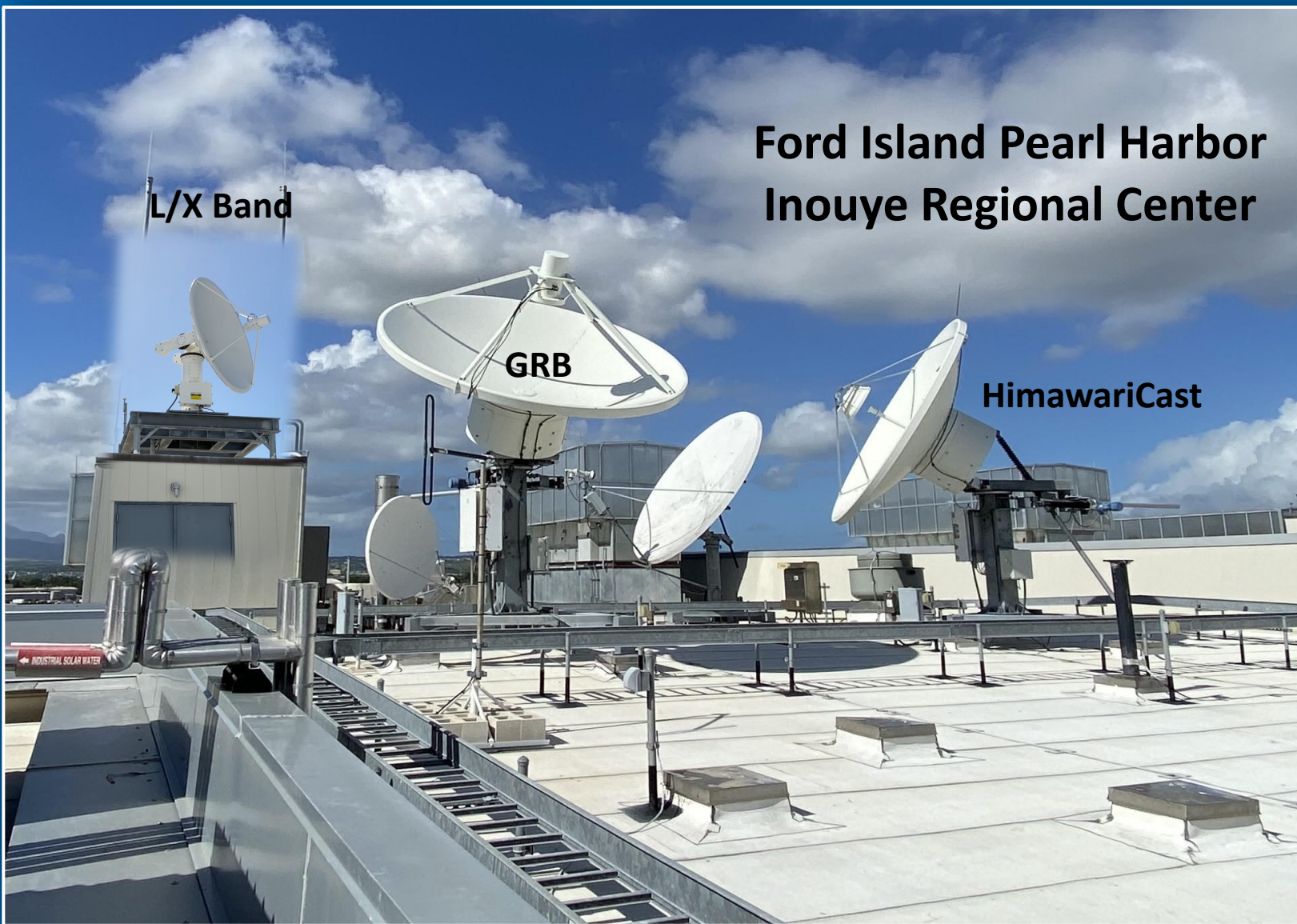
WSO Pago Pago



Satellite systems in the Pacific Region



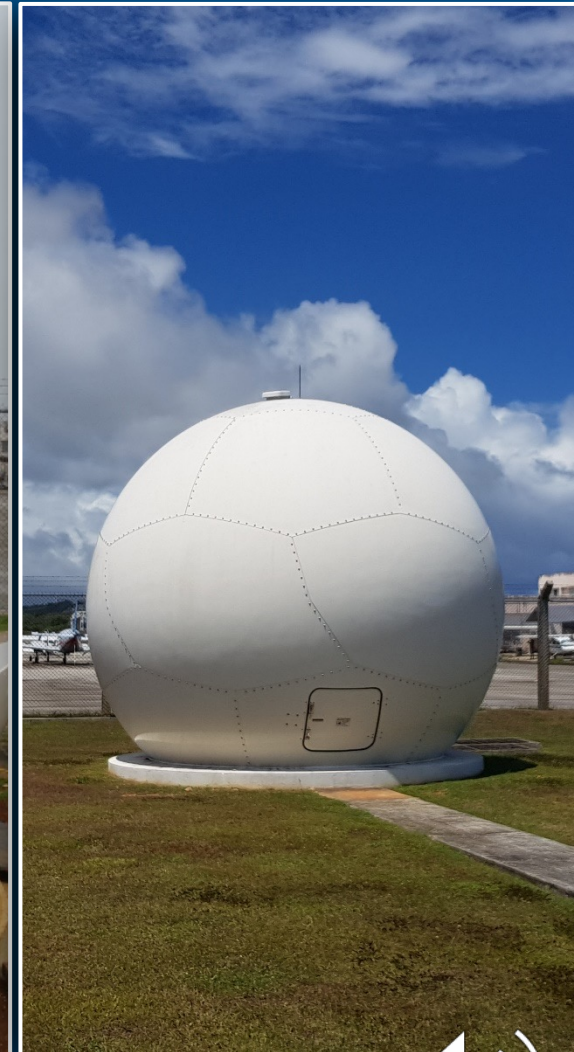
Pacific Region Satellite Ground Stations: *Hawaii*



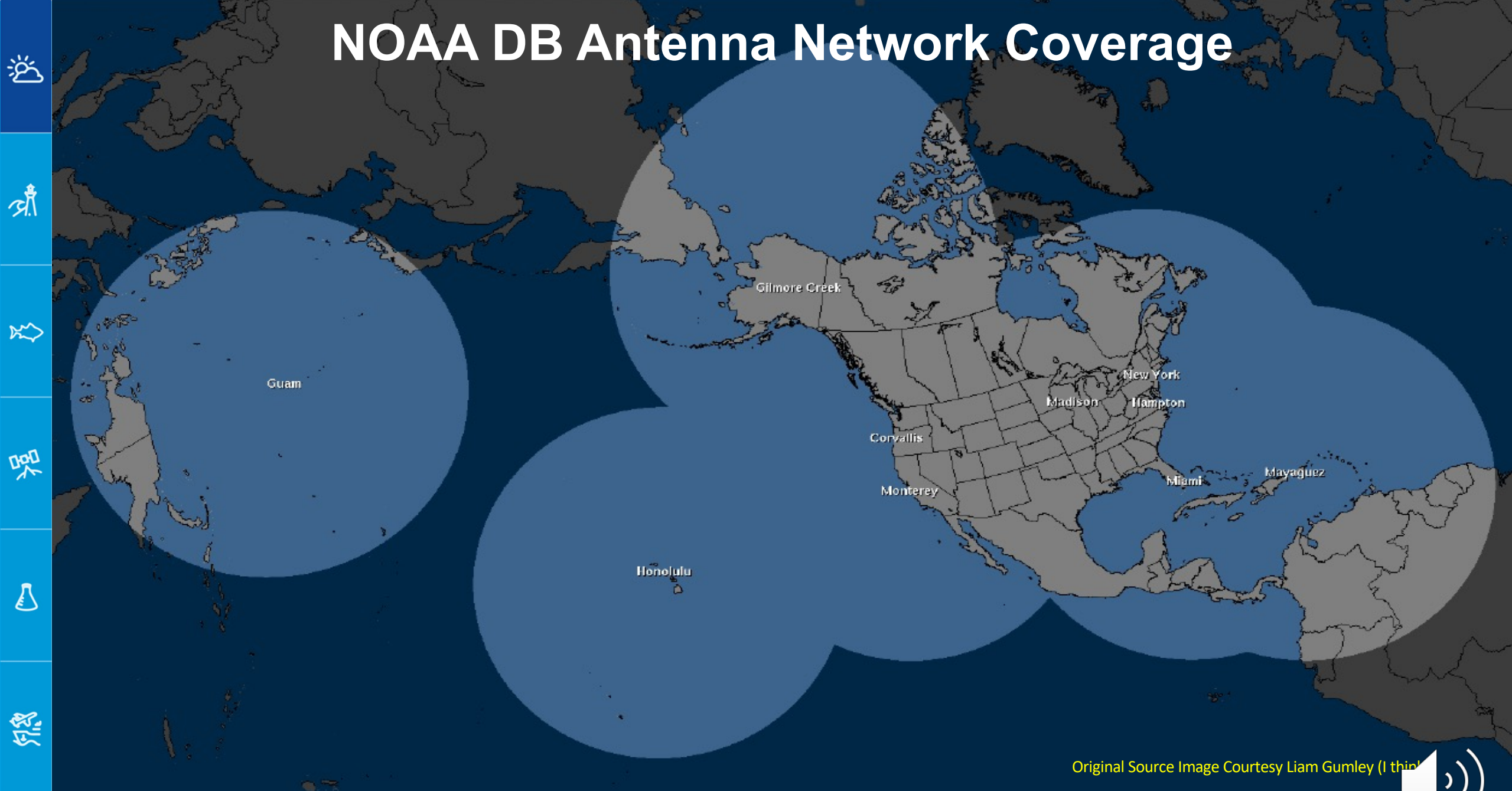
Ford Island Pearl Harbor
Inouye Regional Center



Pacific Region Satellite Ground Stations: *Guam*



NOAA DB Antenna Network Coverage






Original Source Image Courtesy Liam Gumley (I think)





Supported Satellites

- 
- **NOAA-20 and Suomi NPP** – data from these satellites are priority
 - **Terra and Aqua** (NASA)
 - **Metop-B** (EUMETSAT)
 - **GCOM-WI** (JAXA)
- 
- 

Supported Sensors



➤ Multispectral Imagers

- VIIRS x 2
- MODIS x 2
- AVHRR x 4

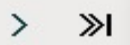
➤ Infrared Sounders

- CrIS x 2
- IASI x 2
- AIRS
- HIRS x 4



➤ Microwave Sounders

- ATMS x 2
 - AMSU x 4
 - MHS x 4
- 



localSat x

- Himawari-8/9
- Local Himawari-8/9 RGBs
- Guam L/X-Band Antenna
- MIMIC
- NASA SPoRT
- Himawari 8/9 Derived Motion Winds -----
- By Pressure
- By Mandatory Levels
- By Channel

ames: 30 Mag: 1.0 Density: 1.0 WarnGen H

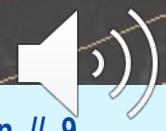
TESTING 4P MODEL Upper-Air

Guam L/X-Band Antenna x

- Guam L/X-Band Antenna ---
- VIIRS (Pacific) - NPP/JPSS
- ATMS MIRS (Pacific) - NPP/JPSS
- MHS MIRS (Pacific) - NOAA/MetOp
- AMSR-2 (Pacific) - GCOM
- AVHRR (Pacific) - NOAA/MetOp
- MODIS (Pacific) - Aqua/Terra
- Composite ACSPO SST 07.2301
- Composite MIRS TPW 07.2301

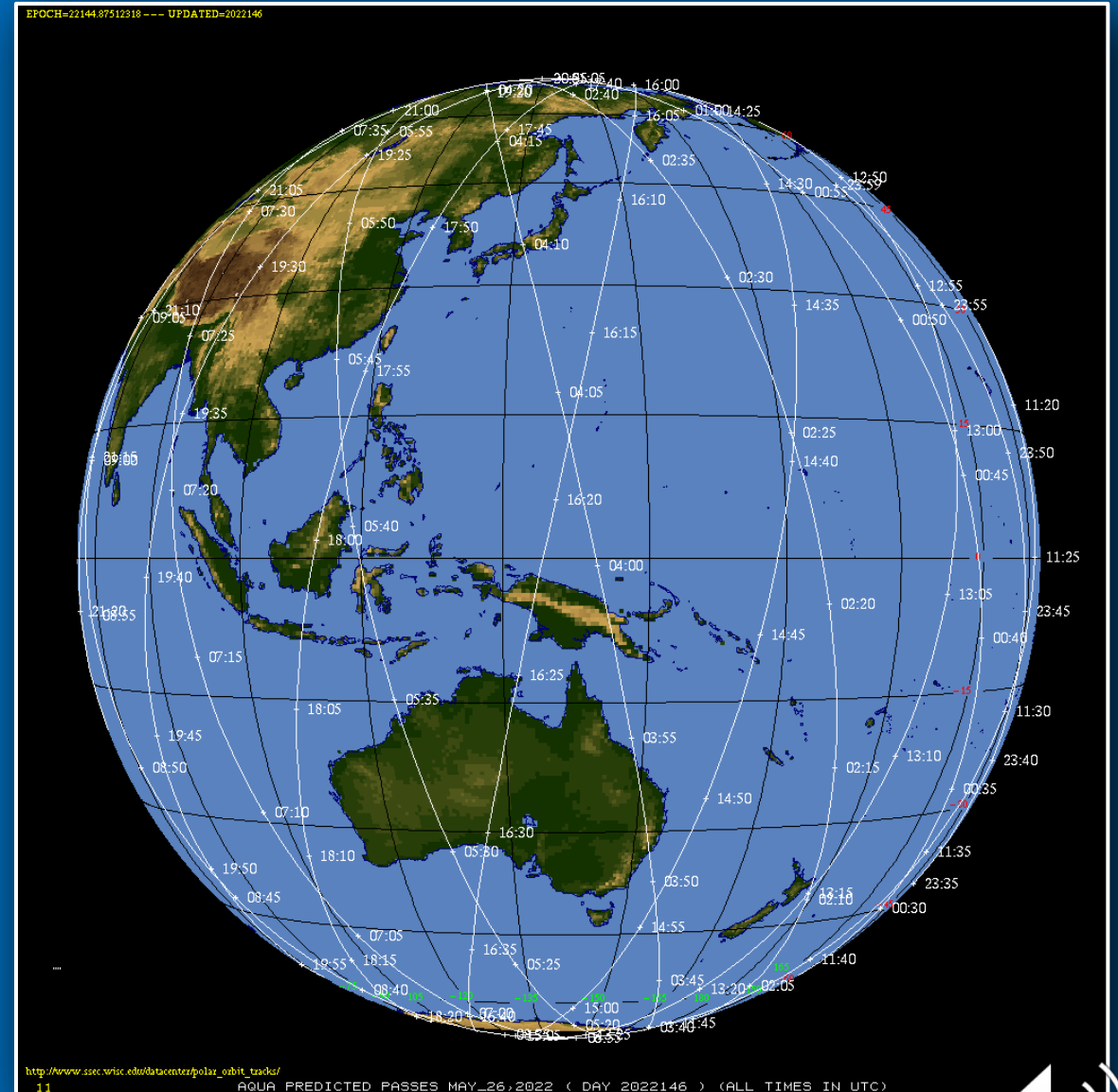
VIIRS (Pacific) - NPP/JPSS x

VIIRS BM2 0.45 µm Ref	07.0448
VIIRS BI1 0.64 µm Ref	07.0448
VIIRS BI2 0.87 µm Ref	07.0448
VIIRS BM9 1.38 µm Ref	07.0448
VIIRS BI3 1.61 µm Ref	07.0448
VIIRS BM11 2.25 µm Ref	07.0448
VIIRS BI4 3.74 µm BT	07.1723
VIIRS BM14 8.6 µm BT	07.1723
VIIRS BM15 10.8 µm BT	07.1723
VIIRS BI5 11.5 µm BT	07.1723
VIIRS Histogram DNB	07.1723
VIIRS Adaptive DNB	07.1723
VIIRS Dynamic DNB	07.1723
VIIRS Split Ash/Dust (11.5-8.6 µm) BTD	07.1723
VIIRS Split SO2 (10.8-8.6 µm) BTD	07.1723
True Color RGB	??.????
False Color RGB	??.????
VIIRS ACSPO SST	07.1723



Benefits to the NWS

- **Spatial resolution:** Thermal infrared at 375m; visible & near-IR at 375m with 4 satellites providing 250m resolution.
- **Geophysical products:** SST, Clouds, Rain Rate, Aerosols, Temperature, Moisture
- **Day/Night imaging:** 2 satellites with nighttime optical imaging
- **Microwave** sounding & imaging
- **Lowered latency:** Image products available within 10-15 min



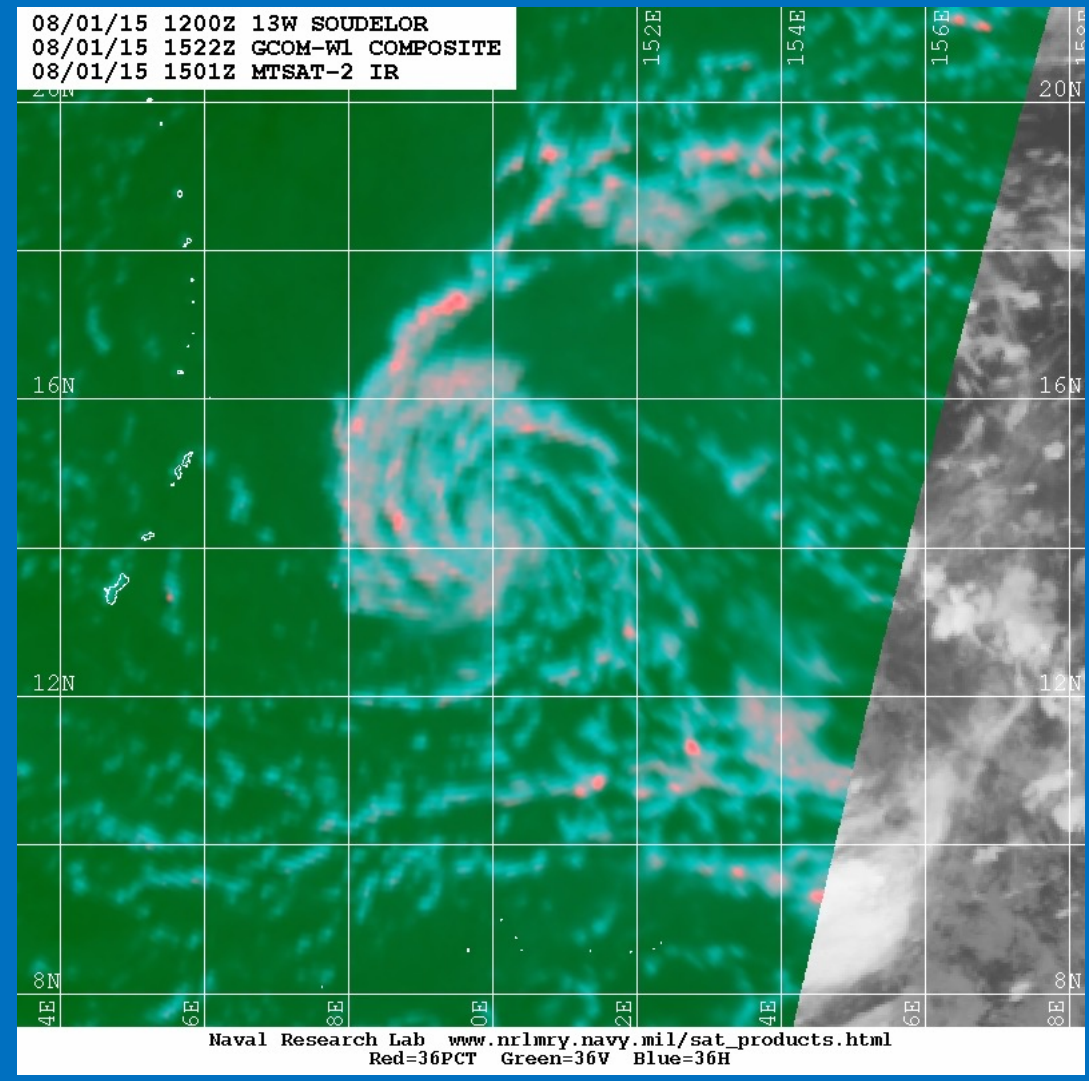
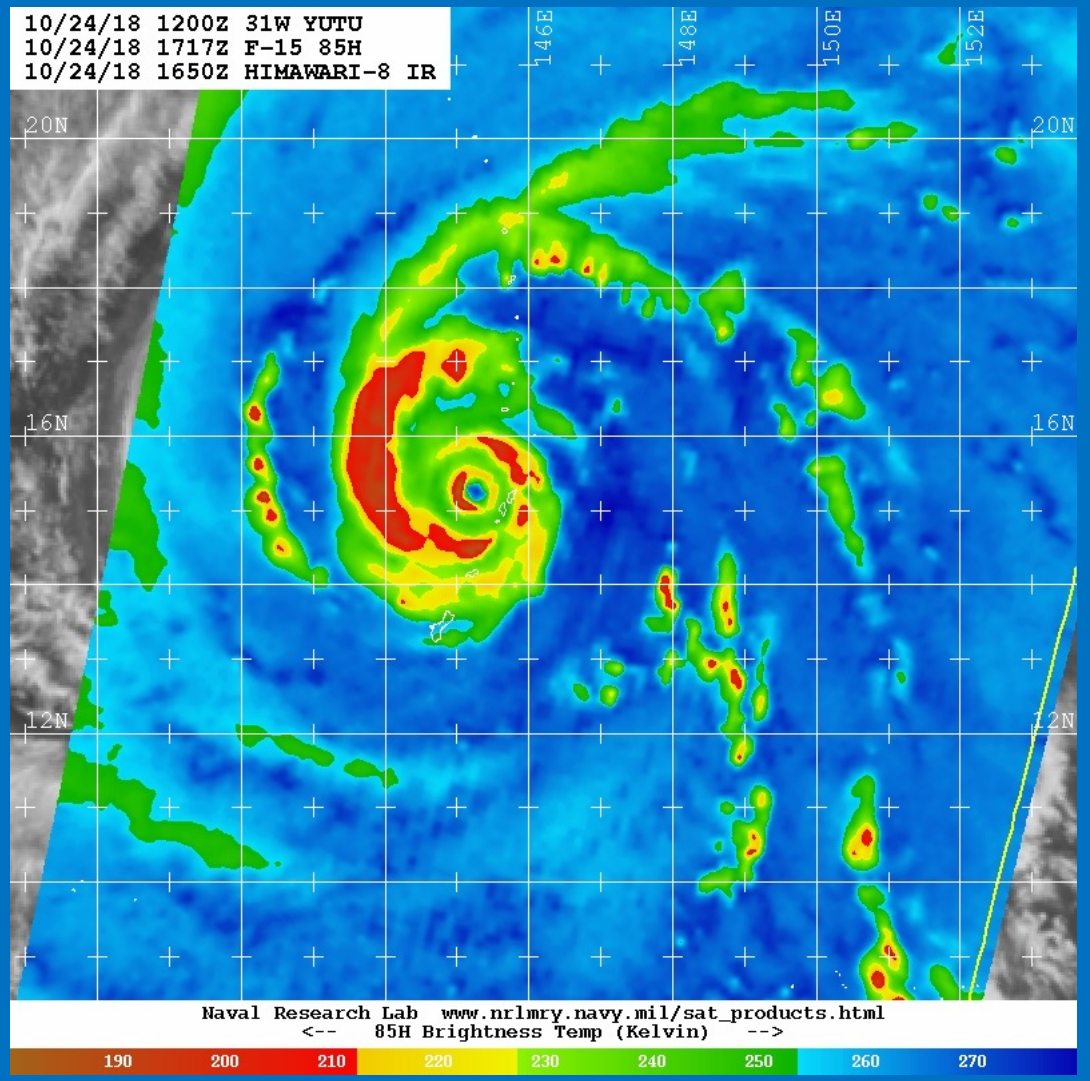


Operational Use of DB Satellite Products

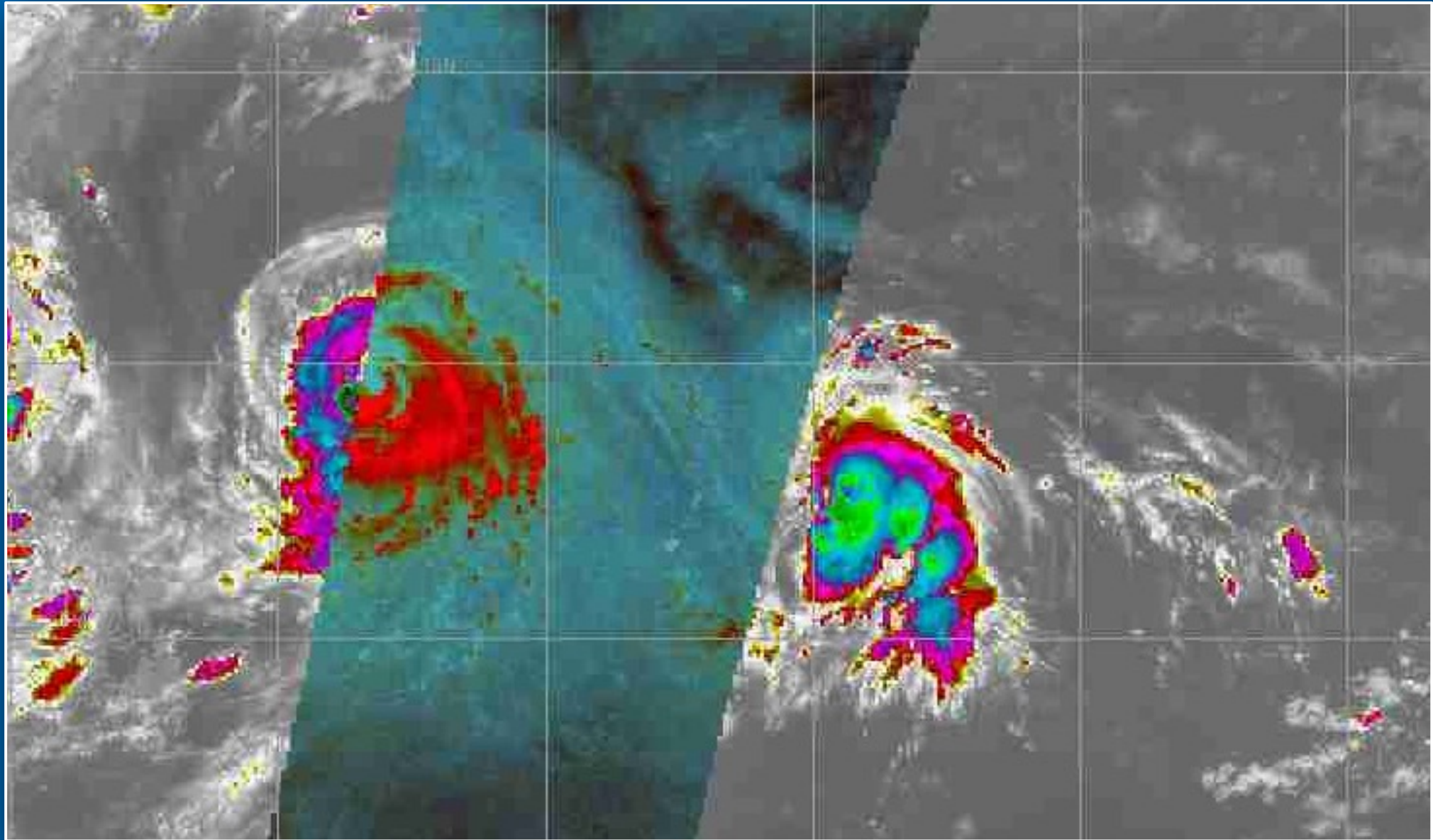
Tropical Cyclones



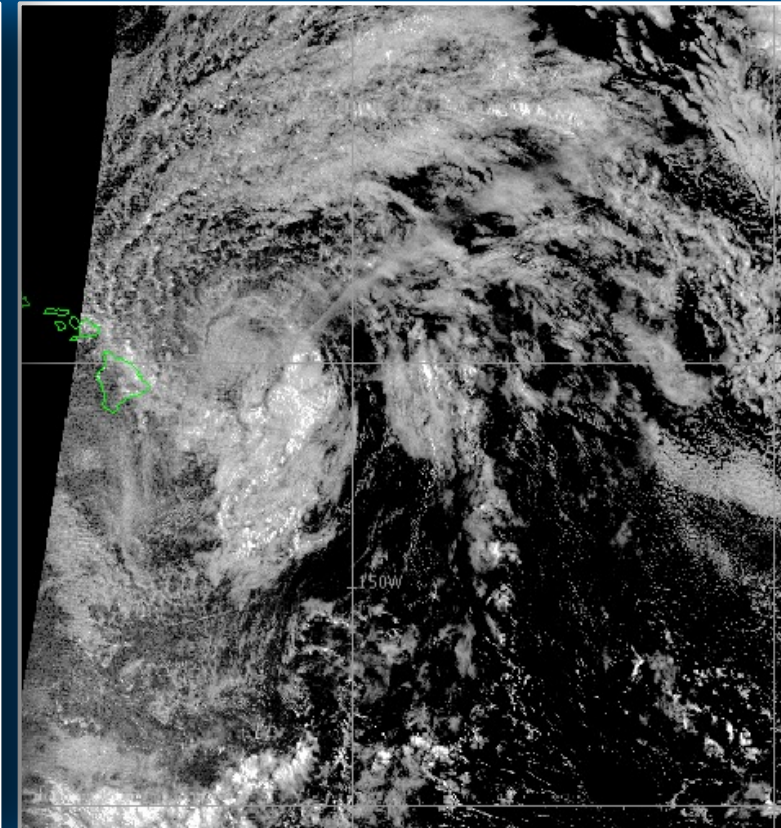
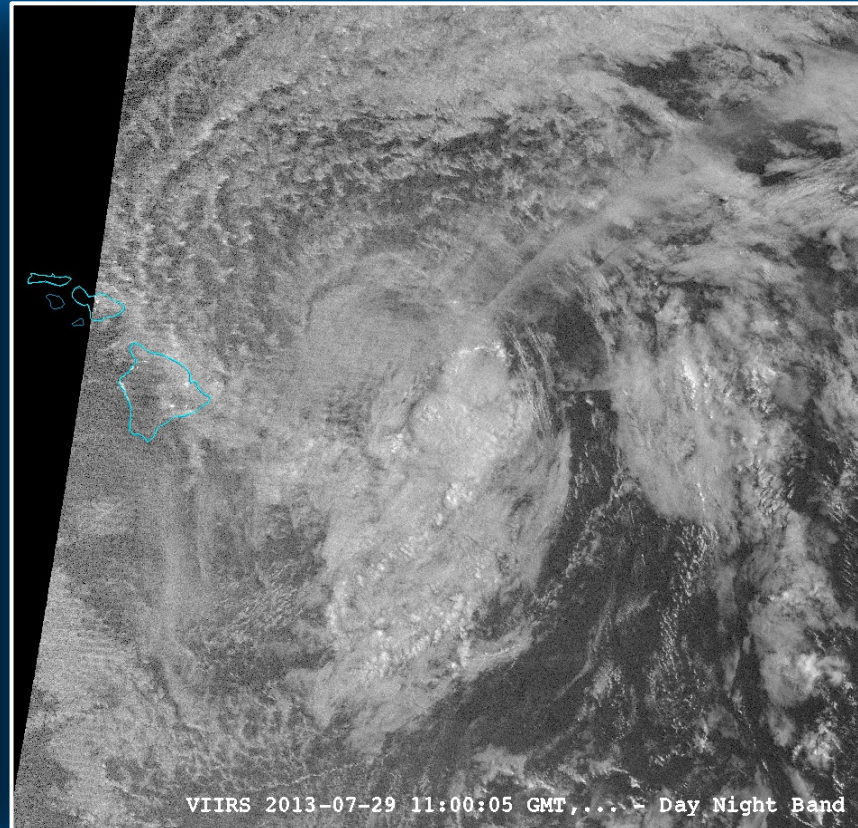
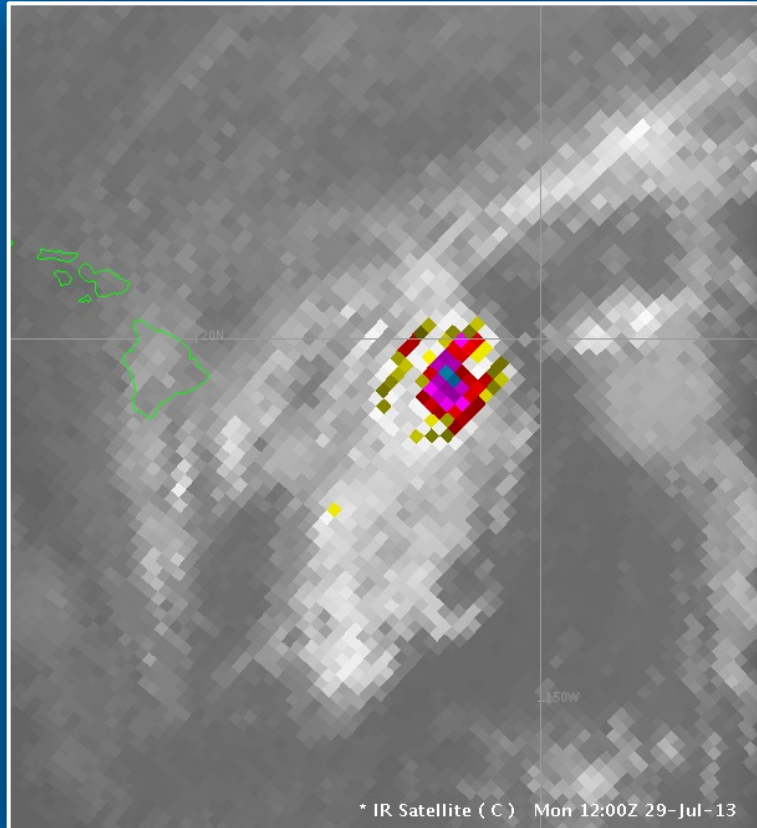
Microwave Imagery



Improved Center 'Fixing' and Identification of Rain Bands

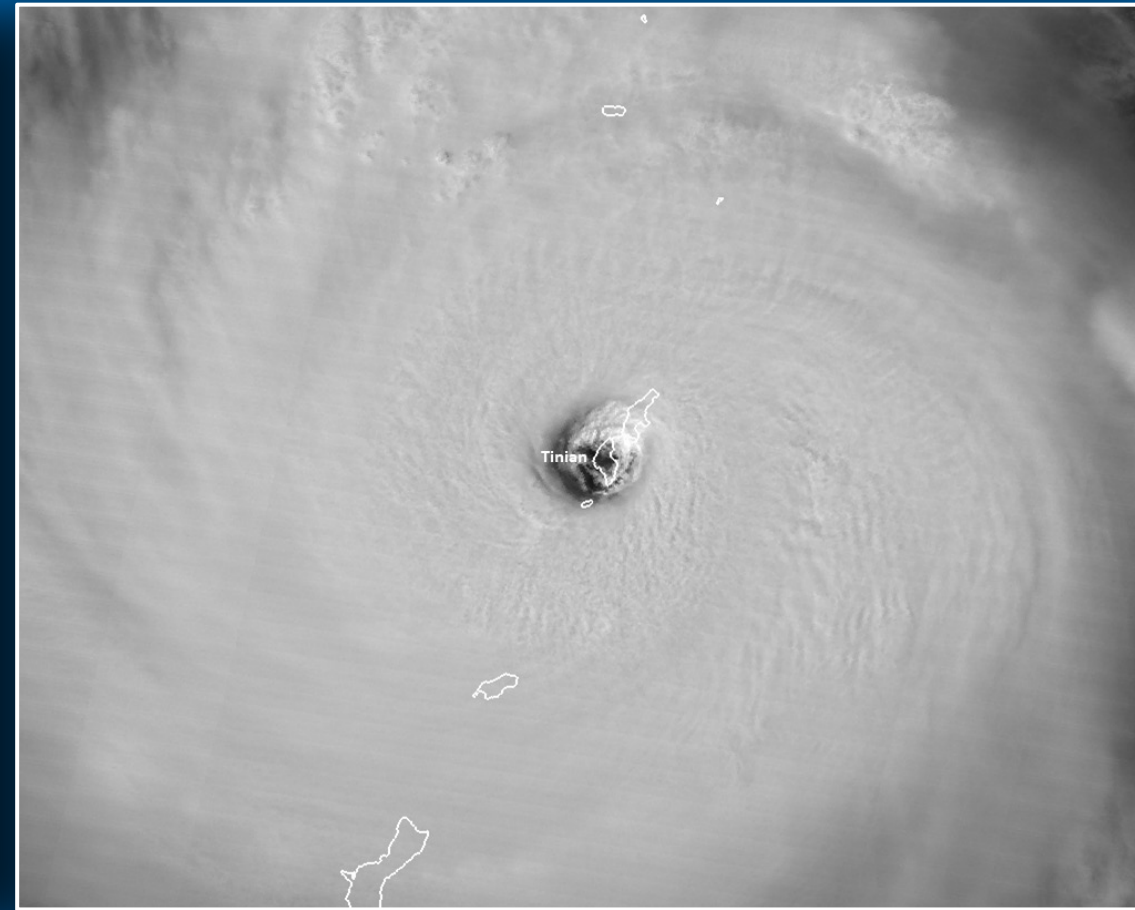
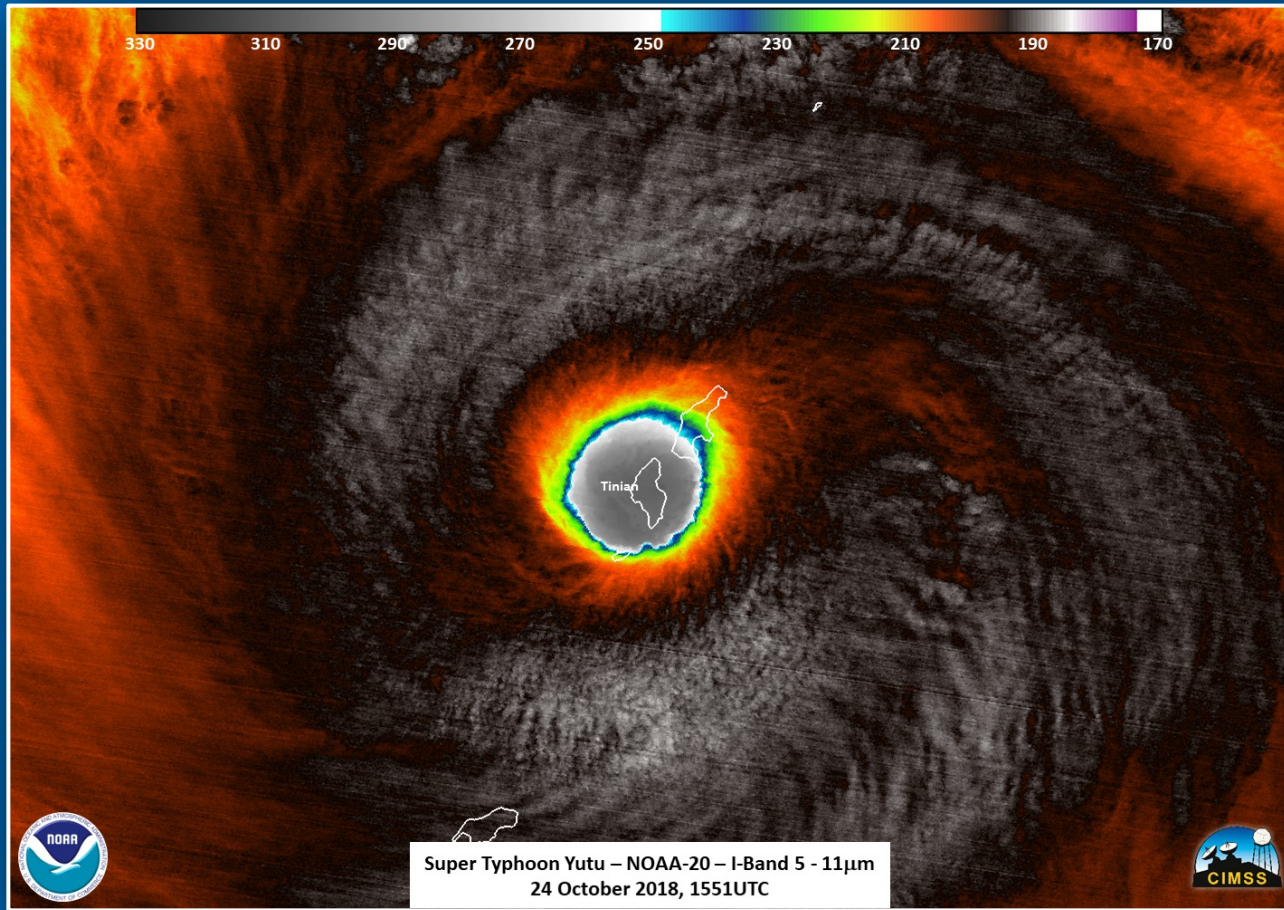


VIIRS Day Night Band



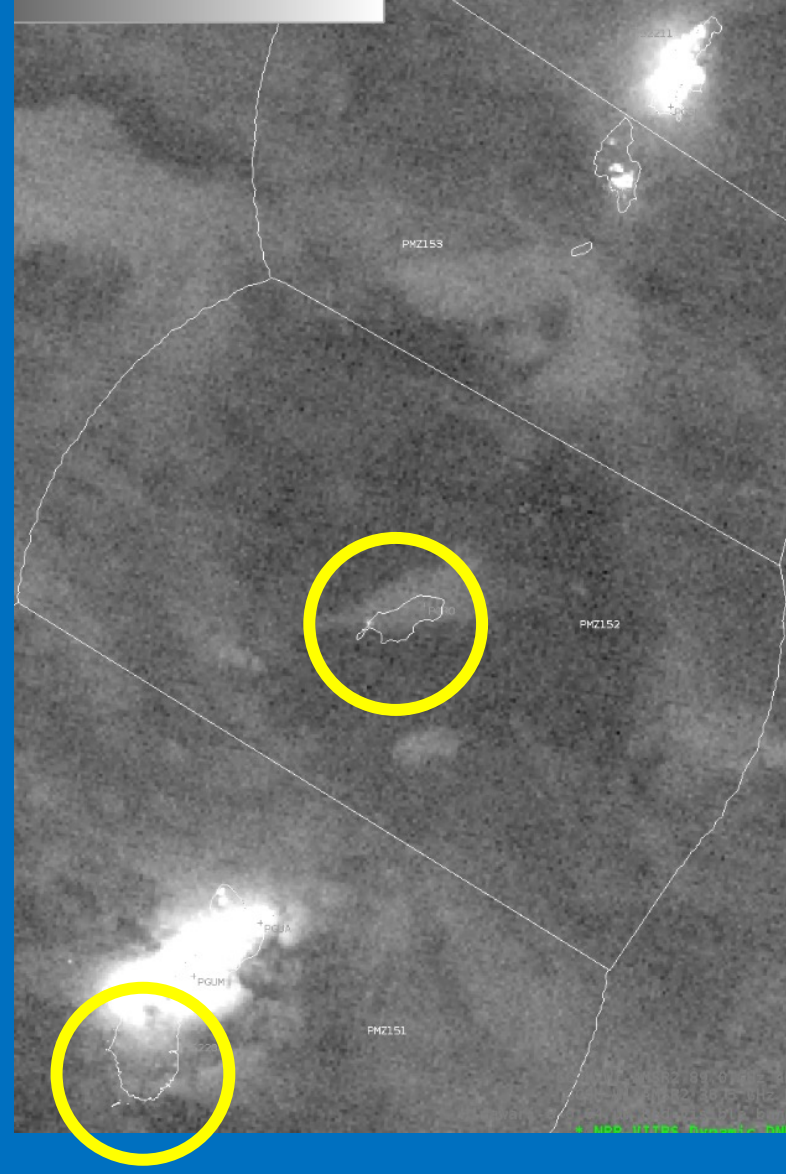
*Hawaii's Tropical Storm Flossie (40 kt)
29 July 2013*

VIIRS from NOAA-20



*Super Typhoon Yutu in the Mariana Islands
24 October 2018*

VIIRS DNB: Before & After 2018's TY Mangkhut



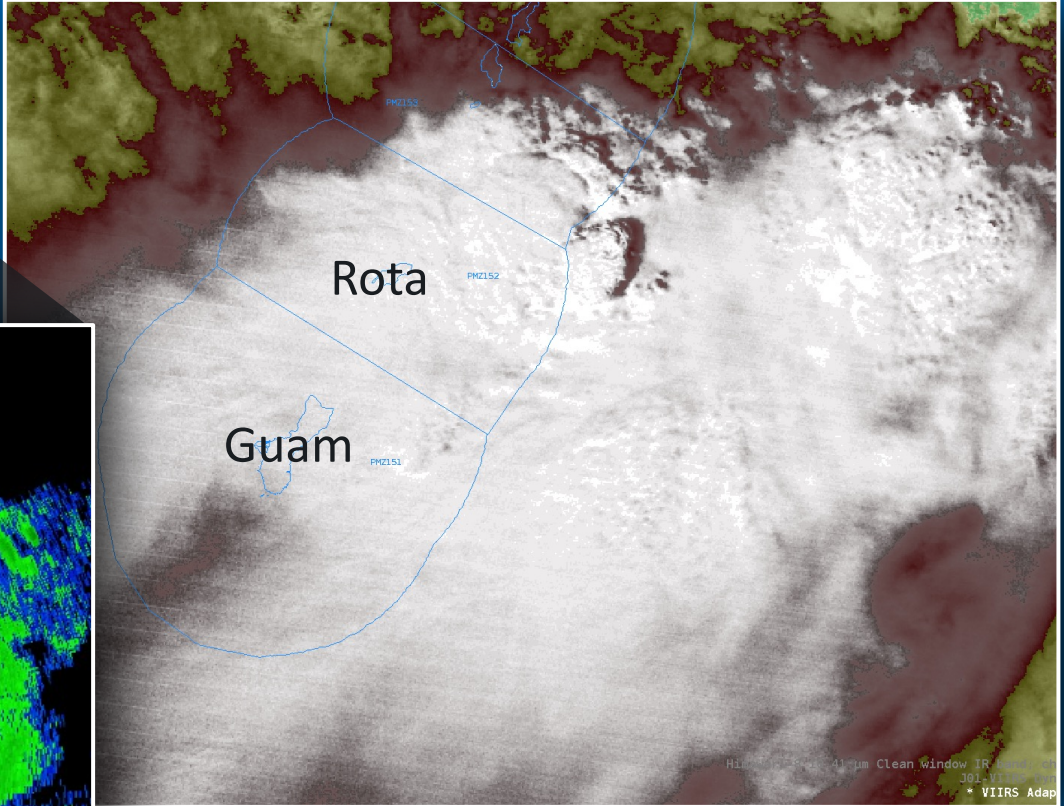
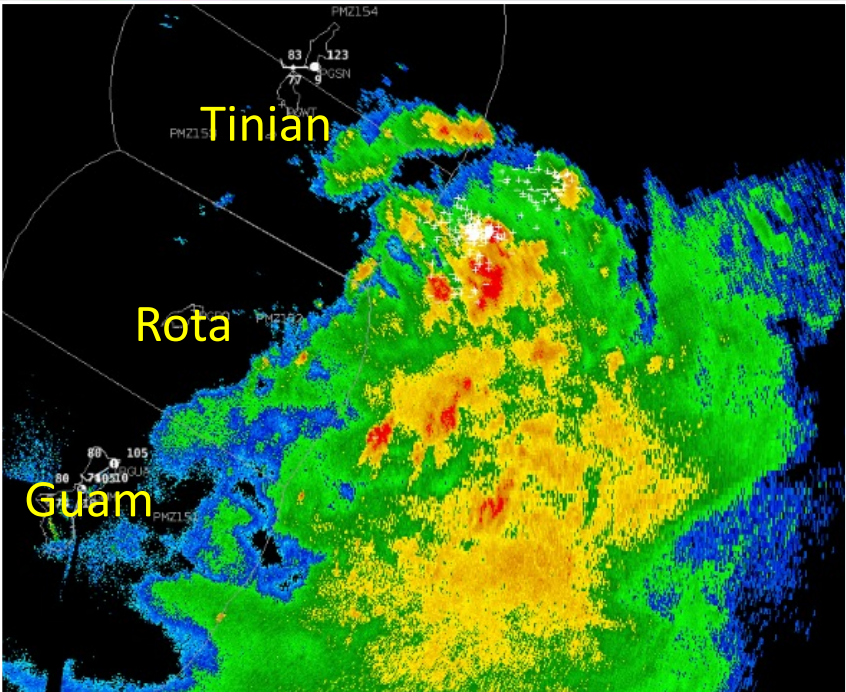
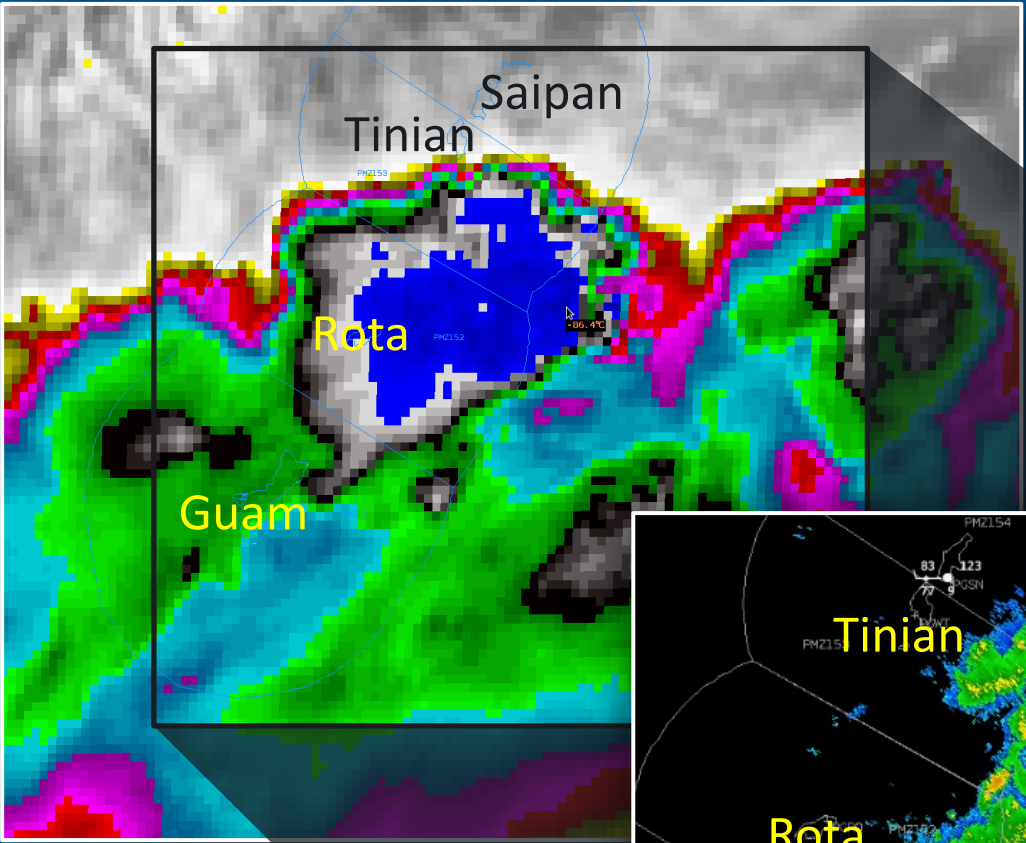


Operational Use of DB Satellite Products

Strong / Severe Convection



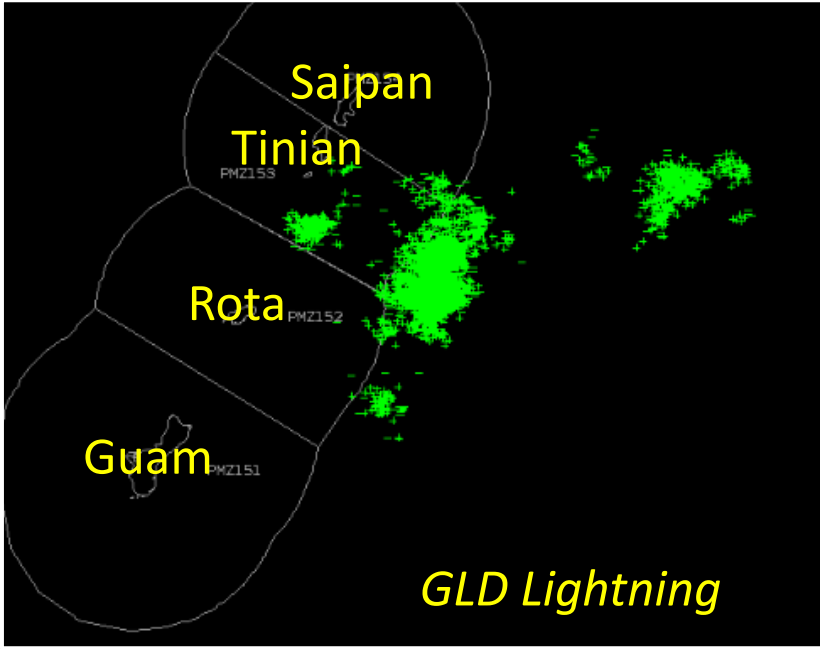
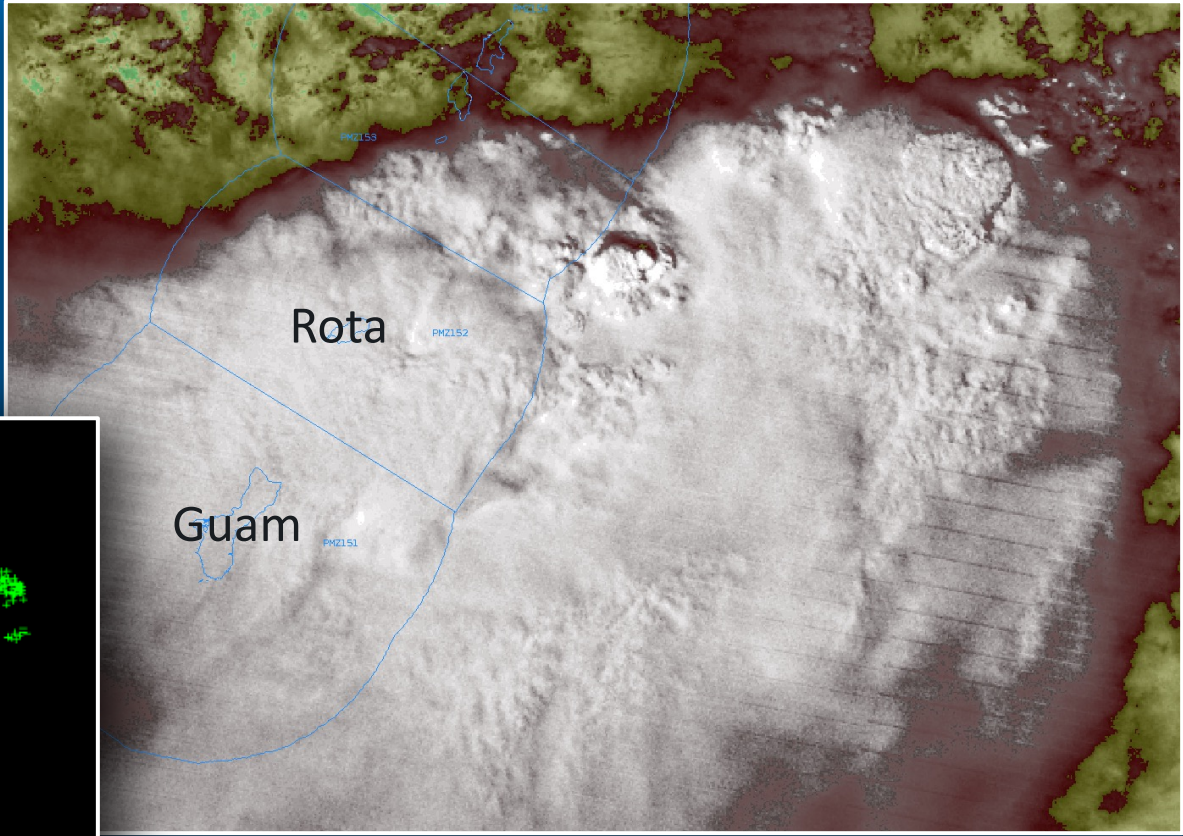
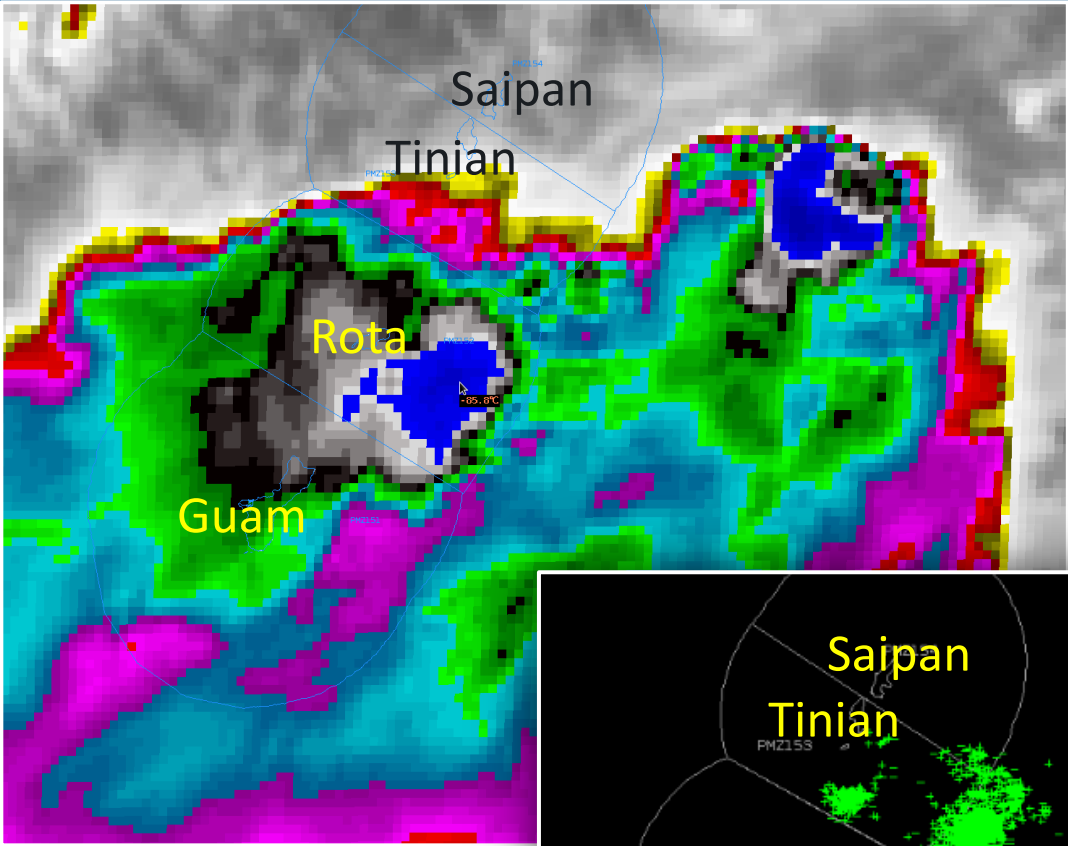
The Rare Strong Tropical Thunderstorms 14 September 2019



VIIRS Adaptive DNB



The Rare Strong Tropical Thunderstorms 14 September 2019



VIIRS Adaptive DNB

GLD Lightning





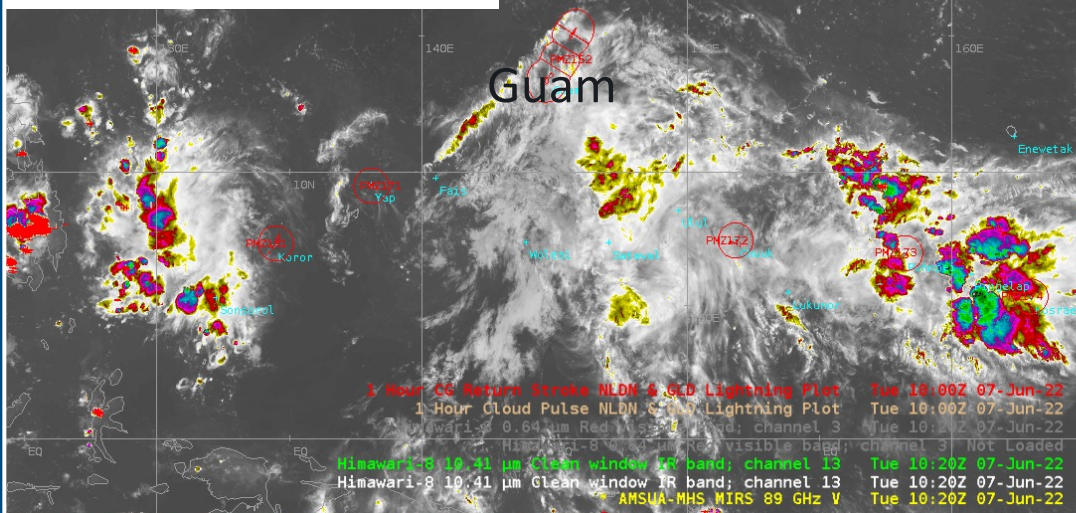
Operational Use of DB Satellite Products

Heavy Rainfall / Rain Rates

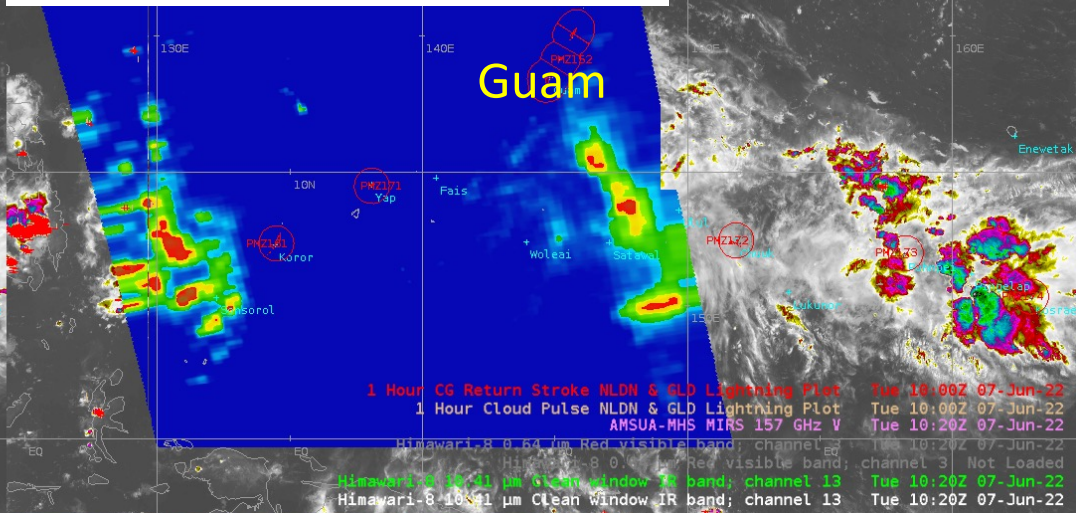


Microwave Imagery & Atmospheric Precipitable Water

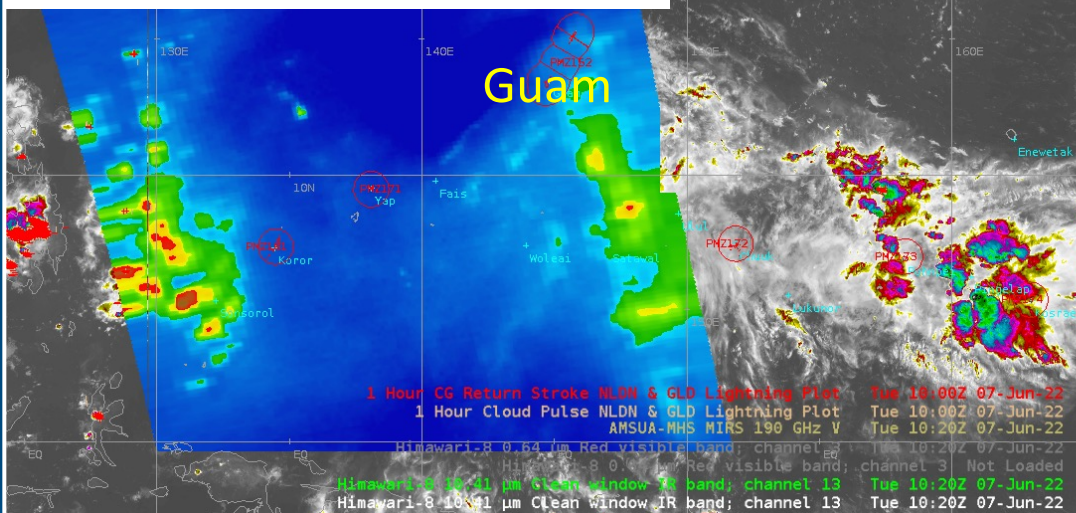
Himawari-8 Clean IR



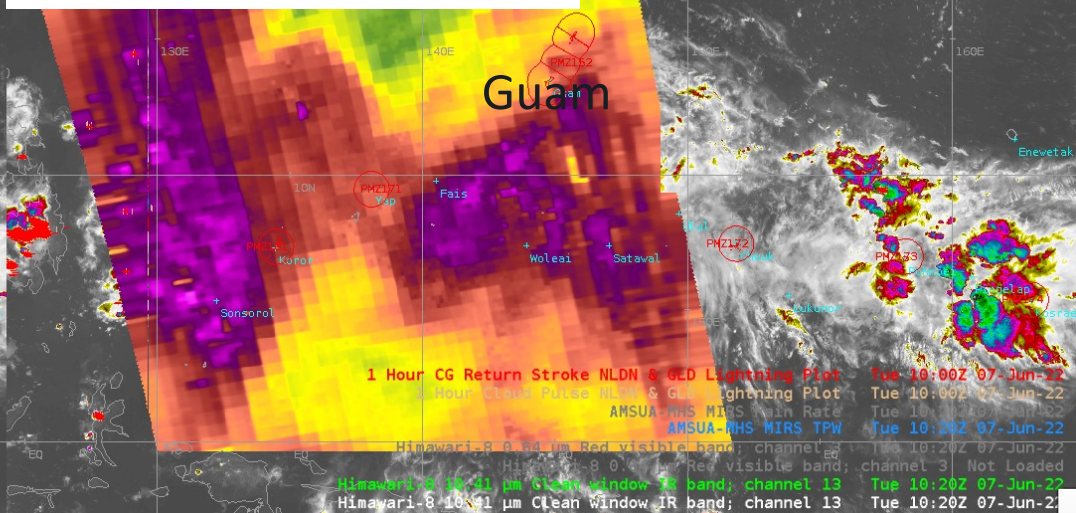
AMSUA-MHS MIRS 157 GHz



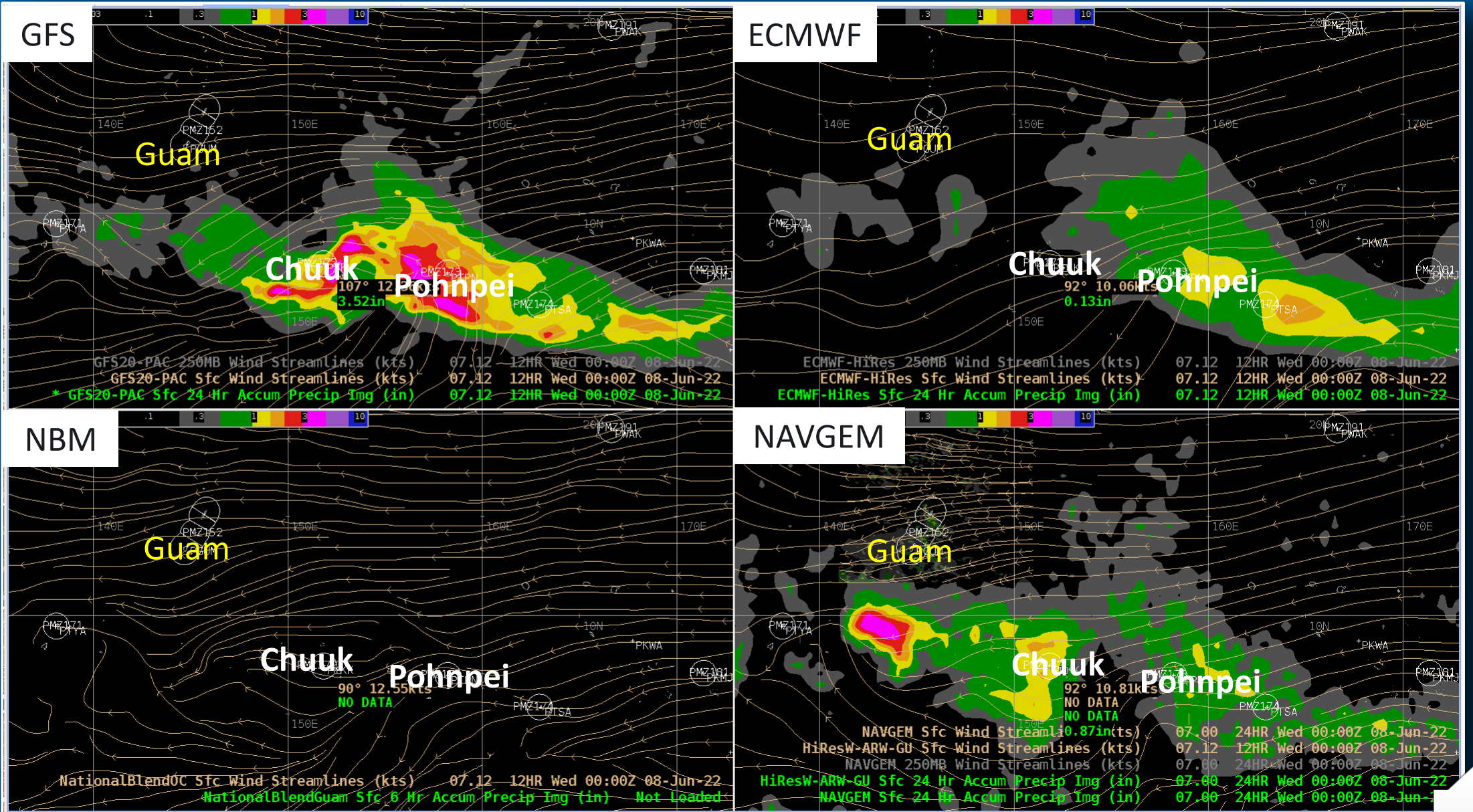
AMSUA-MHS MIRS 190 GHz



AMSUA-MHS MIRS TPW

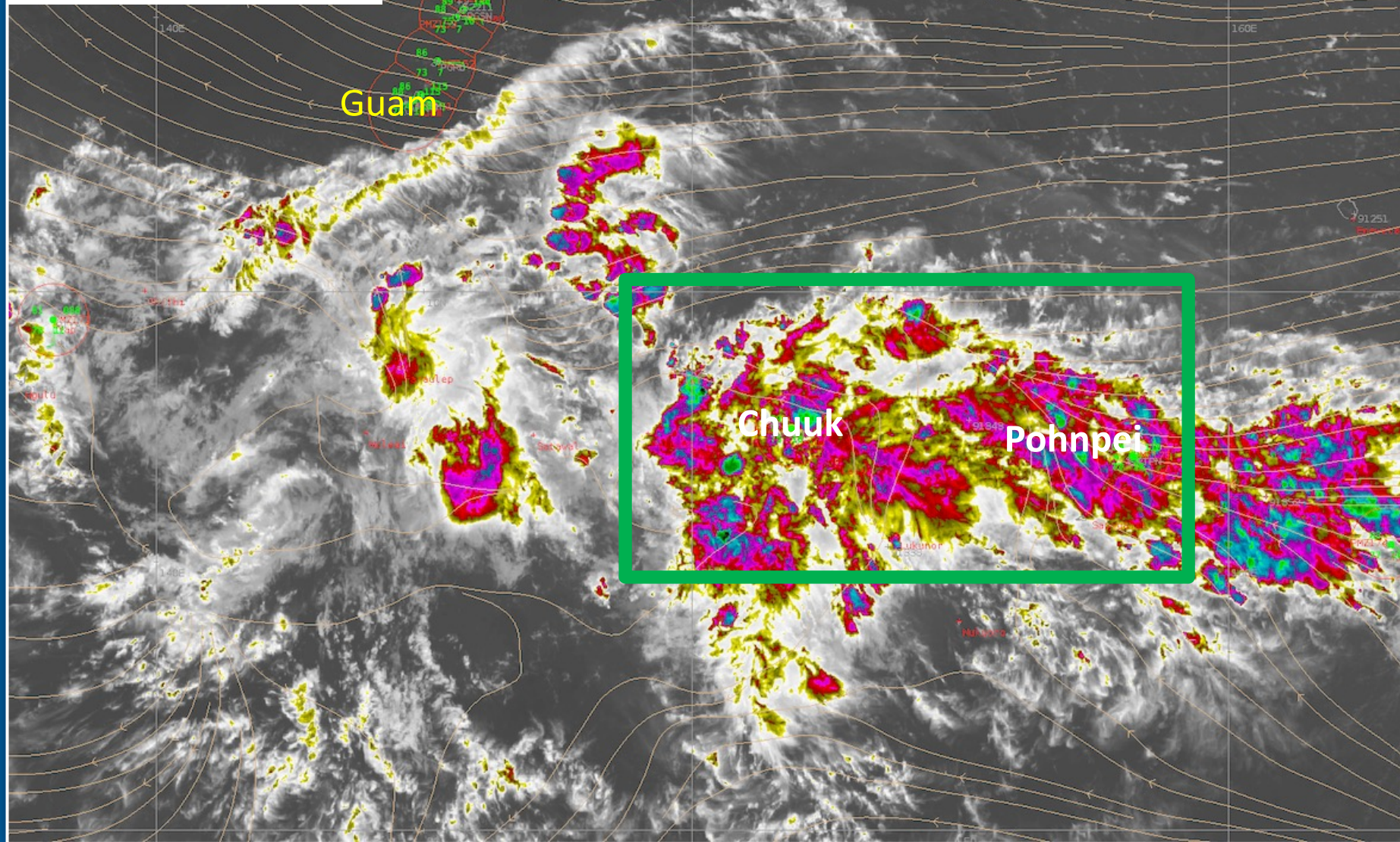


Convective Rains: What the Models are Suggesting



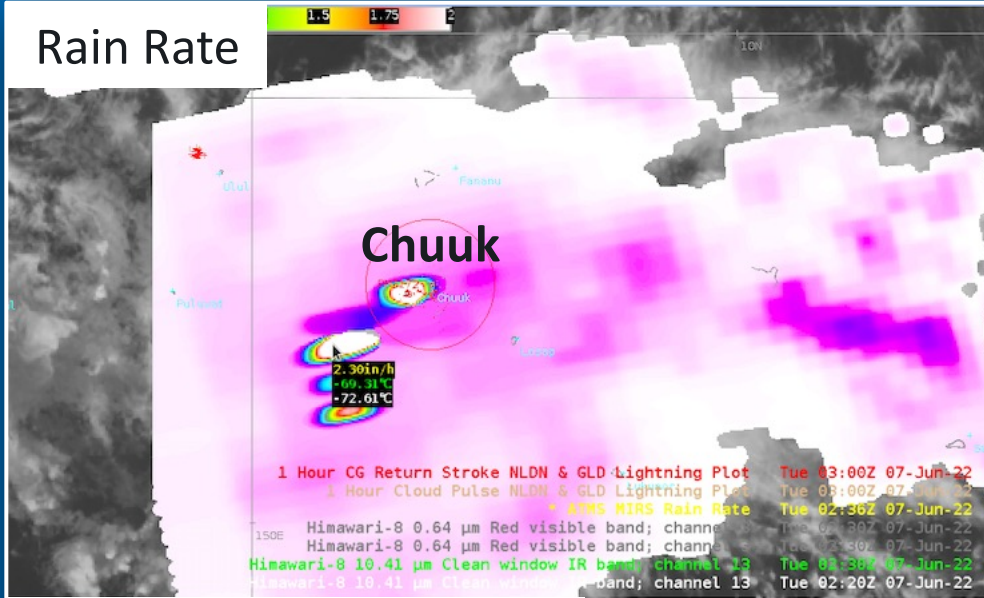
Convective Rains: Where's the Heaviest Rain?

Himawari-8 Clean IR

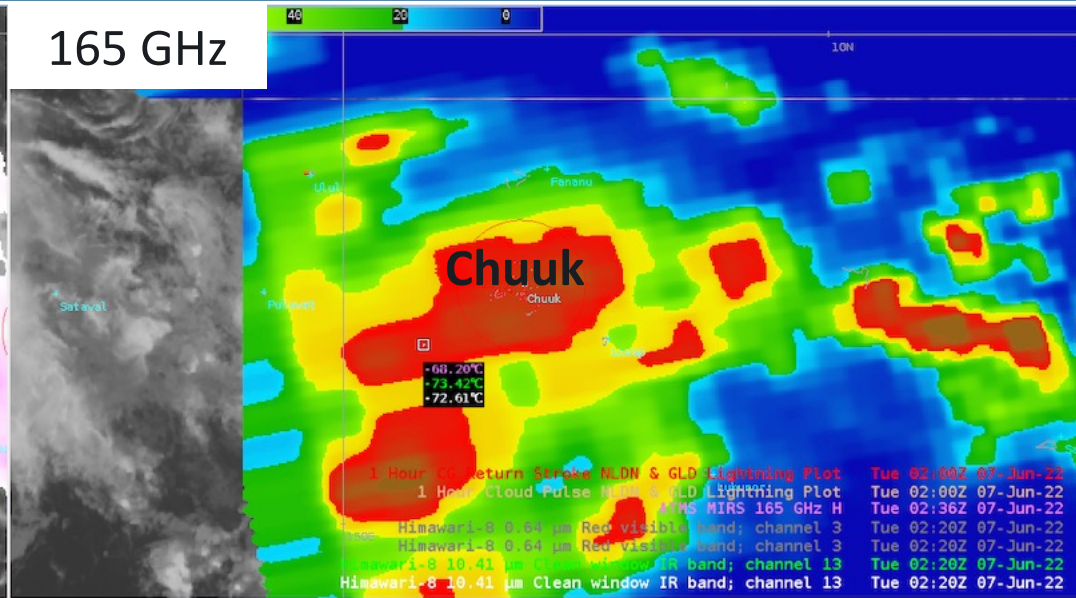


Heavy Convective Rains: ATMS MIRS

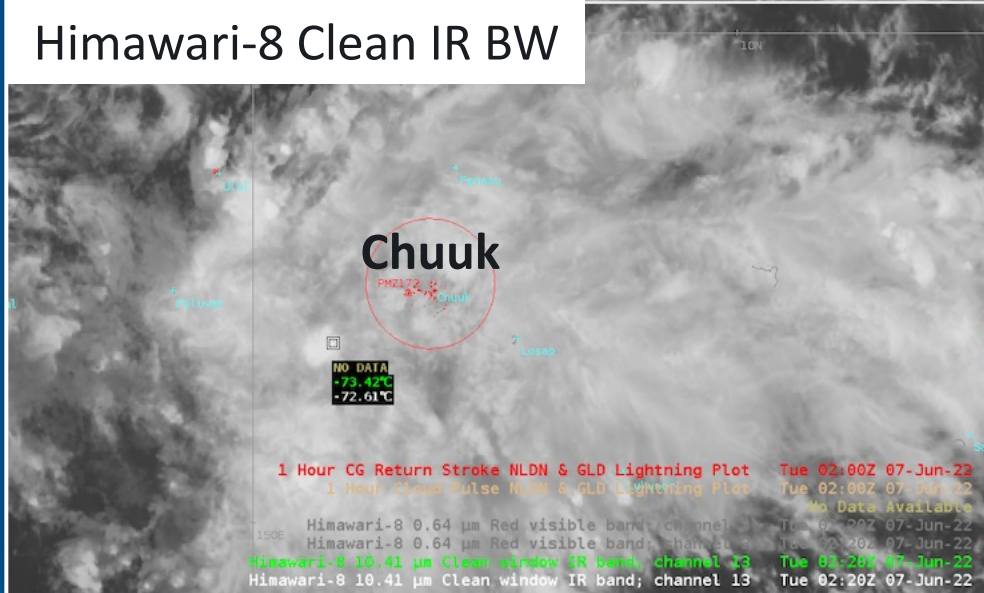
Rain Rate



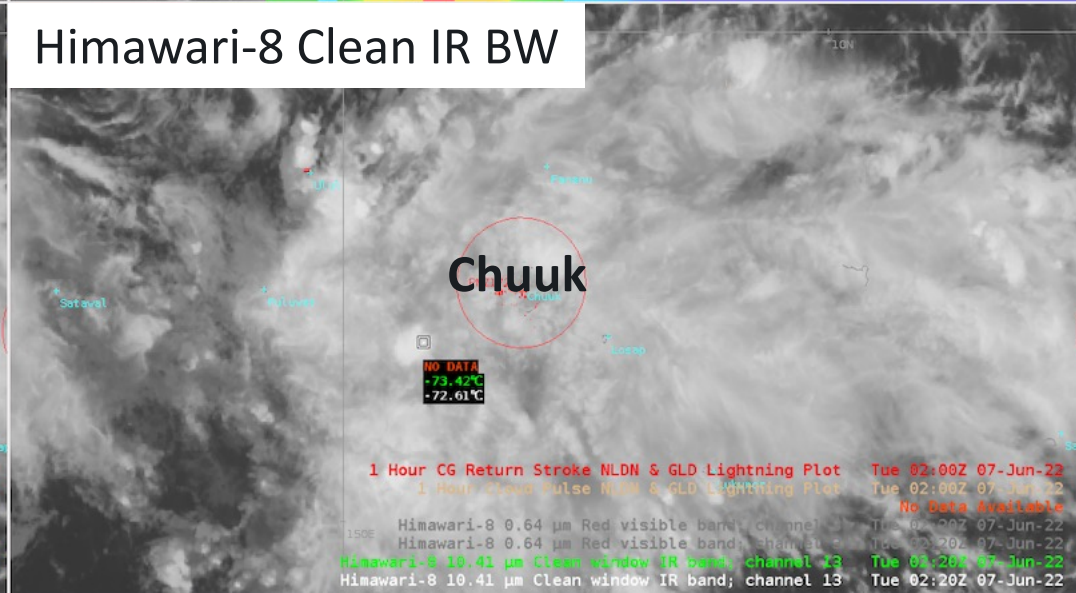
165 GHz



Himawari-8 Clean IR BW

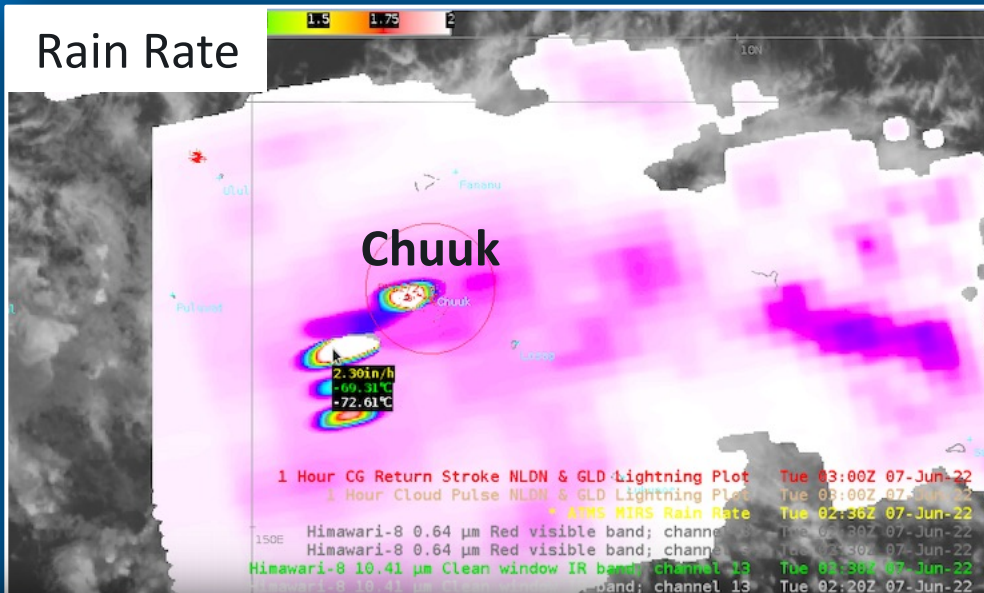


Himawari-8 Clean IR BW

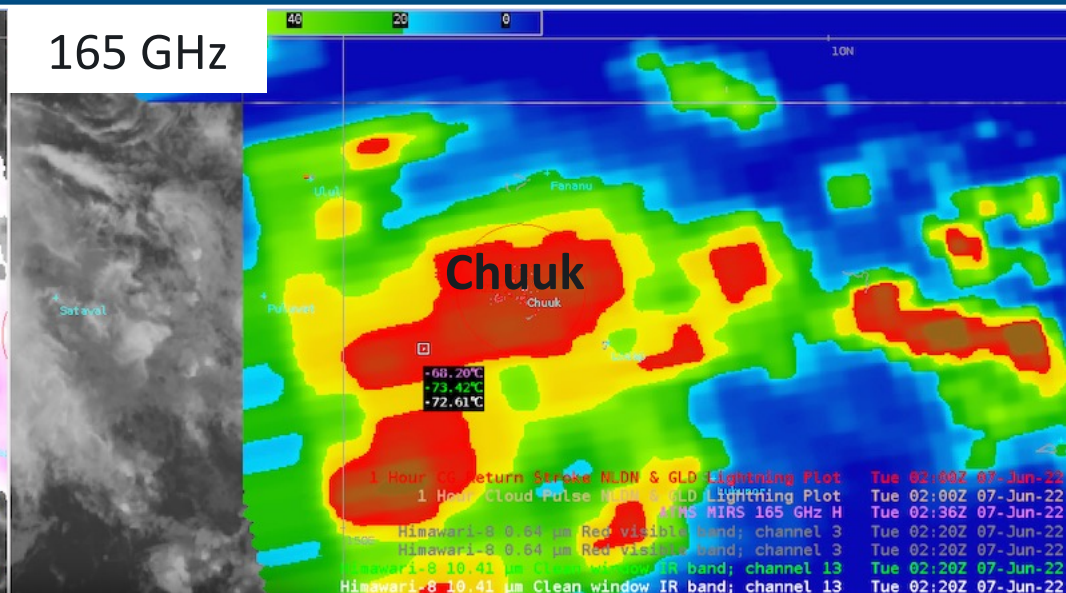


Heavy Convective Rains: ATMS MIRS

Rain Rate



165 GHz

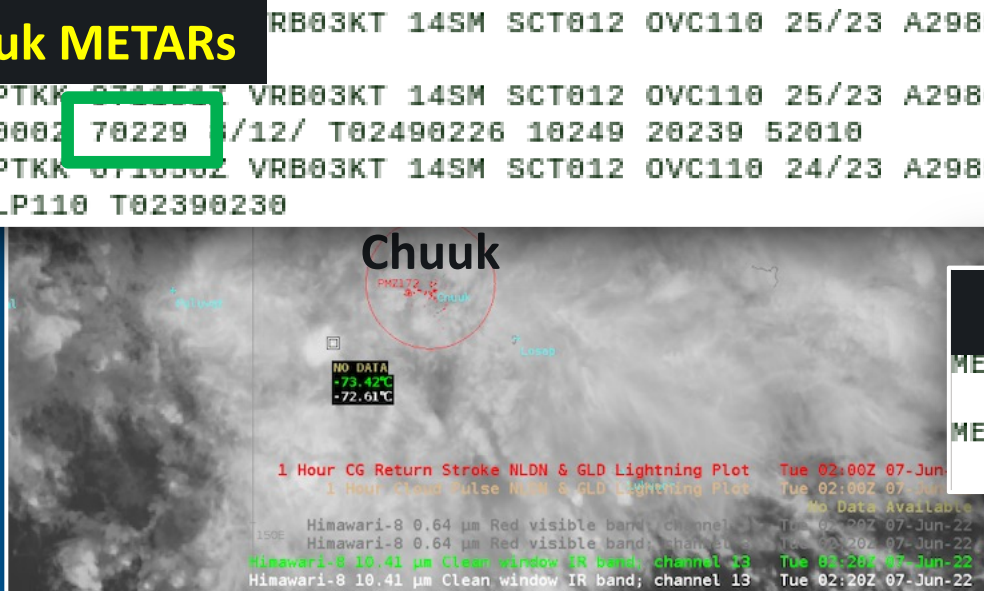


Chuuk METARs

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RB03KT 14SM SCT012 OVC110 25/23 A2985 RMK SLP111
METAR PTKK 071855Z VRB03KT 14SM SCT012 OVC110 25/23 A2986 RMK SLP113
60002 70229 1/12/ T02490226 10249 20239 52010
METAR PTKK 071850Z VRB03KT 14SM SCT012 OVC110 24/23 A2985 RMK RAE15
SLP110 T02390230
    
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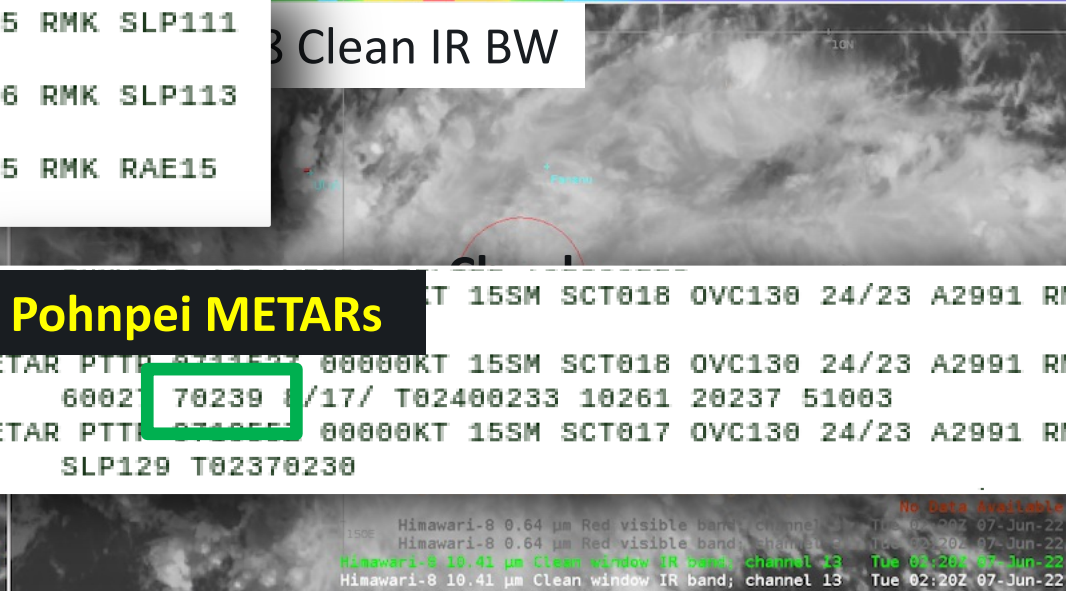
Clean IR BW



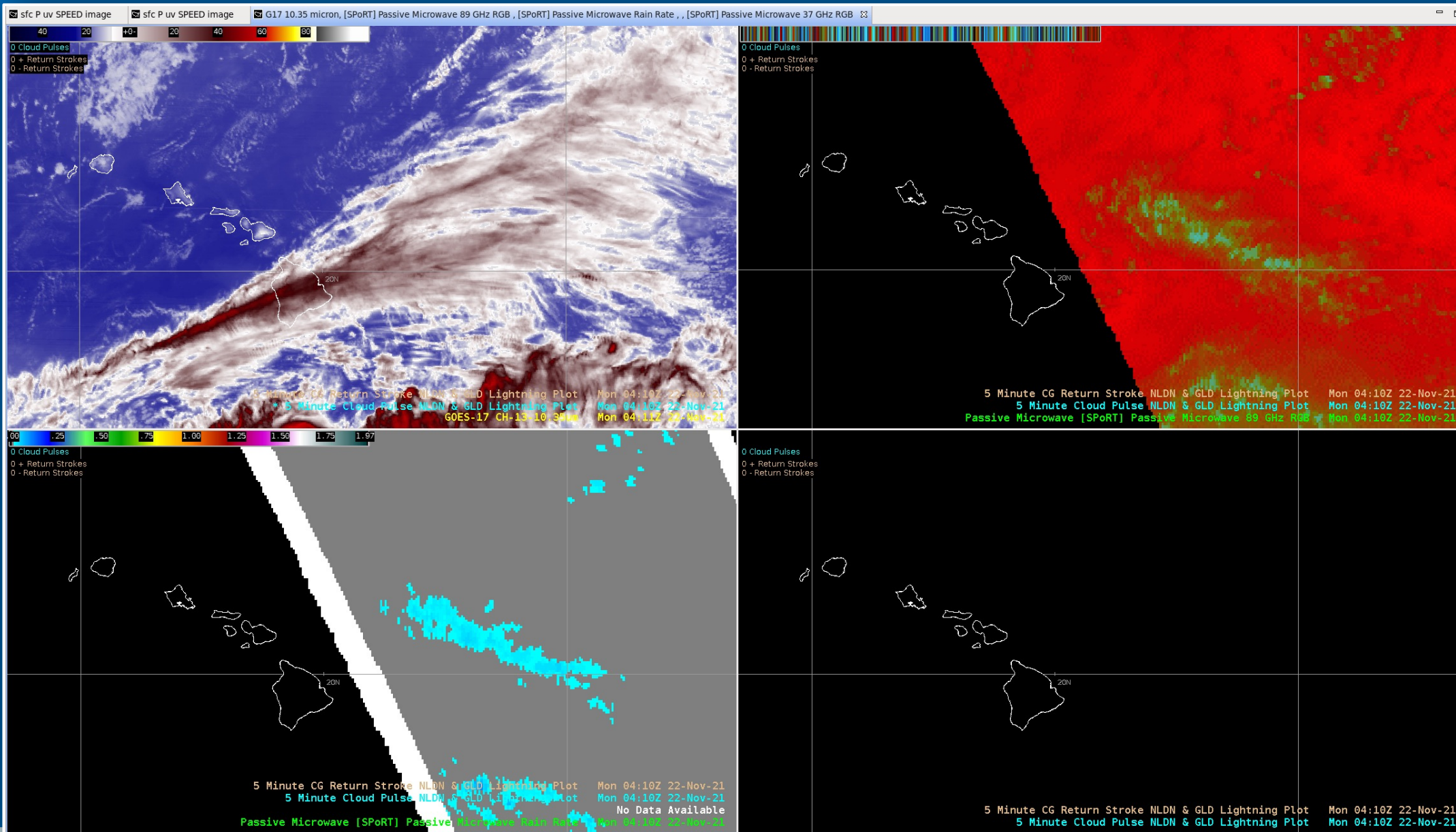
Pohnpei METARs

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PTT 071855Z 00000KT 15SM SCT018 OVC130 24/23 A2991 RMK SLP129
METAR PTT 071850Z 00000KT 15SM SCT018 OVC130 24/23 A2991 RMK SLP129
6002 70239 1/17/ T02400233 10261 20237 51003
METAR PTT 071855Z 00000KT 15SM SCT017 OVC130 24/23 A2991 RMK SHRAE42
SLP129 T02370230
    
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Hidden Hawaiian Rains



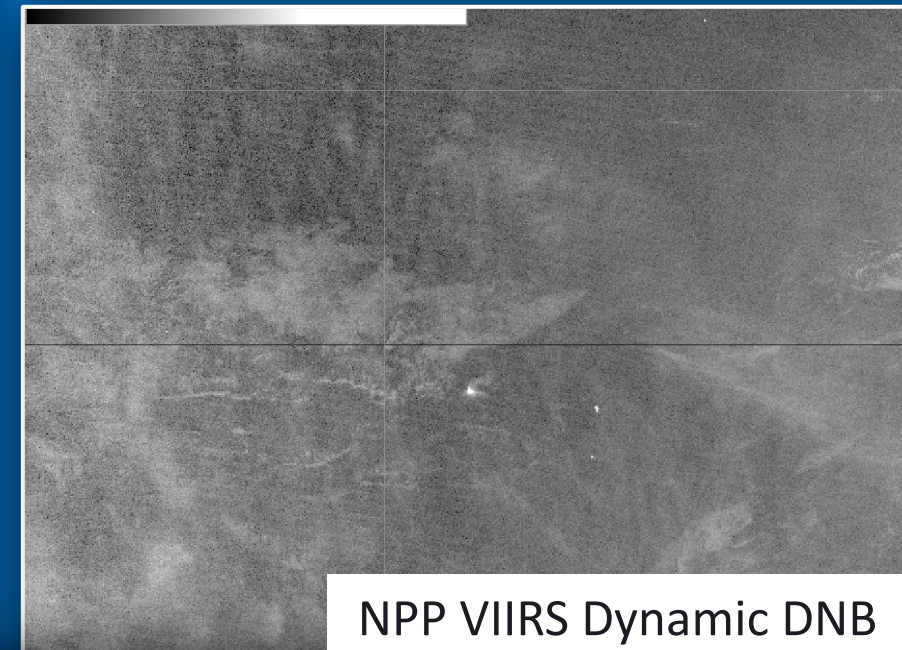
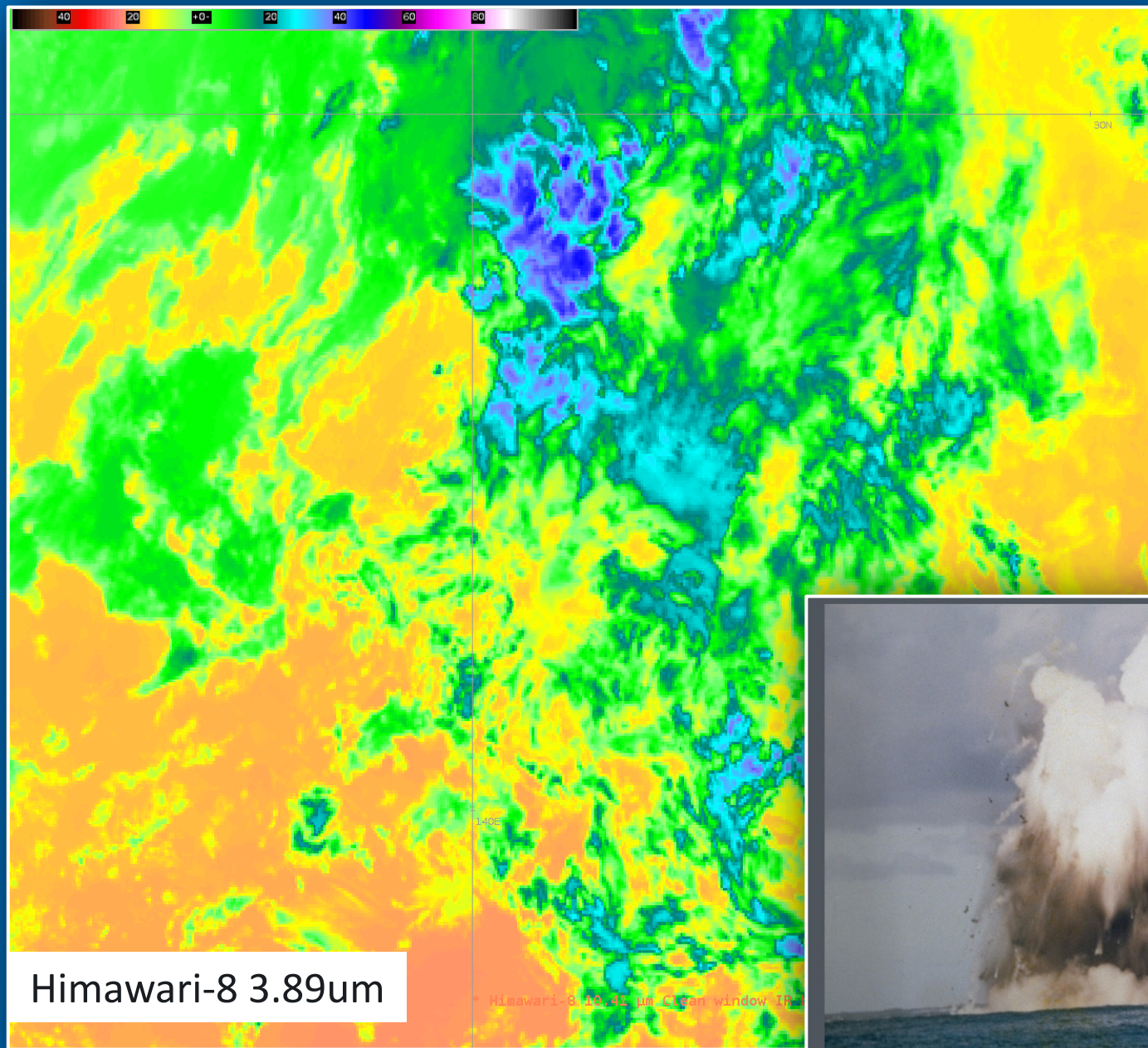


Operational Use of DB Satellite Products

Volcanoes / Hotspots / Wildfires



Nishinoshima



NPP VIIRS Dynamic DNB

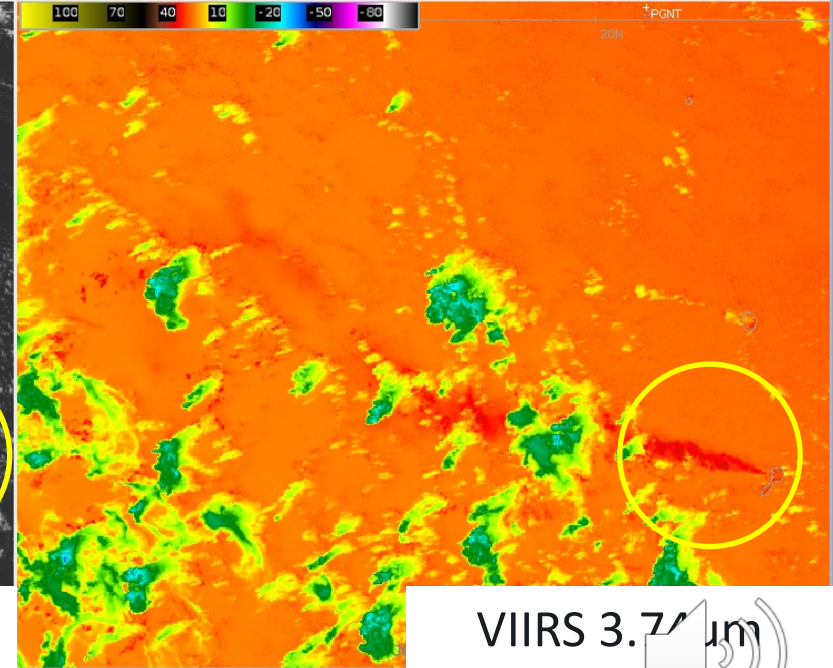
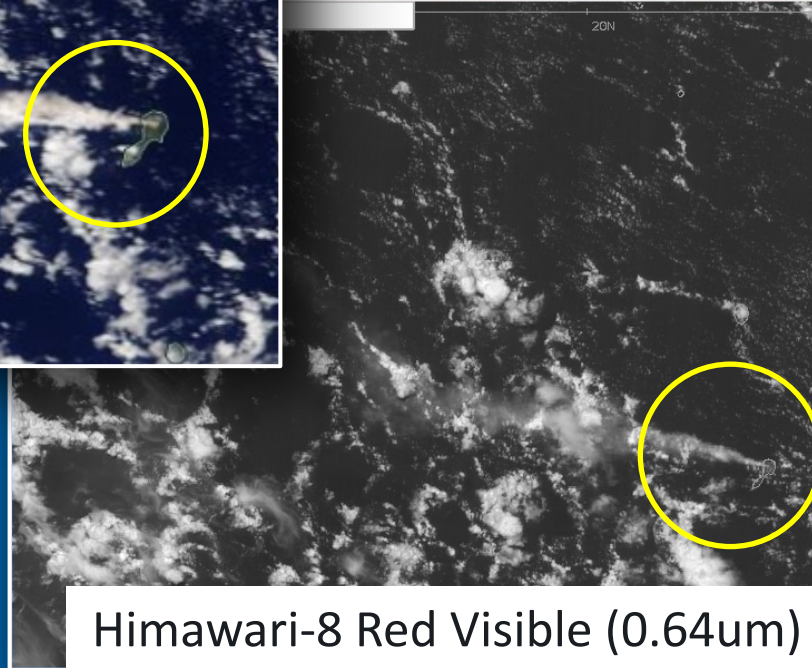
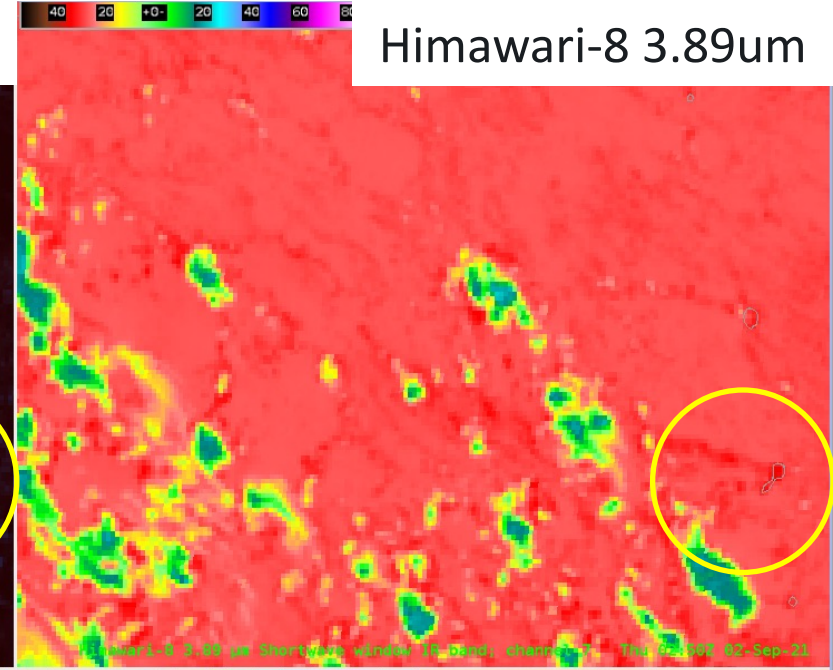
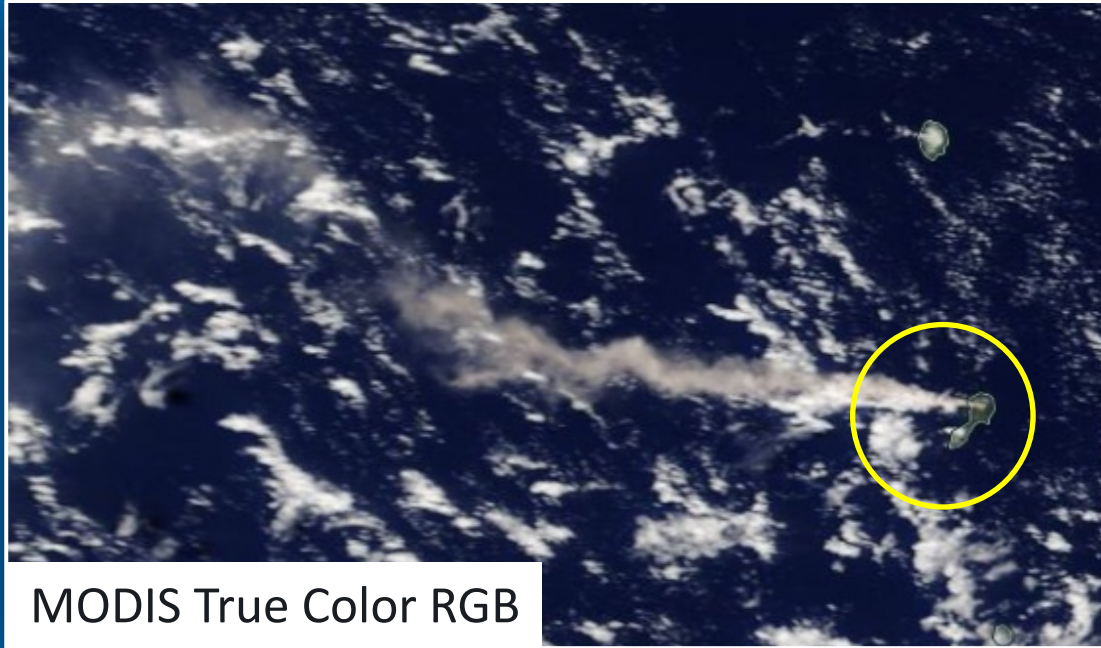


Country	Japan
Primary Volcano Type	Caldera
Last Known Eruption	2021 CE
Latitude	27.247°N
Longitude	140.874°E
Summit Elevation	25 m 82 ft
Volcano Number	284096

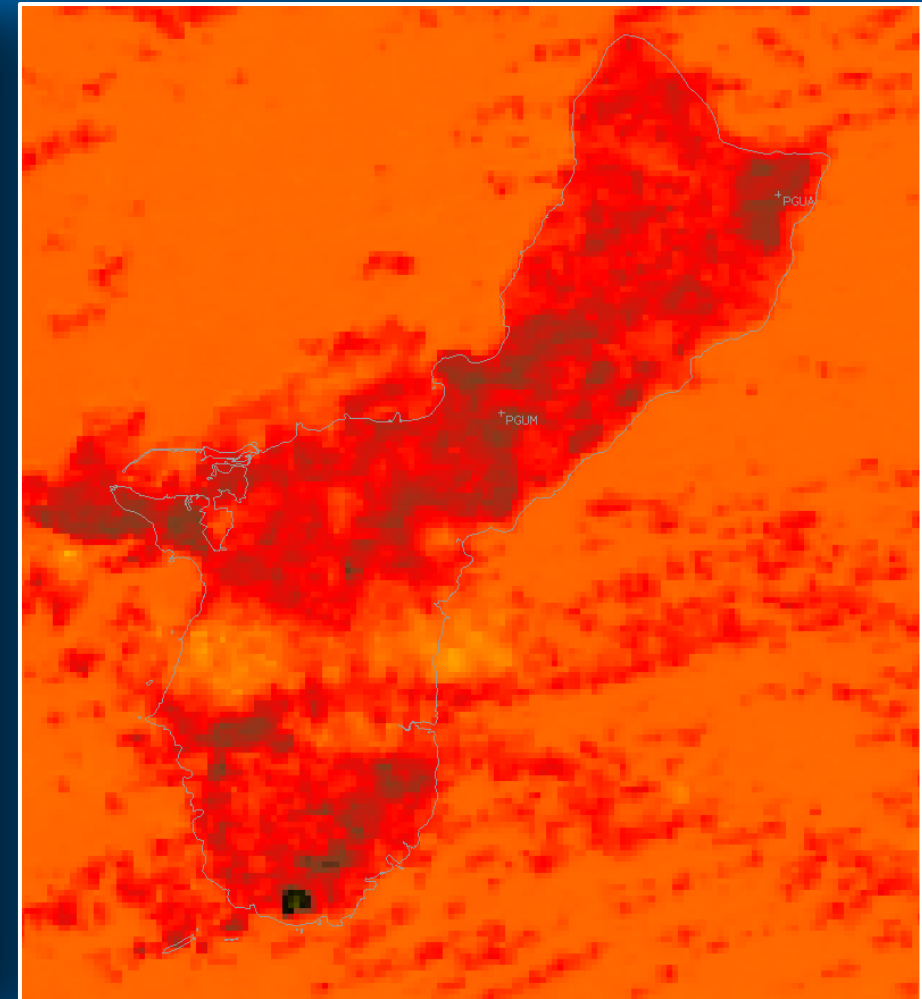
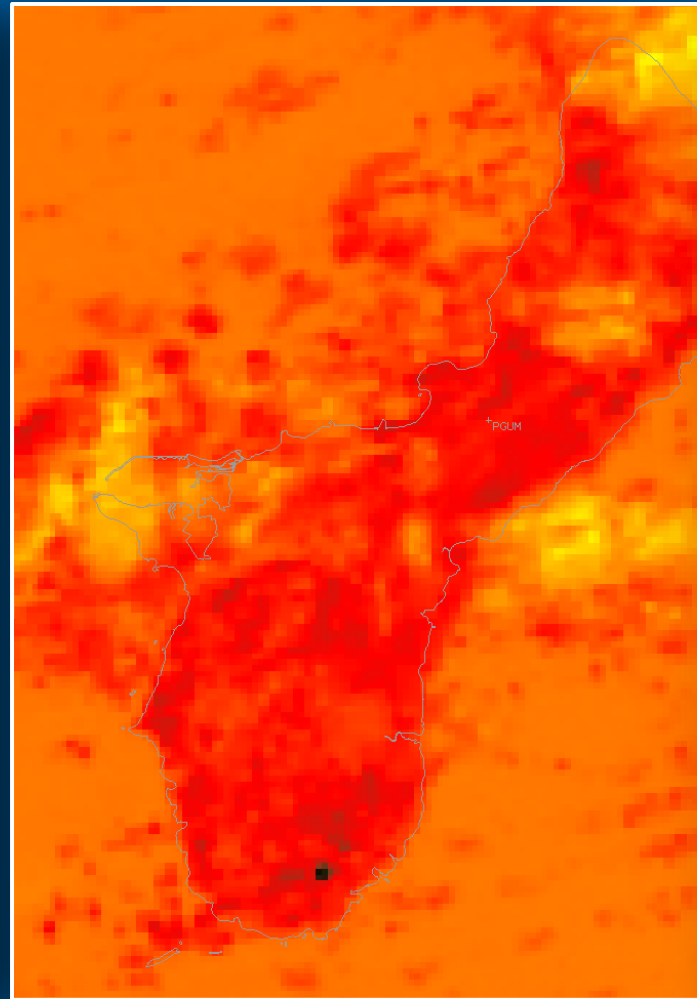
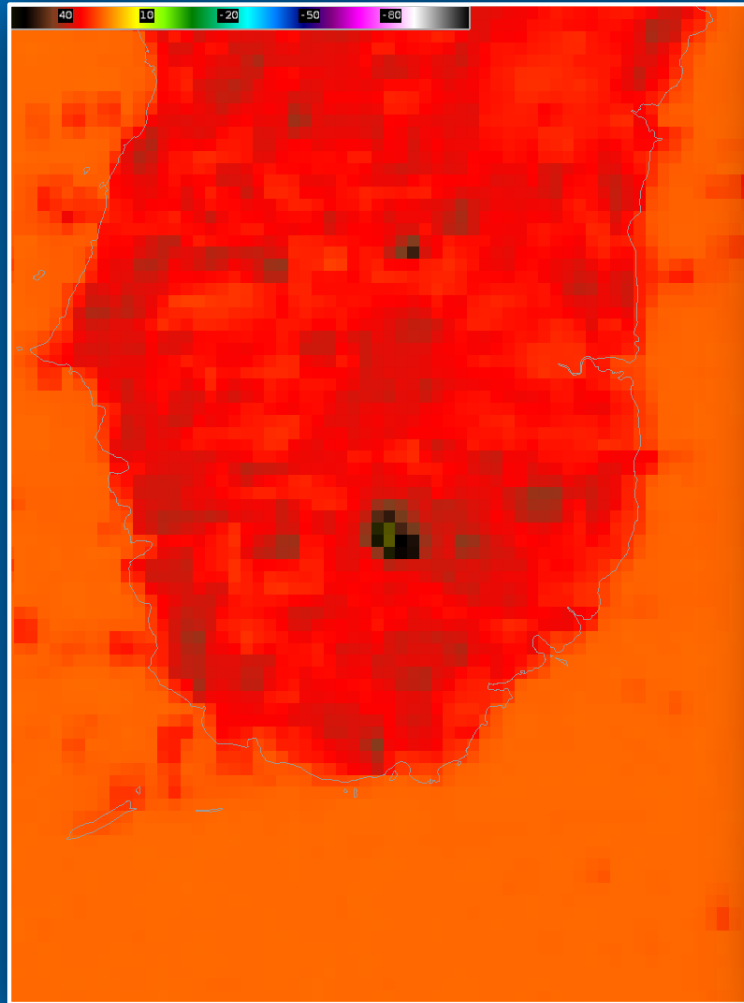
© 2022 TomTom, © 2022 Microsoft Corporation
Microsoft Bing



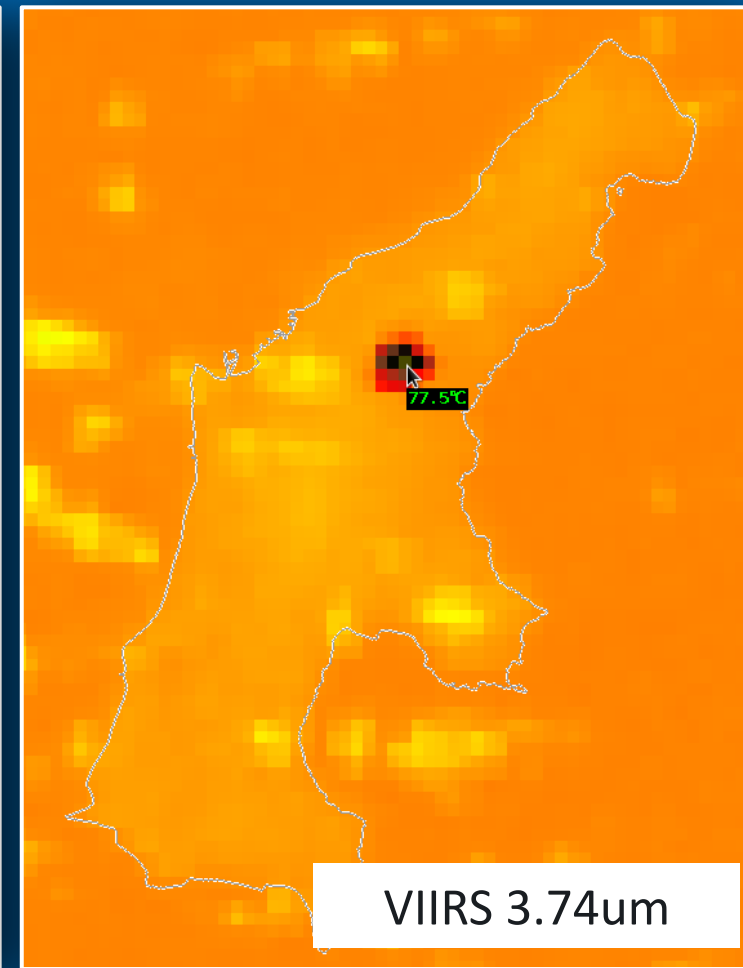
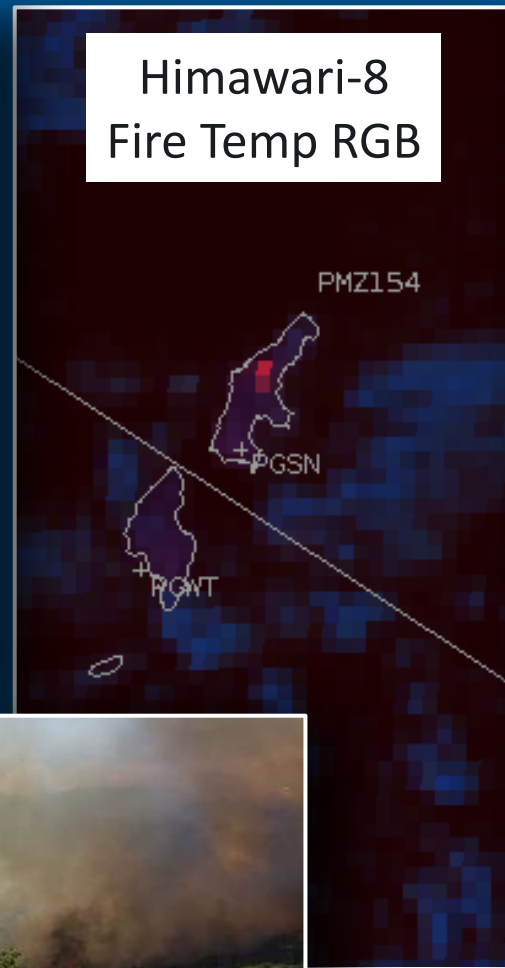
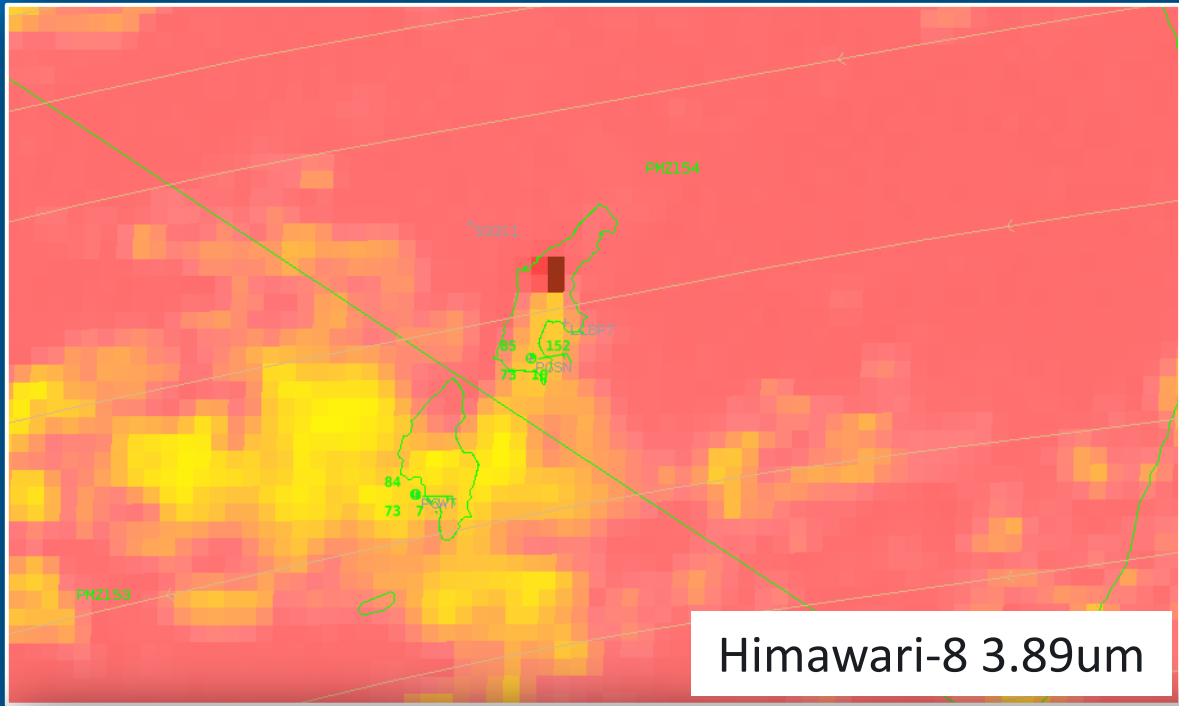
Pagan, Mariana Islands



Guam Wildfires VIIRS 3.74um (Shortwave IR)



Saipan Wildfires



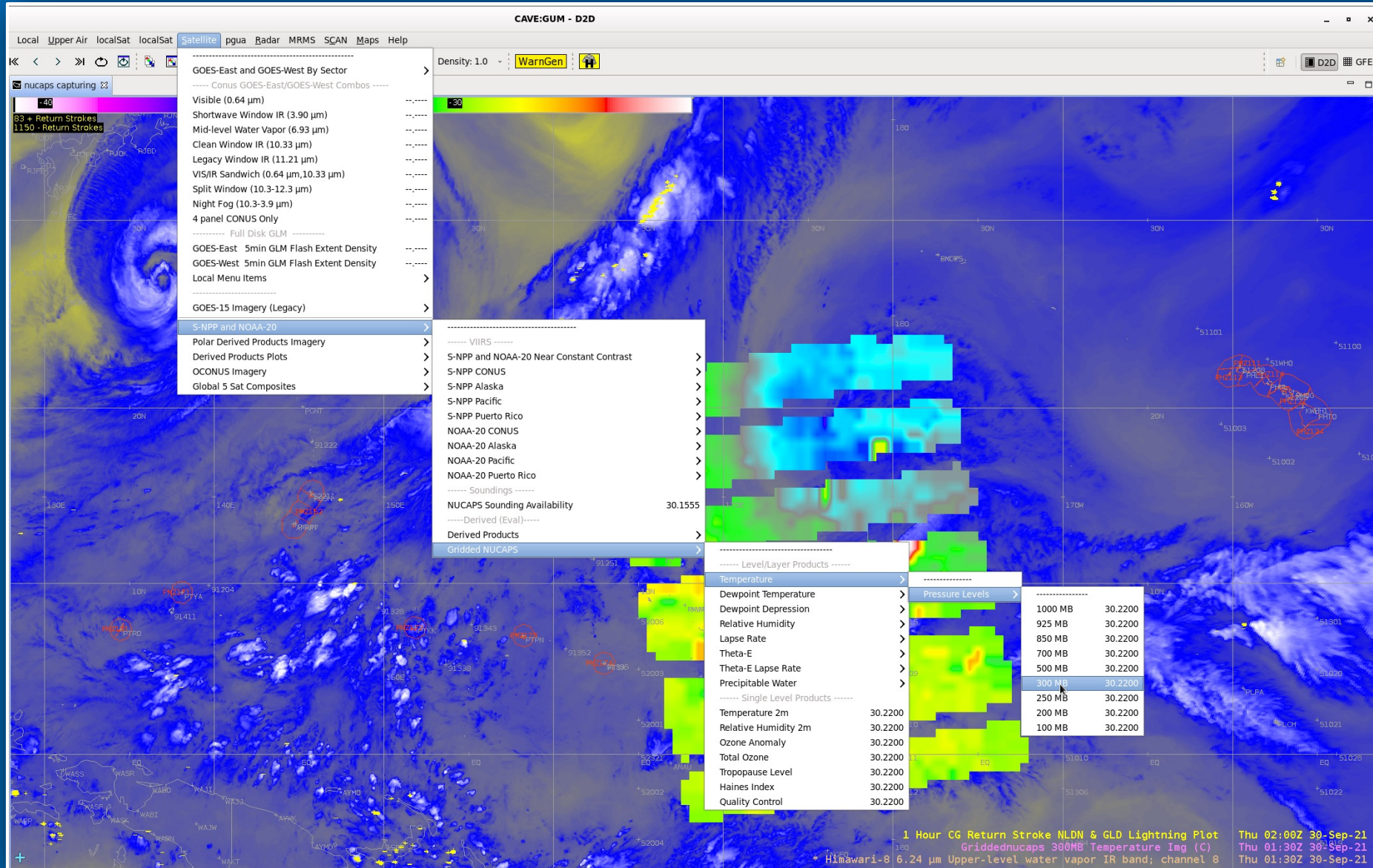


Operational Use of DB Satellite Products

NUCAPS Profiles



NUCAPS Data in AWIPS

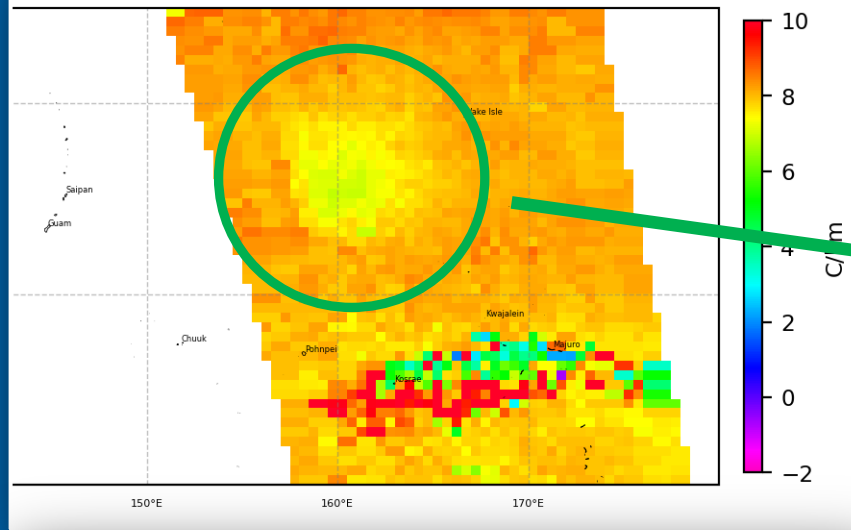


1 Hour CG Return Stroke NLDN & GLD Lightning Plot Thu 02:00Z 30-Sep-21
 Griddednucaps 300MB Temperature Img (C) Thu 01:30Z 30-Sep-21
 Himawari-8 6.24 μm Upper-level water vapor IR band; channel 8 Thu 01:30Z 30-Sep-21

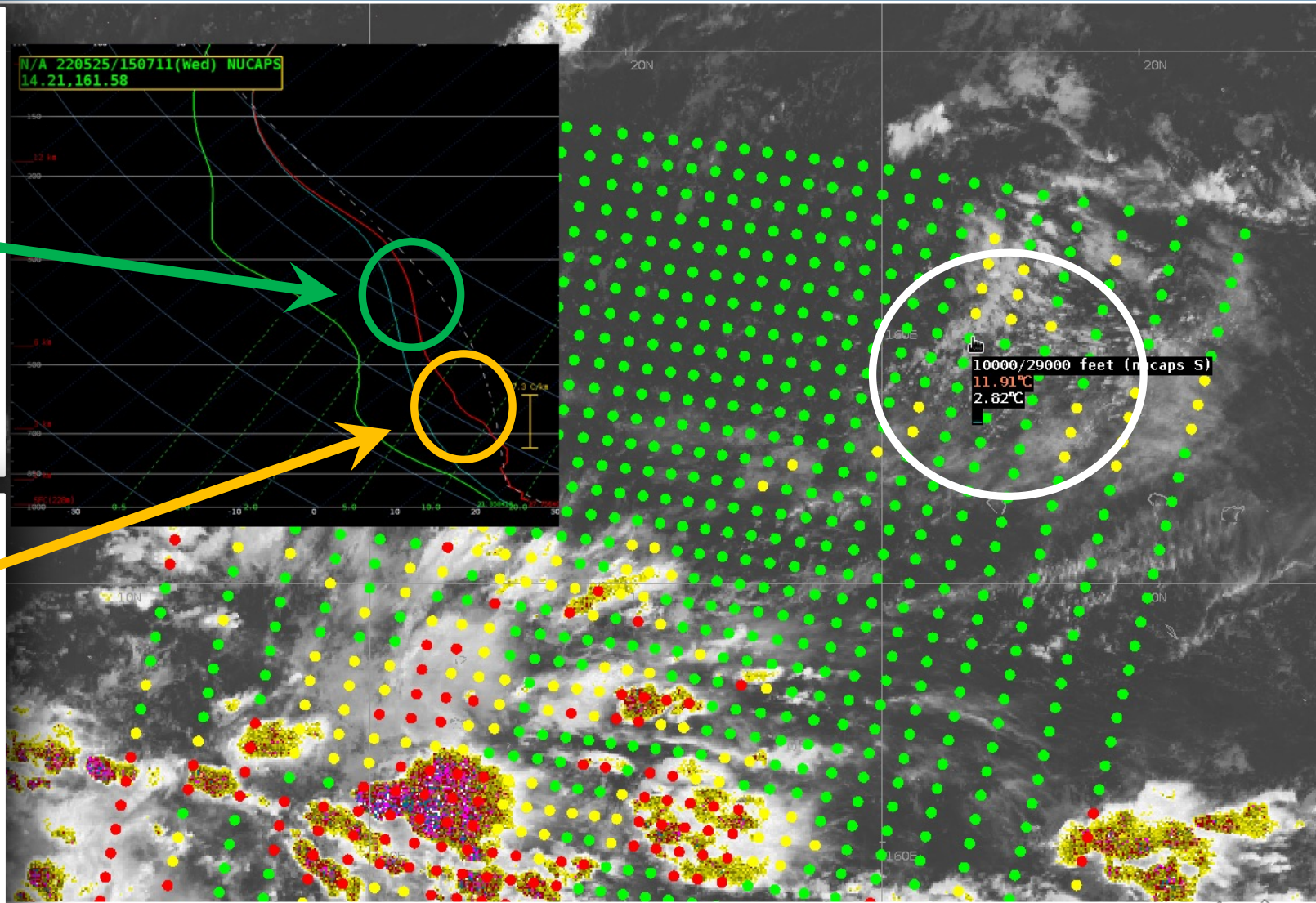
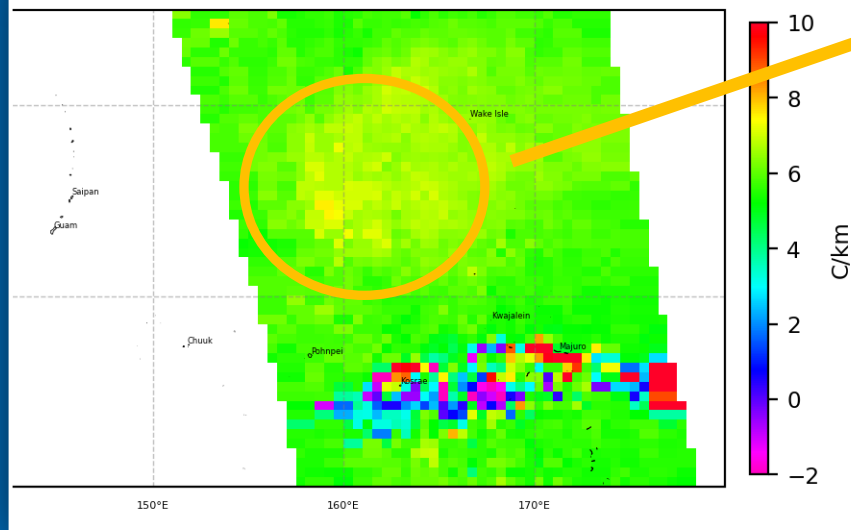


Mid/Upper Atmospheric Instability

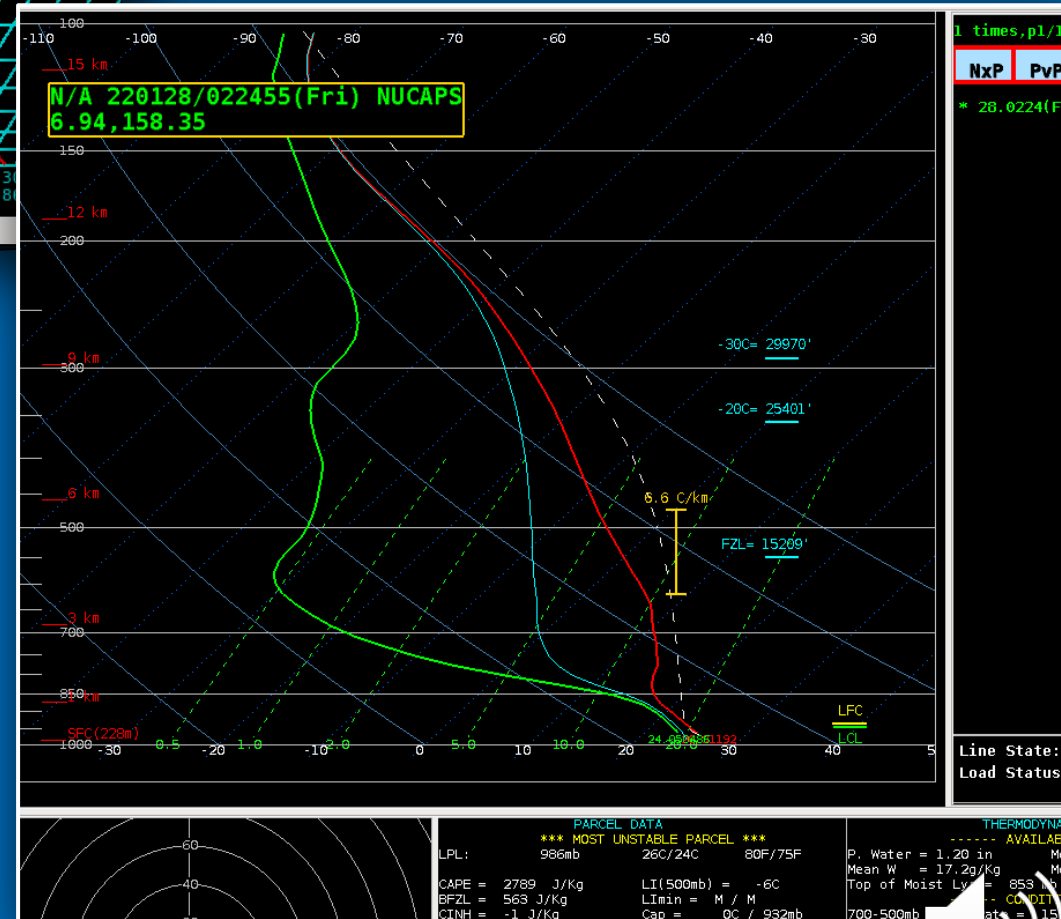
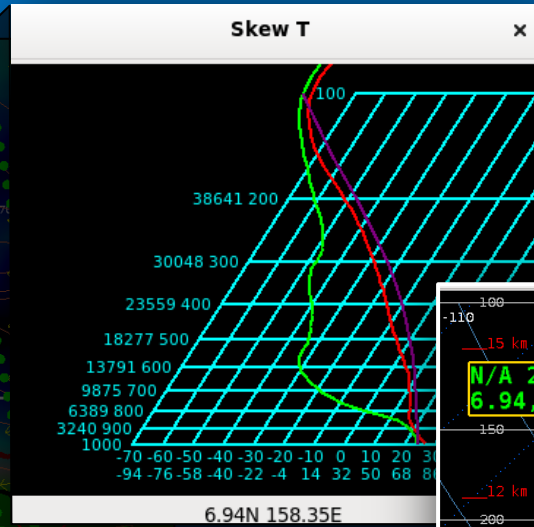
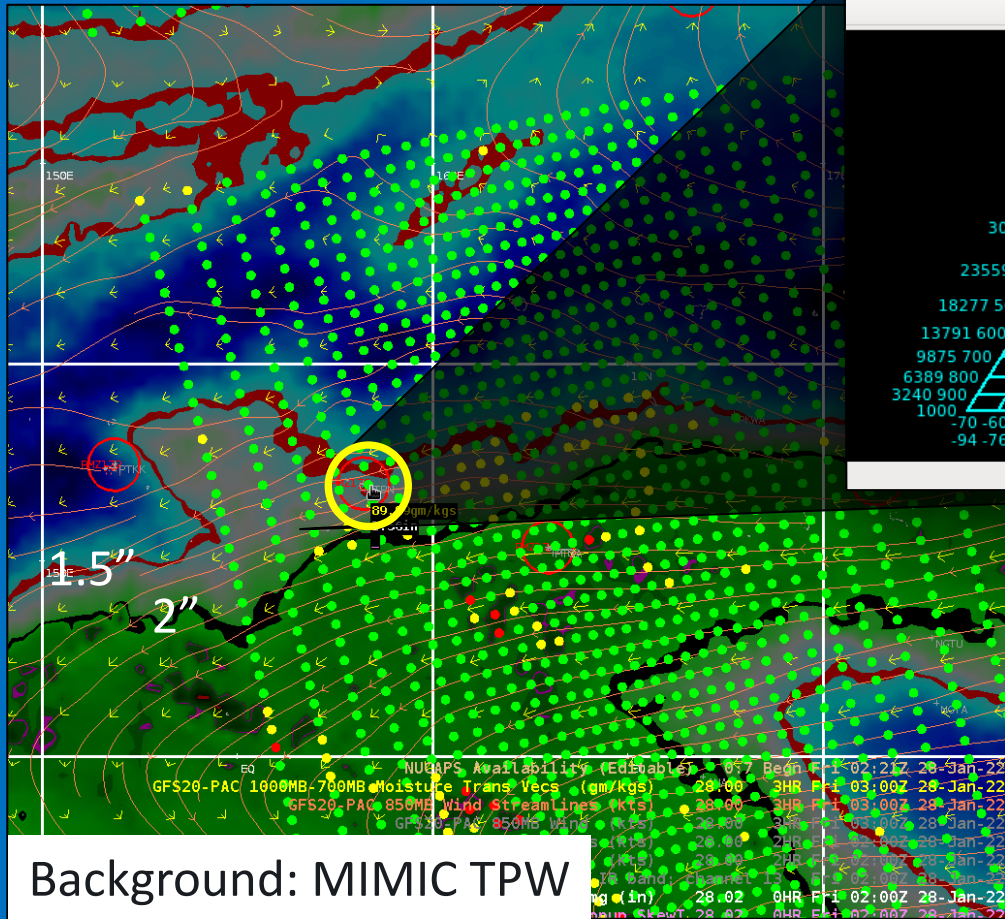
S/ATMS Gridded NUCAPS Lapse Rate 400-200mb 20220526 0211 UTC



S/ATMS Gridded NUCAPS Lapse Rate 700-500mb 20220526 0211 UTC



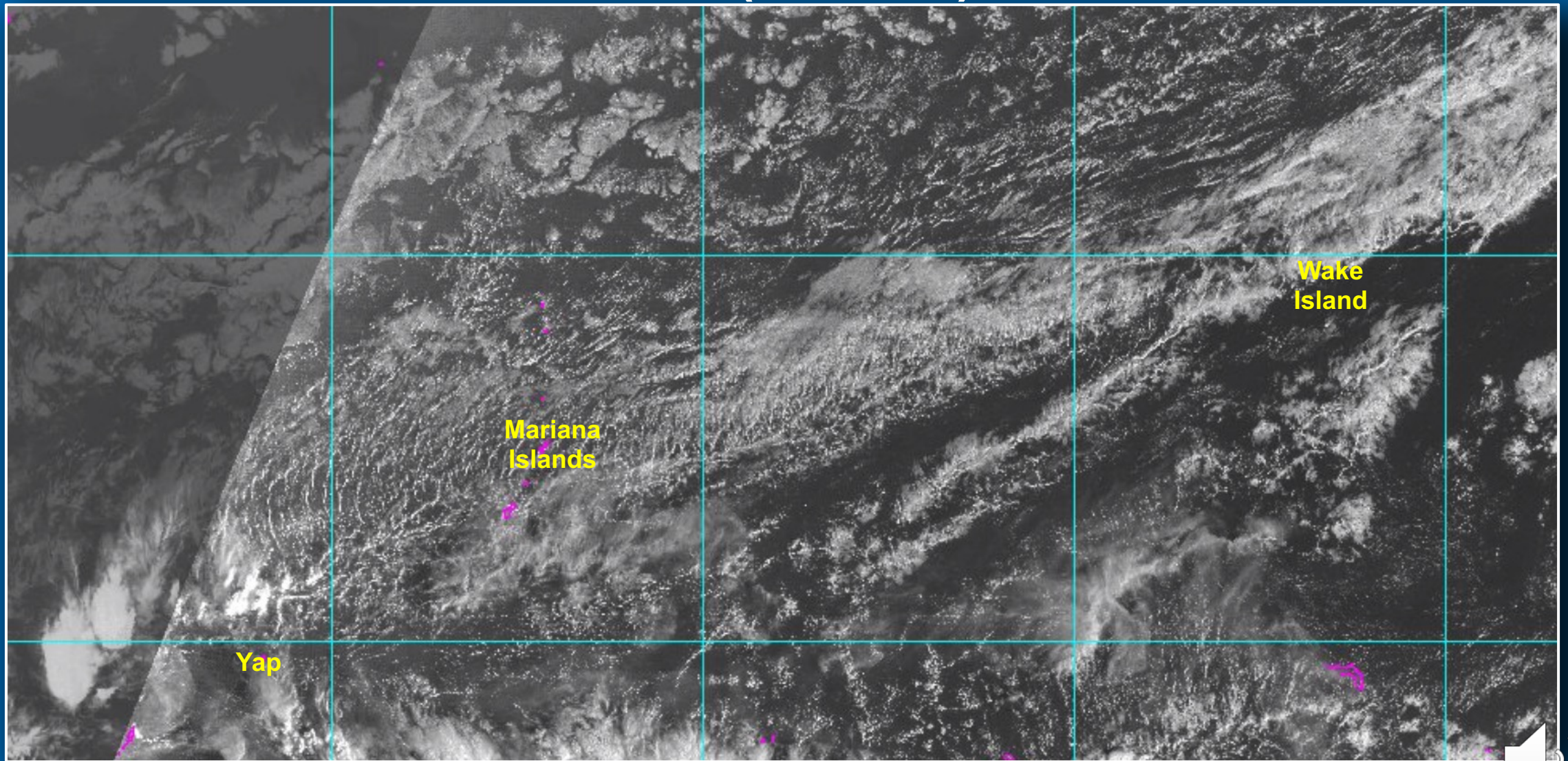
Diagnosis of Atmospheric Moisture



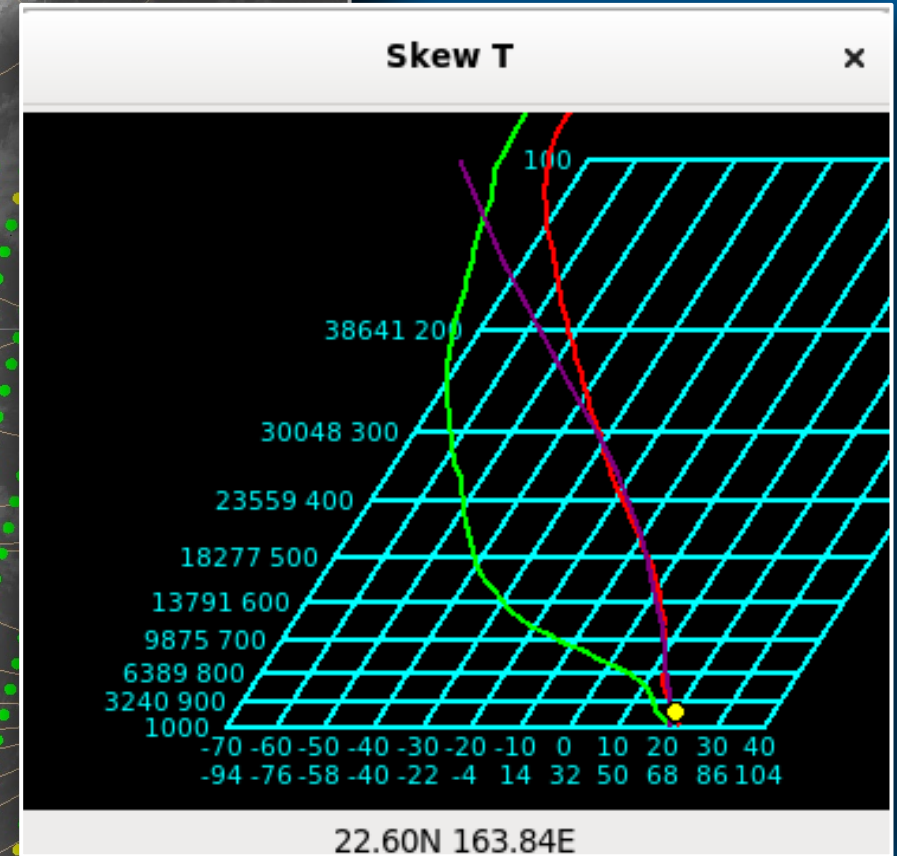
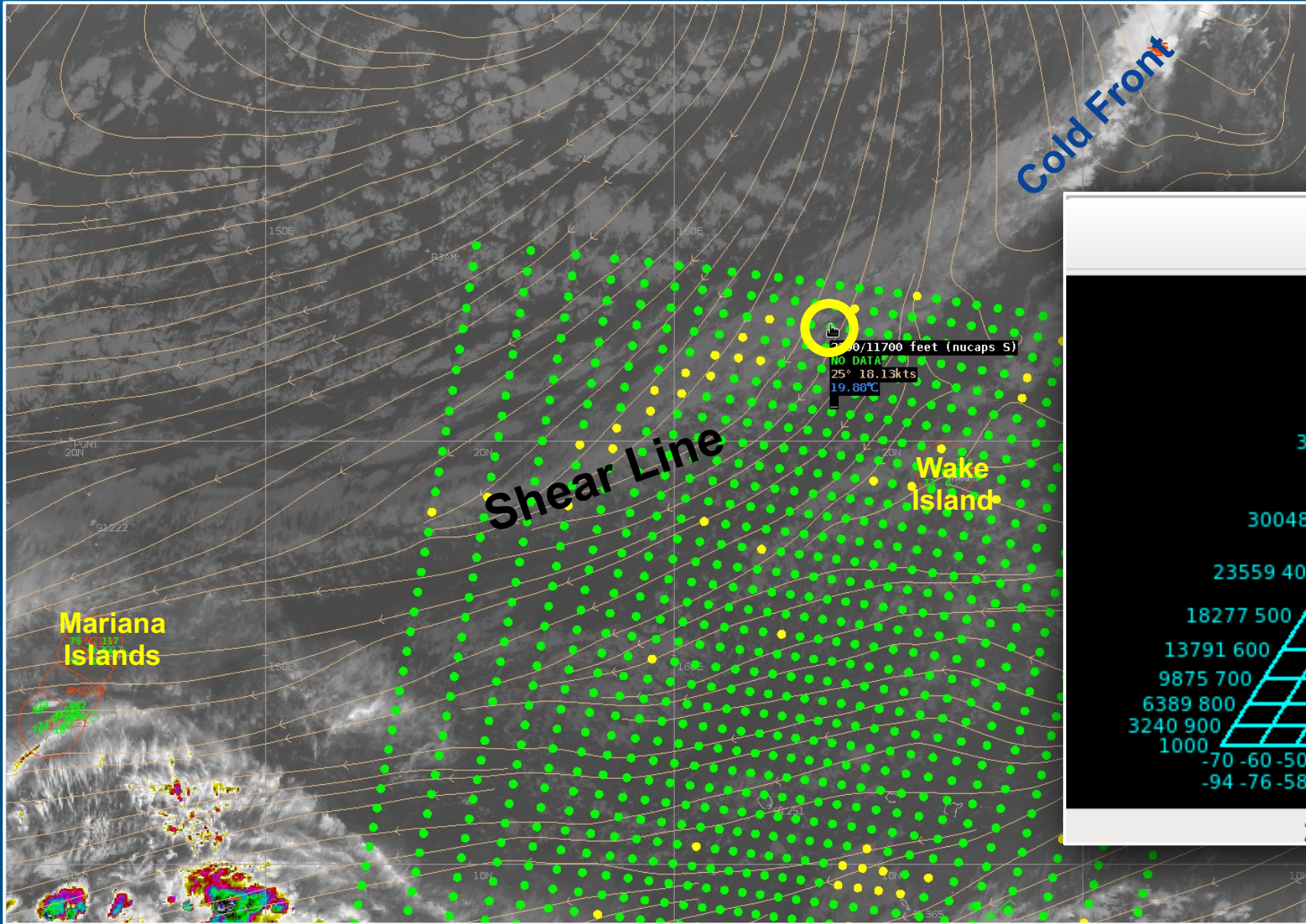
The NUCAPS profile nearest Pohnpei shows a very dry atmosphere above a shallow moist layer: classic dry season trade-wind pattern. **1.2" PWAT**



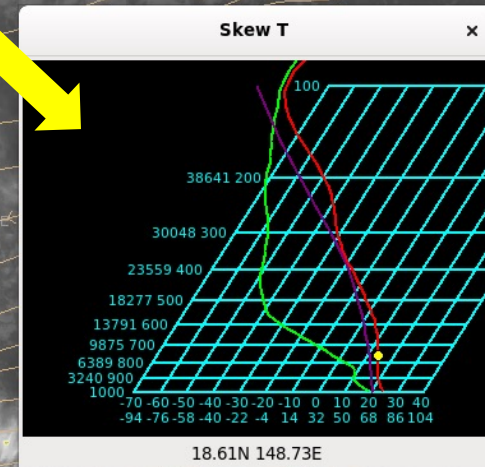
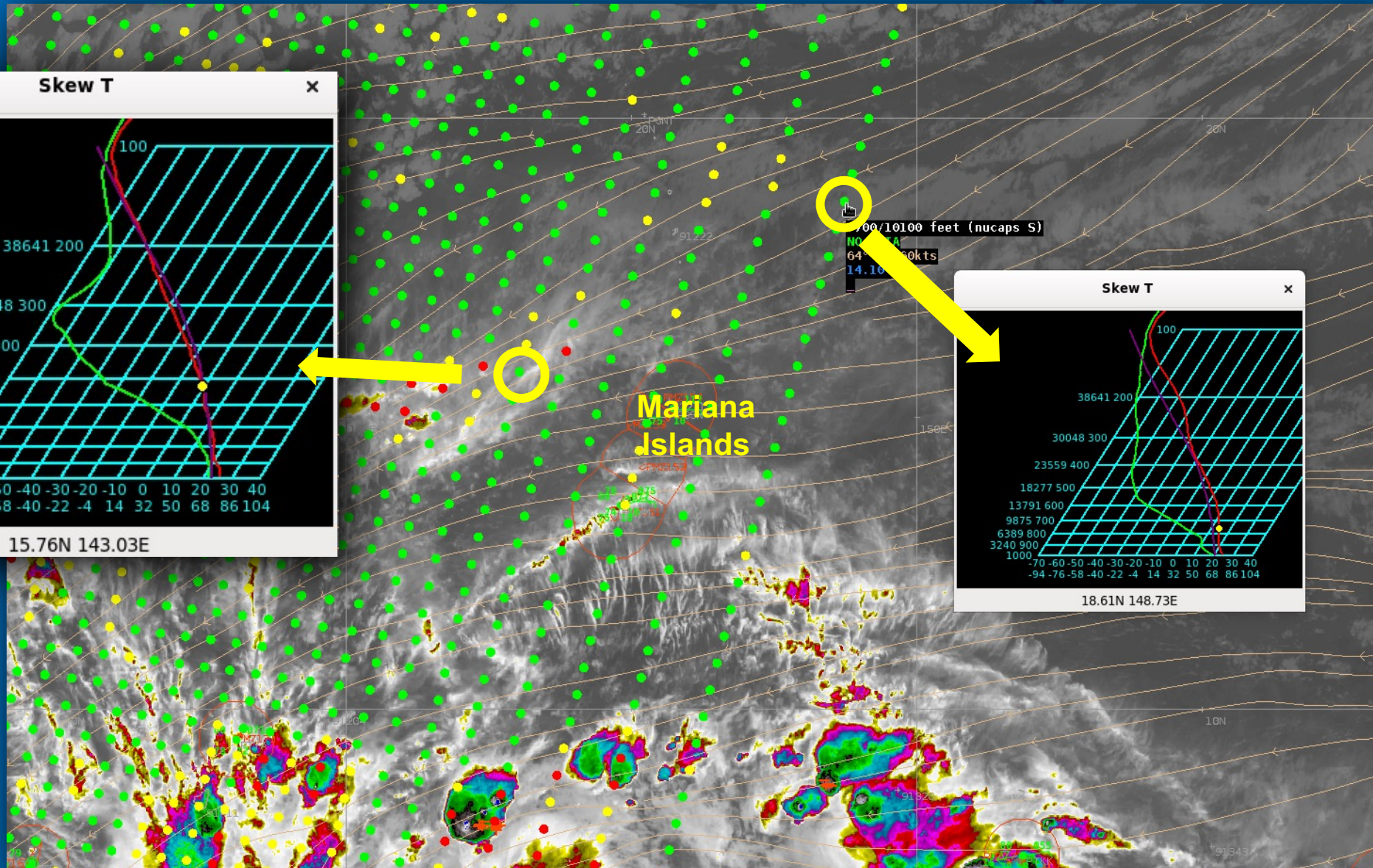
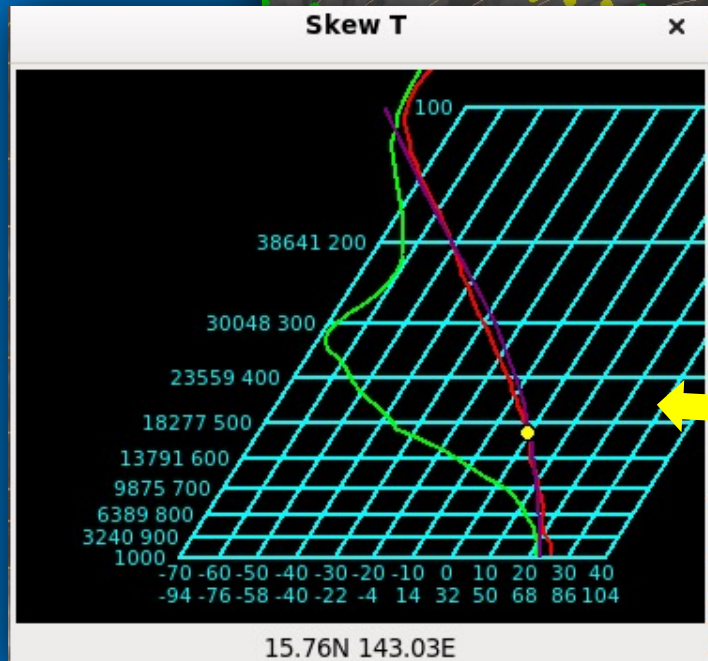
Dry Season Shear Lines: Himawari-8 Red Visible (0.64um)



NUCAPS Profile Assessment



NUCAPS Profile Assessment

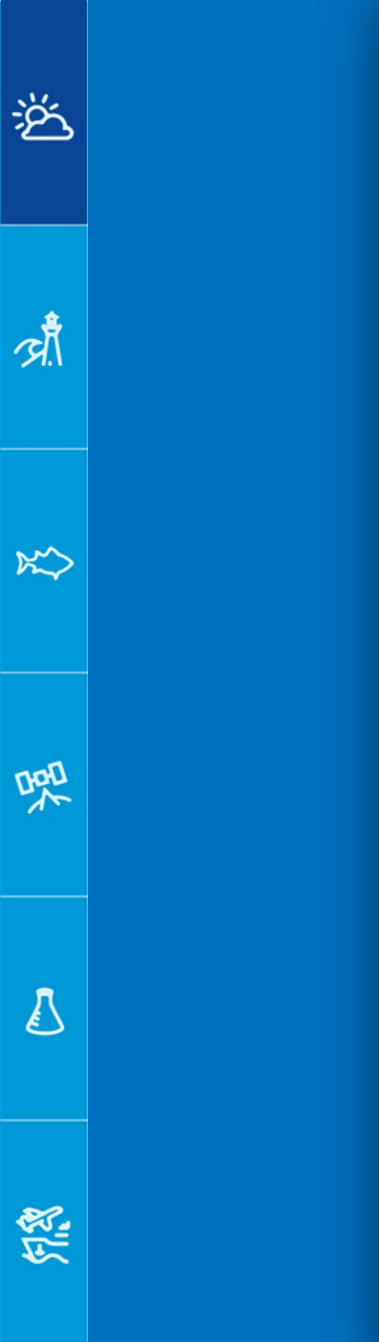




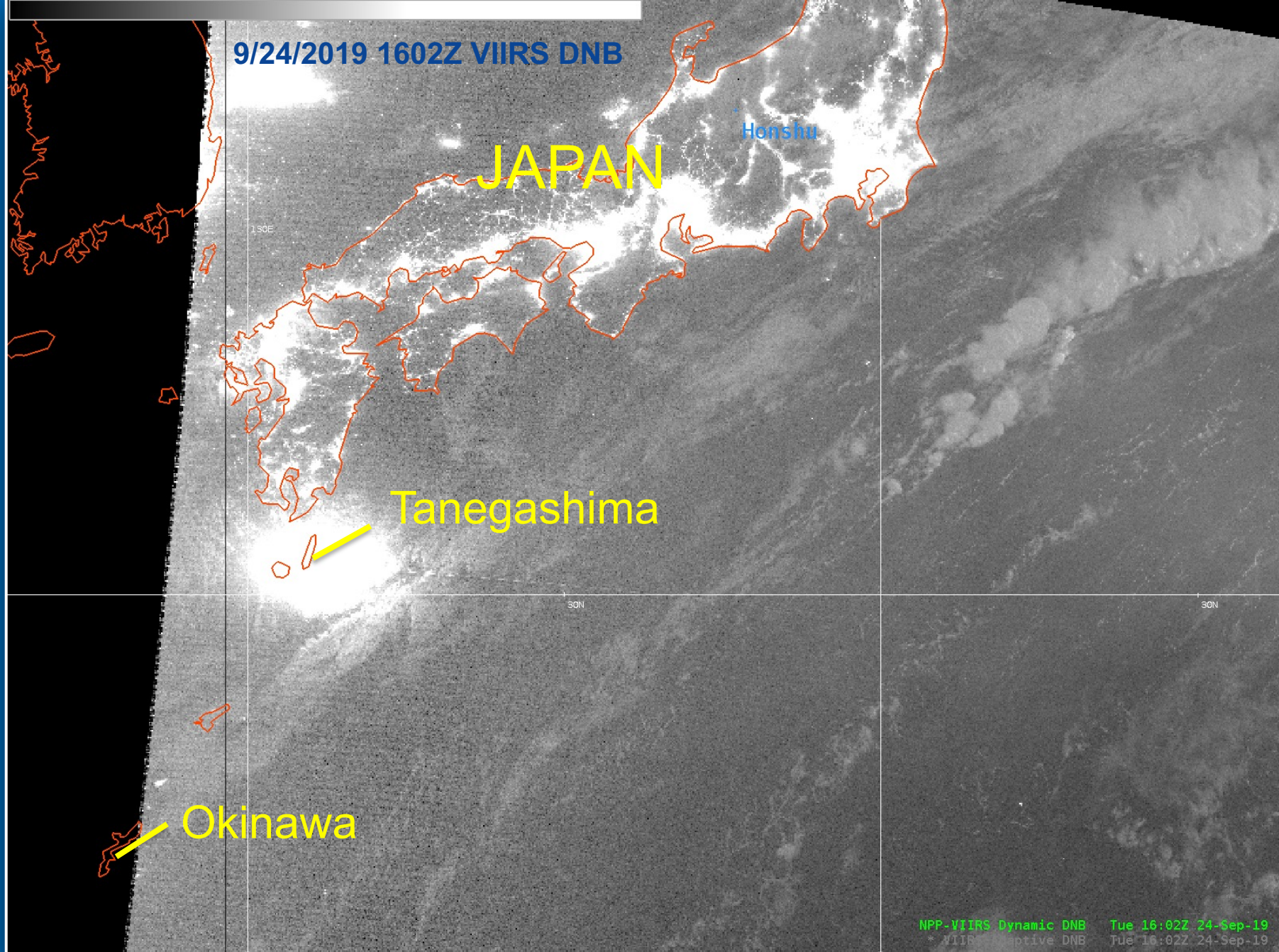
Operational Use of DB Satellite Products

*Other Interesting &
Sometimes Puzzling Features*





9/24/2019 1602Z VIIRS DNB



NPP-VIIRS Dynamic DNB Tue 16:02Z 24-Sep-19
* VIIRS Composite DNB Tue 16:02Z 24-Sep-19



9/24/2019 1654Z VIIRS DNB

Honshu

JAPAN

Tanegashima

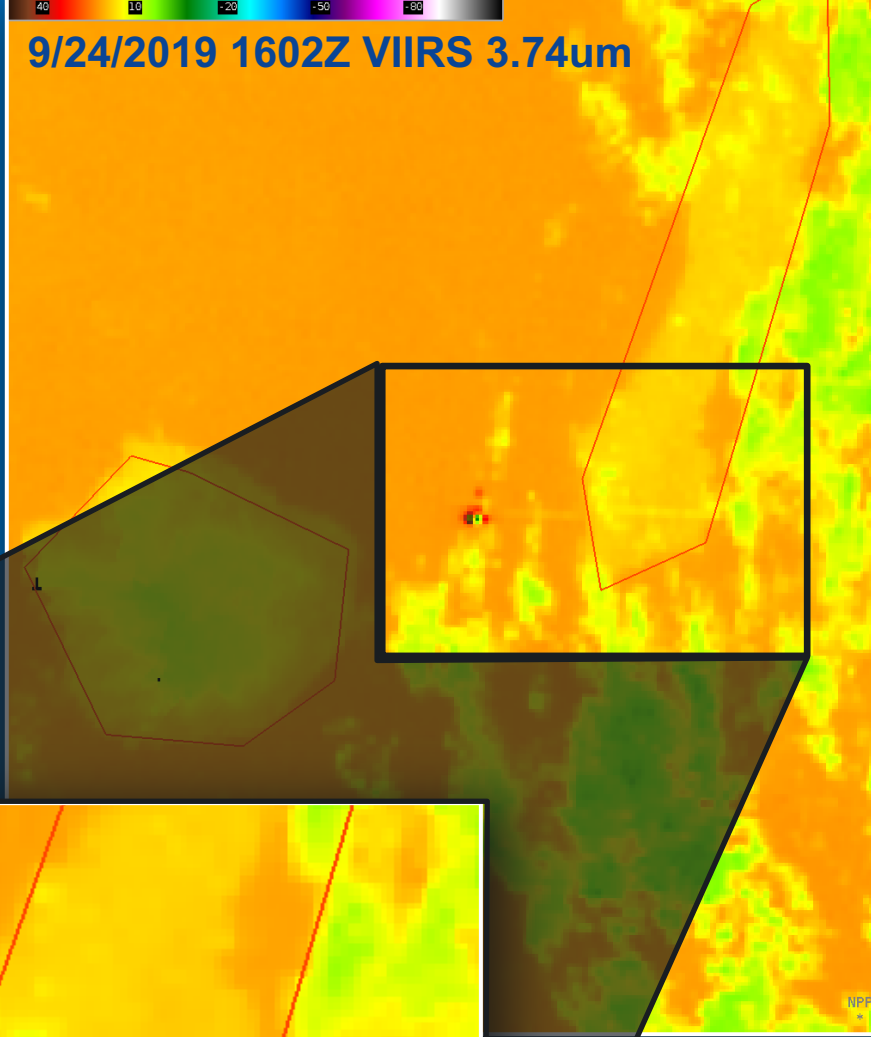
Okinawa

NPP-VIIRS Dynamic RGB 7:56:16 AM 24-Sep-19

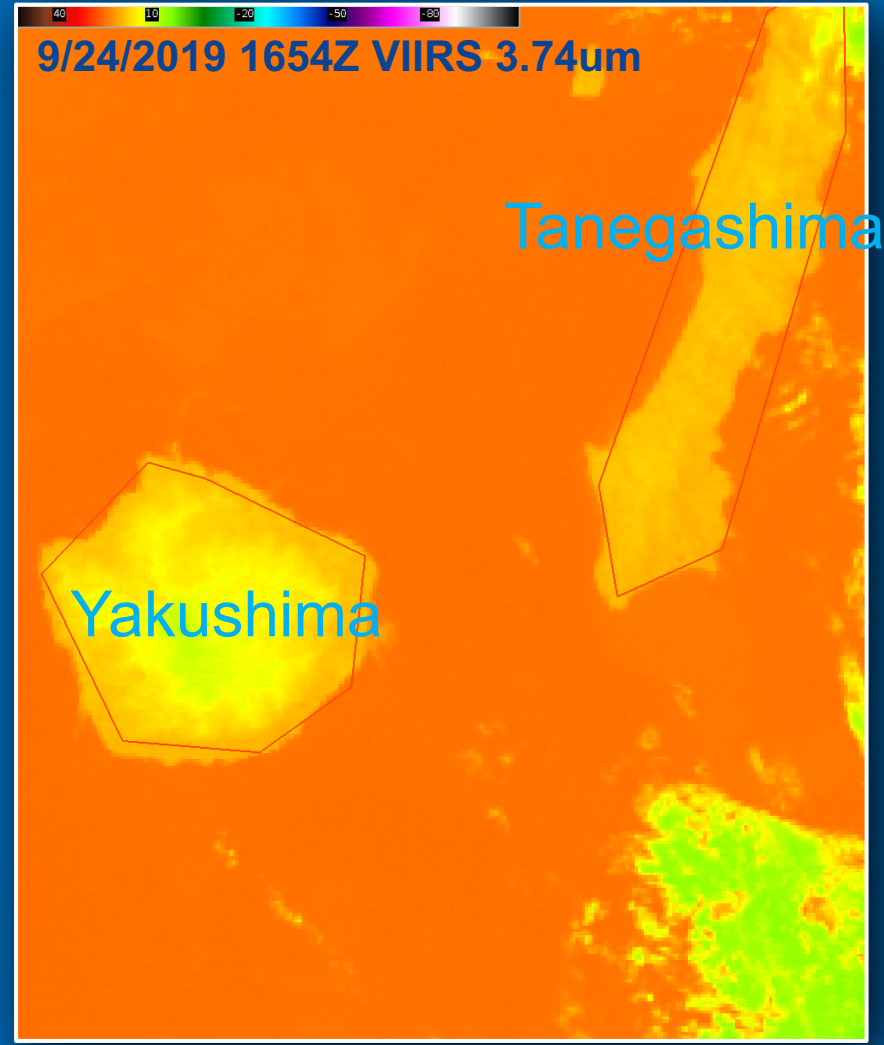




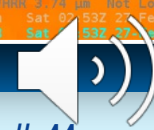
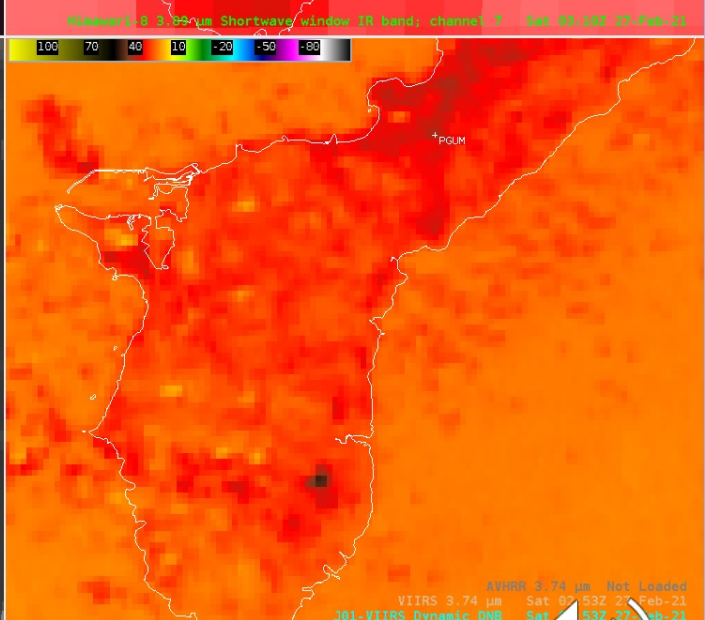
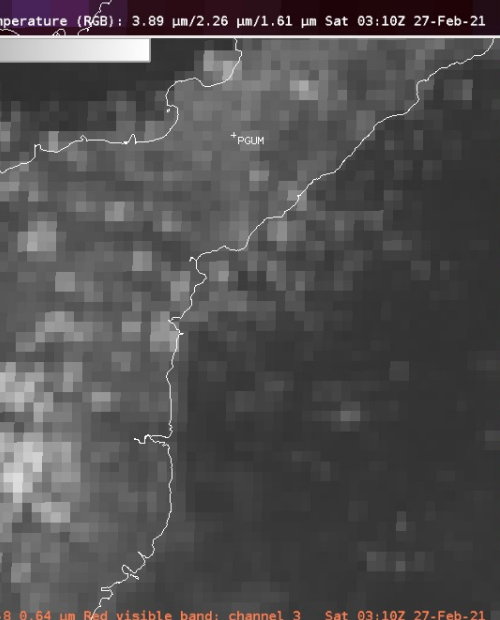
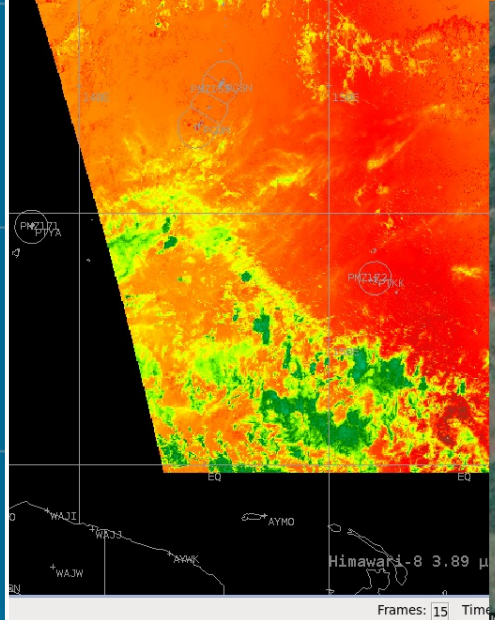
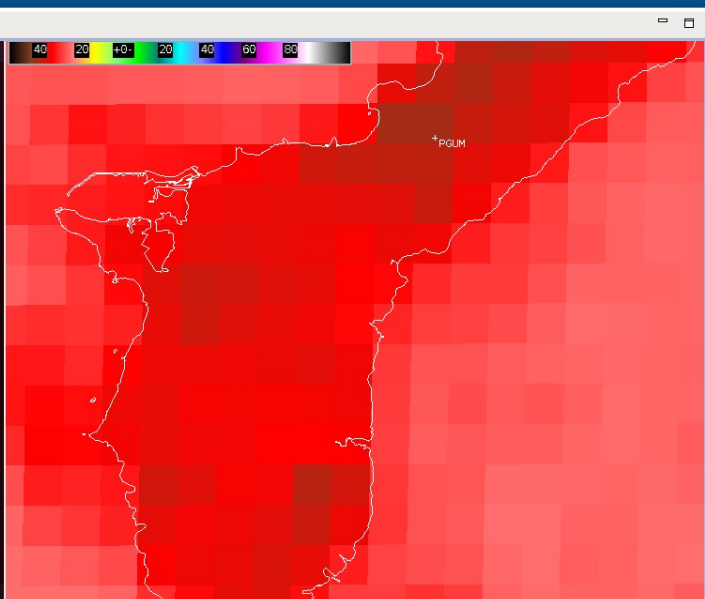
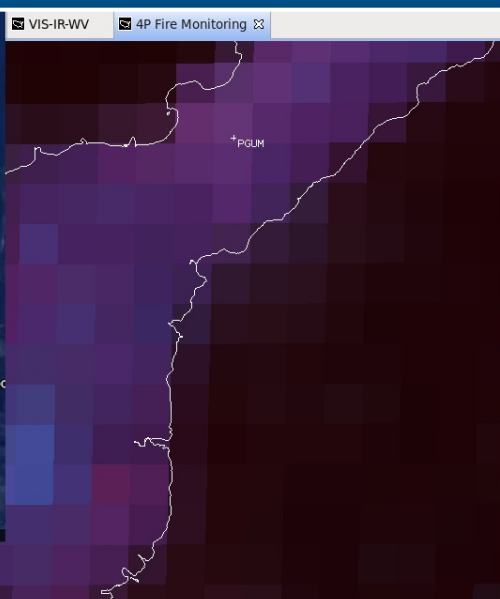
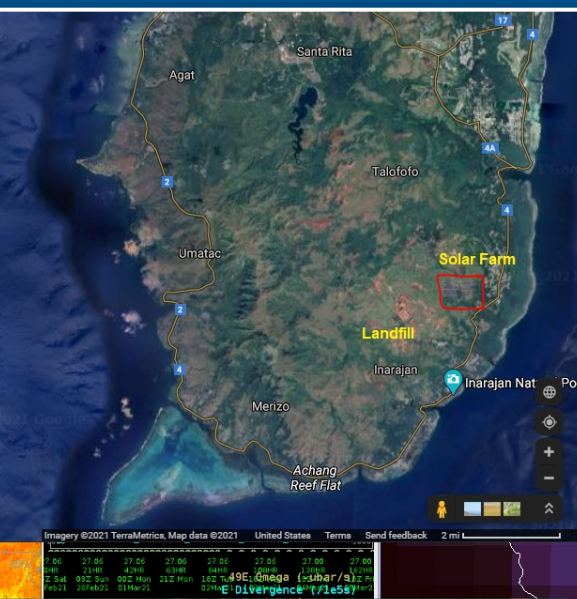
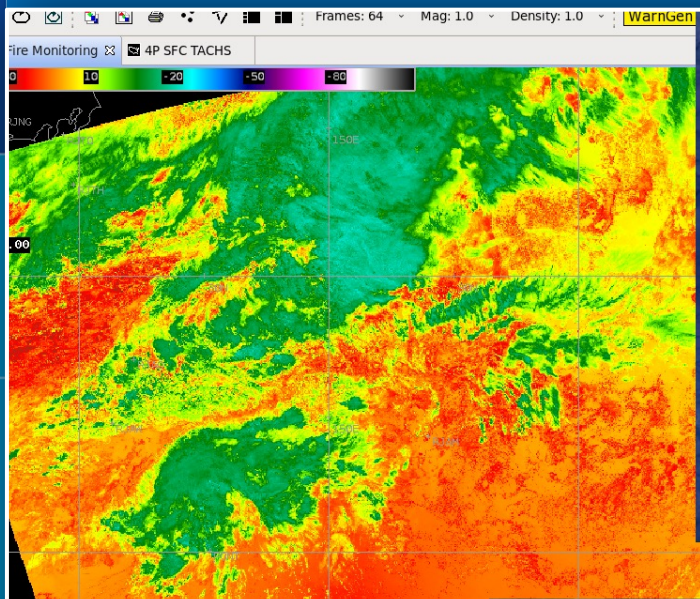
9/24/2019 1602Z VIIRS 3.74um



9/24/2019 1654Z VIIRS 3.74um







Questions?



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