Use of S-NPP VIIRS Data in Navy/DoD Operations

NRL

Jeremy Solbrig, Arunas Kuciauskas, Mindy Surratt, Rich Bankert, Kim Richardson

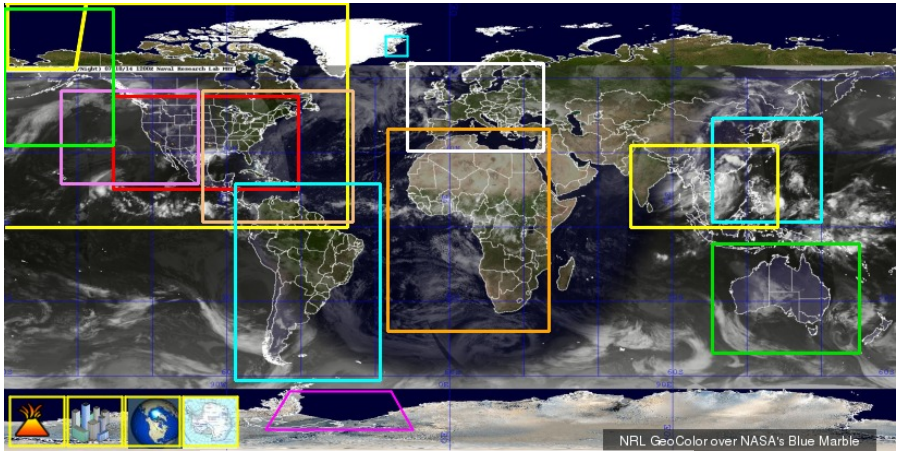
CIRA

Steve Miller

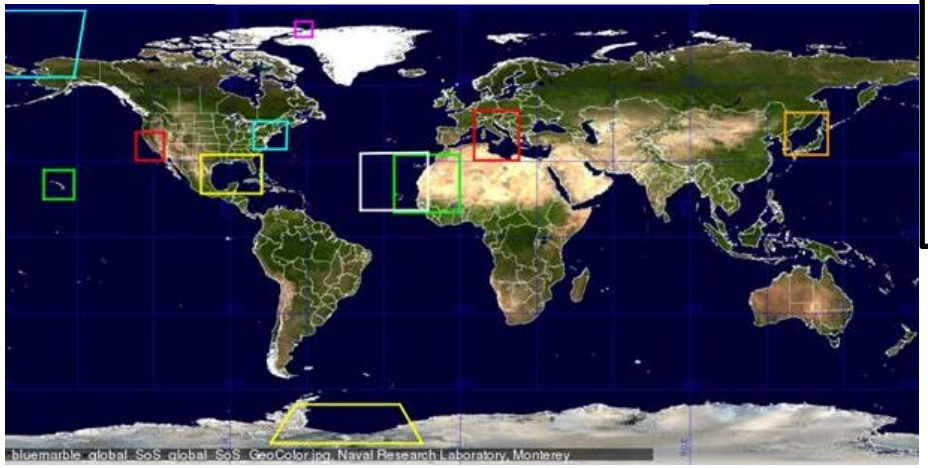
Naval Research Laboratory
Marine Meteorology Division

VIIRS Imagery Demonstration

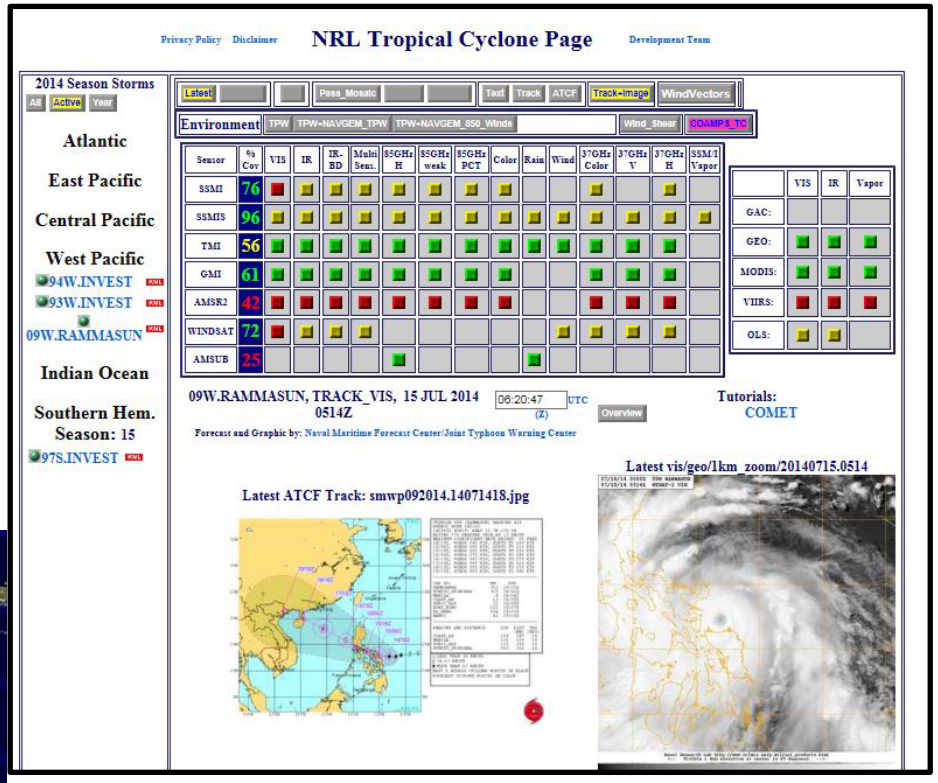
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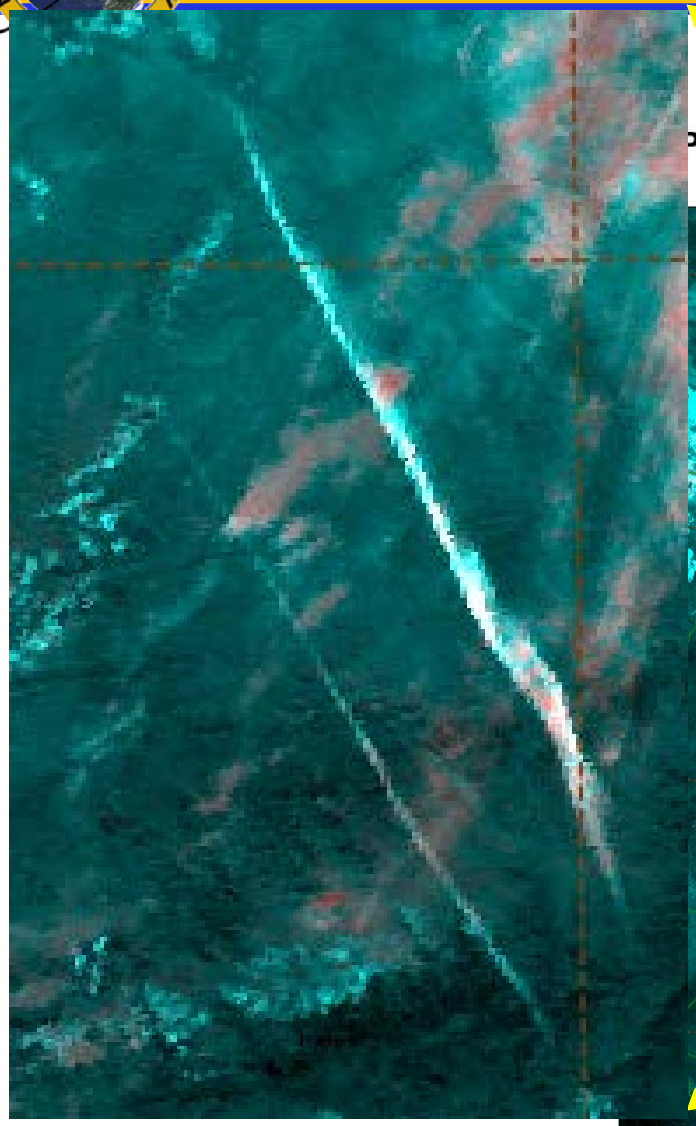
VIIRS Demo

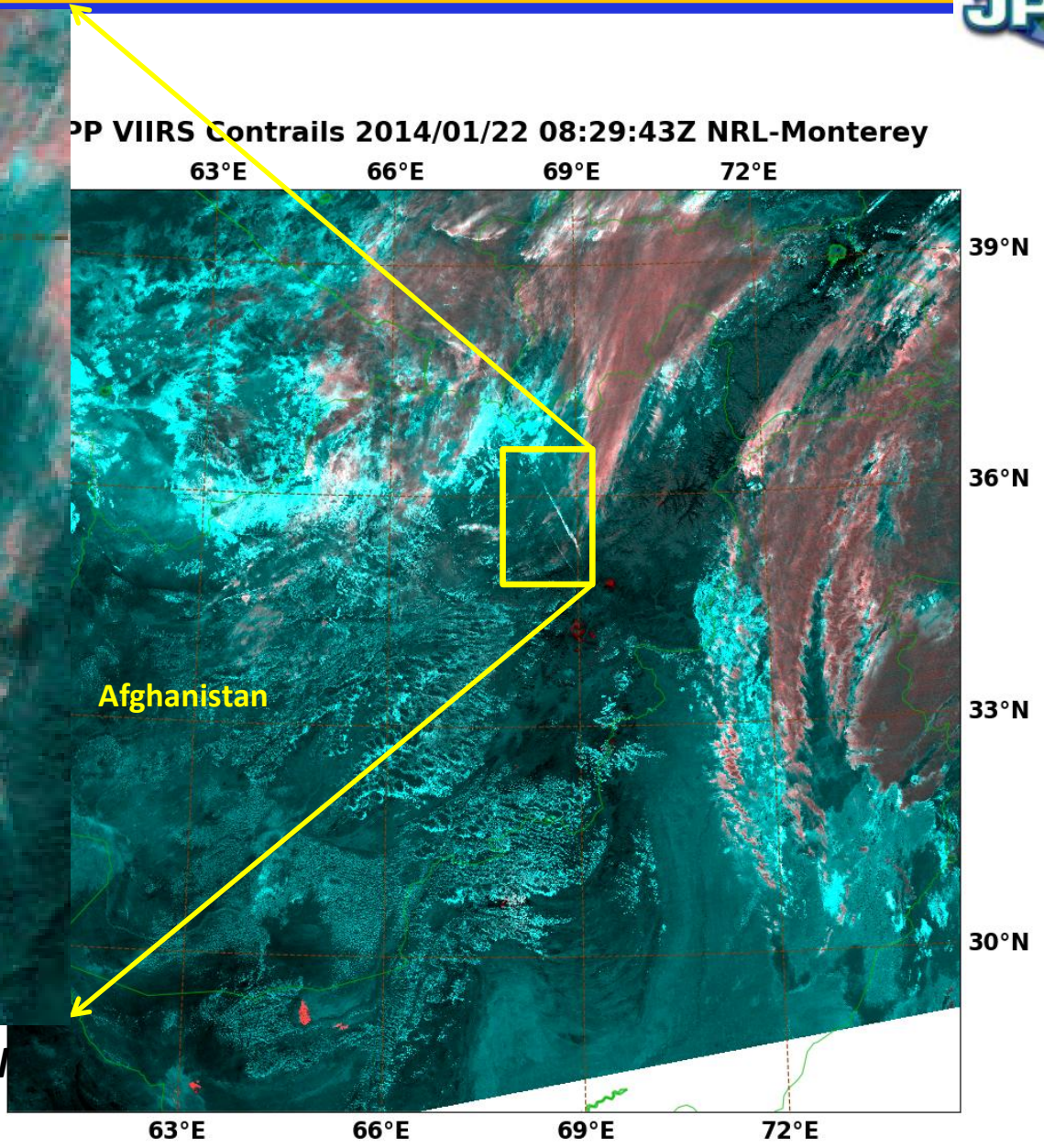


TCWeb



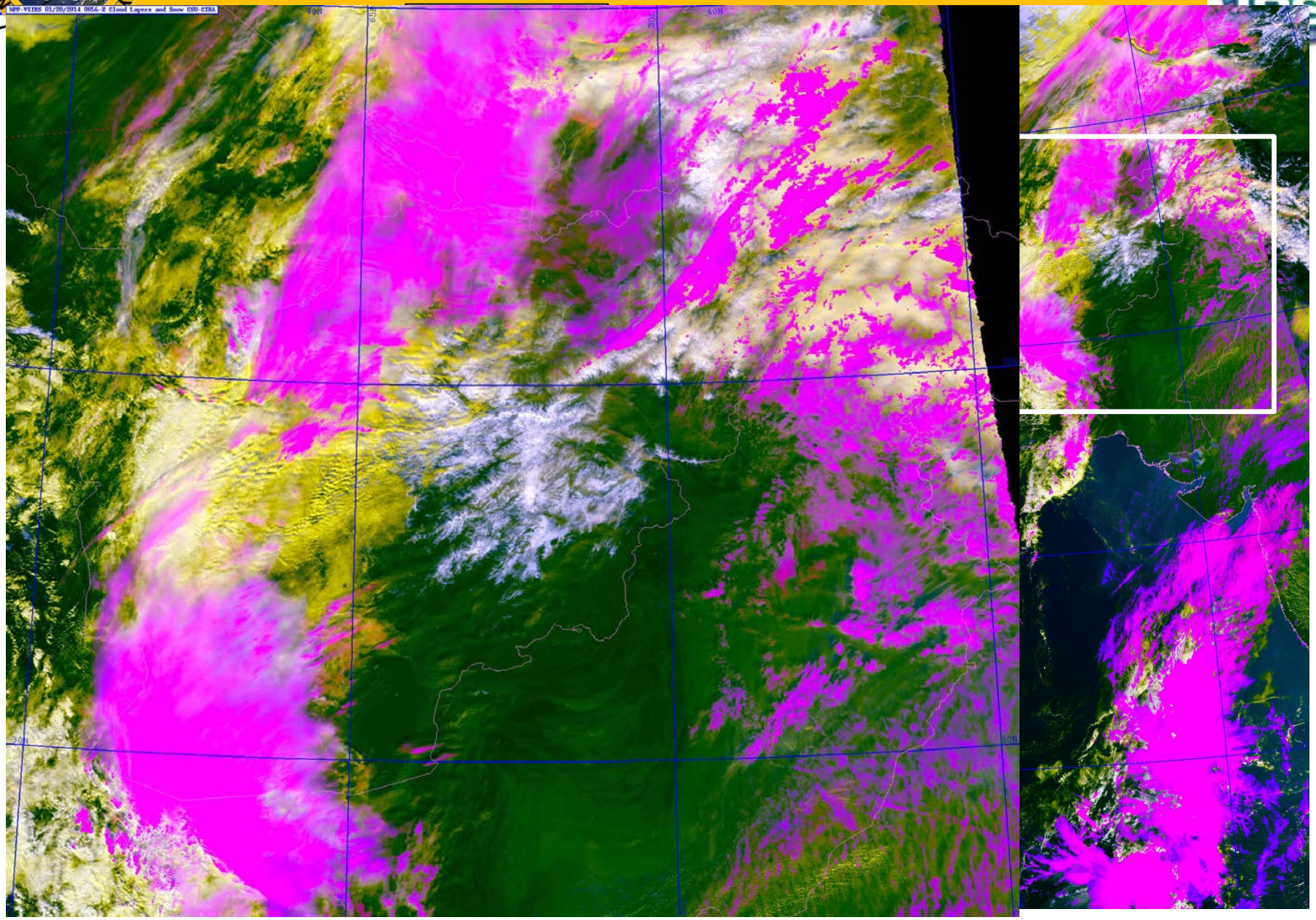
VIIRS Contrail Detection





Transitioned to Fleet Numerical for Operational use

Cloud/Snow Discrimination



VIIRS (Blue-Light) Dust

GOAL: Enhance and isolate lofted dust over desert (daytime) to reduce or avoid the problems associated with limited visibility in airborne dust.

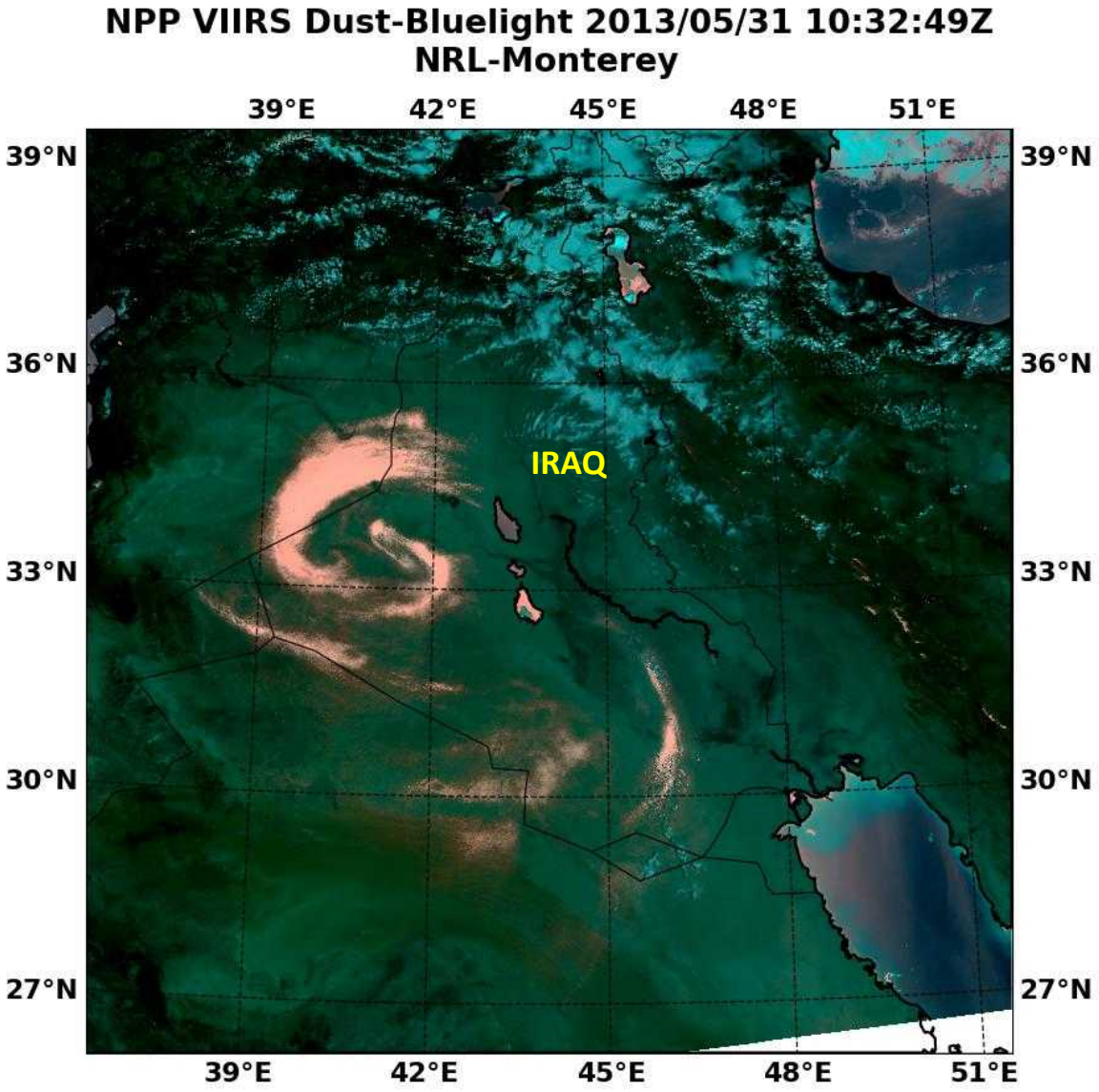
NRL Dust Enhancement Algorithm uses a multispectral (7-band) function that takes advantage of these dust properties:

- **Higher blue light absorption for dust**
- **Thermal contrast (dust and surface)**
- **IR split window difference (opposite in sign to Ci)**

A false-color enhancement is created to isolate the lofted dust:

R: 7-band function (VIS/NIR/TIR)
G: Rayleigh-corrected green band
B: Rayleigh-corrected blue band

Transitioned to Fleet Numerical for Operational use

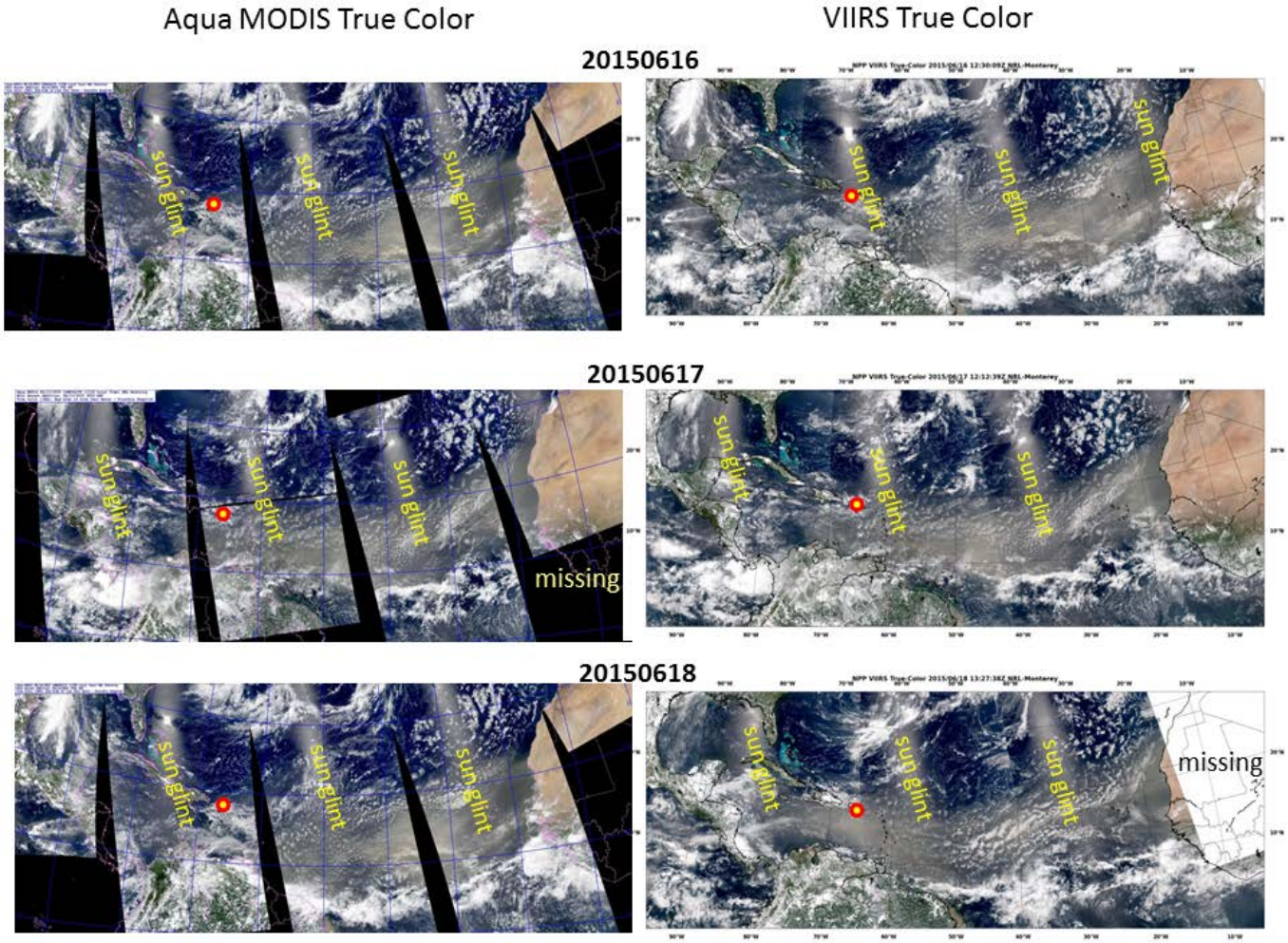


Saharan Air Layer - Dust

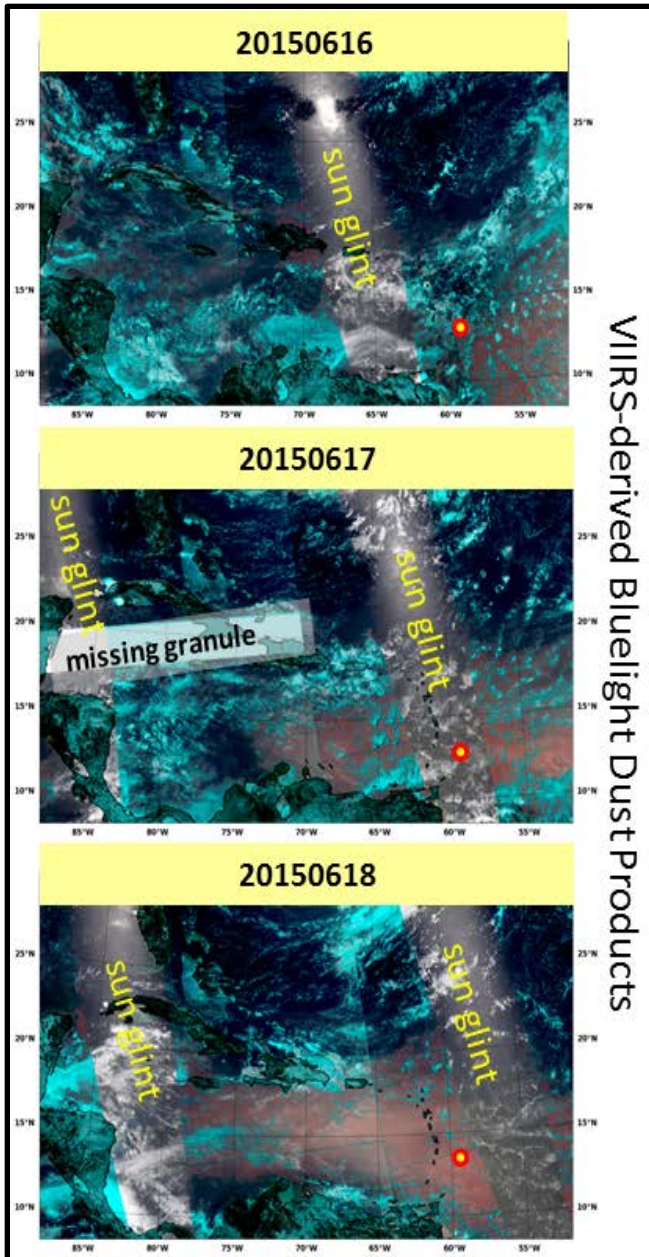
SAL borne dust is important for both visibility and health in the Caribbean.

VIIRS provides a significant improvement over MODIS for detection and assessment due to larger swath and improved resolution at scan edge.

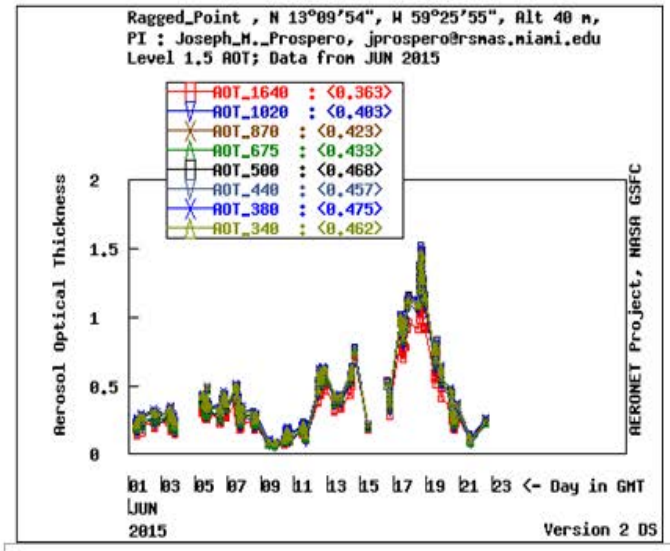
Monitored by the Puerto Rico NWS office.

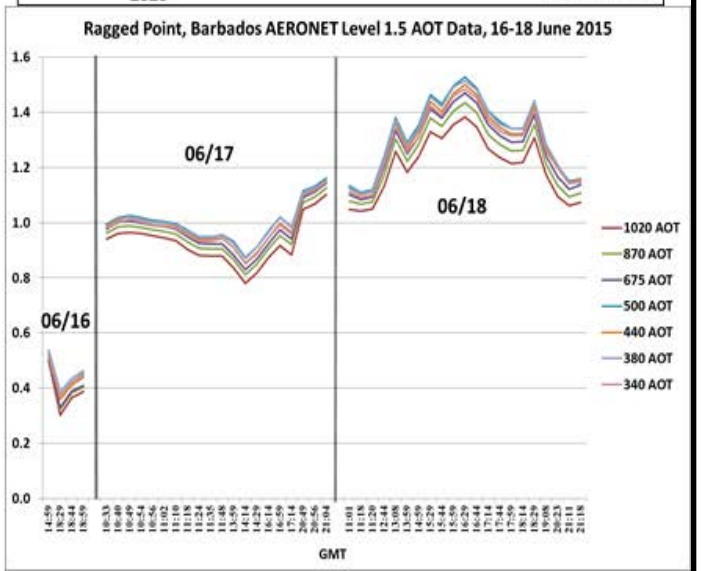


Saharan Air Layer - Dust



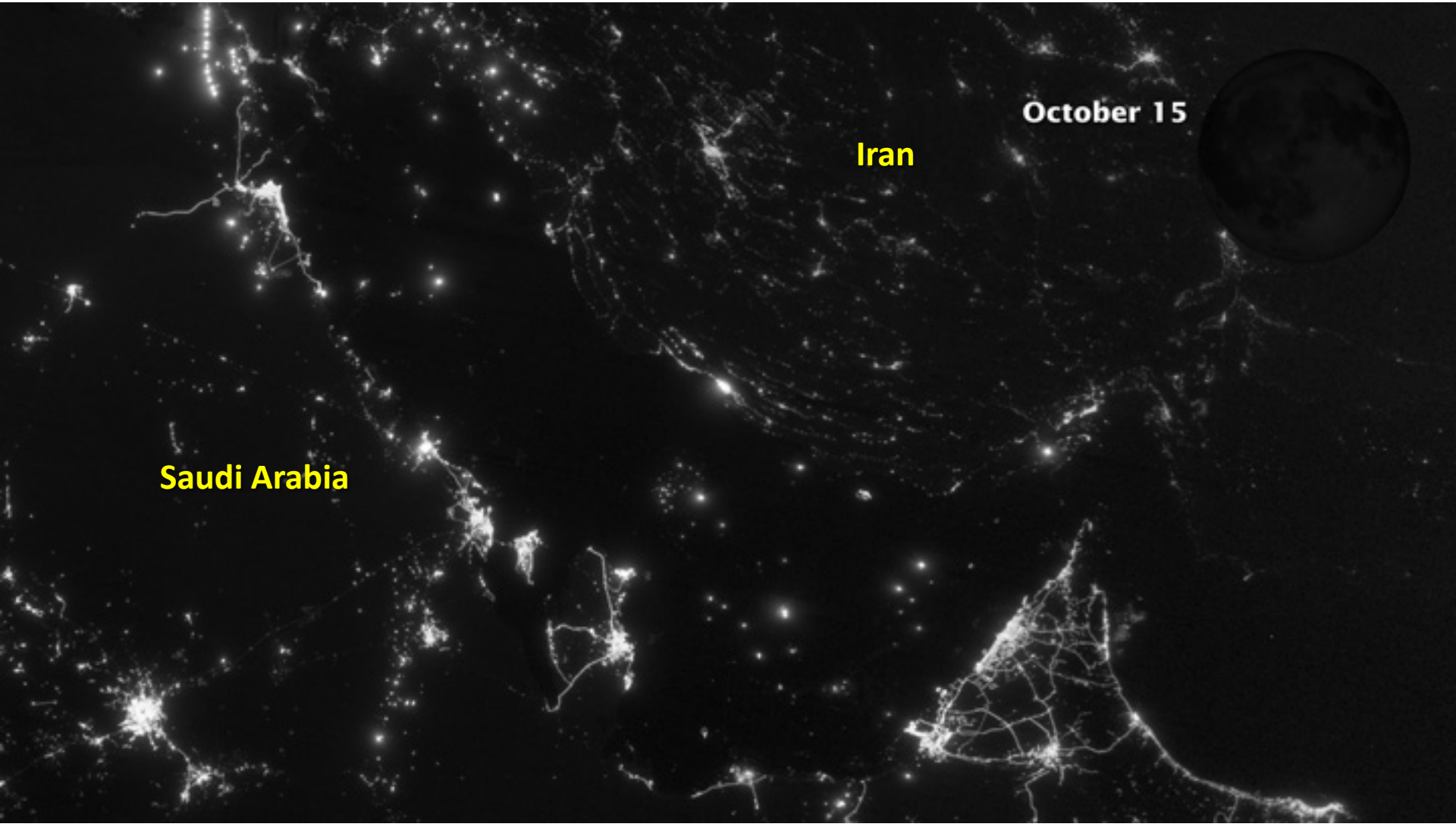
AERONET AOD at Ragged Pt, Barbados





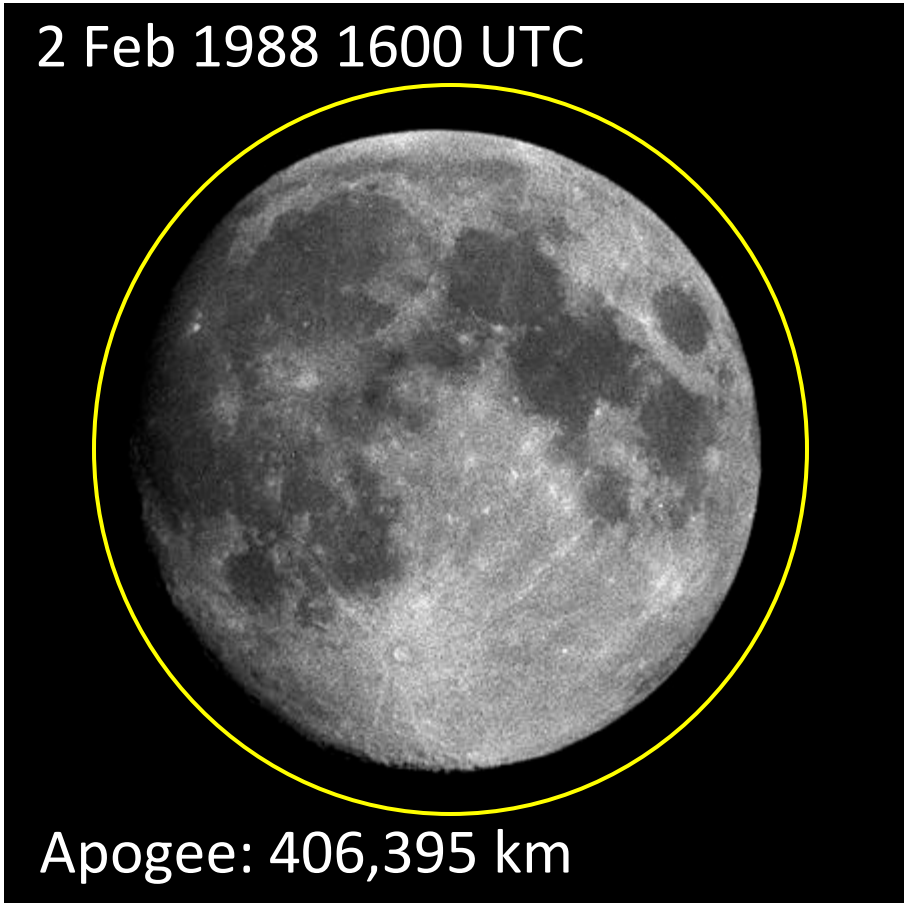
The Lunar Cycle

Sep 30 – Oct 15 2012



The Lunar Cycle





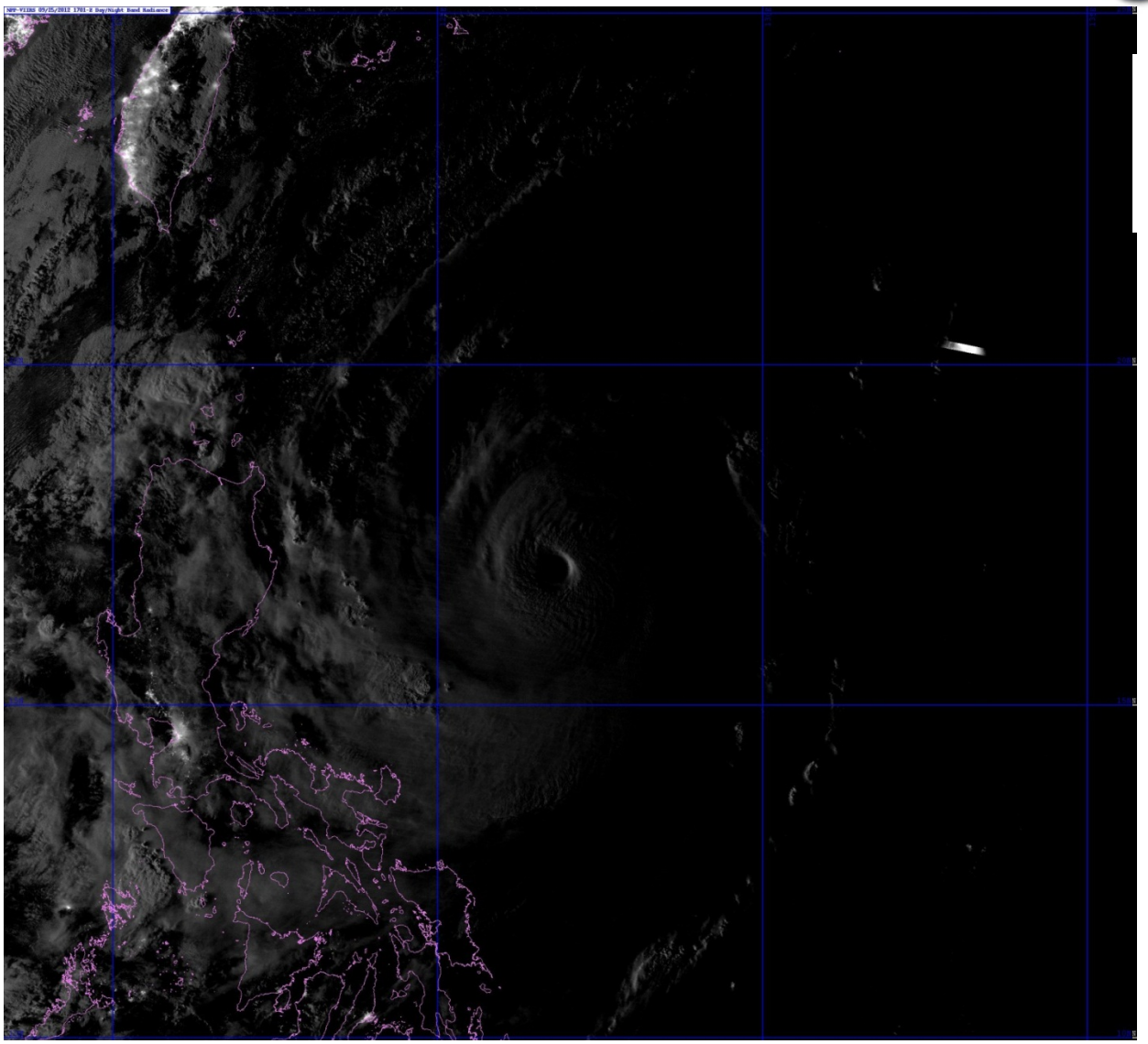
Quantitative Lunar Reflectances

Lunar model is used to produce a form of near constant contrast (NCC) imagery.

Not applicable to the day/night terminator where solar signal is present.

Moon phase: 80%

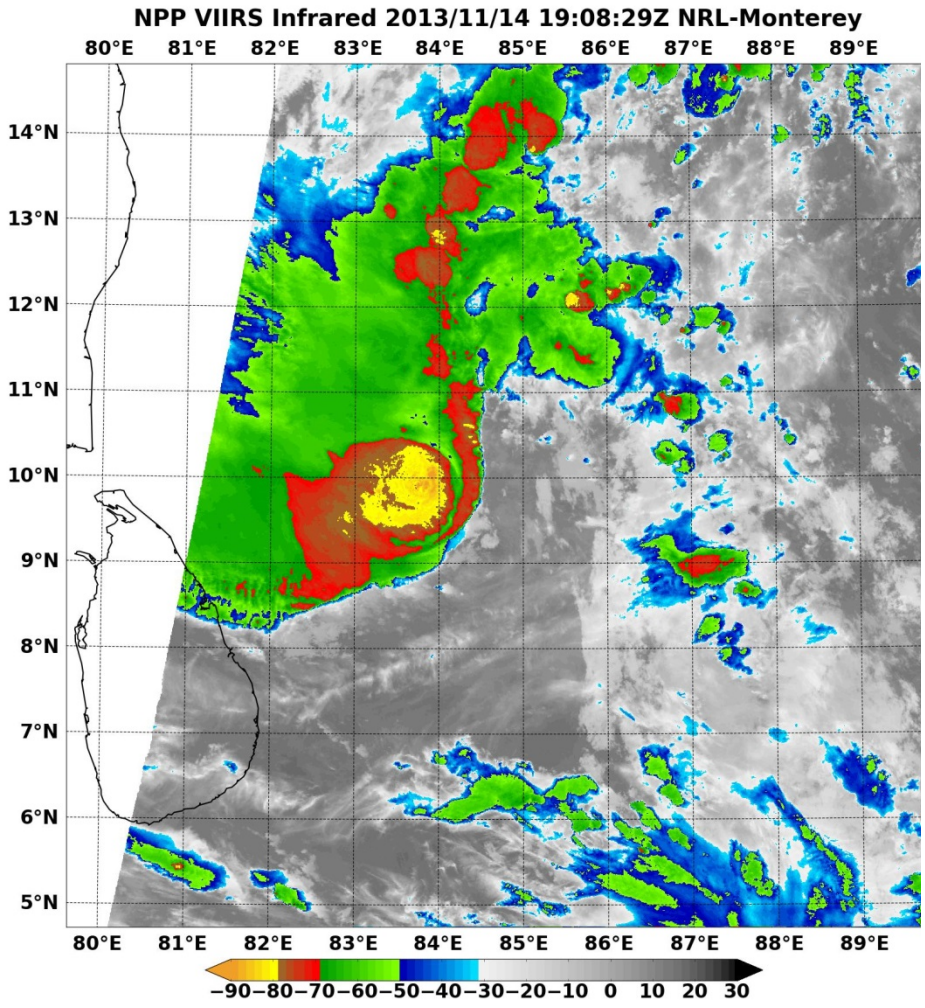
Transitioned to Fleet Numerical for Operational use

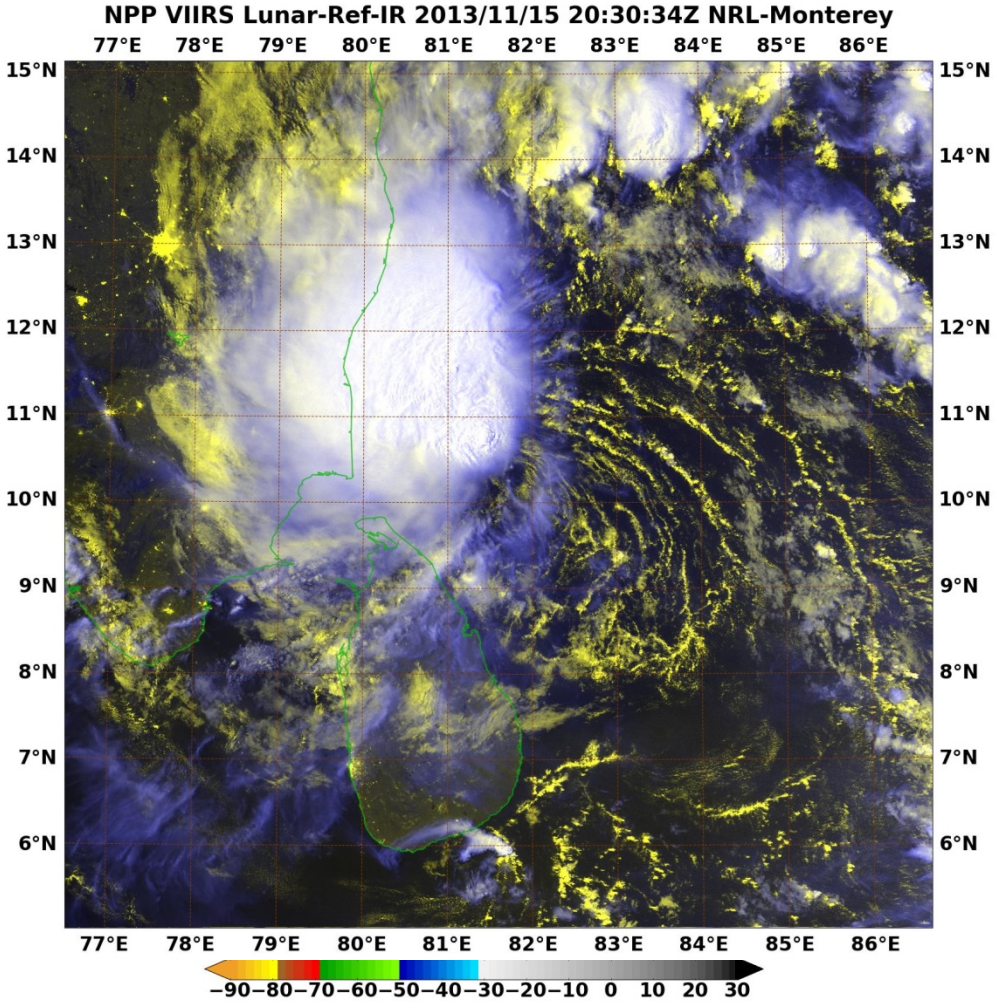


Quantitative visible reflectance values: many applications

DNB Reveals Low-Level Features

Typhoon Haiyan

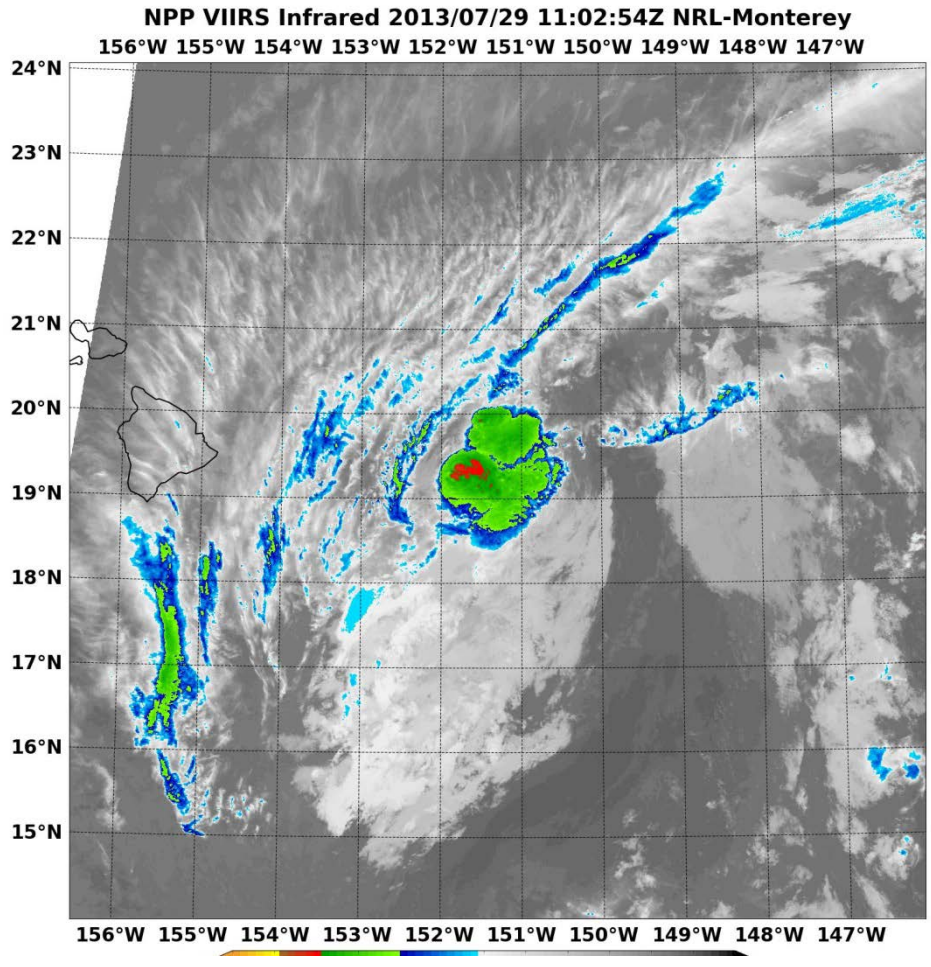


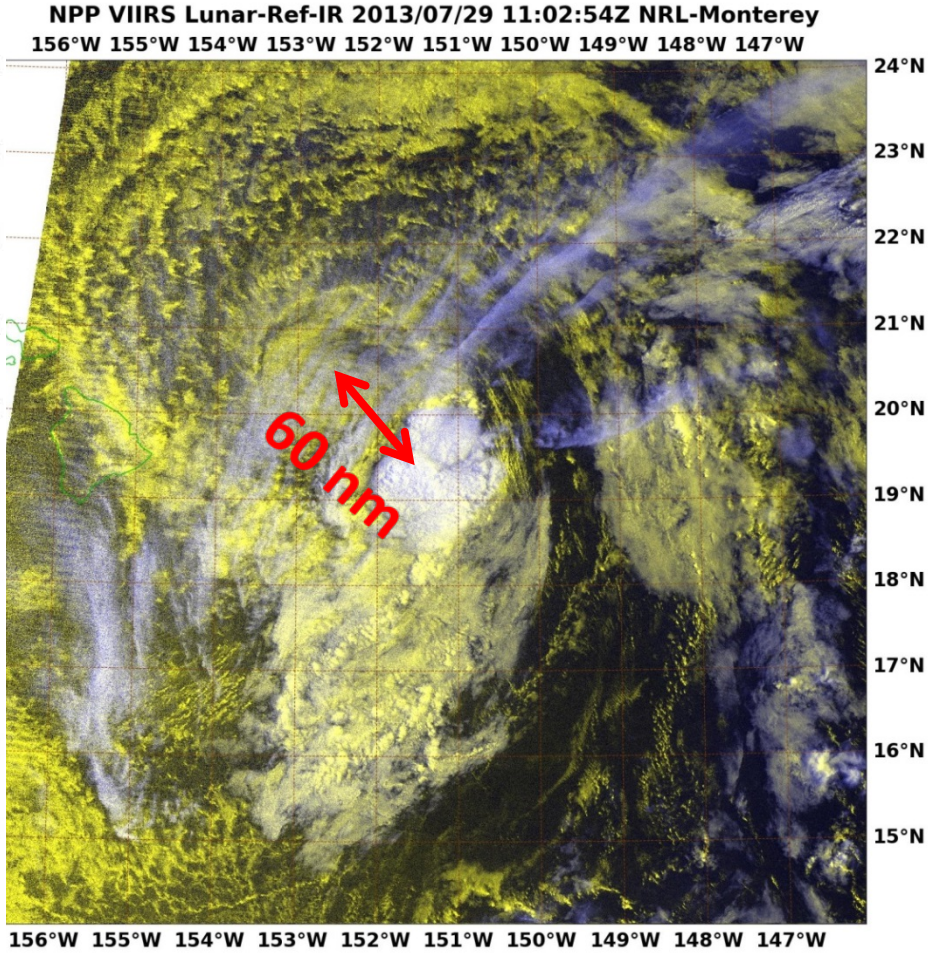


LLCC “exposed” by VIIRS DNB lunar illumination

DNB Reveals Low-Level Features

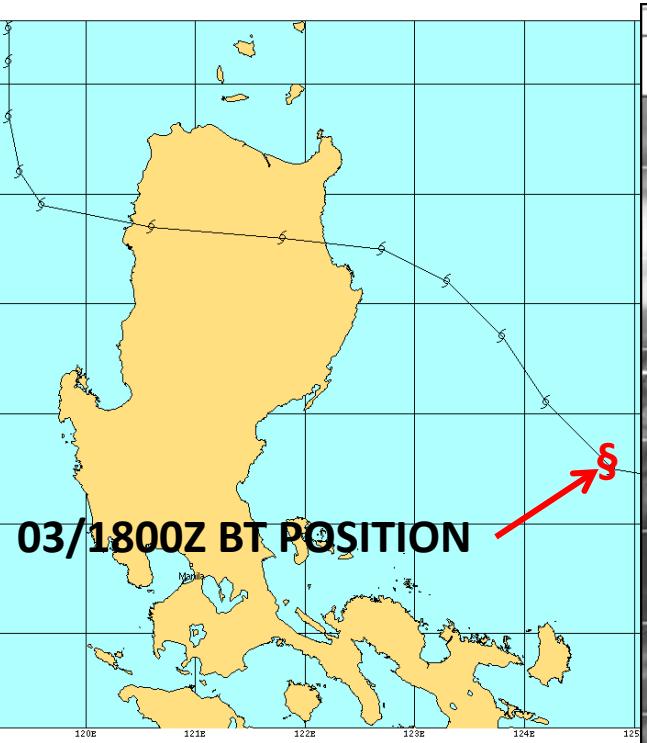
Hurricane Flossie

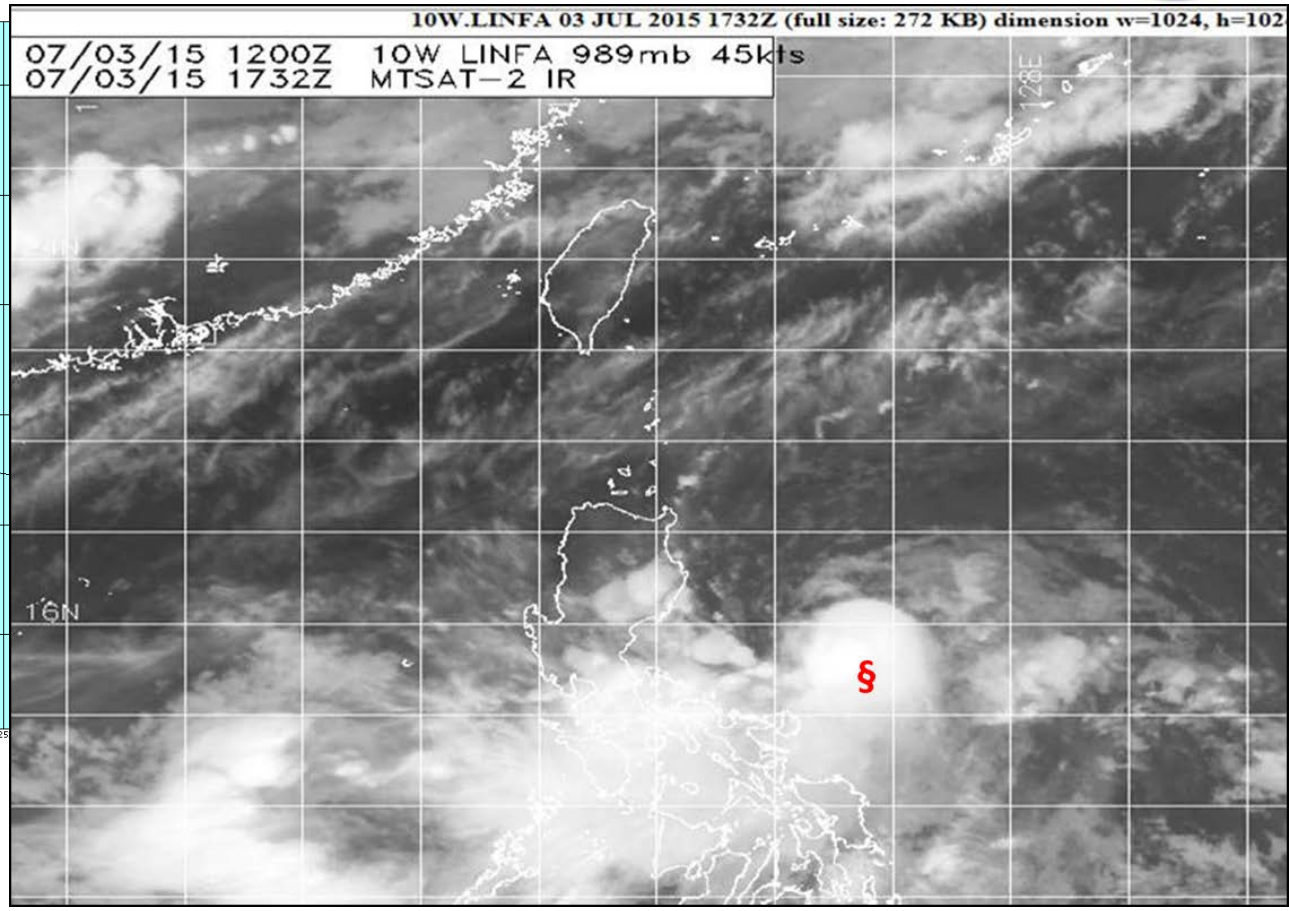




VIIRS DNB dramatically altered CPHC Flossie forecast to the NW, directly impacting landfall and day 1-3 day warnings

Typhoon Linfa





Infrared imagery provides low confidence of storm location.

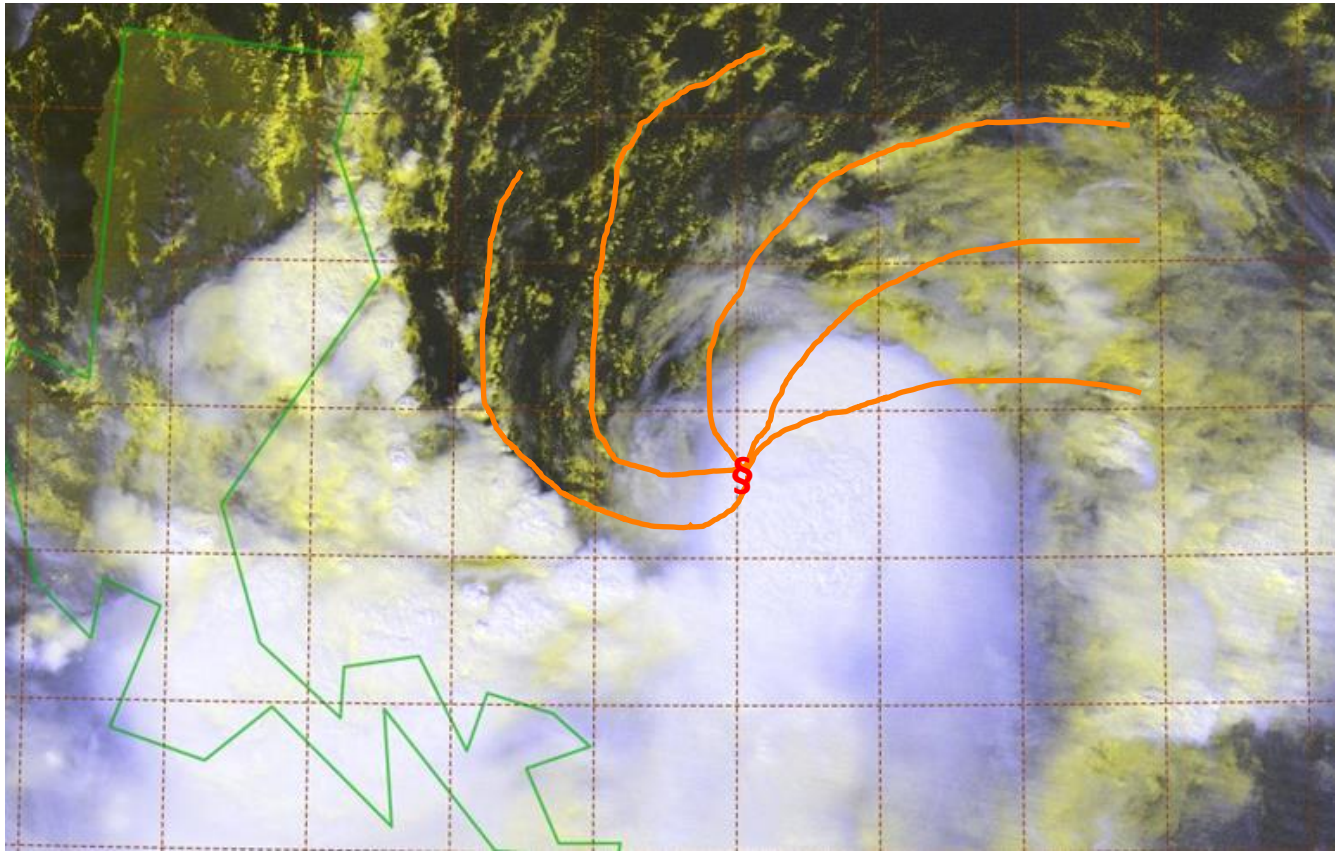
No microwave imagery available at the time to improve confidence.

Typhoon Linfa

VIIRS allowed analysts to greatly improve upon IR-only storm center.

Low level cloud lines are easily traced to the storm center.

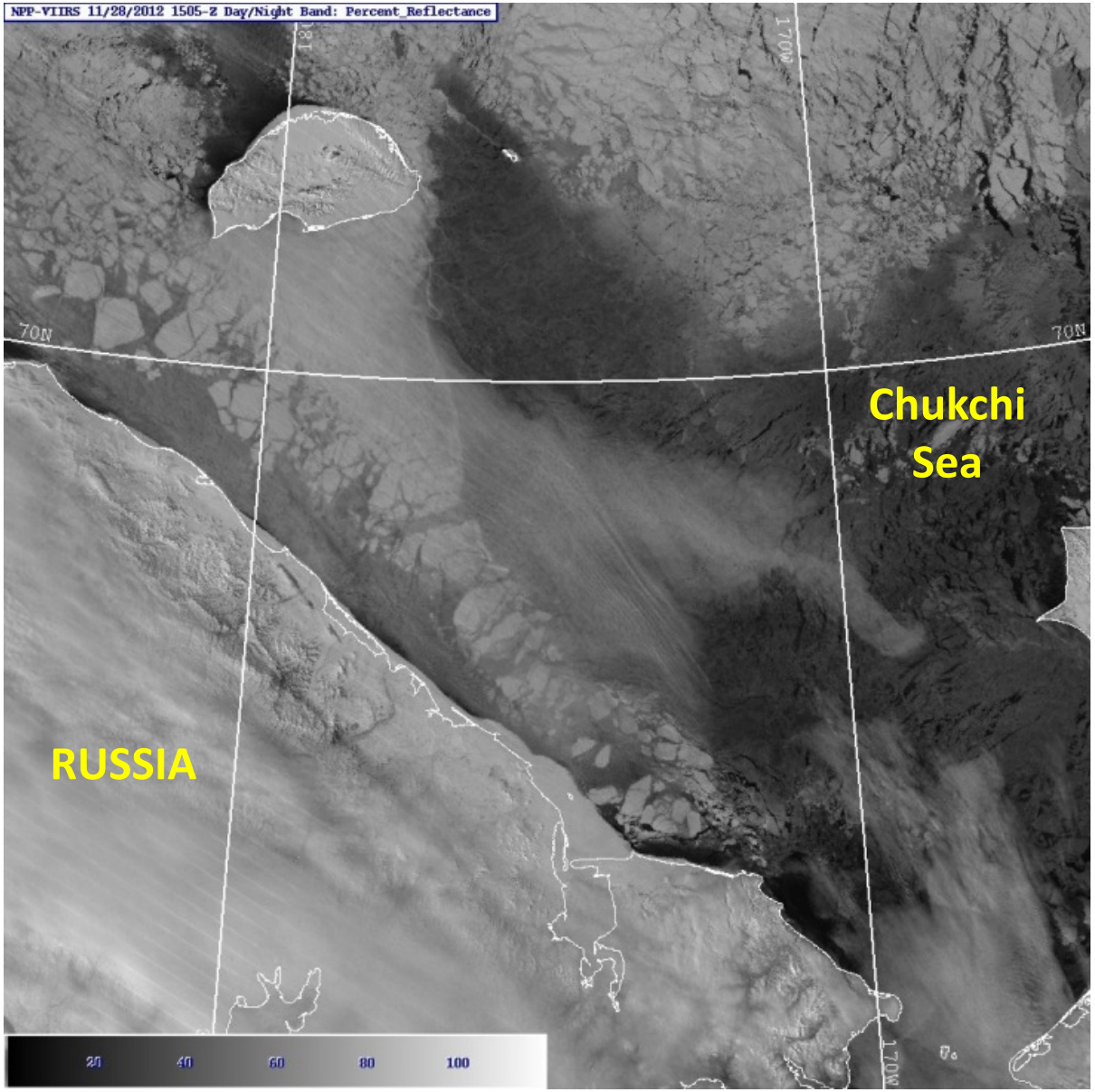
Without DNB, analysts would have favored a position under the deeper convection



"Without the VIIRS image, TC position would have been derived from IR only, which would have placed the center further southeast ~20 miles"

Courtesy of Capt. Brian Decicco and TSGT Ricky Frye, Joint Typhoon Warning Center

DNB For Nighttime Sea Ice

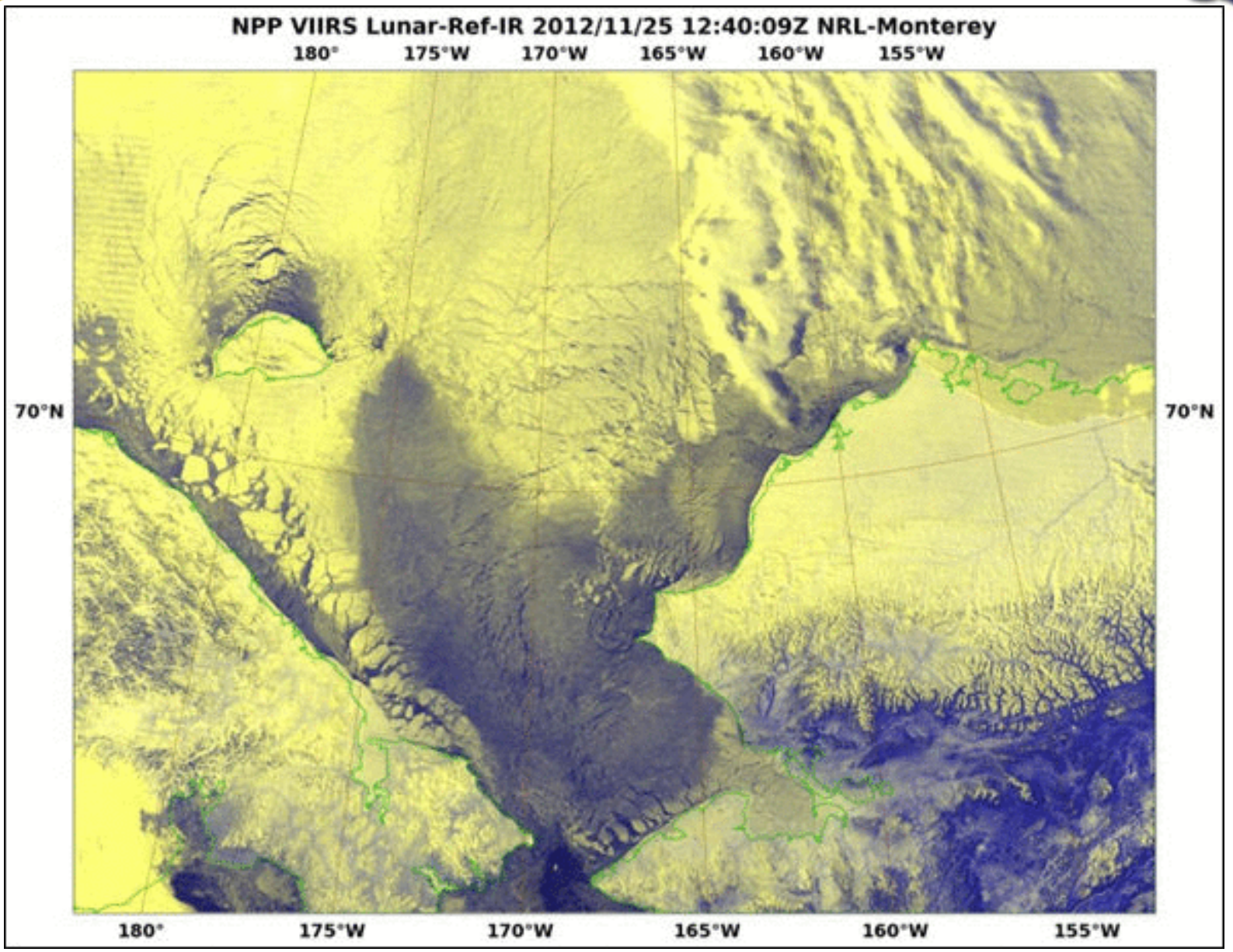




Lunar illumination passes through thin cirrus and reflects off sea ice below

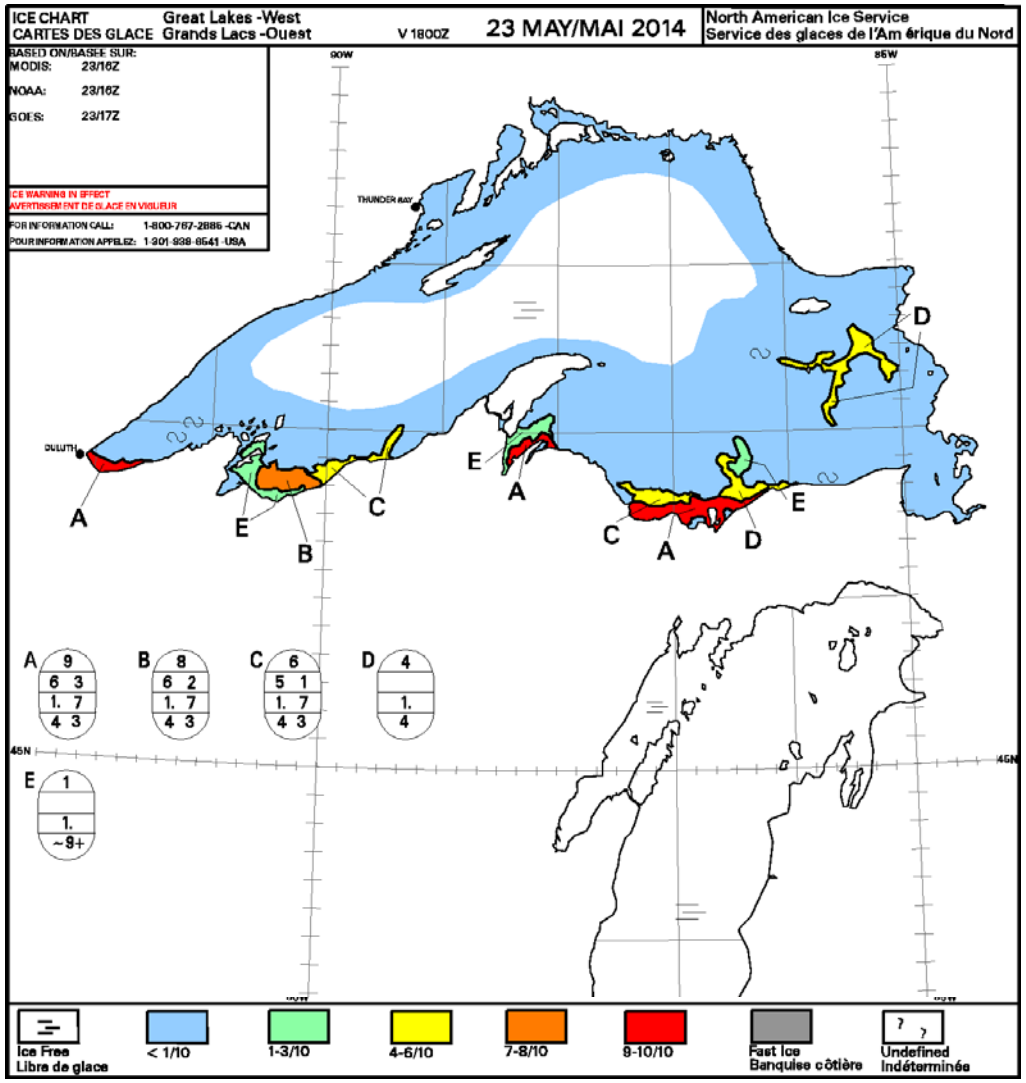
Cooperative Institute for Research in the Atmosphere

DNB For Nighttime Sea Ice



Great Lakes Ice Demo

NIC
Great Lakes
Lake Ice Map
May 23, 2014

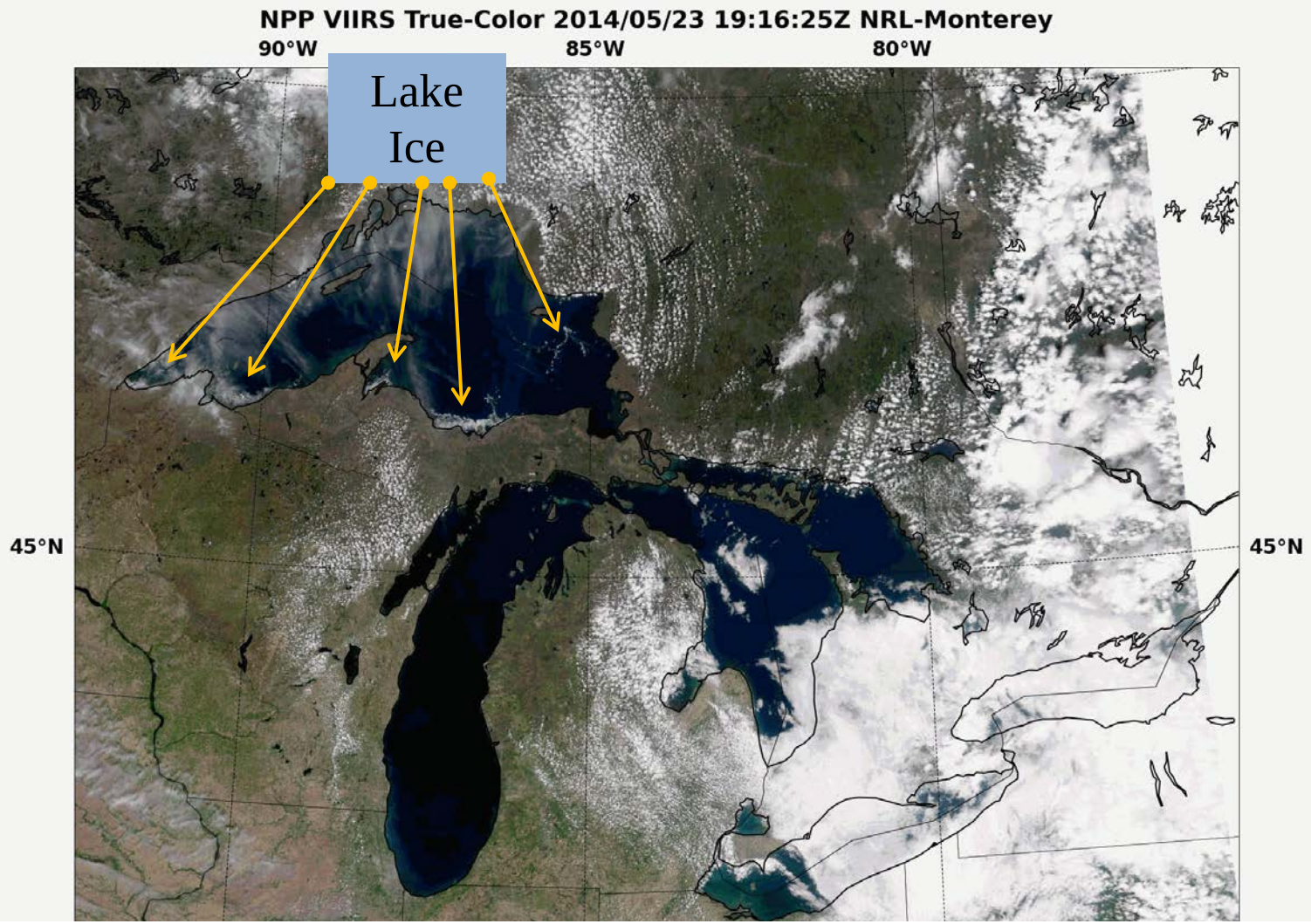


< 1/10 (light blue), isolated lake ice near south shore and Michipicoten Island

Great Lakes Ice Demo

VIIRS True Color Animation

May 23-30 , 2014



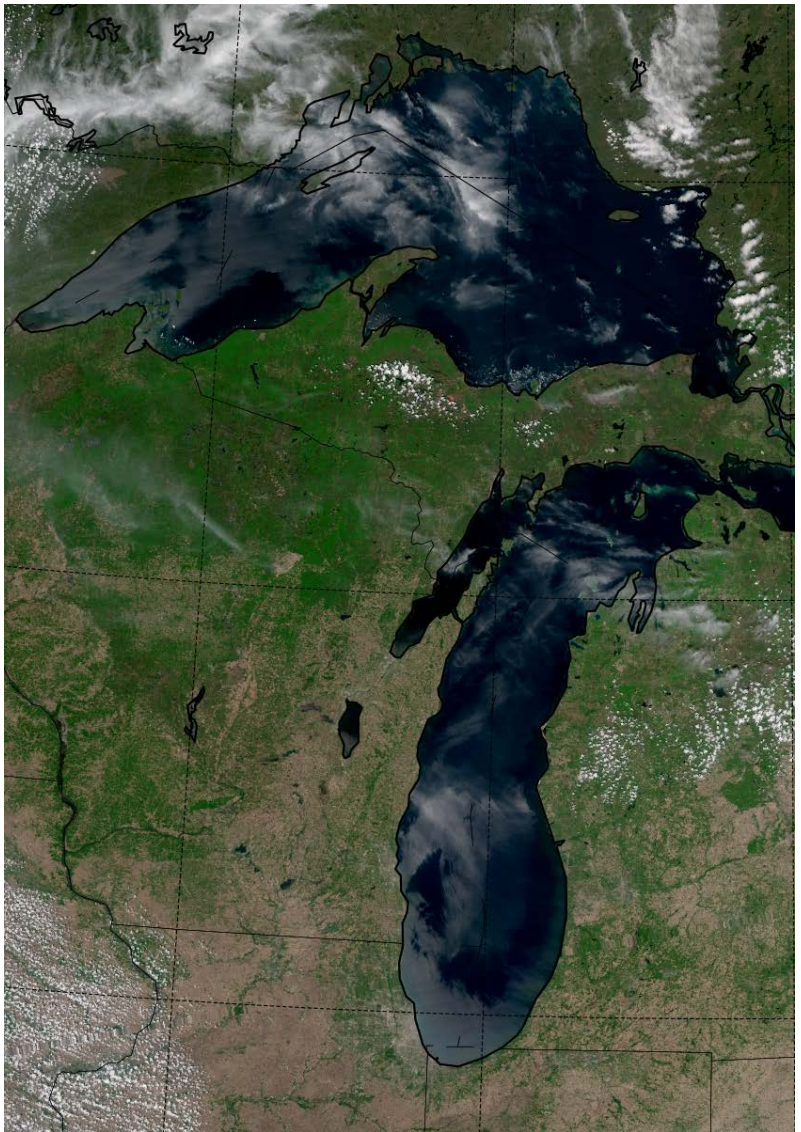
Created Great Lakes VIIRS sea ice demo within 15 minutes of NIC request using GeoIPS software

Great Lakes Ice Demo

May 24, 2015



May 30, 2015



NIC Use of VIIRS

NRL added seven polar domains in support of NIC operations.

VIIRS frequently used as a component of sea ice analysis.

The NIC has since begun receiving an operational VIIRS feed.

Summary

- VIIRS imagery is actively playing a role in operational analysis and forecasting.
- The DNB has directly influenced tropical cyclone forecasts on multiple occasions and is relied upon by JTWC and the CHPC.
- The National Ice Center has incorporated VIIRS into its workflow.
- Dust imagery derived from VIIRS has proven useful for detection and forecasting of SAL borne dust outbreaks in the Caribbean.
- Several algorithms based on VIIRS imagery have transitioned to FNMOC for operational use by the Navy.