



NRL-MRY VIIRS Demonstrations

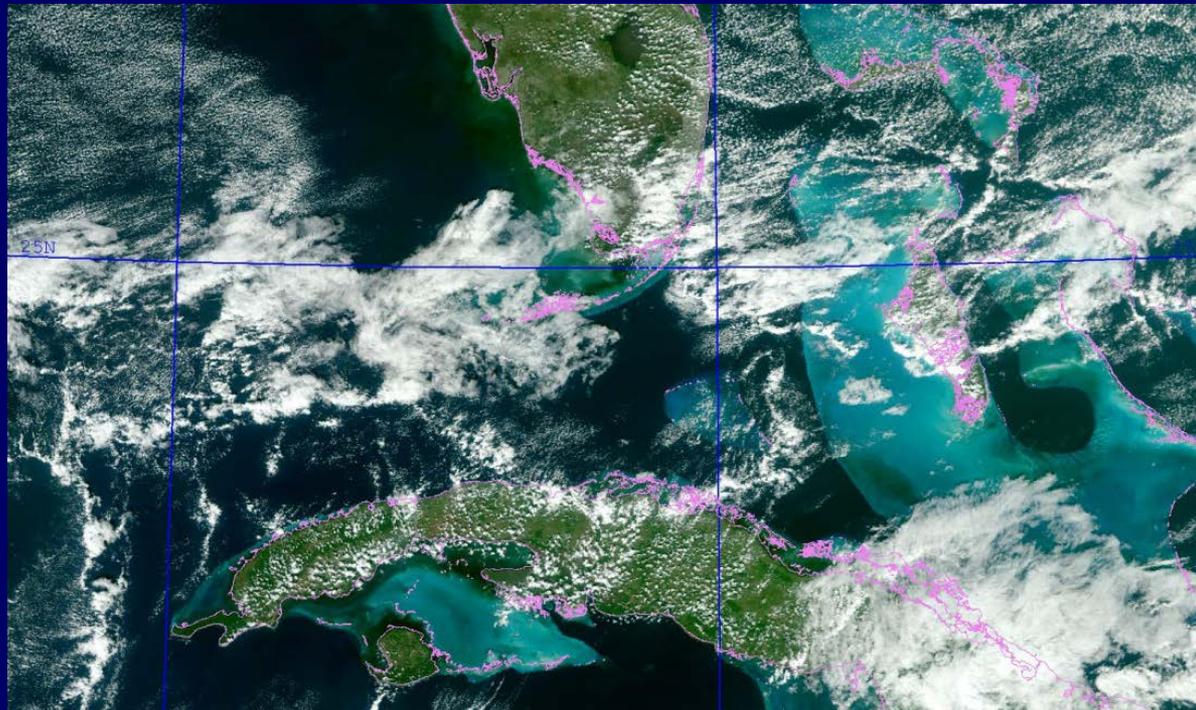
Satellite Meteorological Applications Section

Naval Research Laboratory

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VIIRS Imagery User Feedback

January 7, 2017



NexSat Home Page

<http://www.nrlmry.navy.mil/NEXSAT.html>



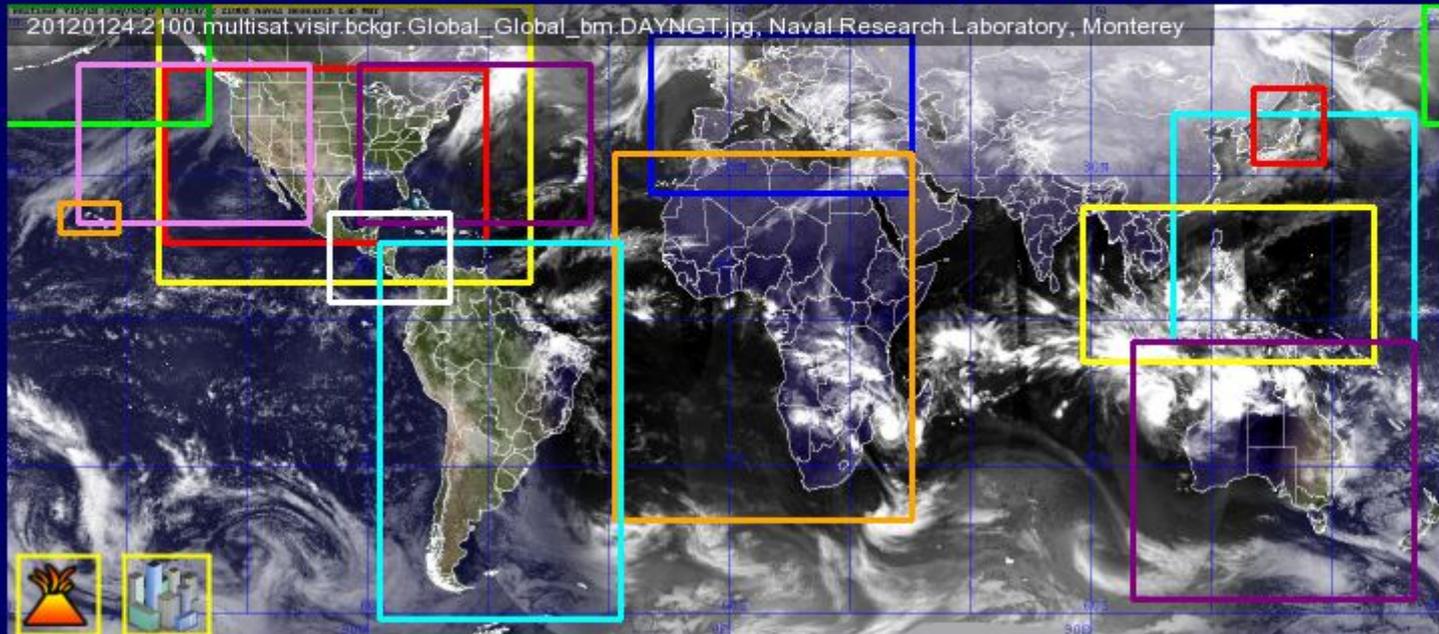
NexSat

[Feedback?](#)

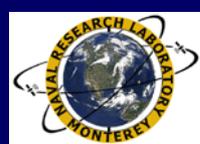
[About Nexsat](#)



Select Nexsat area of interest in the image map below.



Volcanoes Cities



NexSat: CONUS Domain

Products

Visible
Infrared
Vapor
True Color
GEO-Color
Cloud Tops
Cloud Layers
Cirrus
Snow Cover
Rain Rates
Rain Totals
Contrails
Winds
LowCloud
Model Overlays
Night Visible

Age \leq 1 h
Age \leq 12 h
Age \leq 24 h
Age $>$ 24 h

West

North

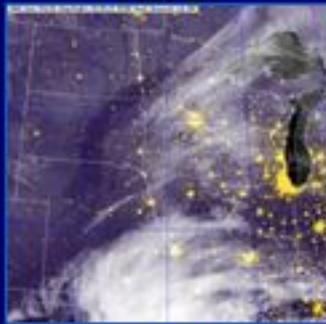


South



Central

North



South



East

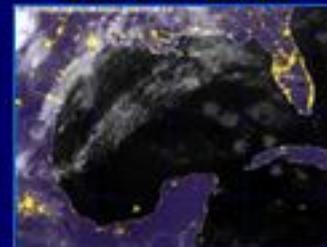
North



South



GulfOfMexico





Catalog of NexSat Products

Standard Products

Visible (daytime)

Visible (night time)

Infrared

Water Vapor

True Color

Pseudo/GEO True Color

Rain Rates

Rain Totals

- 3, 6, 12, 24 hours
- 2, 3, 4, 5, 6, 7, 10, 12, 14 days

*Winds

- speed and direction
- low level
- middle level
- upper level

Cloud Products

Cloud layers (snow, low-middle, high)

CloudSat (cloud profile)

Cirrus cloud detection

Contrail detection

Low cloud detection (night)

Convective cloud top height

Cloud properties

- effective radius
- optical depth
- cloud top temperature
- cloud top height
- cloud type

Environmental Products

Aerosol amounts (optical depth)

Biomass (vegetation type)

Dust detection

Fire detection (hot spots)

Lightning detection

Snow cover (surface)

*NWP model overlays

Sea Level Pressure

500 mb Heights

sfc, 700 500 300 mb Winds

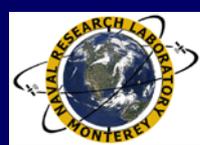
1000-500 mb Thickness

Surface Temperature

Jet Stream

* NAVGEM and COAMPS[®]

VIIRS products in orange



NRL VIIRS Cal/Val Web Page

<http://www.nrlmry.navy.mil/VIIRS.html>

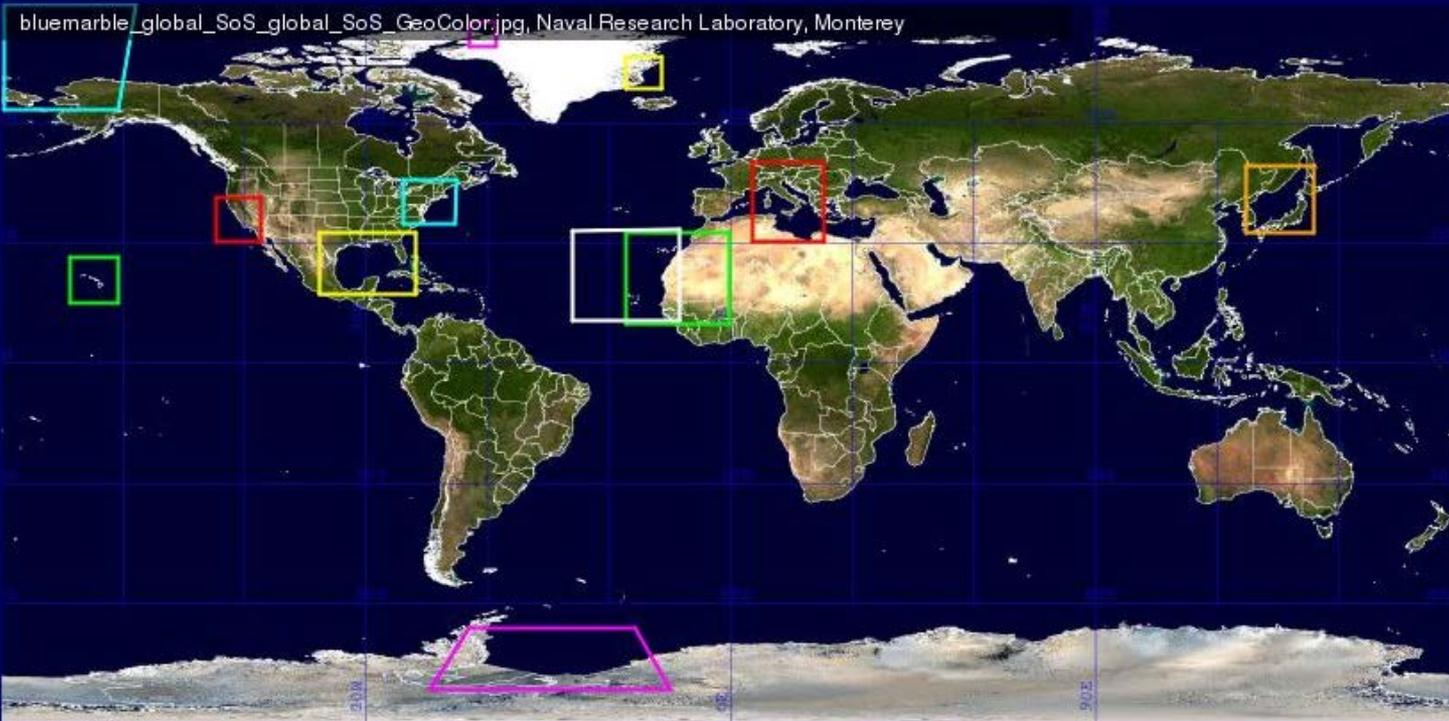


VIIRS

[Feedback?](#) [About VIIRS](#) [NexSat](#)



Select VIIRS area of interest in the image map below.





Monitoring Volcanic Plumes

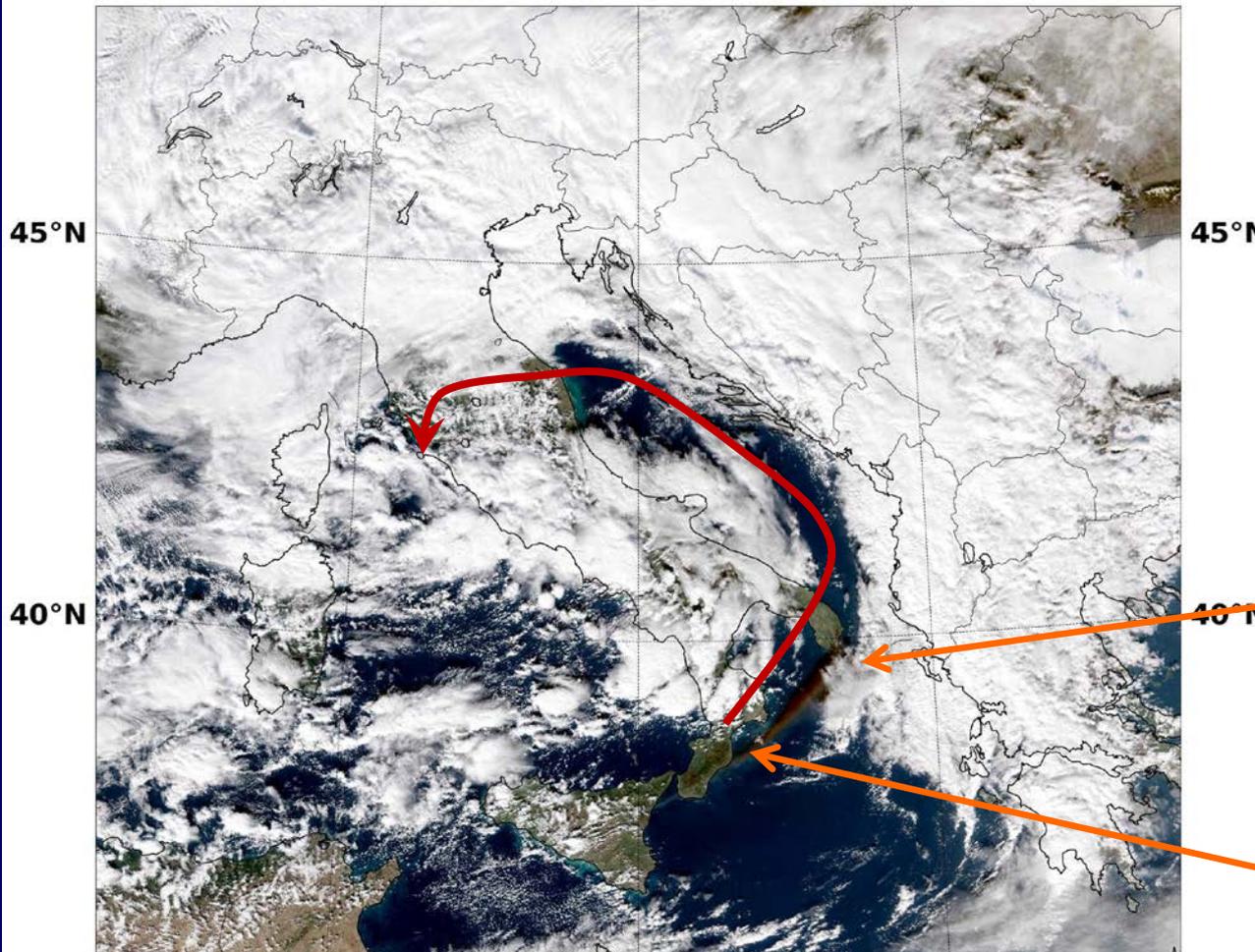
Mt. Etna Eruption

NPP VIIRS True-Color 2013/11/23 12:16:22Z NRL-Monterey

10°E

15°E

20°E



VIIRS products available to the Volcanic Ash Advisory Centers (VAAC)

Dark airborne ash plume being ingested into mesoscale low

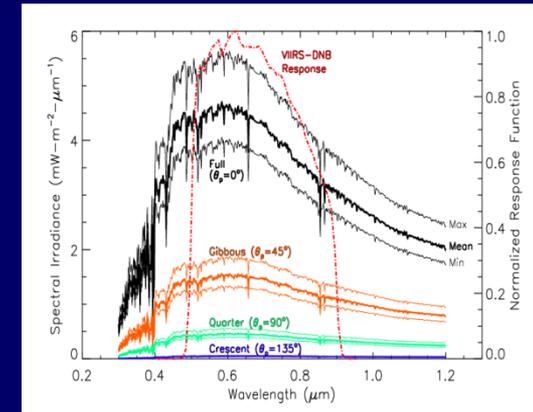
Collaboration: Volcanic Ash Advisory Centers (VAAC)



Tools for Quantitative Lunar Applications from the VIIRS/DNB

- A lunar irradiance prediction model to allow conversion from DNB radiance to reflectance units

$$R = \pi I^{\uparrow} / [\cos(\theta_m) E_m]$$

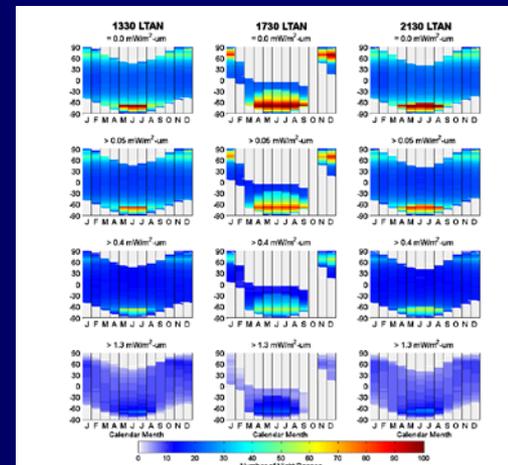


- Enables quantitative applications from measurements of reflected moonlight

Miller and Turner, 2009. *IEEE Trans. Geosci. Rem. Sens.*, **47**(7), 2316-2329.

A lunar availability assessment for the VIIRS/DNB to determine when and where nighttime lunar applications are possible for NPP and other polar orbits.

- ~45% all nights at mid-latitudes offer sufficient levels of moonlight



Miller et al., 2012. *J. Atmos. Ocean. Tech.*, In Press.



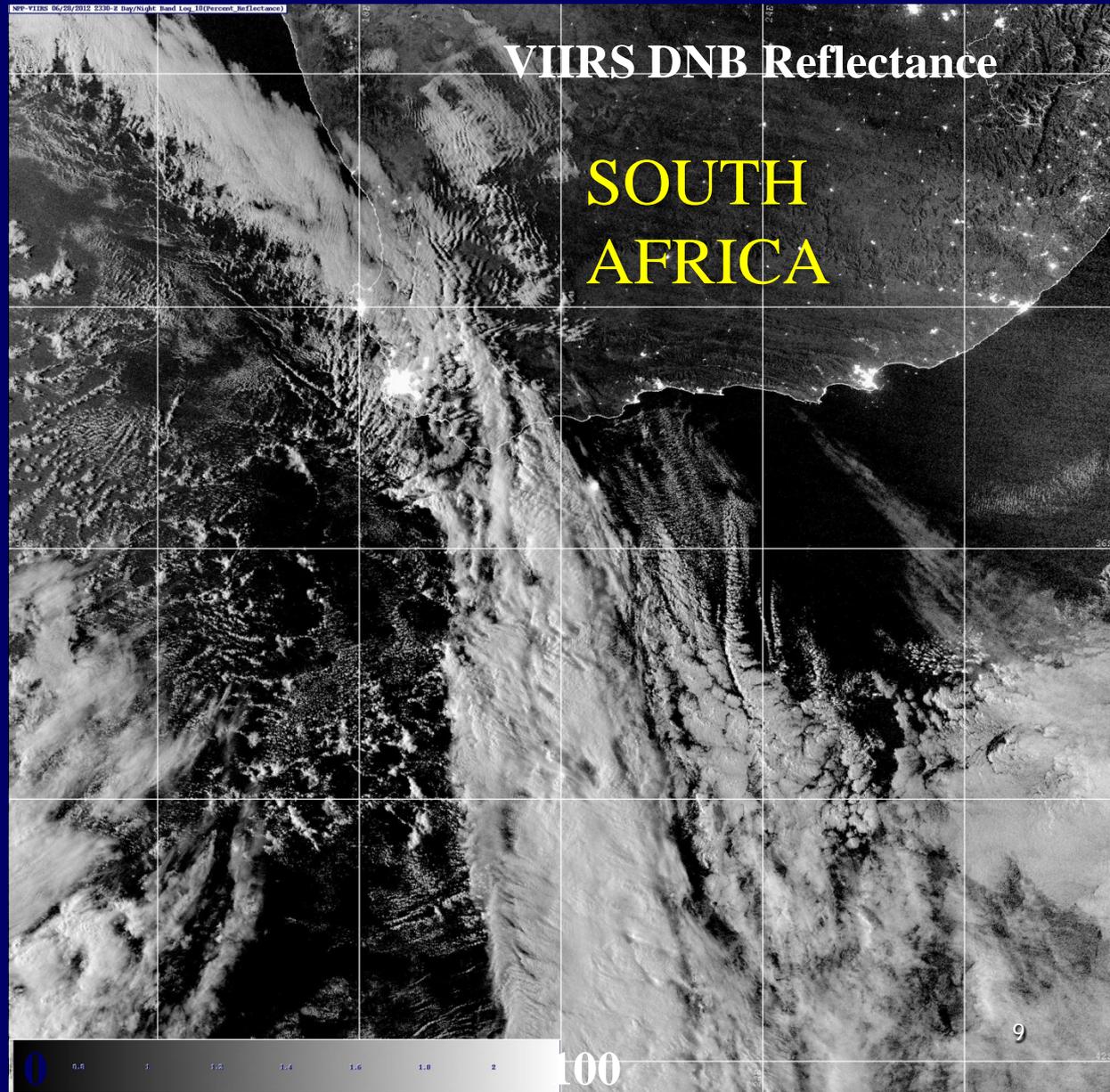
Reflectance Near 'Lunar Terminator'

The lunar model can be used to produce a form of near constant contrast (NCC) imagery.

Applicable to **night-only** (i.e., to lunar observations at different times in the lunar cycle, especially near lunar terminator.

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

(28 June 2012, South Africa, around first-quarter Moon) shown here... → Moon is setting in the west at the time of the DNB nighttime overpass.

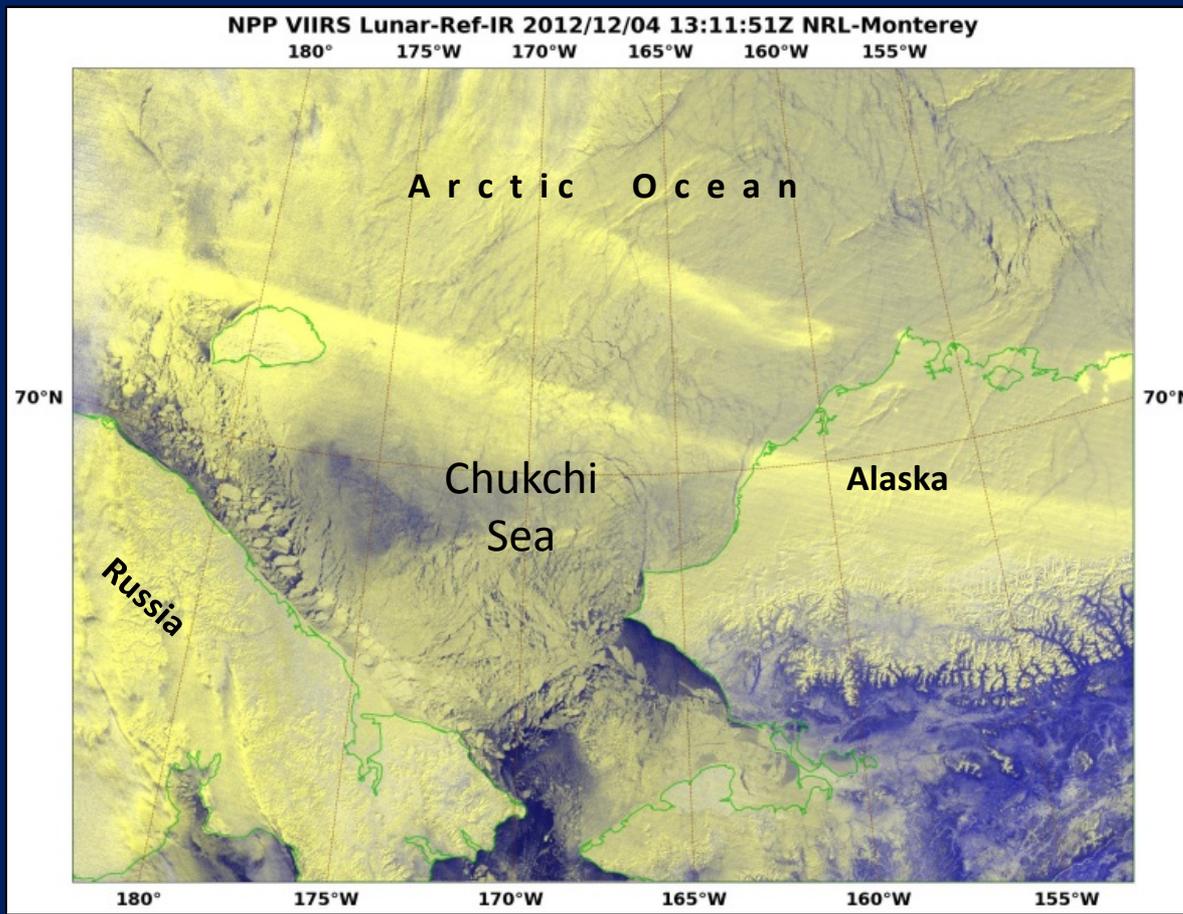




Nighttime Sea Ice Monitoring

DNB (low light visible) - Nighttime during Full Moon

11/27 – 12/04, Lunar cycle > 3/4



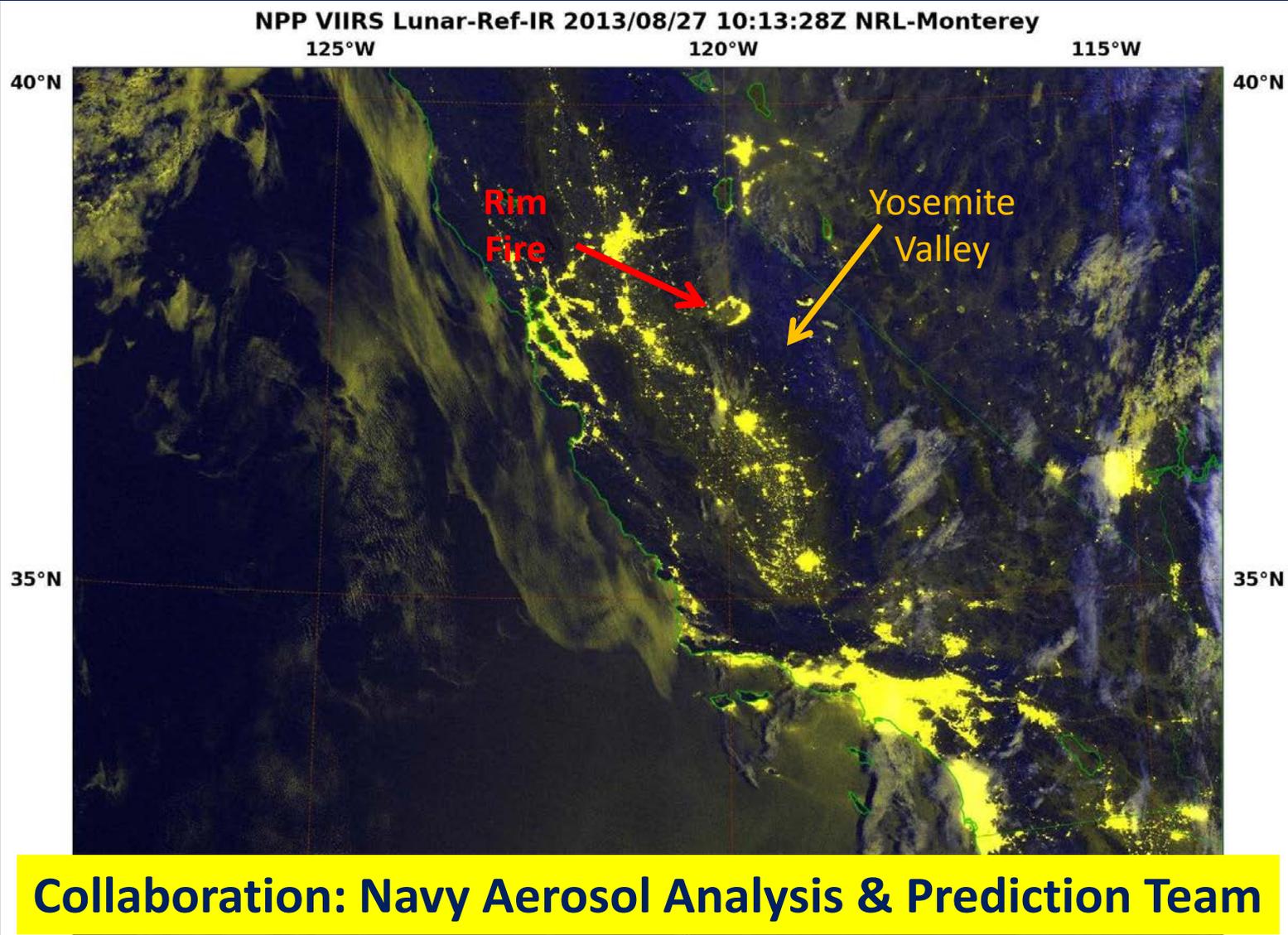
Collaboration with National Ice Center: Suitland, MD



Tracking the Rim Fire at Night

VIIRS DNB + IR enhanced with Lunar Irradiance Model

18 – 27 August

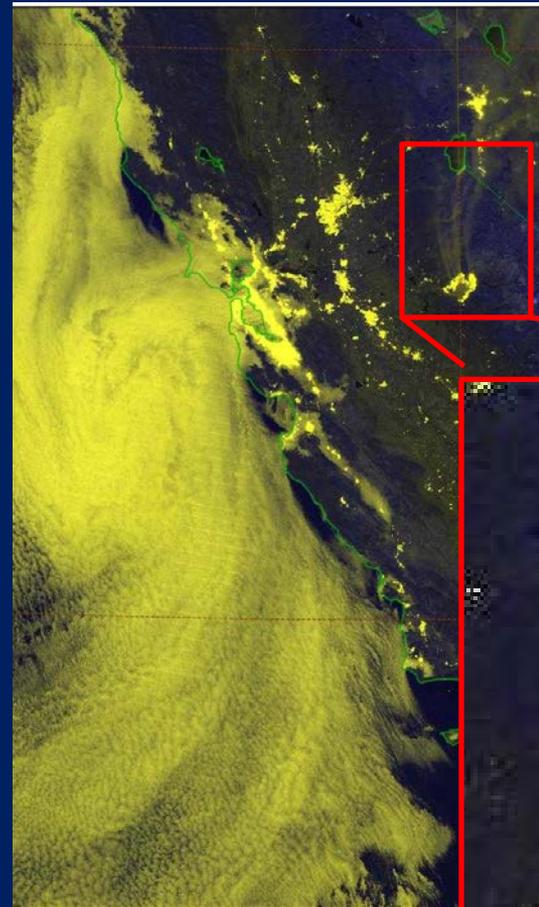




Comparing Nighttime Visible Products

DMSP-OLS 04:29Z

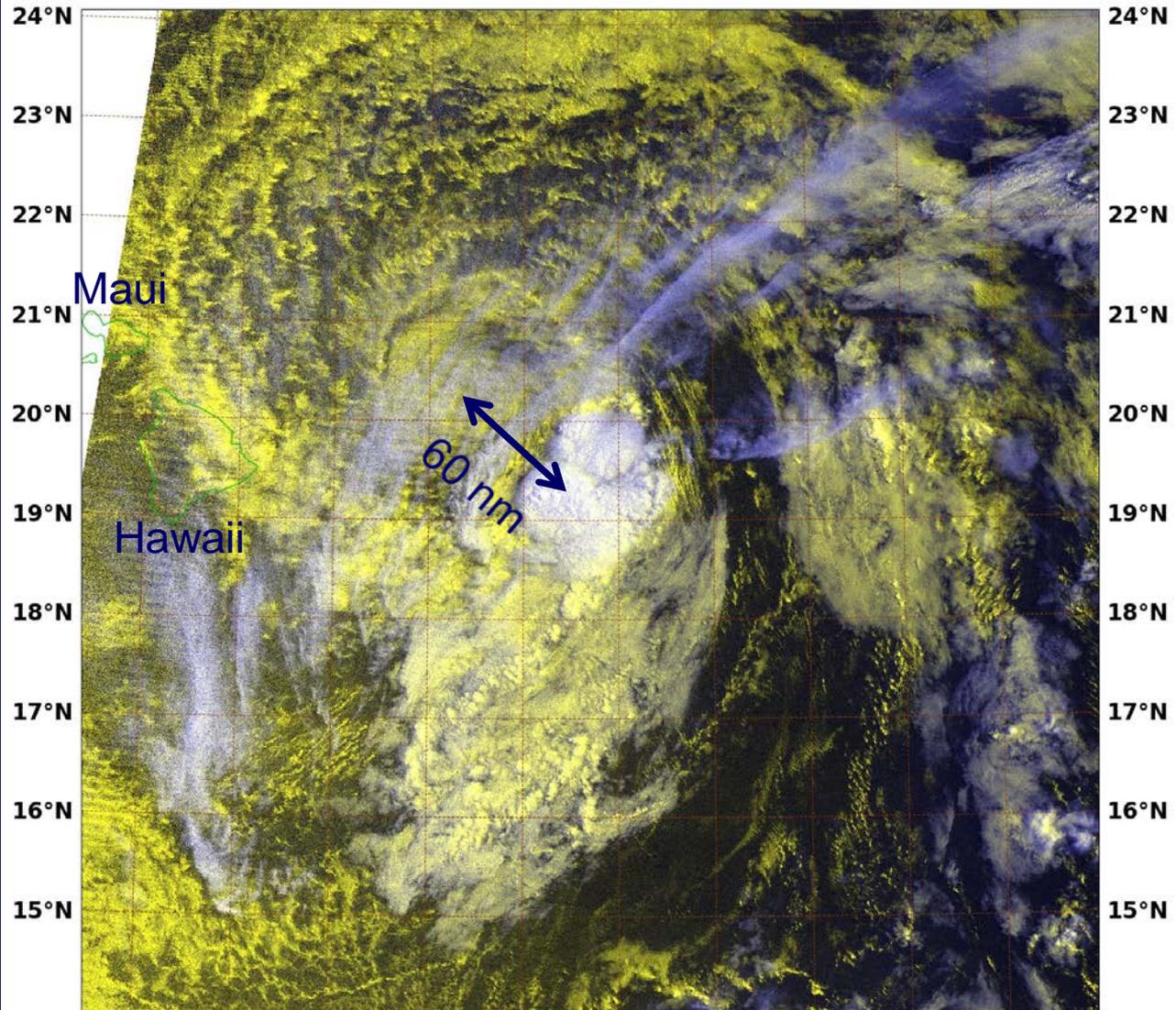
23 Aug VIIRS-DNB 09:48Z





Nighttime TC Monitoring Via DNB

NPP VIIRS Lunar-Ref-IR 2013/07/29 11:02:54Z NRL-Monterey
156°W 155°W 154°W 153°W 152°W 151°W 150°W 149°W 148°W 147°W



VIIRS DNB reflectance +
IR reveals LLCC
displaced ~60 nm from
IR convection center

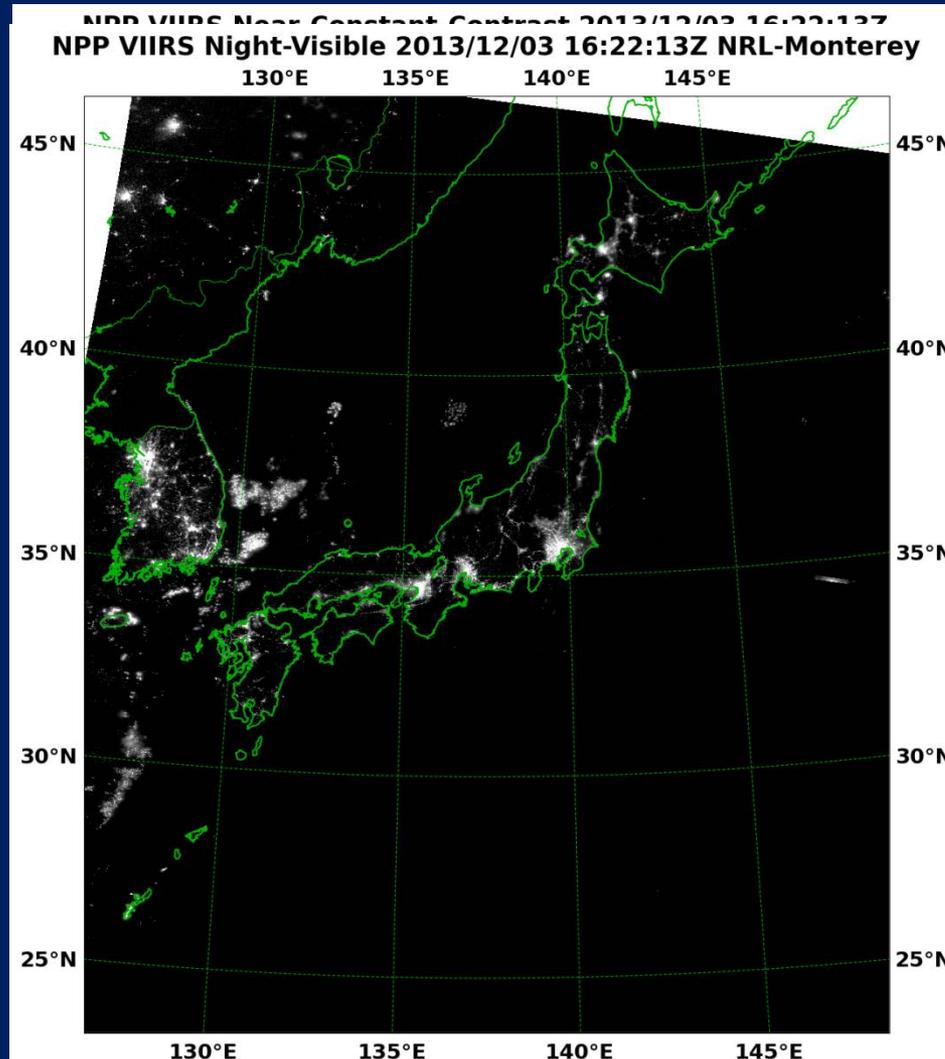
CPHC Warning :

- Relocated TS Flossie center fix well north
- Landfall no longer on island of Hawaii
- Revised track now impacts area along northern coasts

Collaboration: Joint Typhoon Warning Center



VIIRS Near Constant Contrast (NCC)

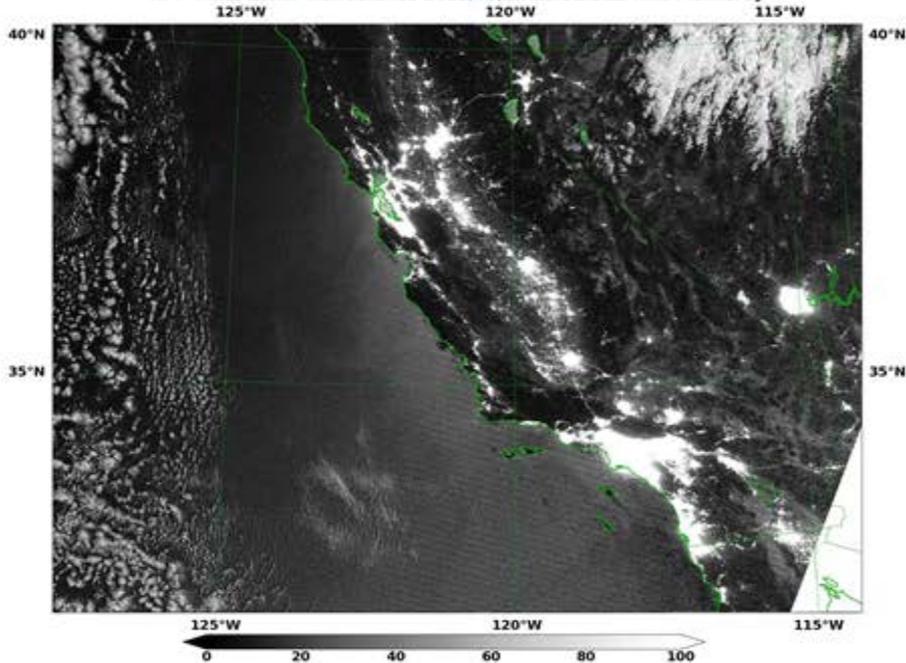


1. Contrast enhancement for cloud detection under faint illumination
2. Take advantage of highly variable air glow opportunities

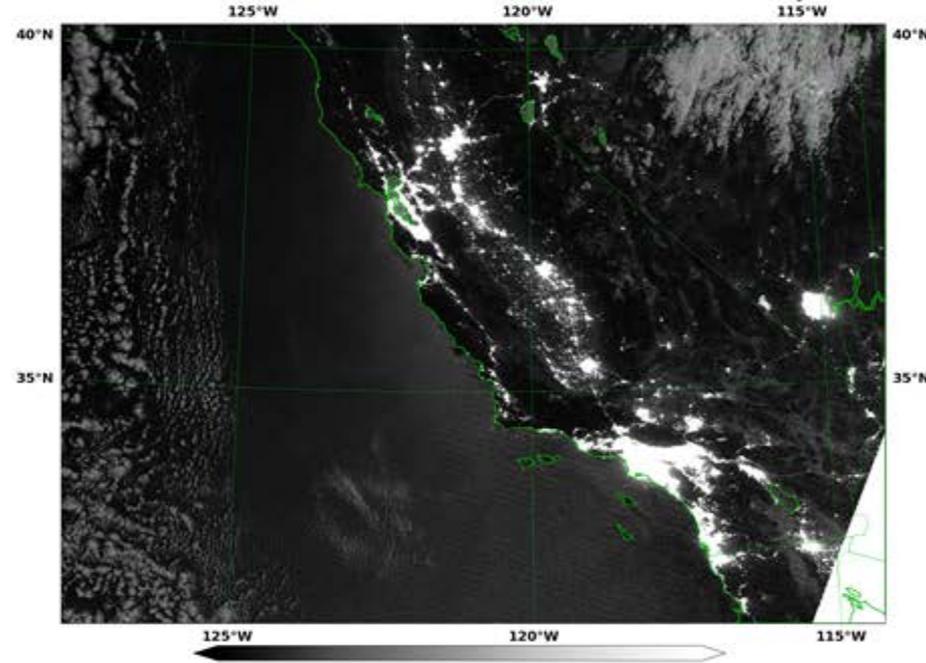


VIIRS Reflectances vs NCC

NPP VIIRS Lunar-Reflectance 2013/09/27 10:32:51Z NRL-Monterey



NPP VIIRS Near-Constant-Contrast 2013/09/27 10:32:39Z NRL-Monterey



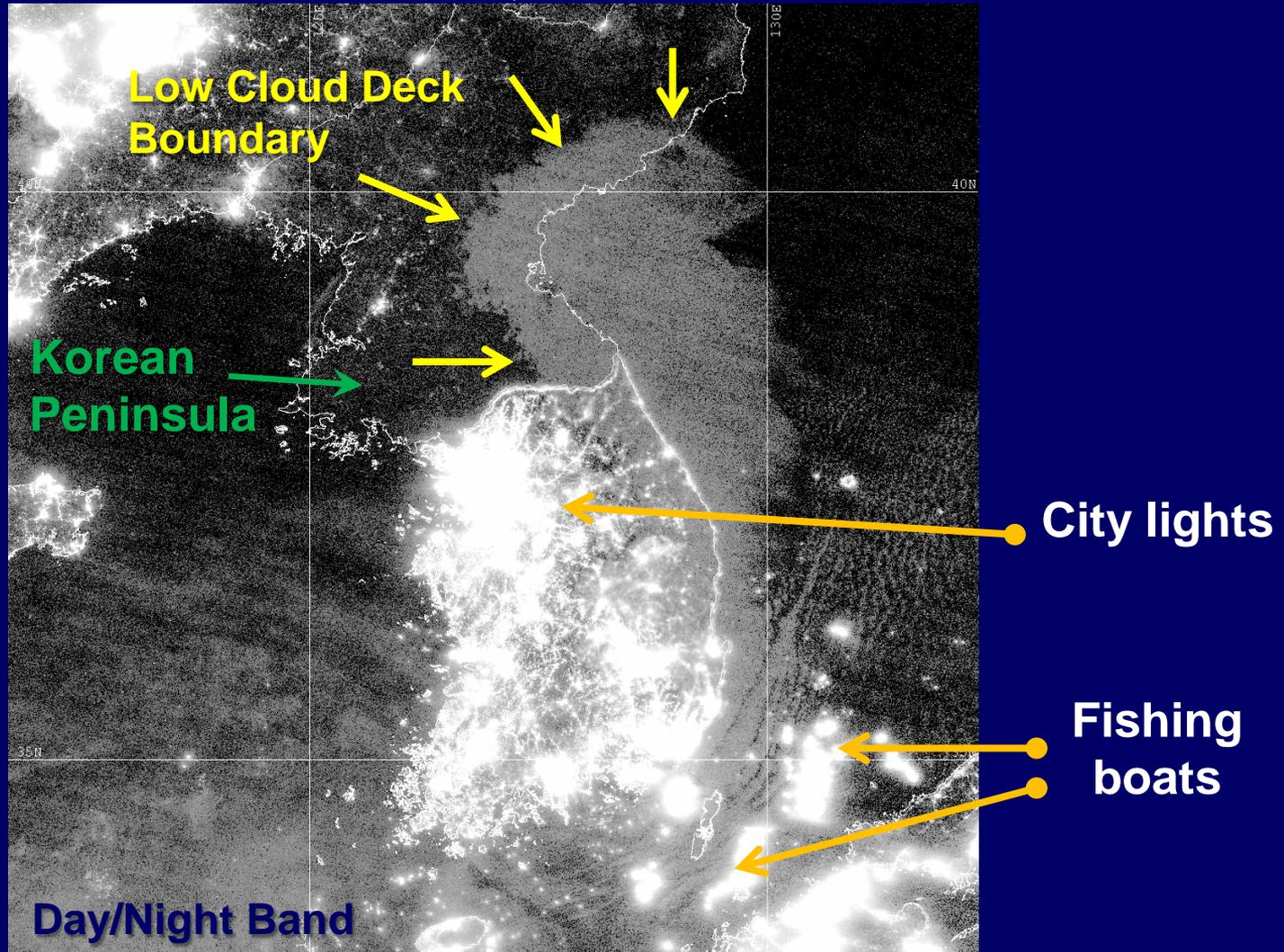
1. Better land surface details in the desert SW.
2. Improved cloud detail and contrast of clouds with land/ocean backgrounds.
3. Moonglint region--better illustration of the island wake calm waters (SE of Catalina Island) for surface wind speed and direction inference.
4. Not only is it a nice image, but it's **quantitative** information which can be translated into various physical properties like cloud optical depth.



Low Clouds & Fog Detection

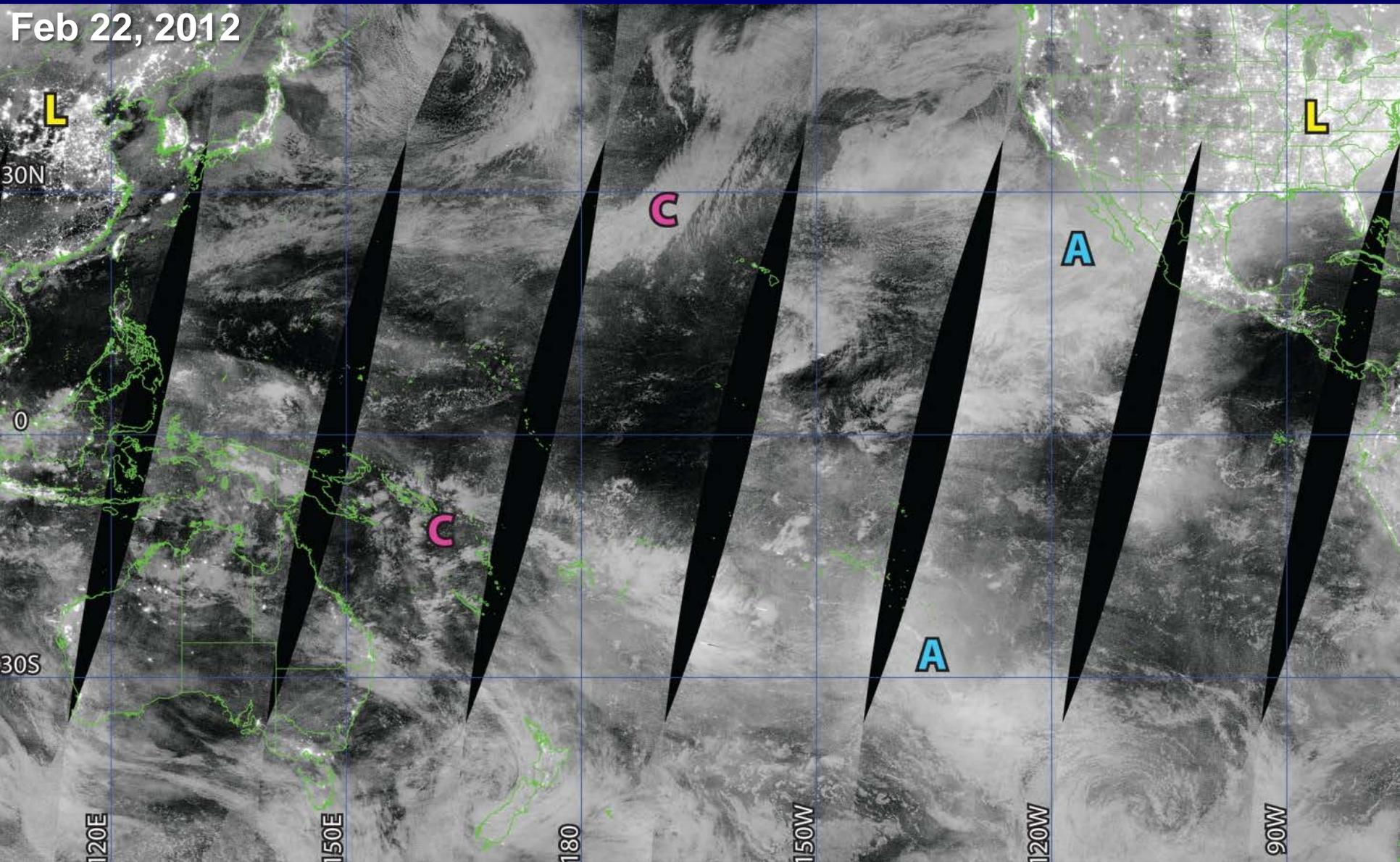
Feb 23, 2012

Airglow provides sufficient illumination to "light up" low clouds



Collaboration: Fleet Numerical & Meteorology Center

Feb 22, 2012



Courtesy: S. Miller, CSU/CIARA

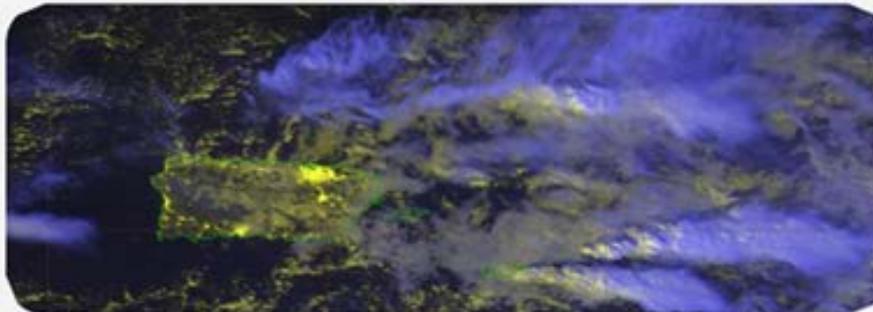


Outreach: Puerto Rico NWS Support



New Satellite Tools

By: Luis Rosa



The NWS San Juan is very pleased to announce a customized domain of satellite imagery for Puerto Rico courtesy of the Naval Research Laboratory in Monterey, CA (NRL-MRY). The [NexSat \(Next-Generation Weather Satellite Demonstration Project\) website](#) displays high-resolution imagery from the newest sensor Visible Infrared Imager Radiometer Suite (VIIRS) that flies on the Suomi NPP (National Polar-orbiting Partnership) polar orbiter, the Moderate Resolution Imaging SpectroRadiometer (MODIS) on board NASA's Aqua and Terra satellites, the Advanced Very High Resolution Radiometer (AVHRR) from NOAA's and EUMETSAT satellites, and the Operational Linescan System (OLS) from the Defense Meteorological Satellite Program (DMSP). The VIIRS instrument has significant improvements over its heritage instruments AVHRR, MODIS and OLS in which its 3000 km wide scanning swath overlaps previous scans providing complete coverage of tropical regions at least twice daily sometimes twice in less than two hours. The satellite also maintains the same resolution

Collaboration: NWS Puerto Rico