JPSS Training and Products in AWIPS-II for NWS forecasters

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CIRA/CSU

16 August 2017
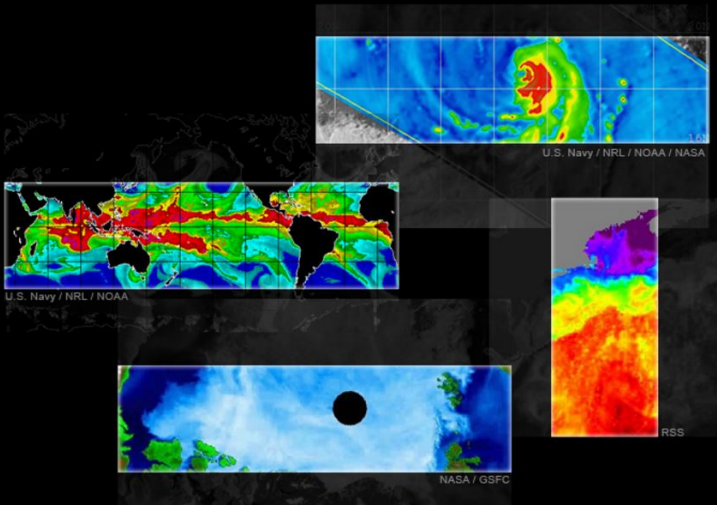
STAR JPSS 2017 Annual Science Team Meeting

The Need for JPSS Training

◈ Suomi-NPP (VIIRS) was launched in October 2011 and JPSS-1 that will be launched in Fall 2017.

◈ Beneficial for NWS forecasters to utilize satellite data in their forecasts and daily operations. Key for forecasters to understand how JPSS satellite products add observational value to the forecast process.

◈ Awareness of Existing Training

Key aspects of Polar-orbiting Satellites

◈ Also known as Low Earth Orbiting (LEO) satellites

◈ Sun-synchronous

◈ Improved weather forecasting via assimilation of observations twice a day into Numerical Weather Prediction (NWP) models

◈ Provide global coverage over the oceans/remote areas where radar coverage and ground observations are poor and or limited

◈ Higher spatial and spectral resolution

◈ Provides observational value in complement to GOES-R

Source: Introduction to VIIRS Imaging and Applications Module (COMET)

Users

- Who are the primary/targeted users?
  - NOAA and non-NOAA users
- How mature are the user relationships?
  - More established for OCONUS
  - CONUS less established

NWS Offices and National Centers

Satellite Liaisons

Teletraining, Online Modules, Monthly Virtual Discussions, Blogs, Help Desk, Office Visits

Training Examples

Day/Night Band (DNB)

'Hurricane Franklin, 7-10 August 2017. See reflected and emitted light sources, and their appearance in satellite imagery. Night-time images in animation are ~ 6-8Z local time.'

Day/Night Band (DNB) (0.7μm) at 0632Z, 7 August 2017
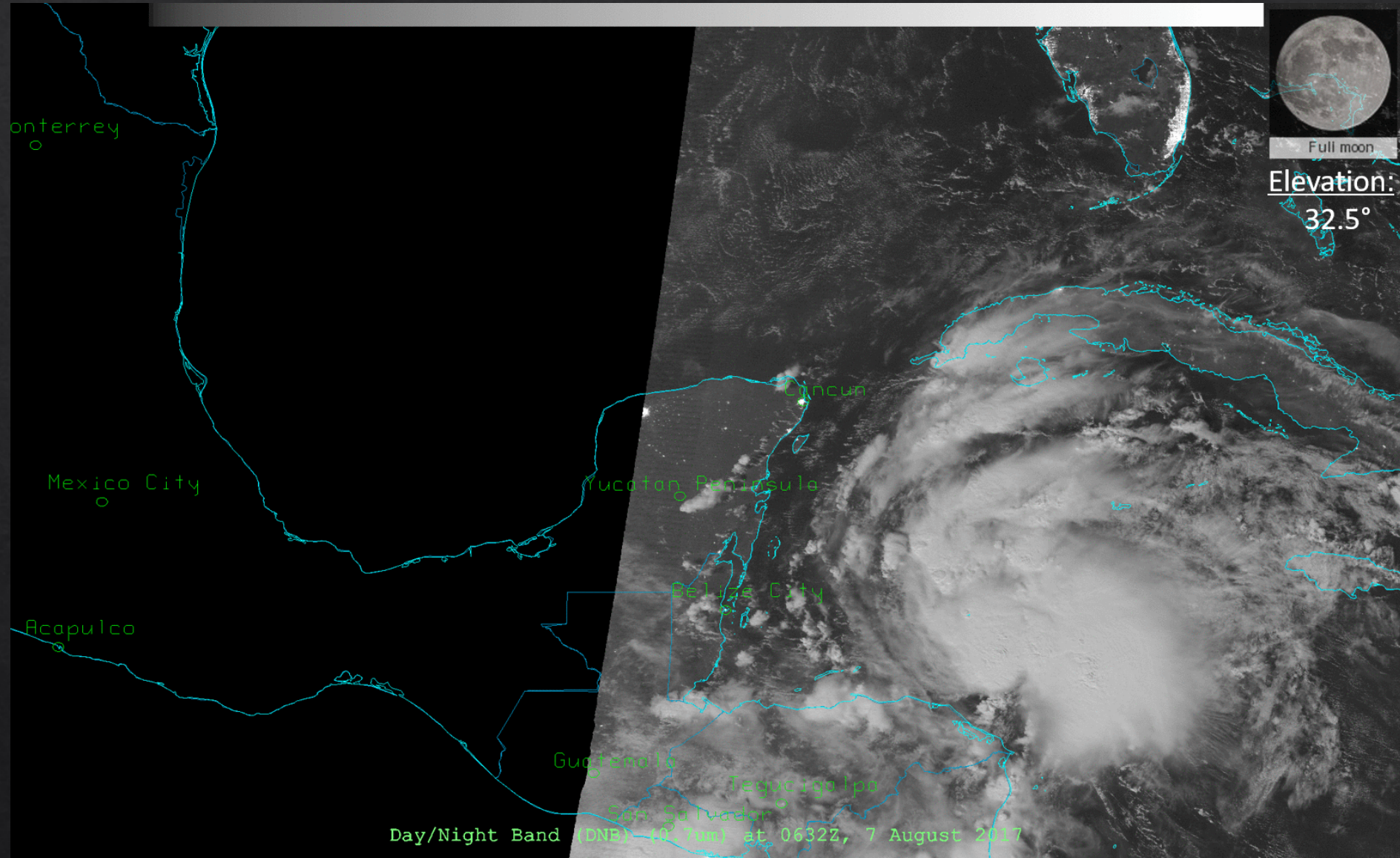
Hurricane Matthew

'Near-Constant Contrast (NCC): Faint Eye Wall detected with No Moon Present.'
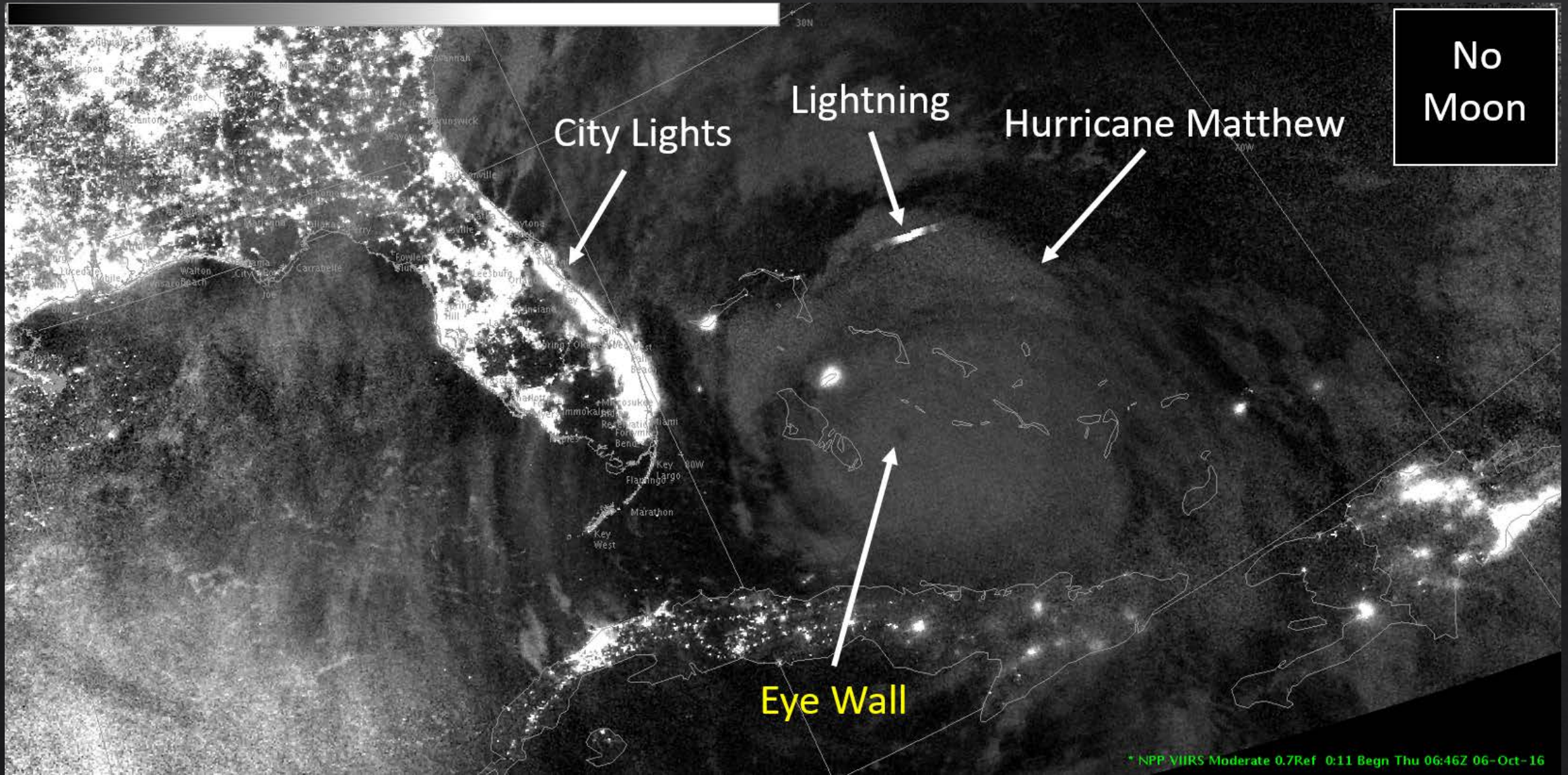
West Mims Fires, Georgia

'Fires detected by DNB in southeastern Georgia, 5-12 May 2017'.

Okefenokee National
Wildlife Refuge
'Wildfire Area'

69% visible

Elevation:
2.8°

Emitted City Lights

Clouds

Gainesville

Day/Night Band (DNB) (0.7um) at 0735Z, 5 May 2017
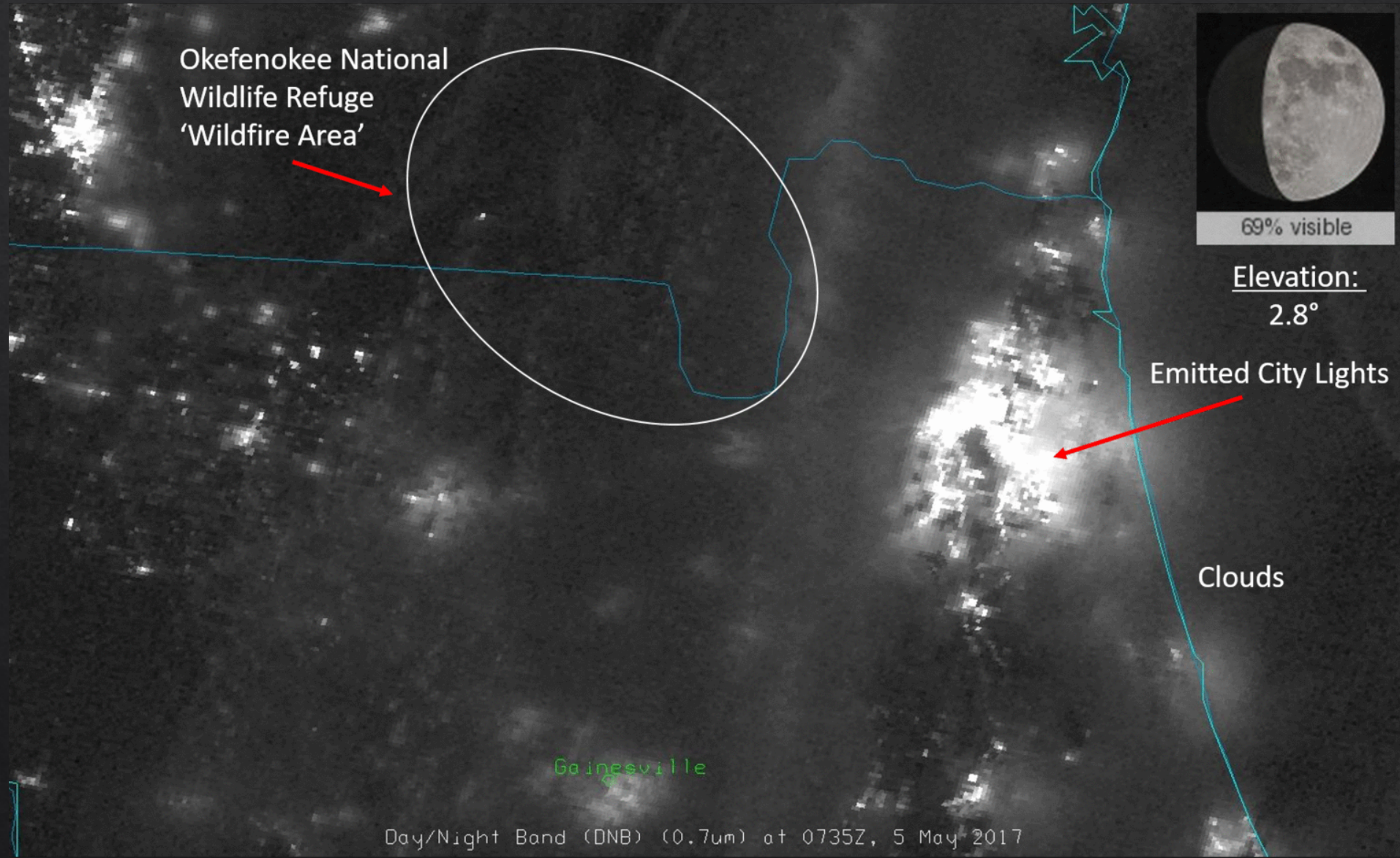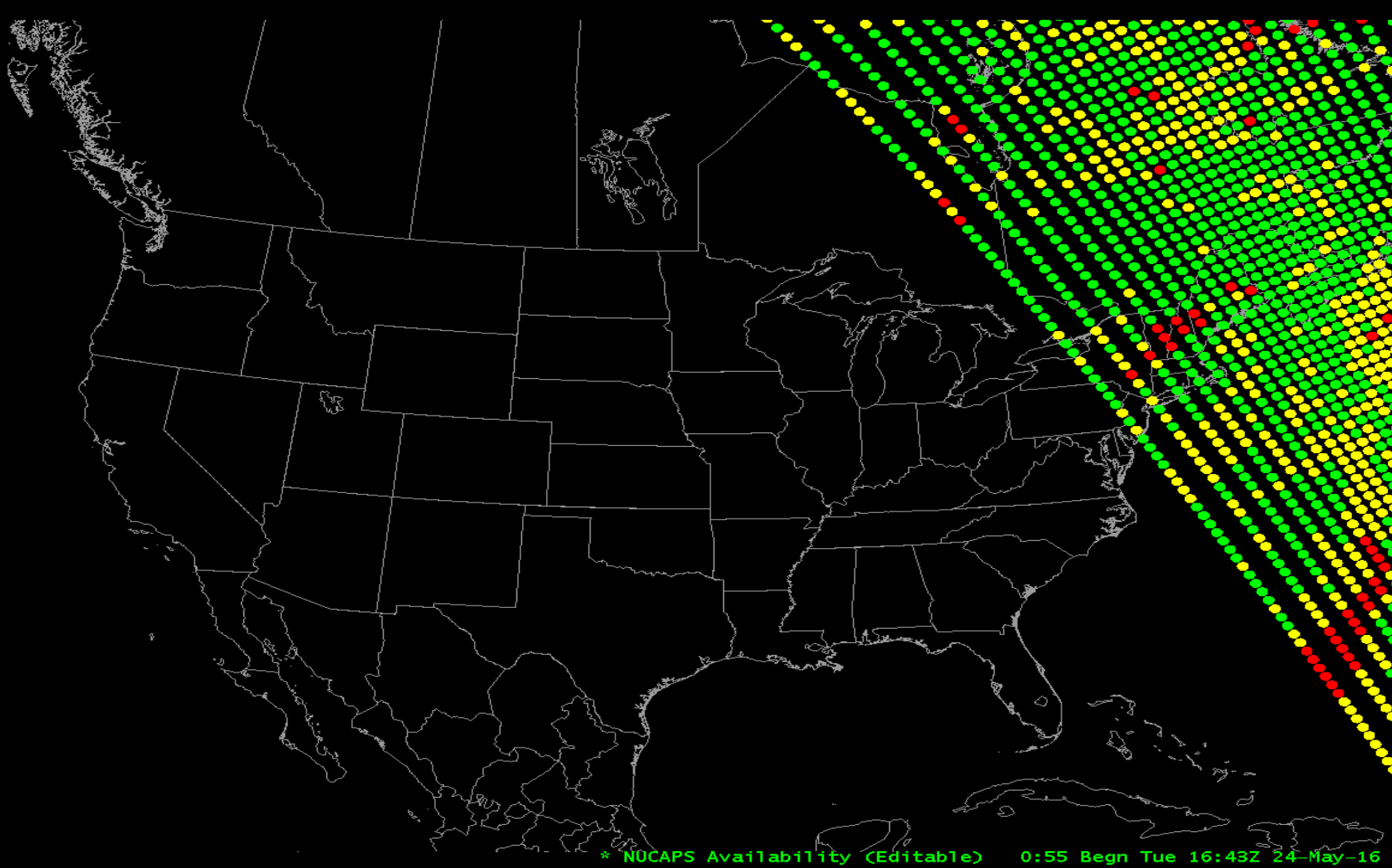
Puerto Rico Power Outage

'Emitted city lights reduced in Puerto Rico, 21-22 September 2017'

Elevation: 63.2°

76% visible

Aguierre Power Plant

* NPP VIIRS Moderate 0.7Ref 0:13 Begn Wed 06:27Z 21-Sep-16
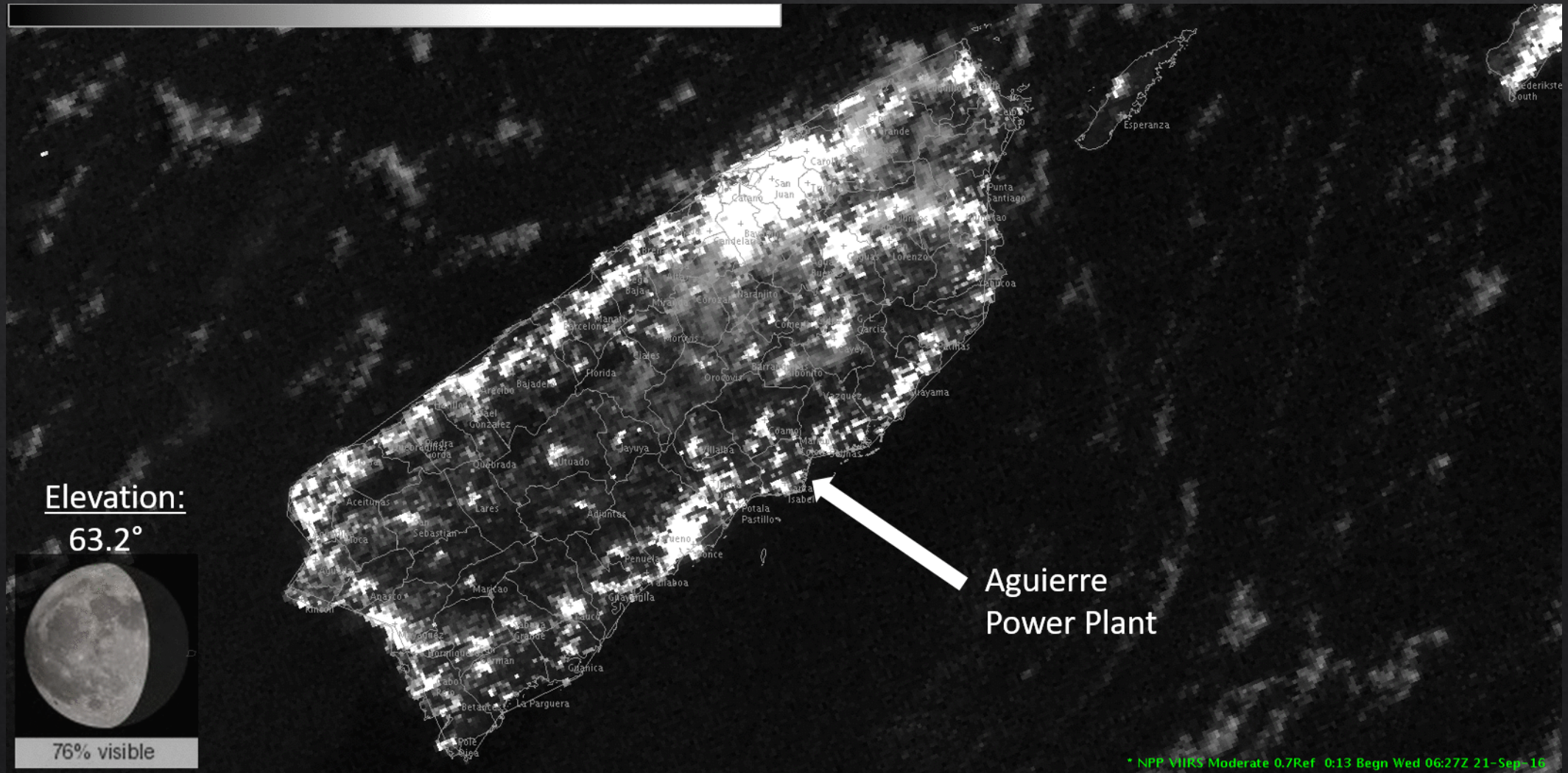
NUCAPS: MICROWAVE/IR Soundings

* NOAA – Unique Combined Processing System (NUCAPS)
* Operational CrIS and ATMS Physical Retrieval Algorithm
* Vertical temperature and moisture soundings ~50 km (30 miles) apart

Source: Bill Line, Hazardous Weather Testbed Presentation (2016)

NUCAPS: MICROWAVE/IR Soundings

* NUCAPS Availability (Editable)   0:55 Begn Tue 16:43Z 24–May–16

- Quality Control Flags
- <u>Green</u> = Good (microwave, IR regression, retrieval)
- <u>Yellow</u> = Caution (microwave OK, IR regression or retrieval failed)
- <u>Red</u> = Data likely unusable (microwave and other sensors failed)

Source: Bill Line, Hazardous Weather Testbed Presentation (2016)

NUCAPS
'Pop-up Skew-T Soundings over New York City.' (29 June 2017)
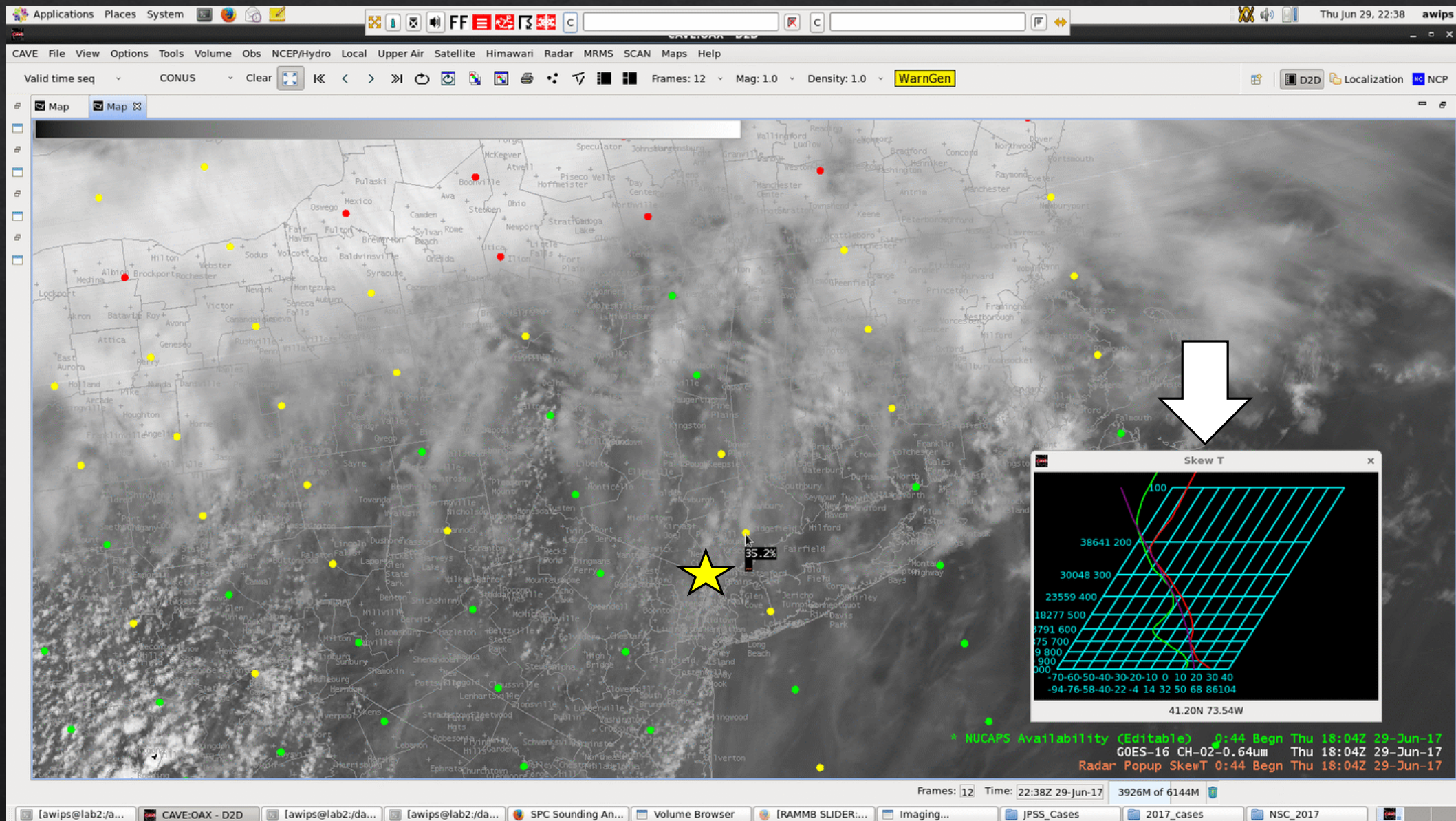
NUCAPS: COLOR VISION DEFICIENCY

Configuration of the NUCAPS soundings (colors) will be implemented in AWIPS 18.1.1 to adapt for users that have color-vision deficiencies.

Standard NUCAPS Soundings

* NUCAPS Availability (Editable)   0:35 Begn Tue 08:39Z 22-Nov-16
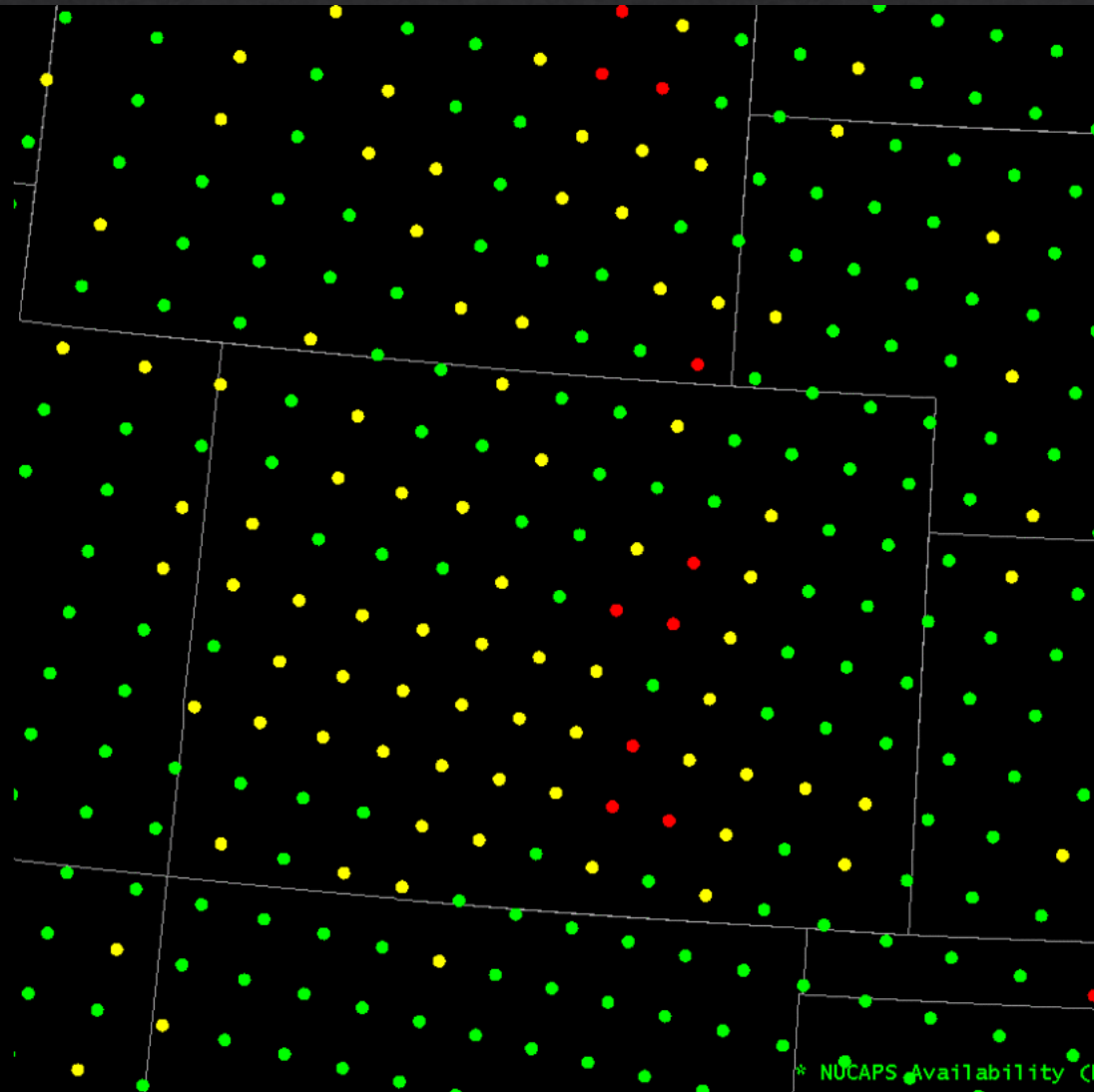
Blended Total Precipitable Water (bTPW)

Derived from several data sources: SSM/I (DMSP), AMSU (POES), GPS, GOES-East and GOES-West sounders. Currently operational and can be accessed in AWIPS-II for NWS forecasters. Animation of bTPW shown throughout the morning hours on 1 August 2017.
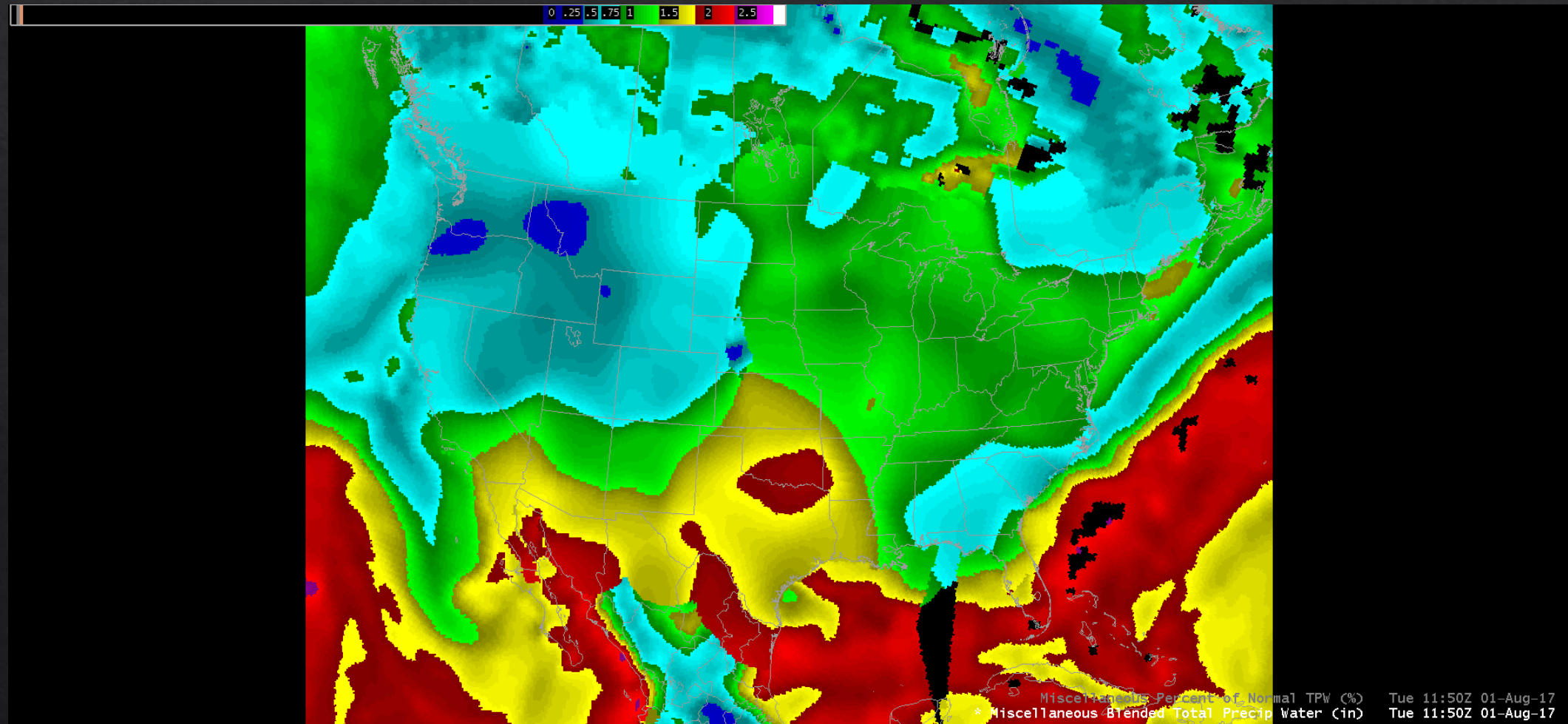
Percent of Normal TPW

A TPW anomaly that displays the percentage departure from climatology. High percentages indicate strong flooding potential, conversely, low percentages indicate potential fire hazards. Animation shown throughout the morning hours on 1 August 2017.
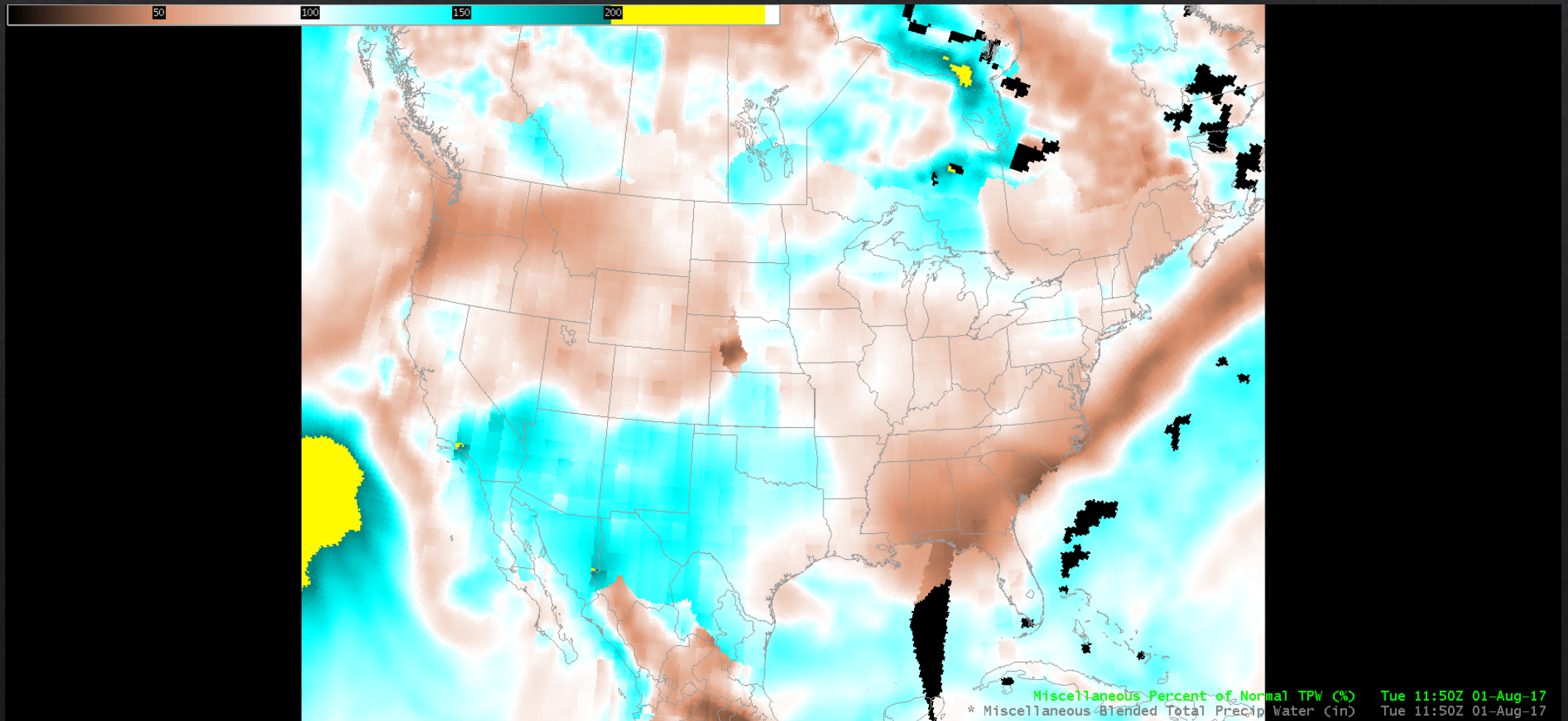
How to Access Polar Data

Animation shows how to access polar data (i.e. bTPW, NCC and NUCAPS) in AWIPS-II interface.

Satellite Foundational Course – JPSS (SatFC-J)

- Current Status: underway
- Collaborative development effort between: OCLO/STAT, CIRA, CIMSS, NASA-SPoRT, and COMET
- Length: 3-4 hours of content
- Available: Fall/Winter 2017

SatFC-J Training Plan Overview
Objective 1: Introduction to Microwave Remote Sensing
Objective 2: Introducing Suomi-NPP, JPSS, GCOM, GPM
Objective 3: Basic Forecast Applications
Follow on Section: Additional SNPP/JPSS Applications

Past JPSS Training Workshops

NUCAPS Horizontal Profiles

- Temperature Profiles (800-1000mb levels) on 26 January 2017 (morning overpass).
- Water Vapor Profiles (800-1000mb levels) on 26 January 2017 (morning overpass).
- Temperature Profiles (800-1000mb levels) on 26 January 2017 (evening overpass).
- Water Vapor Profiles (800-1000mb levels) on 26 January 2017 (evening overpass).

VIIRS Active Fire (VIIRS-AF) Data

- VIIRS-AF Download
- VIIRS-AF Text File (26 January 2017 @ 0531Z)
- VIIRS-AF PNG File (26 January 2017 @ 0531Z)
- VIIRS-AF Netcdf File (26 January 2017 @ 0531Z)

VIIRS Active Fire Global Map

- Global Map

Chilean Wildfires Handout

- Handout

Photos of the Event via various Media Outlets

- Photos from CNN.
- Photos from The Guardian.
- Photos from National Geographic.

JPSS Training

0430-0455PM: JPSS Online Training Resources (Jorel Torres)

- JPSS Online Training Resources Presentaion

0455-0500PM: Wrap-Up, Questions from audience

- JPSS Training Evaluation Form

0500PM: End of Workshop

Training Resources

- JPSS Satellites (COMET)
- VIIRS Products (NASA SPoRT)
- The Wide World of SPoRT Blog (NASA SPoRT)
- VISIT Satellite Chat (CIRA)
- VISIT: Meteorological Interpretation Blog (CIRA)
- CIMSS Satellite Blog (CIMSS)
- Direct Broadcast Applications Workshop (CIMSS)
- JPSS Training Questionnaire

Chilean Wildfires: Imagery Band (I-4) (3.74um), January 2017
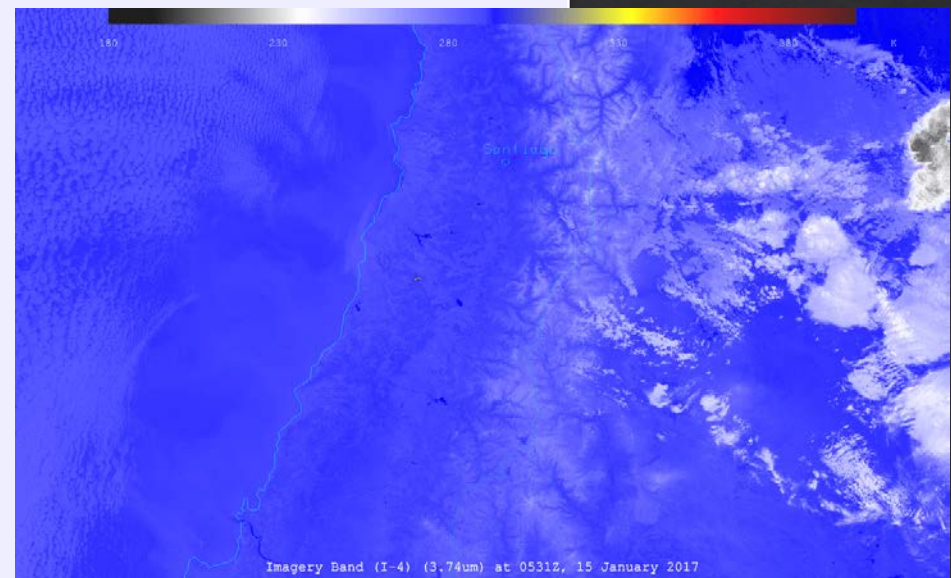
Hurricane Otto: Imagery Band (I-1)(0.64um), 20-26 November 2016

More Existing JPSS Training Links....

◈ Suomi NPP: A New Generation of Environmental Satellites (COMET, 2012)
https://www.meted.ucar.edu/training_module.php?id=948

◈ Introduction to VIIRS Imaging and Applications (COMET, 2013)
https://www.meted.ucar.edu/training_module.php?id=1075

◈ Advances in Space-Based Nighttime Visible Observation, 2nd Edition (COMET, 2017)
https://www.meted.ucar.edu/training_module.php?id=1327

◈ NUCAPS Soundings in AWIPS (VISIT/CIMSS, 2015)
http://rammb.cira.colostate.edu/training/visit/training_sessions/nucaps_soundings_in_awips/

◈ The use of JPSS Soundings in the Forecast Process (VISIT, 2014)
https://www.youtube.com/watch?v=JpQ0KUJXOhQ

◈ Microwave Remote Sensing: Overview, 2nd Edition (COMET, 2012)
https://www.meted.ucar.edu/training_module.php?id=979

◈ Microwave Remote Sensing: Clouds, Precipitation, and Water Vapor (COMET, 2006)
https://www.meted.ucar.edu/training_module.php?id=226

◈ Microwave Remote Sensing: Land and Ocean Surface Applications, 2nd Edition (COMET, 2015)
https://www.meted.ucar.edu/training_module.php?id=1100

The Use of JPSS Soundings in the Forecast Process (NUCAPS)

2014 GOES-R/JPSS R2O Interchange Meeting
Thursday, July 31, 2014
Chris Barnet

With lots of help:
NUCAPS product graphics: Colby Francoeur (STC summer intern)
Direct Broadcast Implementation: Thomas King and Letitia Soulliard (STAR), James Davies and Liam Gumley (CIMSS)
CalWater-2 Early Start Campaign: Ryan Spackman (STC)
NUCAPS SAM Initiative: Bill Sjoberg and Brian Motta (NOAA)

Begin
Download
Quiz
User Survey
Media Gallery
MetEd Home
COMET Home

Advances in Space-based Nighttime Visible Observation, 2nd Ed.
Produced by The COMET® Program

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UAF-GINA

List of Available Satellite Blogs and Additional Training Resources
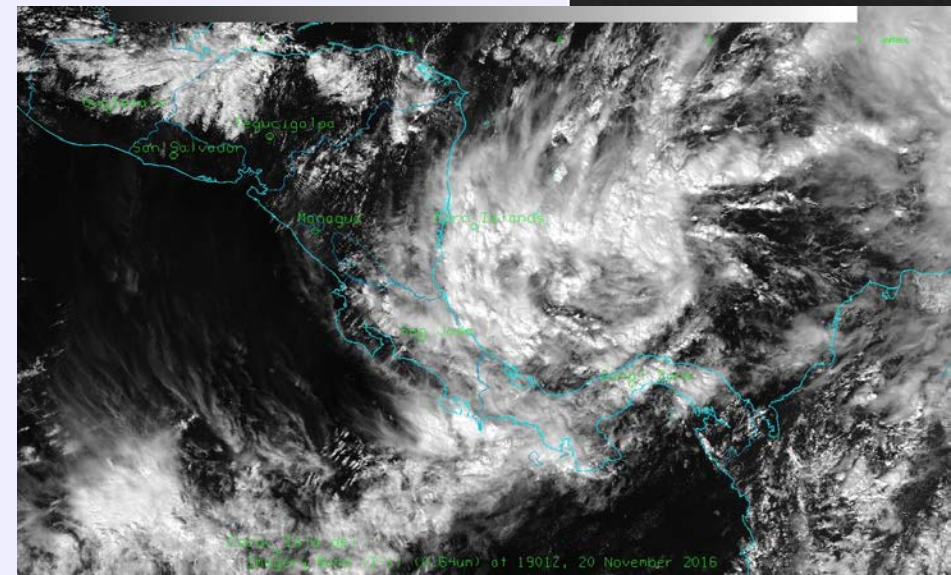
- JPSS Satellites (COMET)
- VIIRS Products (NASA-SPoRT)
- The World Wide of SPoRT Blog (NASA-SPoRT)
- VISIT Satellite Chat (CIRA)
- VISIT Meteorological Interpretation Blog (CIRA)
- CIMSS Satellite Blog (CIMSS)
- Direct Broadcast Applications Workshop (CIMSS)
- GEONETCast Blog
- More Links to Blogs

It's #WorldOceansDay! Join us in celebrating the beauty, wonder, and ecological importance of the Earth's oceans!

goo.gl/QYXnC1

Suomi NPP captured this true-color image of ice melting into the Atlantic Ocean off the coast of Newfoundland on June 7, 2017.

Look forward to future JPSS Workshops

Questions ????

Contact Information
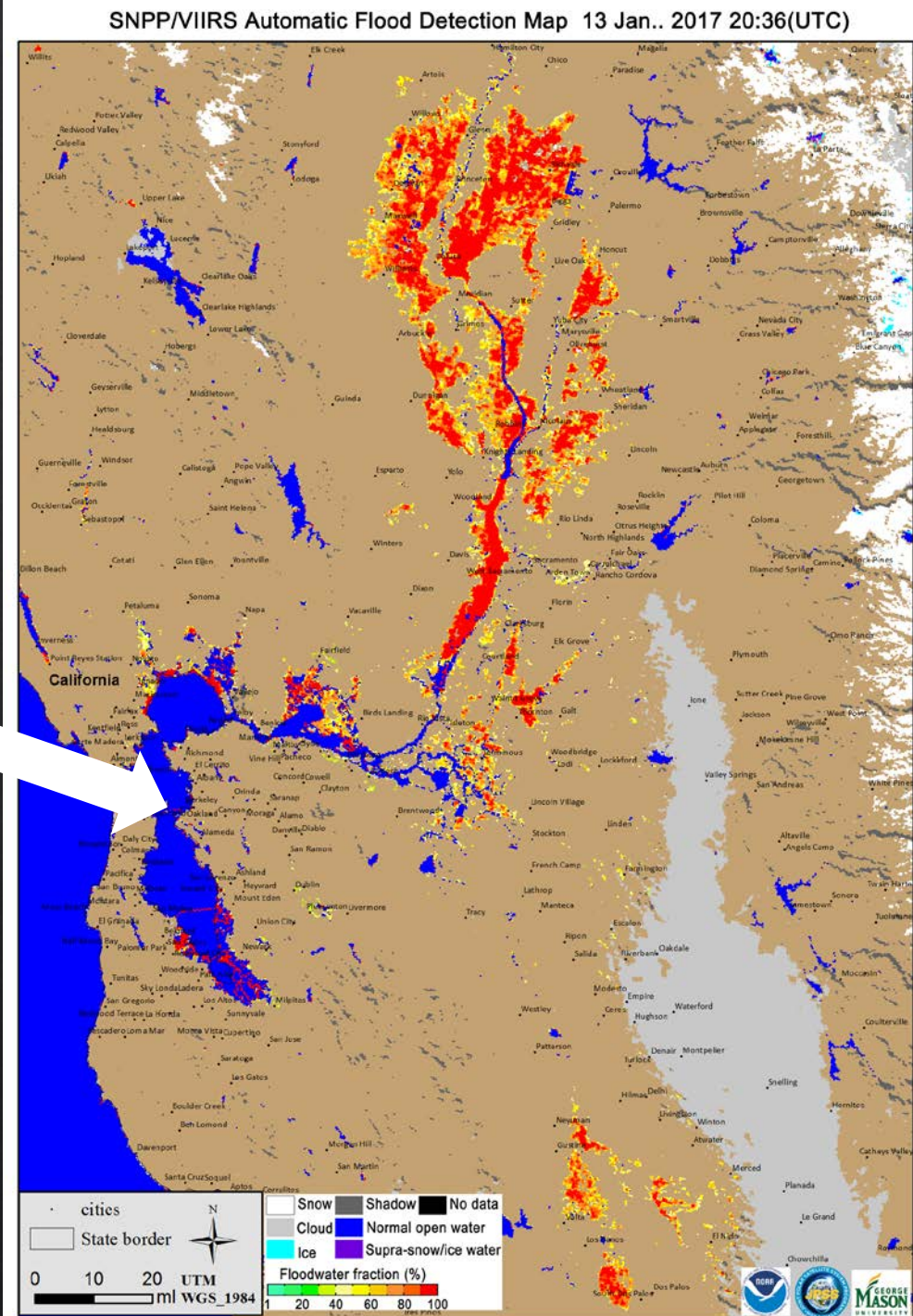
Jorel.Torres@colostate.edu

Jorel.Torres@noaa.gov

Supplemental slides

VIIRS FLOOD Detection MAP

◈ 375 m spatial resolution

◈ Map of Northern California

  ◇ Flooding evident north-east of San Francisco Bay Area

  ◇ After atmospheric river event last weekend, 13 January 2017 at 2036 UTC

SNPP/VIIRS Automatic Flood Detection Map 13 Jan.. 2017 20:36(UTC)

Provided by Sanmei Li, GMU

- How do we engage users?
  - Blogs, input to satellite chats, quick guides.
    - http://rammb.cira.colostate.edu/training/visit/blog/
  - JPSS Workshops: Case Scenarios
- Welcome feedback to address product issues and improve training.

-JPSS Products

VIIRS Flood Detection Map
Quick Guide

What is the VIIRS Flood Detection Map?

The VIIRS Flood Detection Map, which is called VIIRS NOAA&GMU Flood Version 1.0 (VNG Flood V1.0), is a satellite-based flood extent product derived from daytime Suomi-NPP/VIIRS imagery with solar zenith angles less than 85 degrees. Its spatial resolution is 375 meters. Flood extent is represented in floodwater fractions (water fraction means percentage of water extent in a VIIRS 375-m pixel).

What is the VIIRS Flood Detection Map algorithm?

VIIRS Flood Detection includes a series of algorithms: a water detection algorithm based on decision-tree approach, a geometry-based cloud shadow removal algorithm, an object-based terrain shadow removal algorithm, a minor flood detection based on change detection algorithm and a water fraction retrieval algorithm with dynamic nearest neighboring searching method. Floodwater is determined by comparing the detected water against a water reference map derived from MODIS global 250-m water mask (MOD44W) and water layer in the 30-m National Land Cover Dataset.

Which spectral bands make up the algorithm?

The spectral bands used in the algorithms are Suomi-NPP/VIIRS Imager bands 1 (600~680 nm), 2 (850~880 nm), 3 (1580~1640 nm) and 5 (1050~1240 nm) with 375-m nominal resolution and I-band terrain-corrected geolocation data (i.e. GITCO) including longitude, latitude, solar zenith angles, solar azimuth angles, sensor zenith angles and sensor azimuth angles.

Data latency of VIIRS Flood Detection Map data?

The VIIRS flood detection system is running routinely at SSEC/UW-Madison and GINA/UAF using direct broadcasting VIIRS data. VIIRS near real-time flood maps have about a 1-hour latency after VIIRS daytime overpasses are received. Generally, VIIRS flood maps are available around 13:30pm local time in the lower 48 states - more frequent coverage is achieved in Alaska.

Available in AWIPS-II for National Weather Service Forecasters

Near real-time flood maps are distributed via the Unidata Local Data Manager (LDM) in AWIPS-II. The instruction document is here:
https://drive.google.com/open?id=1mEDFEXzIXCTEGXfb_coLGm2fkONdsPI9G0hj7xS2AYM
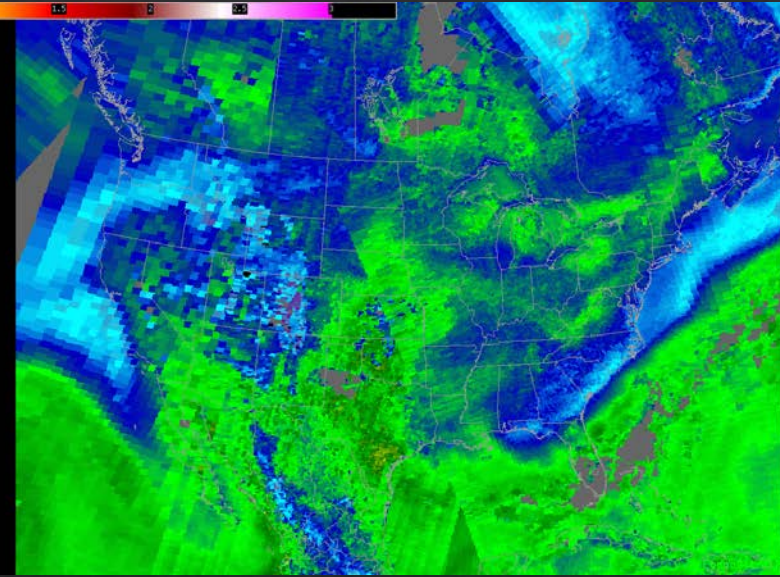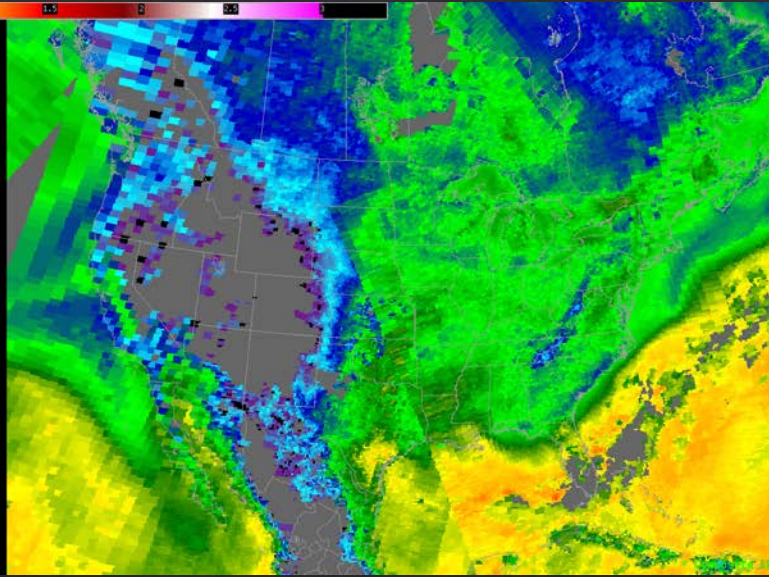Please contact Jay Hoffman (jay.hoffman@ssec.wisc.edu) for any questions related to AWIPS-II.
Additionally, the latest 30-day flood maps are also available in SSEC's Real Earth:
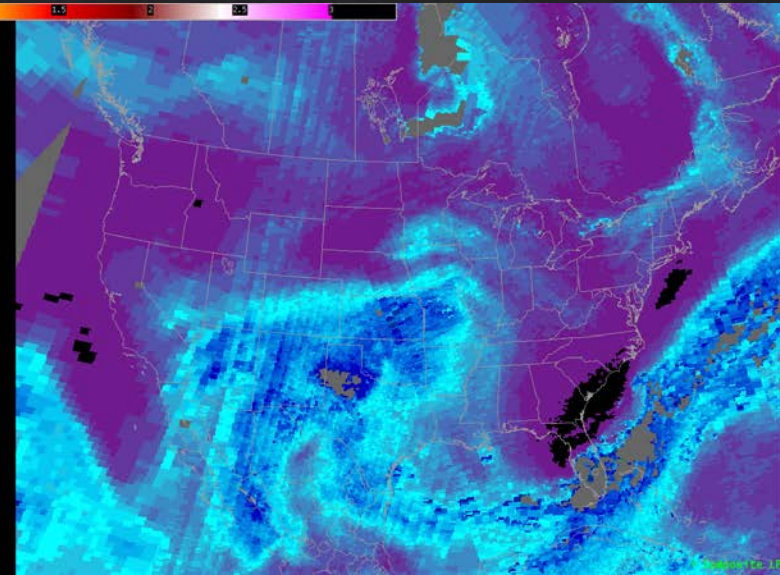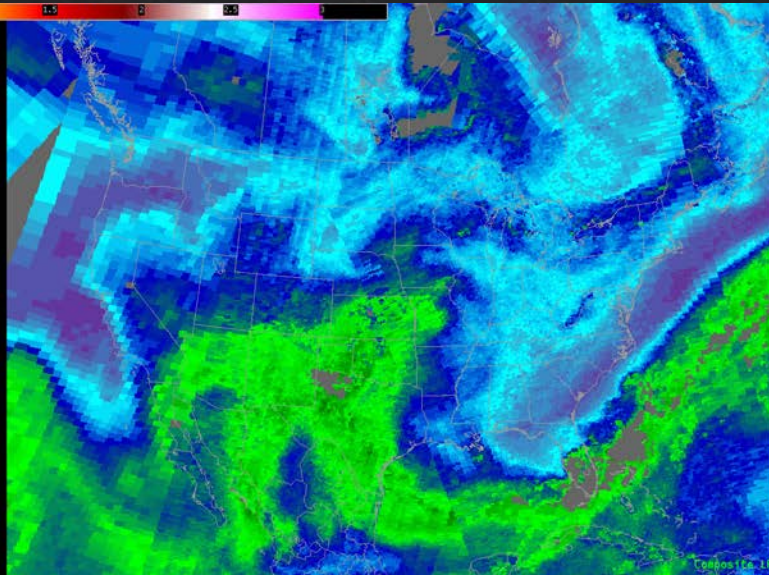
LPW

◇ Surface-850mb

• 850-700mb

• 700-500mb

• 500-300mb

Advected LPW