JPSS Training

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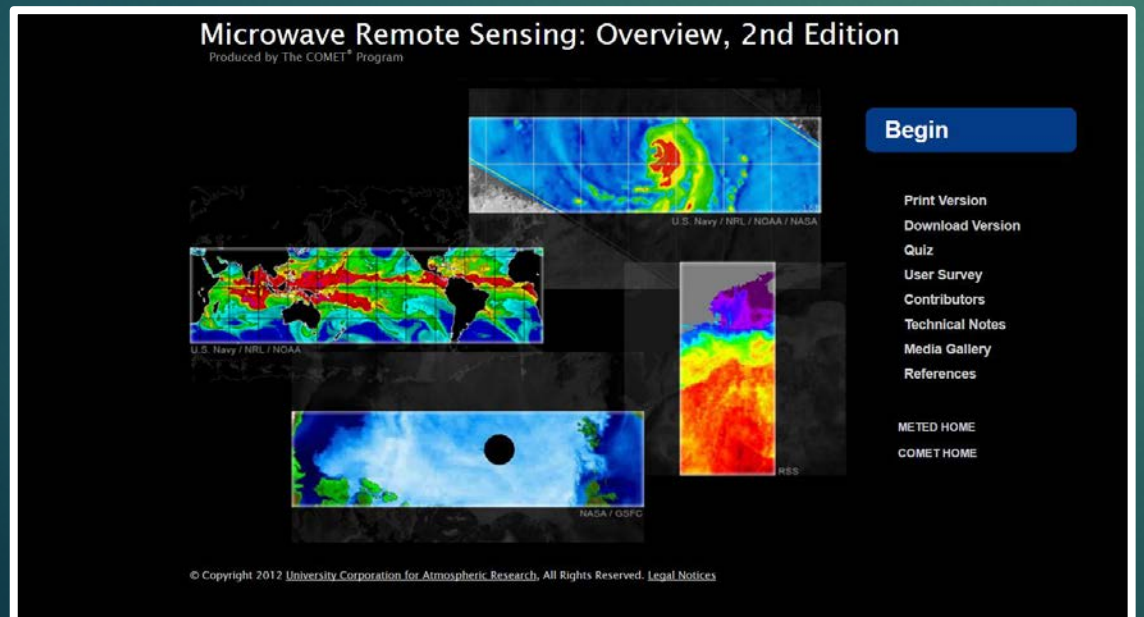
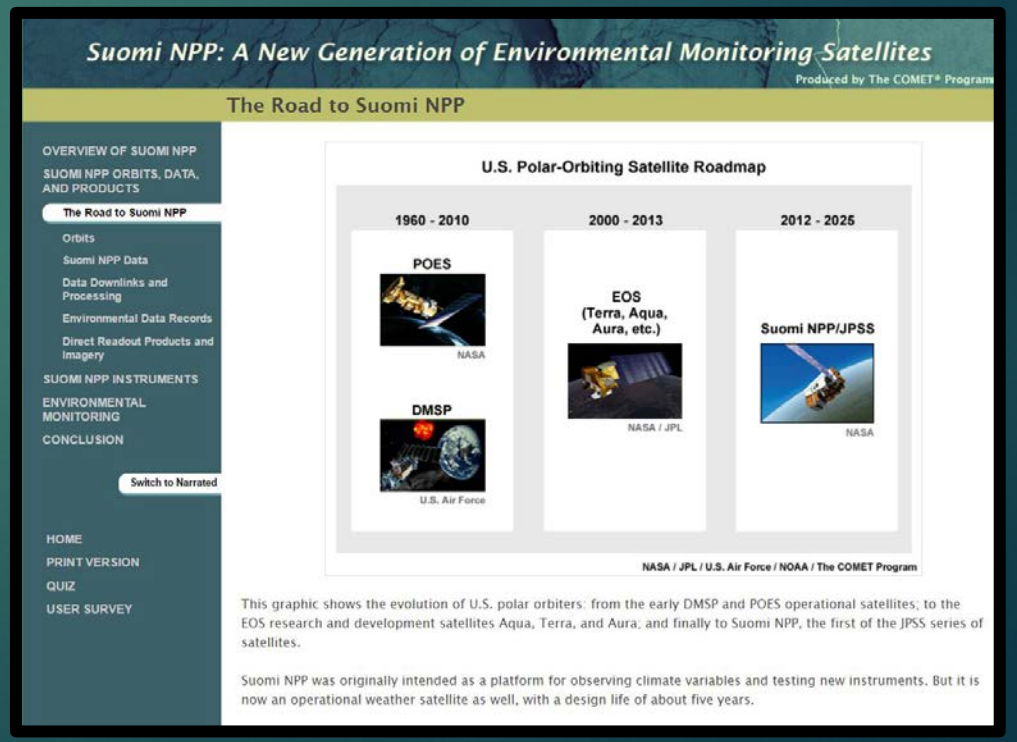
COOPERATIVE INSTITUTE FOR RESEARCH IN THE ATMOSPHERE (CIRA)[1]

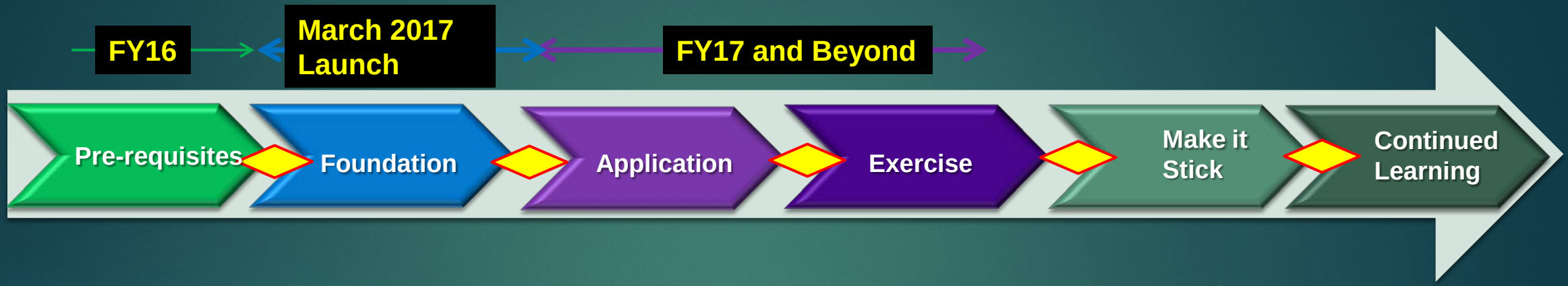
The Need for JPSS Training

- Suomi-NPP (VIIRS) was launched in October 2011 and JPSS-1 that will be launched in March 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





NWS Training Guidance adapted for JPSS



- Basic Remote Sensing
- Characteristics of Satellites

- NWS-Specific development
- AVHRR vs JPSS
- Leo vs Geo
- Strengths & Weaknesses

- Forecast/ warning process
- Phenomena based
- Baseline products
- Service areas
- 10-15 minute mini-modules
- Quick Guides

- Simulations
- Local training initiatives
- "As it occurs" training
- Evolve initial satellite concept of operations

- Reference materials in AWIPS
- Repeat…practice
- Blogs
- Seasonal readiness
- Peer-to-peer sharing
- Storm-of-the month webinars
- Demonstrated performance
- O2R
- Optimize implementations for operations
- Update for evolving science
- Put in IDSS and WRN context

Slide from Office of the Chief Learning Officer (OCLO)

Future JPSS Training…

- JPSS-Formal Training Plan for NWS operational meteorologists
- First Draft: January 2016

  by Bill Ward and Jordan Gerth
- Combines foundational material and applications with focus on specialized/regional utilities.
- Ensure user awareness of the value of polar-orbiting satellites.

Plan for a Formal Training Program
on the
Joint Polar Satellite System (JPSS) and Global Change Observation Mission (GCOM)
for
National Weather Service Operational Meteorologists

Bill Ward and Jordan Gerth
January 2016

Preface

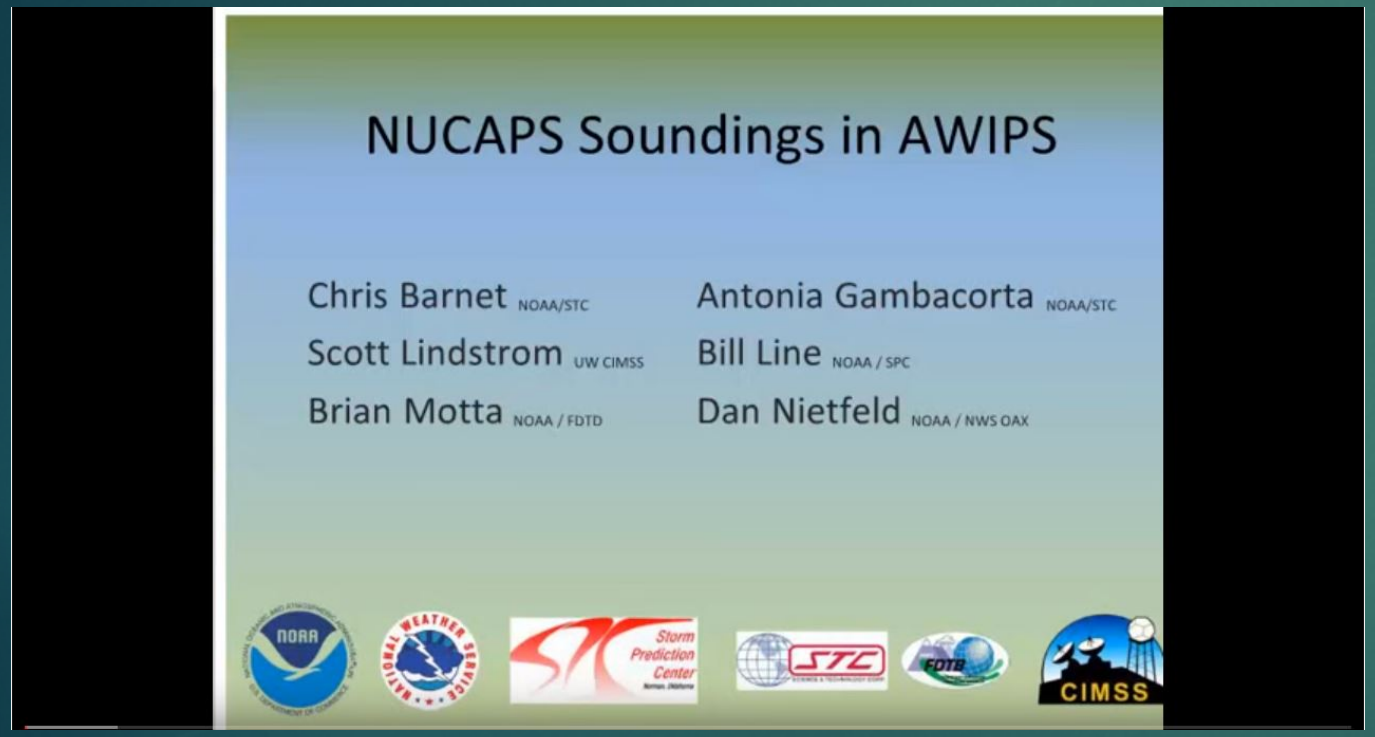
National Weather Service (NWS) operational meteorologists have long had access to imagery from geostationary weather satellites, and routinely use the imagery as part of their weather analysis and forecast responsibilities. A formal training program has been established to prepare forecasters for the Geostationary Operational Environmental Satellite R-Series (GOES-R) so that the NWS field offices and national centers are ready to employ the improved capabilities on "day one". This document establishes a complementary program for the Joint Polar Satellite System (JPSS), with the first satellite of the JPSS series launching within months of GOES-R. In some ways, the need for formal training is more pressing for JPSS because the predecessor Suomi National Polar-orbiting Partnership (NPP) satellite is already operational, and providing imagery and products that will continue in the JPSS era with little change in characteristic or quality. Unlike GOES, JPSS and other polar-orbiting satellites, such as the Japan Aerospace Exploration Agency (JAXA) Global Change Observation Mission (GCOM), host instruments for remote sensing in the microwave portion of the electromagnetic spectrum. Furthermore, NOAA has made an investment in L/X-band tracking antennas to receive the direct broadcast of NPP, JPSS, and GCOM imagery, with a number of antennas outside of the contiguous United States to support space-based observations in otherwise data sparse areas. While these antennas collect data for numerical weather prediction (NWP), this imagery and derived products are also starting to find users in nearby NWS field offices.

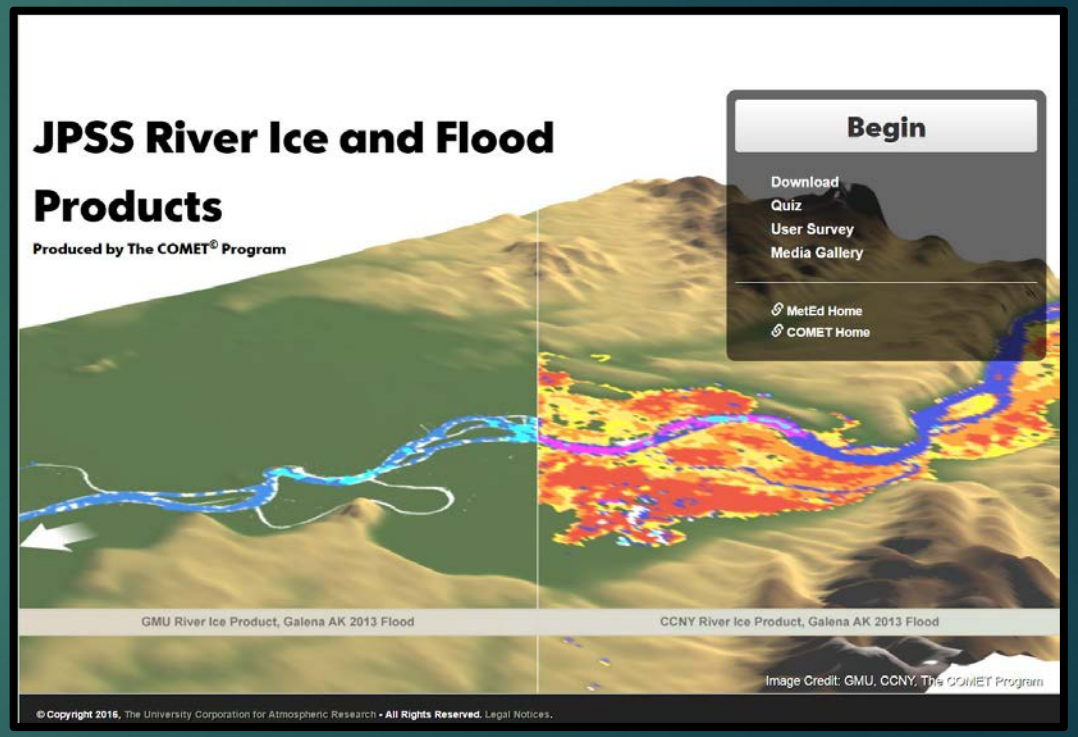
Left: The map shows locations of NOAA-supported L/X-band antennas. The planned Guam antenna is not included. Image source: University of Wisconsin Space Science and Engineering Center (SSEC) Data Center

JPSS Training Overview

Foundational Satellite Training Topic	Run Time	Material to be covered	Existing Training Resources
Introduction to Microwave Remote Sensing, sounders, review of imager.	1 hour and 20 minutes	Comparing microwave bands to infrared bands. Basics of emissivity. Active verse passive remote sensing.	Training developed from COMET, CIRA, CIMSS, GINA, NASA-SPoRT
Introducing Suomi-NPP, JPSS, GCOM	1 hour and 20 minutes	Introduction of satellites, their relative orbits, instrumentation on-board satellites and existing channels.	Training developed from COMET, CIRA, CIMSS, GINA, NASA-SPoRT
Basic Forecast Applications	1 hour and 20 minutes	DNB, NCC, NUCAPS. Uses of imagery. How polar orbiting satellites inform NWP.	Training developed from COMET, CIRA, CIMSS, GINA, NASA-SPoRT

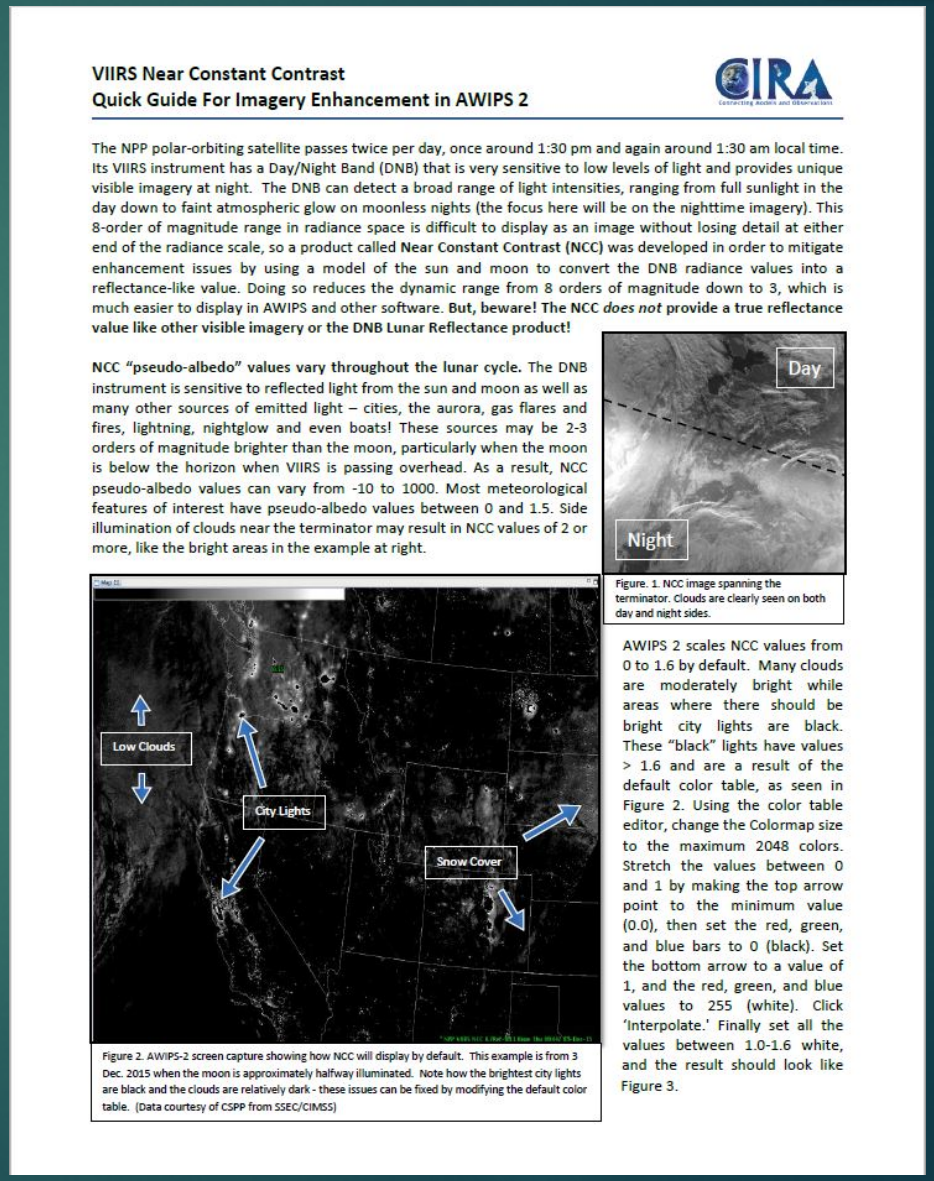
Product Applications for JPSS





Training embedded into AWIPS-II

- ‘Integrated Quick Guides in AWIPS-II’
- Collaboration with NASA SPoRT
- Put in existing quick guides or new quick guides.
- Link to Quick Guide for Imagery Enhancement in AWIPS-II.



VIIRS Near Constant Contrast
Quick Guide For Imagery Enhancement in AWIPS 2

CIRA

The NPP polar-orbiting satellite passes twice per day, once around 1:30 pm and again around 1:30 am local time. Its VIIRS instrument has a Day/Night Band (DNB) that is very sensitive to low levels of light and provides unique visible imagery at night. The DNB can detect a broad range of light intensities, ranging from full sunlight in the day down to faint atmospheric glow on moonless nights (the focus here will be on the nighttime imagery). This 8-order of magnitude range in radiance space is difficult to display as an image without losing detail at either end of the radiance scale, so a product called **Near Constant Contrast (NCC)** was developed in order to mitigate enhancement issues by using a model of the sun and moon to convert the DNB radiance values into a reflectance-like value. Doing so reduces the dynamic range from 8 orders of magnitude down to 3, which is much easier to display in AWIPS and other software. **But, beware! The NCC *does not* provide a true reflectance value like other visible imagery or the DNB Lunar Reflectance product!**

NCC “pseudo-albedo” values vary throughout the lunar cycle. The DNB instrument is sensitive to reflected light from the sun and moon as well as many other sources of emitted light – cities, the aurora, gas flares and fires, lightning, nightglow and even boats! These sources may be 2-3 orders of magnitude brighter than the moon, particularly when the moon is below the horizon when VIIRS is passing overhead. As a result, NCC pseudo-albedo values can vary from -10 to 1000. Most meteorological features of interest have pseudo-albedo values between 0 and 1.5. Side illumination of clouds near the terminator may result in NCC values of 2 or more, like the bright areas in the example at right.

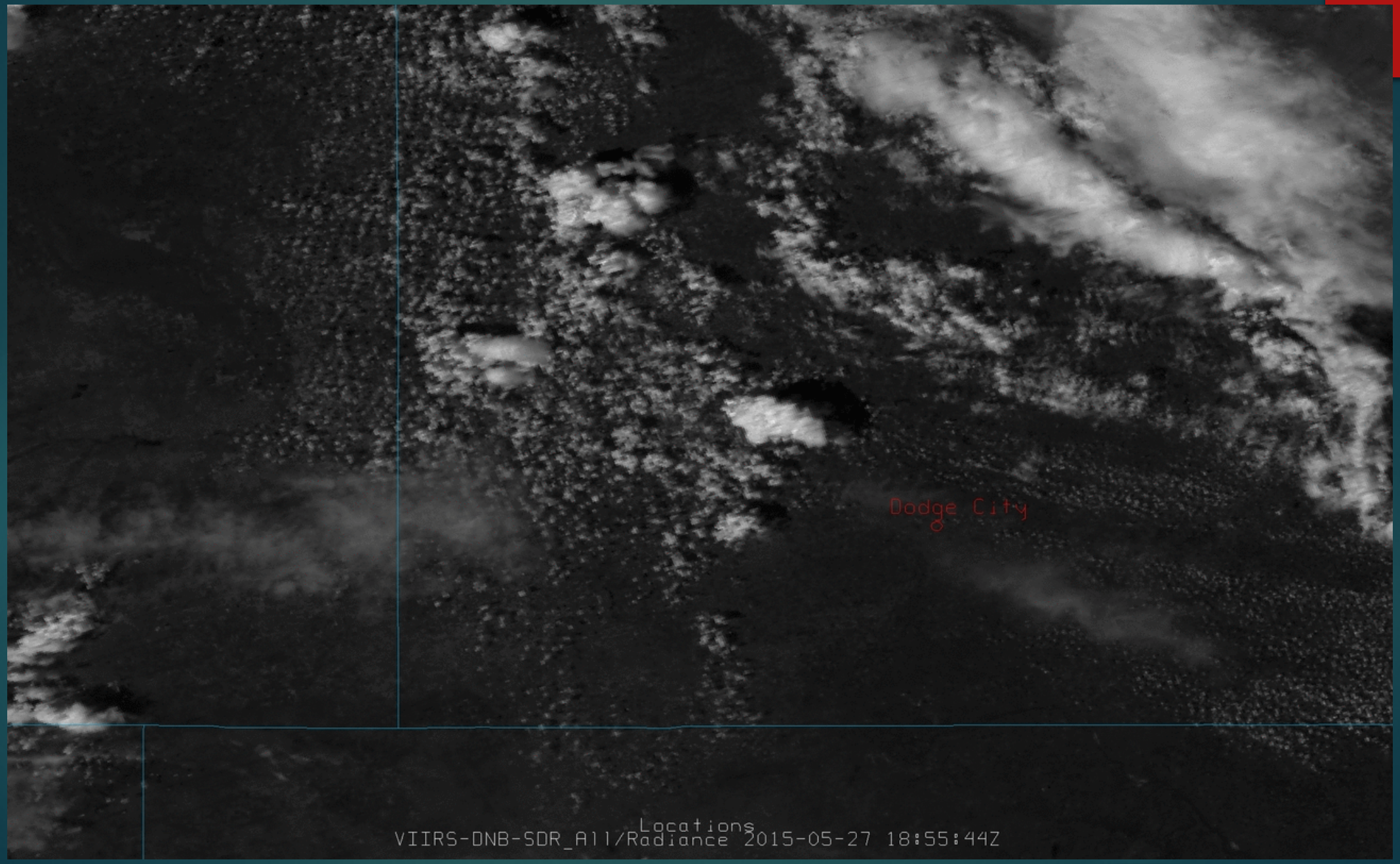
Figure. 1. NCC image spanning the terminator. Clouds are clearly seen on both day and night sides.

Figure 2. AWIPS-2 screen capture showing how NCC will display by default. This example is from 3 Dec. 2015 when the moon is approximately halfway illuminated. Note how the brightest city lights are black and the clouds are relatively dark - these issues can be fixed by modifying the default color table. (Data courtesy of CSPP from SSEC/CIMSS)

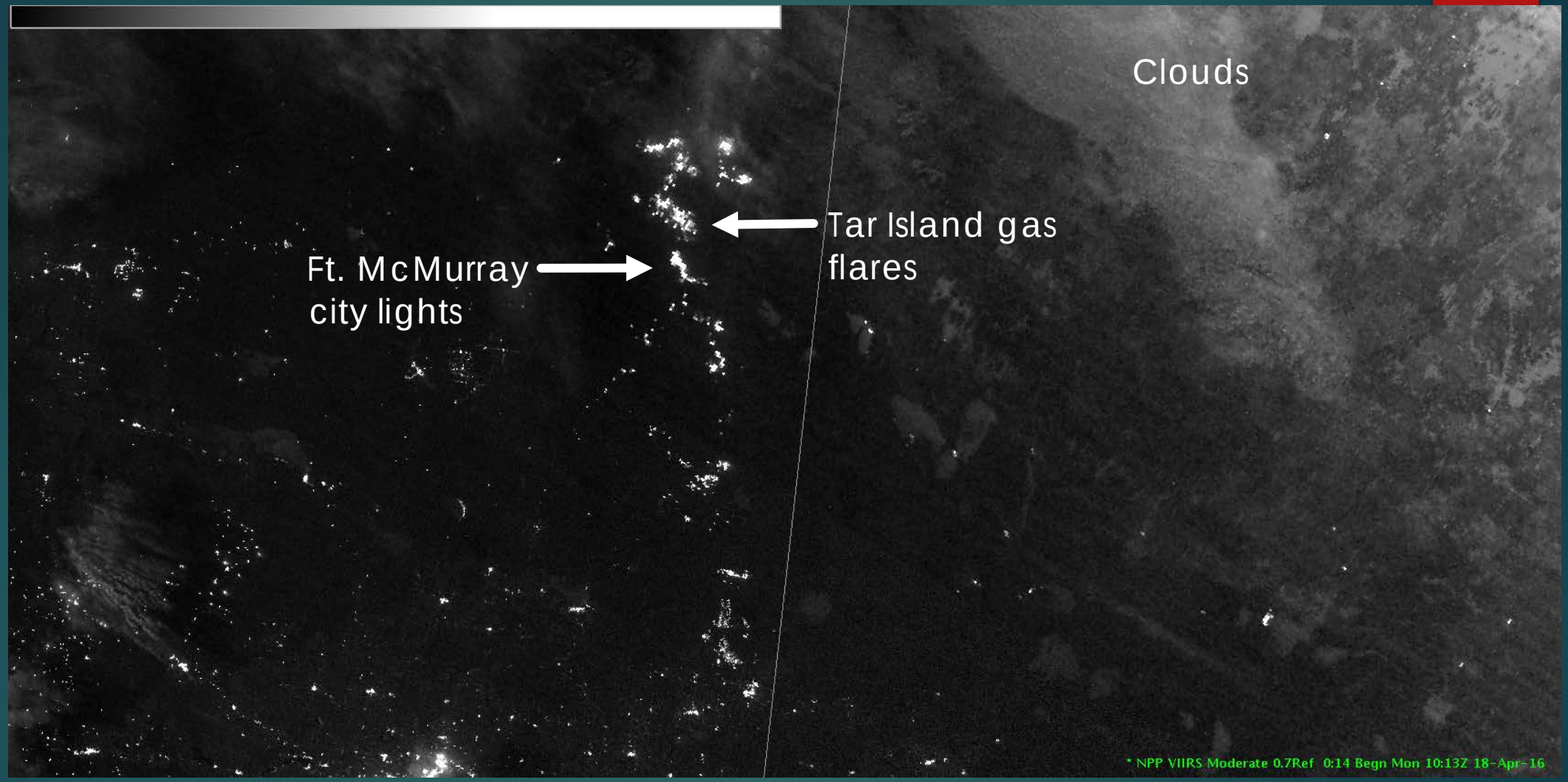
AWIPS 2 scales NCC values from 0 to 1.6 by default. Many clouds are moderately bright while areas where there should be bright city lights are black. These “black” lights have values > 1.6 and are a result of the default color table, as seen in Figure 2. Using the color table editor, change the Colormap size to the maximum 2048 colors. Stretch the values between 0 and 1 by making the top arrow point to the minimum value (0.0), then set the red, green, and blue bars to 0 (black). Set the bottom arrow to a value of 1, and the red, green, and blue values to 255 (white). Click ‘Interpolate.’ Finally set all the values between 1.0-1.6 white, and the result should look like Figure 3.

Training Examples

27 May 2015 @ 2032Z, Dodge City, KS Outbreak



NCC Imagery - Before the fire

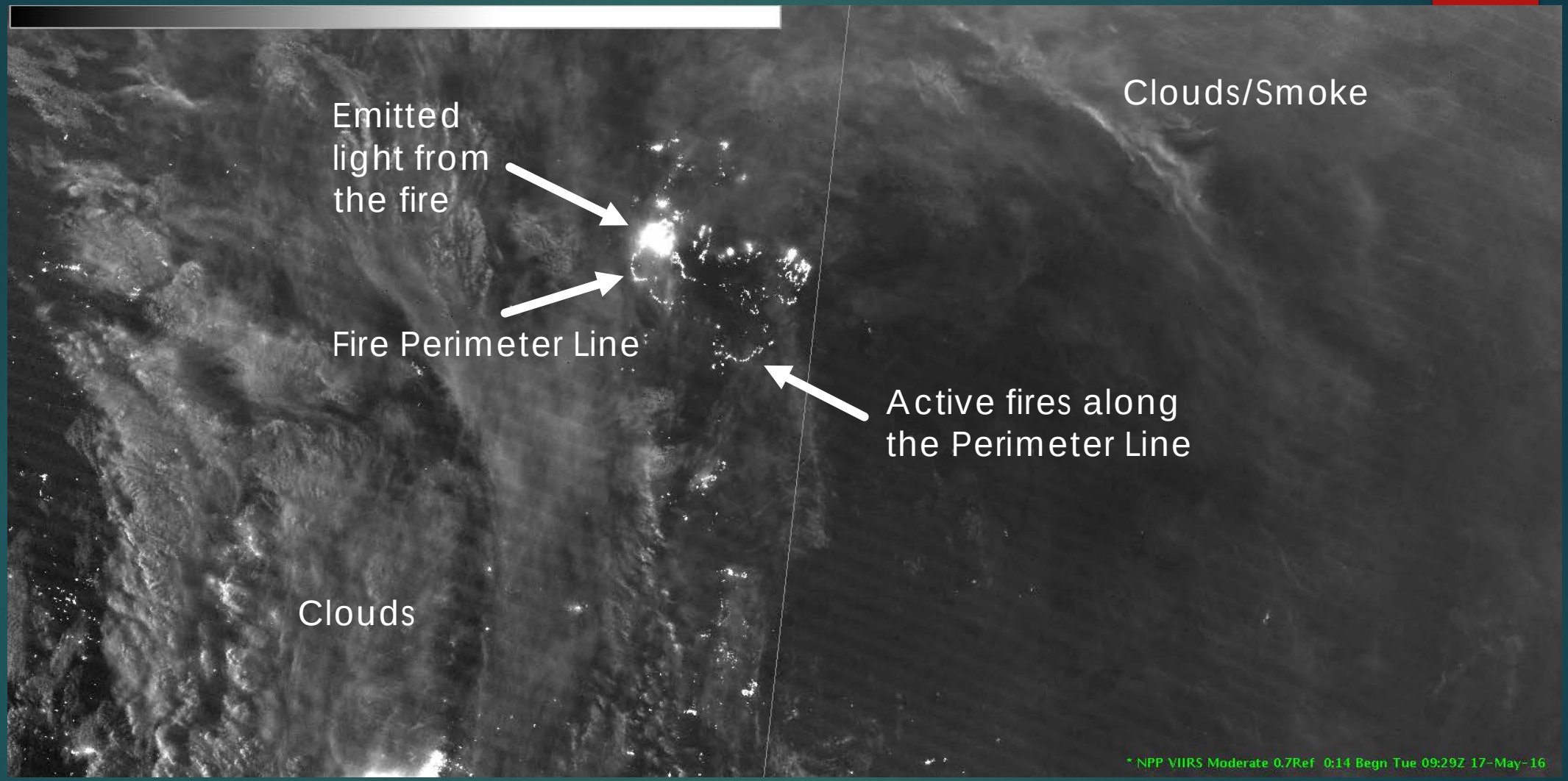


Alberta, Canada

Saskatchewan, Canada

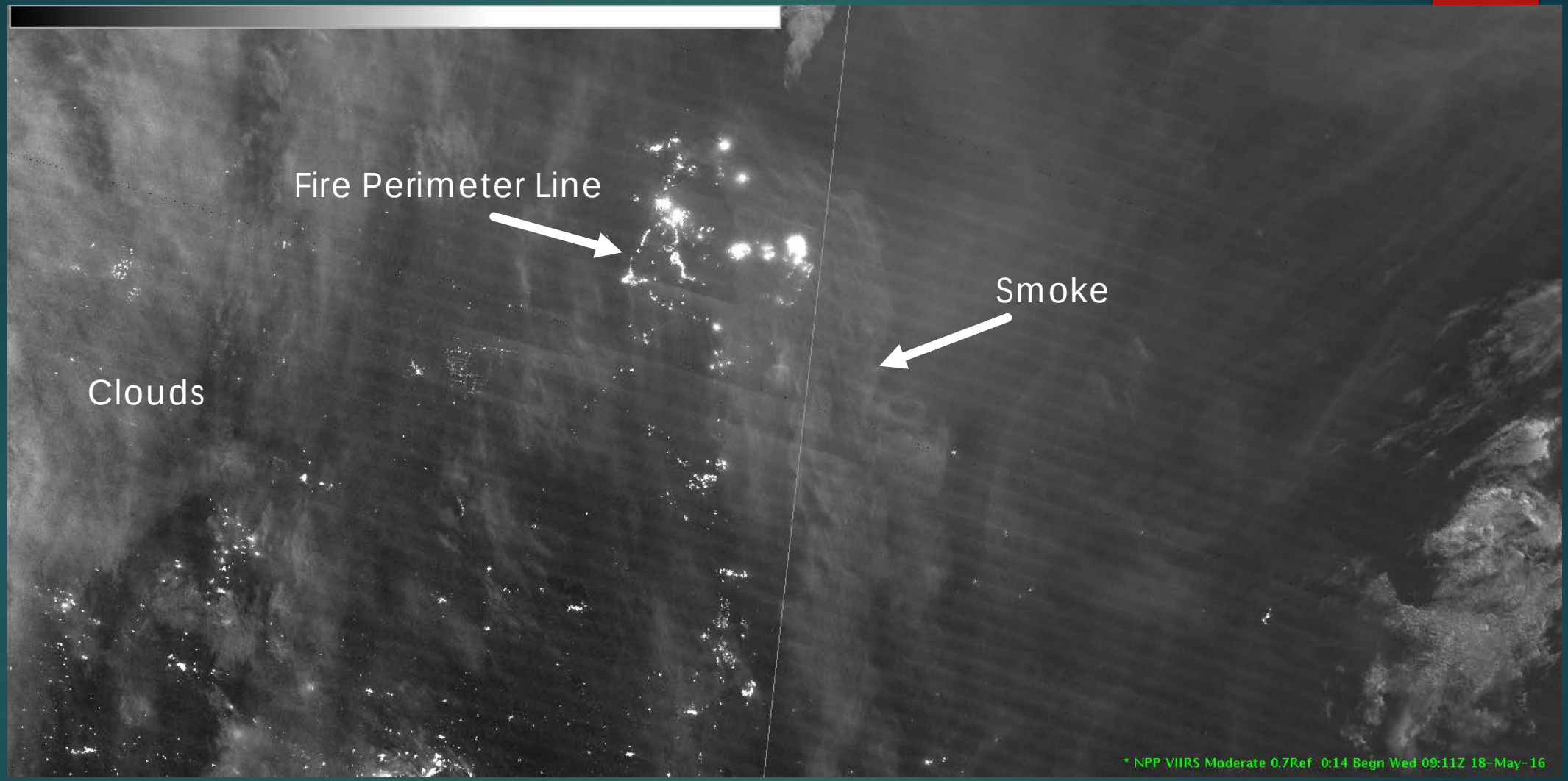
Border between Canadian Provinces

NCC imagery of Ft. McMurray wildfire – 17 May at 0930 UTC

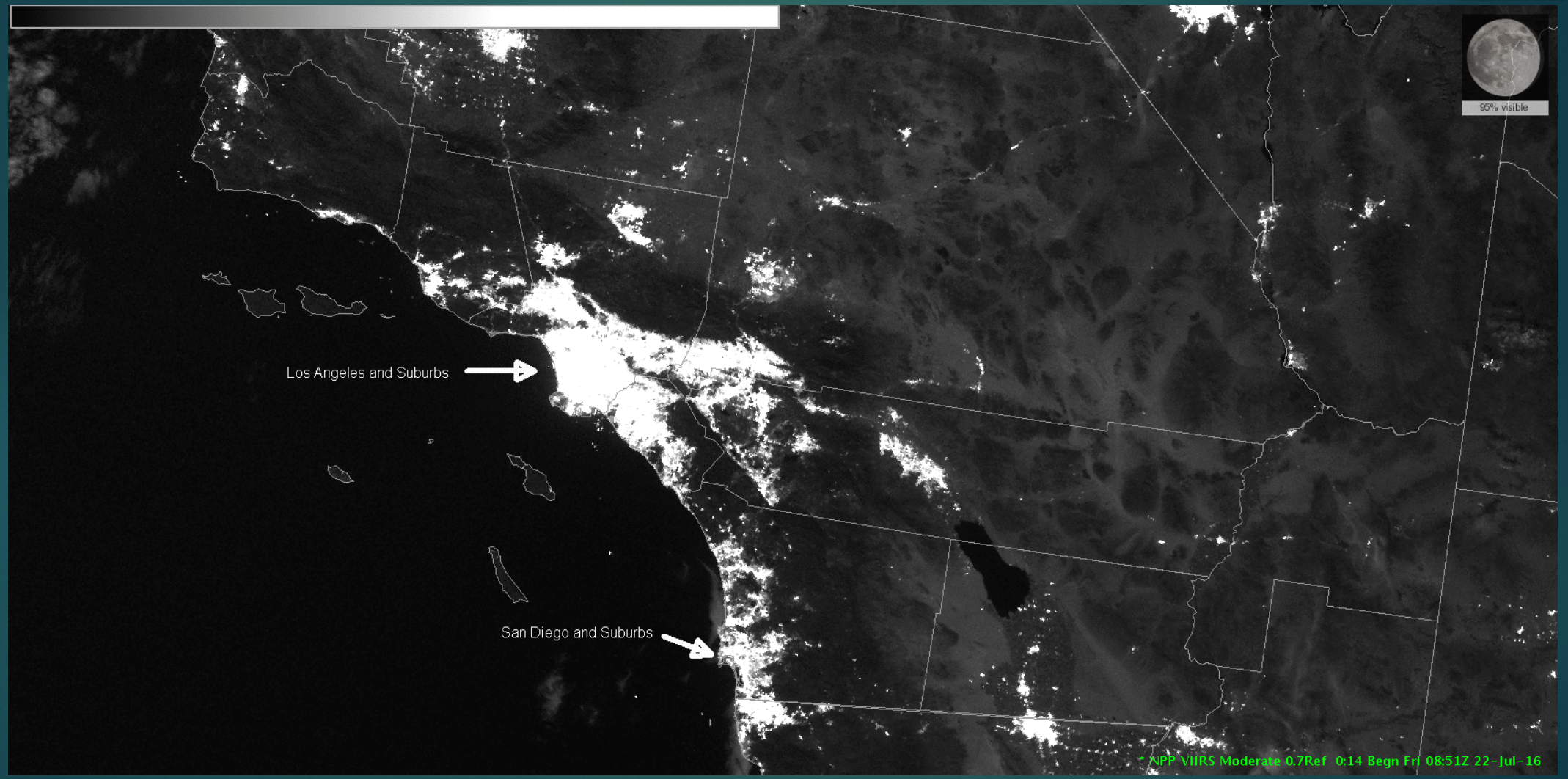


Switch back and forth between the previous slide and this one to see the "new" light sources – these are from actively burning areas

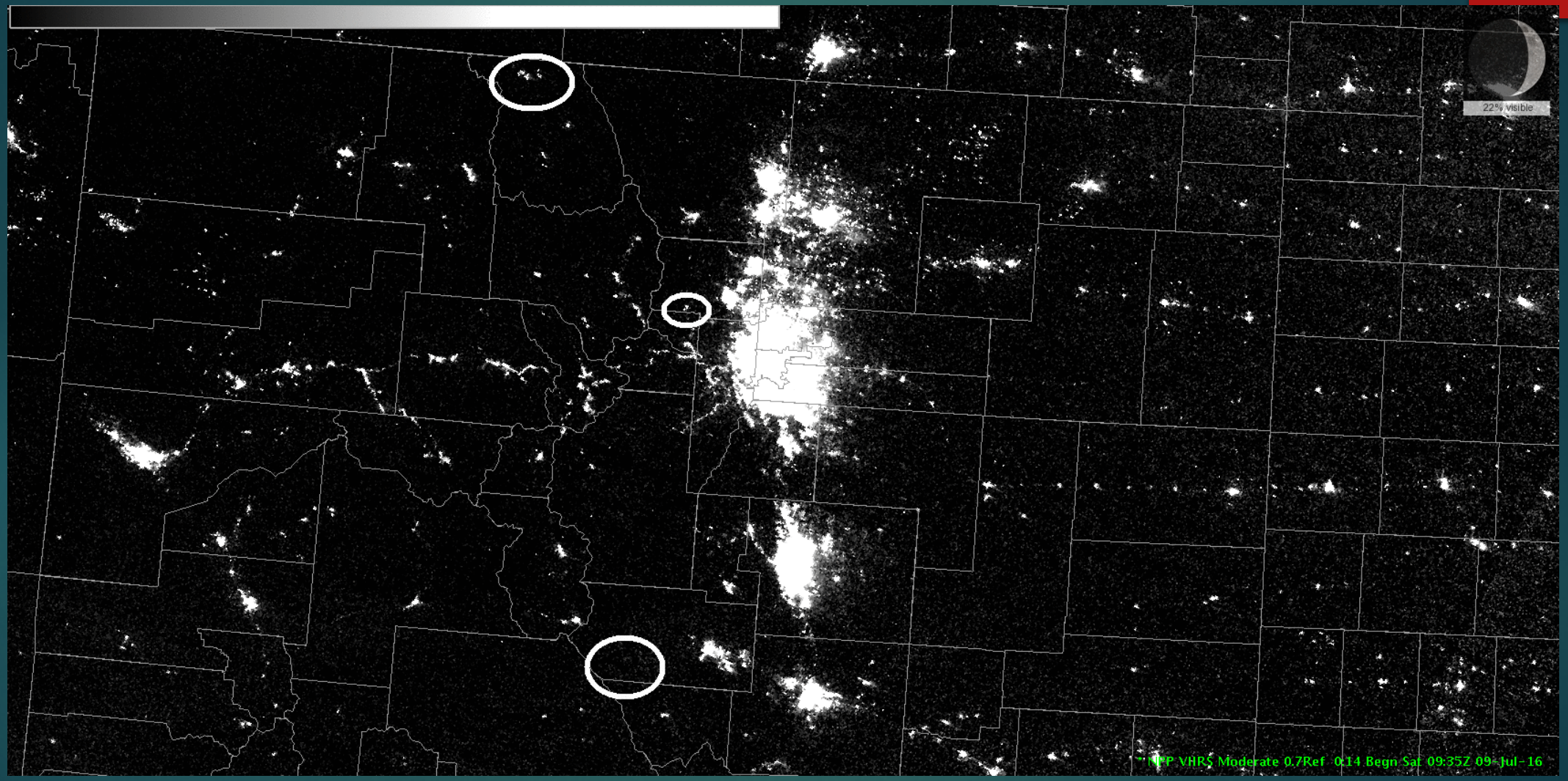
NCC IMAGERY OF FT. MCMURRAY WILDFIRE – 18 MAY AT 0915 UTC



NCC: SAND FIRE, CALIFORNIA

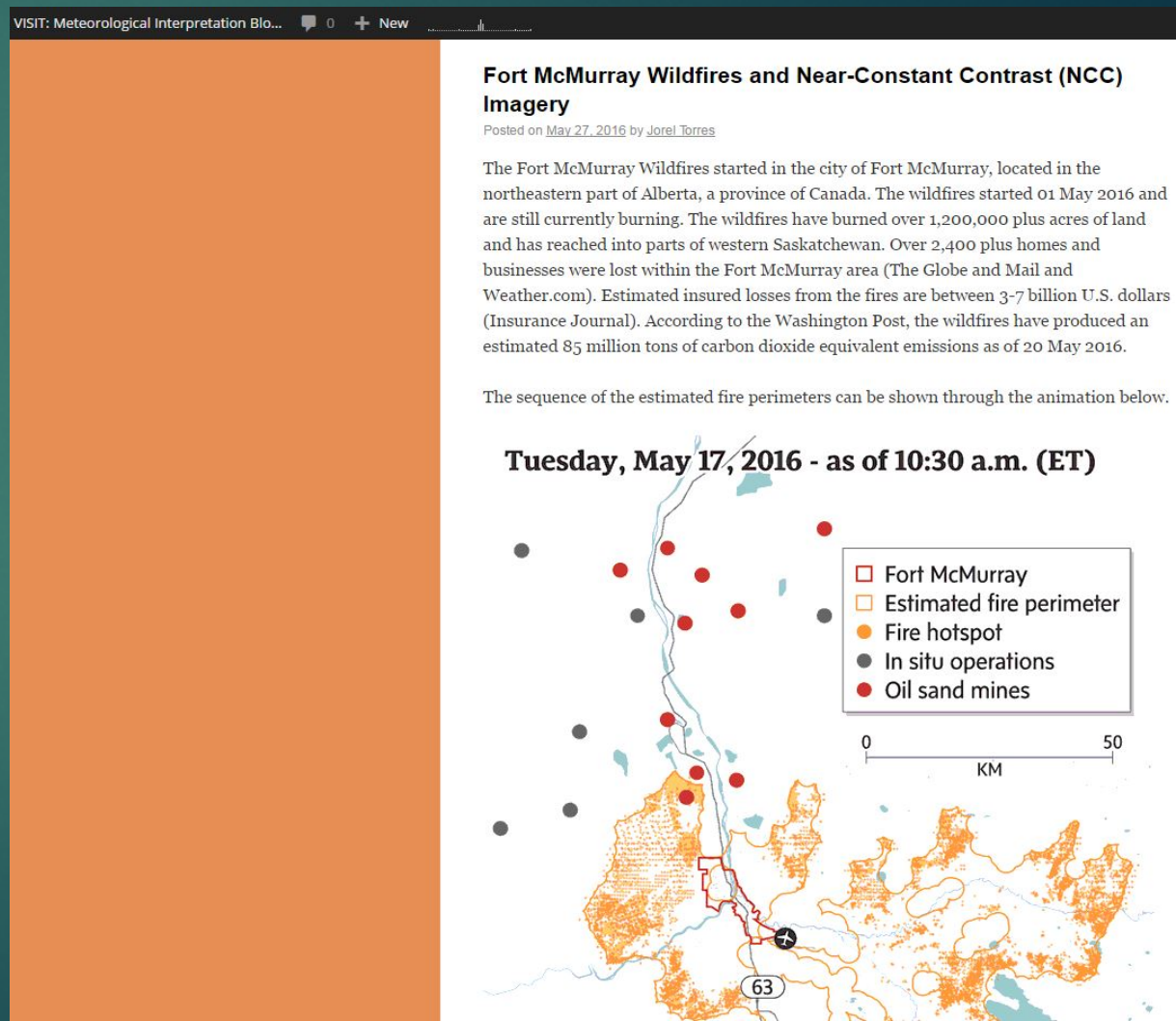


NCC: COLORADO FIRES



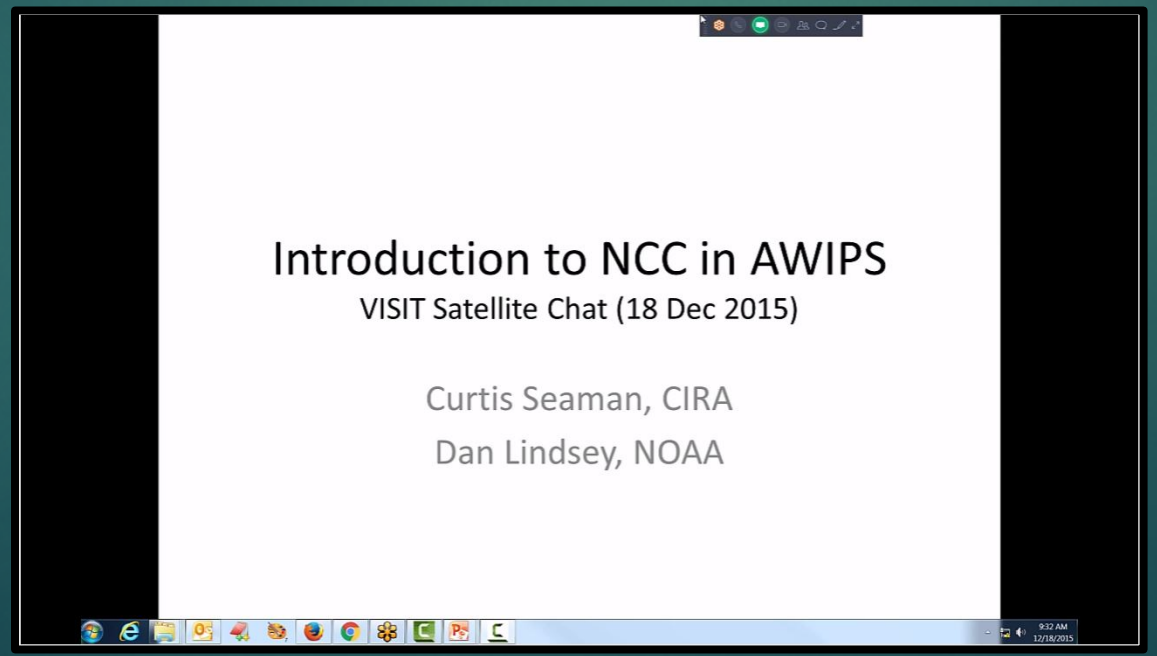
Virtual Institute for Satellite Integration Training (VISIT) Blogs

- http://rammb.cira.colostate.edu/training/visit/
- New VISIT Blogs:
  - NCC Imagery, Colorado Fires in July
  - 19 June 2016-Present: Beaver Creek Fire, Jackson County, Colorado
  - NUCAPS, Part One: Introduction
  - NUCAPS, Part Two: Field Campaign and Observations
  - Fort McMurray Wildfires and Near-Constant Contrast (NCC) Imagery
  - Synthetic Imagery from the NAM Alaska Nest 4 km



Future Goals

- Quick Guides of individual bands, JPSS products in AWIPS-II.
- Expand on existing training and start JPSS training.
- Highlight Uniqueness of JPSS Products.
- Interact with the STAT team and other trainers in Boulder (early September).
- Get ready for JPSS-1 launch.



Questions???