

Satellite Training

(From Satellite PG/User Readiness Meeting)

NWS OCWWS Training Division
NESDIS GOES-R & JPSS

COMET

Satellite Liaisons

VISIT (CIRA/CIMSS)

NWS Regions



August 18 2014





Satellite Training Outline

- Training Review – NWS Training Div
- Introduction to COMET's Satellite Education Resources
- Satellite Liaisons & Training



Training Performance Goals

- Improved NWS short-term forecast and warning operations by optimally using new Digital Satellite data.
- Increased use of Digital Satellite data into operations to support Decision Support Services (DSS) for Weather Ready Nation.



Working Together for Satellite Training

EUMETSAT,
NASA/SPoRT,
Canada, DOD...



UCAR/COMET

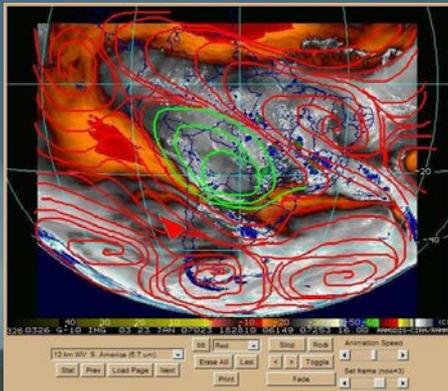
Satellite Liaisons
& Proving
Grounds



NWS Training
Division & SOOs

Users & Developers

VISIT (CIRA/CIMSS)

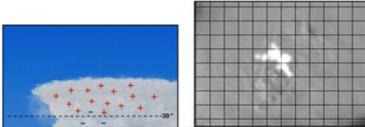


WMO Virtual Lab



GOES

GOES-R GLM:
Lightning Mapping From Geostationary Orbit



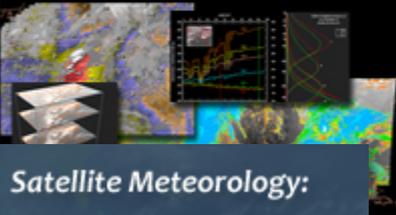
GOES-R ABI:

**Next Generation
Satellite Imaging**

GOES-R:

Benefits of Next-Generation
Environmental Monitoring

Satellite Meteorology:
Introduction to Using the GOES Sounder



Satellite Meteorology:

**GOES Channel
Selection v2**

The COMET®
Program

S-NPP & JPSS

**Introduction to VIIRS Imagery
and Applications**



**ADVANCES IN
SPACE-BASED NIGHTTIME
VISIBLE OBSERVATION**



**Suomi NPP:
A New Generation
of Environmental
Monitoring Satellites**



**IMAGING WITH VIIRS:
A CONVERGENCE OF TECHNOLOGY
AND EXPERIENCE, 2nd Edition**



Multispectral Apps

**Multispectral Satellite
Applications:**



RGB PRODUCTS

**MULTISPECTRAL
SATELLITE
APPLICATIONS:
MONITORING
THE WILDLAND
FIRE CYCLE
2ND ED.**

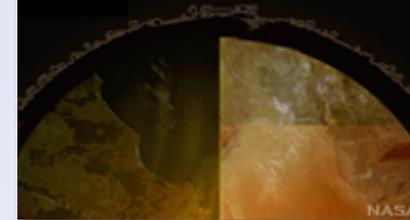
**MONITORING THE CLIMATE
SYSTEM WITH SATELLITES**

**SATELLITE MONITORING
OF ATMOSPHERIC COMPOSITION**



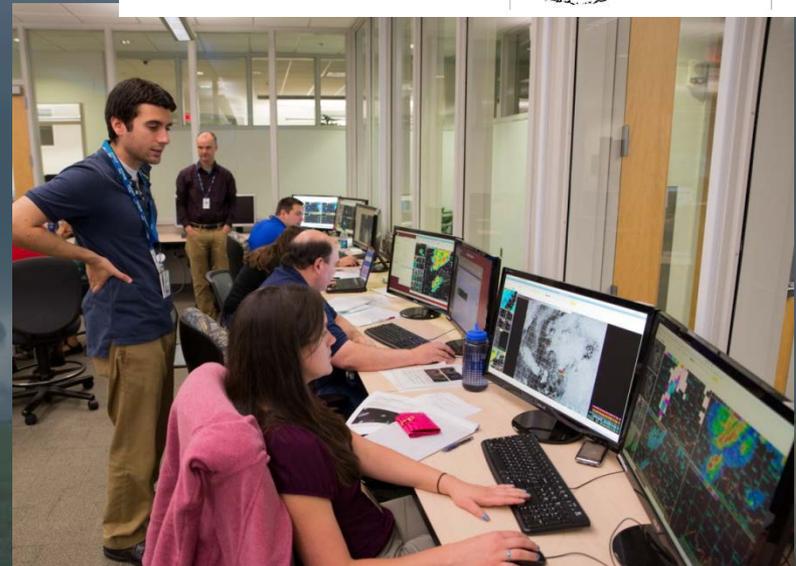
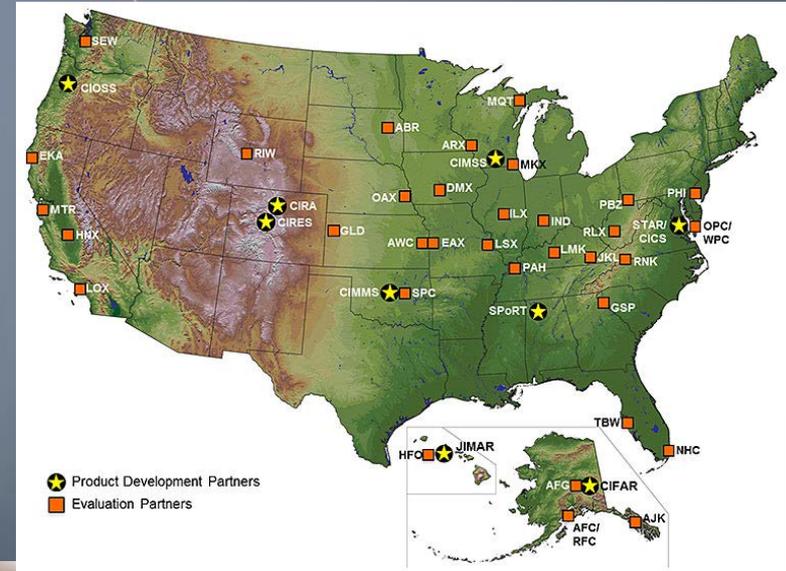
ATMOSPHERIC DUST

PRODUCED BY THE COMET PROGRAM



Inputs to Develop Content

- COMET Modules
- Satellite Liaisons
- SNPP & Himawari Data Sets
- Test Bed Experiments
- OPG Operational Readiness Evaluations
- CIRA/CIMSS/SPoRT
- WMO Virtual Lab
- Satellite Proving Ground/
User Readiness Meetings





Training Plans Overview

Plans in development through NWS Regions, Centers and SOO/DOH Satellite Training Team

- Pre-launch Information Short Training
- Baseline Training
- SOO/DOH – Science Infusion Week
- Ongoing Just-in-Time Training & Resources
- Integration into Forecast & Warning Operations



Pre-Launch Information

- Start 6 months before launch
- 1-2 min information “teasers”
- Intro examples to set baseline understanding
- Youtube type examples on Applications
- Build upon existing Youtube satellite videos



Science Infusion Week

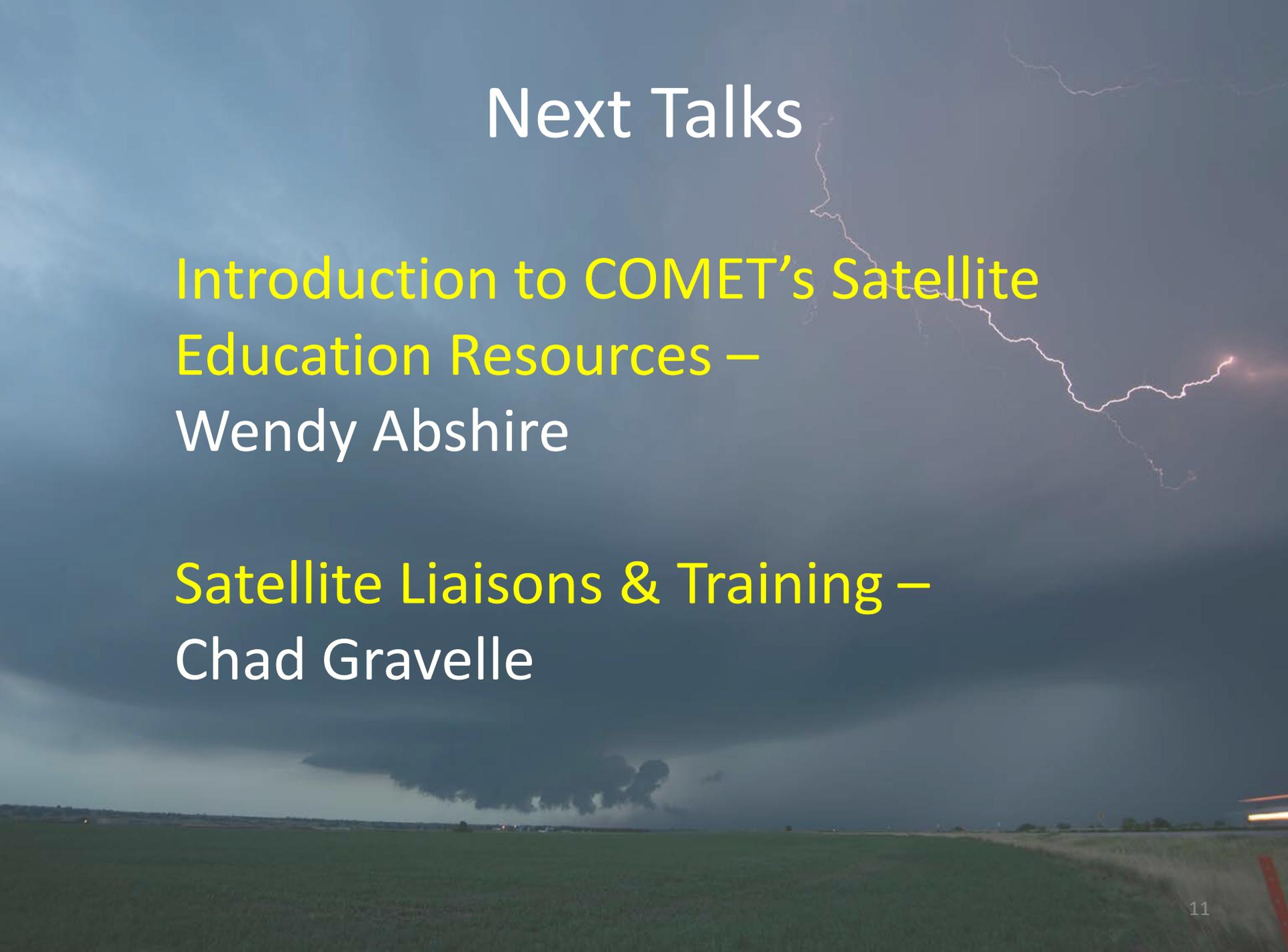
- SOOs/DOHs 1 week residence workshop
- Focus on integrating new data & emerging science to improve science of WRN message
- Focus on evolving forecast & warning process as satellite data are used in high resolution rapid refresh models
- Monthly Follow up sessions on science sharing and operational cases by SOOs/DOHs
- Management support from NWS Regions, HQ, Chief Learning Office & NESDIS



Just-In-Time Training

- Start once GOES-R data available on AWIPS II.
- Training Partners serve as GOES-R Help Desk function via email/chat/FAQs - Real-time access to an expert – daily (24x7)
- Partners host “Storm of the Month” webinars in-depth review of recent cases
- Host collaborative environments involving end users and developers (e.g., consolidated blog)
- **Develop searchable on-line library of training modules, blogs, FAQs, and resources (ESRC)**

Next Talks



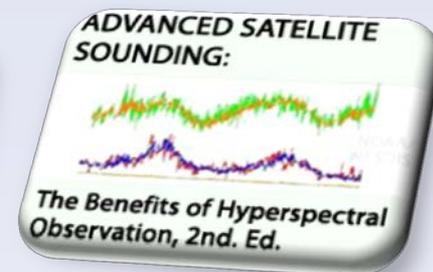
Introduction to COMET's Satellite
Education Resources –
Wendy Abshire

Satellite Liaisons & Training –
Chad Gravelle

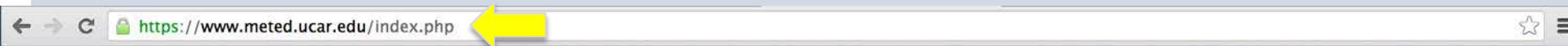
Introduction to COMET's Satellite Education MetEd Resources

Wendy Schreiber-Abshire
UCAR's COMET® Program

Joint JPSS/GOES-R Science Seminar
Introduction to Satellite Training Initiatives and Opportunities
18 August 2014



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Teaching and Training Resources for the Geoscience Community

Recent Publications



Tropical Cyclone Intensity Analysis

This lesson provides guidance for operational forecasters needing to combine different intensity methods to determine the intensity of a tropical cyclone. Each of the intensity methods is summarized, focusing on both strengths and weaknesses. These methods...

[More Information »](#)

1 2 3 4 5 6 7 8 9 10

News and Updates

COMET is a Weather-Ready Nation Ambassador

Posted on: 2014-06-05



Earlier this year, COMET was approached by NOAA to help connect the public with the Weather-Ready Nation

What is MetEd?

MetEd is a free collection of learning resources for the



geoscience community. Whether you're an experienced meteorologist honing existing skills or a student looking for new topics of interest, we have something for you. Learn more about MetEd in this short video.

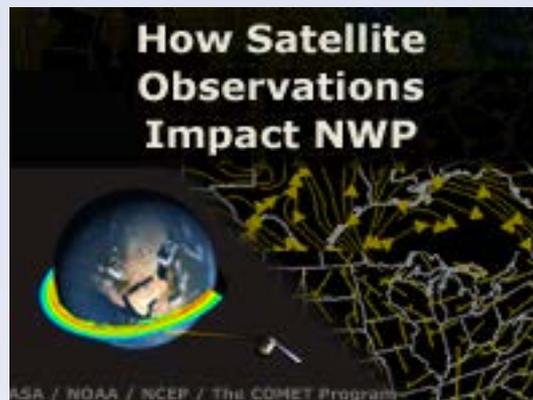


The COMET® Program is a Weather-Ready Nation

- Over 100 Satellite-specific modules on MetEd (69 English, 23 Spanish, 16 French)
- Over 20,000 meaningful English Satellite Module User Sessions per year

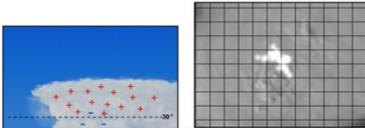
NESDIS satellite training activities with the COMET Program attract additional funding and training development specifically in the satellite topic area from both EUMETSAT and the Meteorological Service of Canada

- Newest publications: *How Satellite Data Impact NWP* and *GOES-R: GLM*



GOES

GOES-R GLM:
Lightning Mapping From Geostationary Orbit



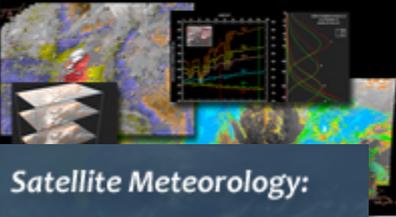
GOES-R ABI:

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Satellite Meteorology:
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Satellite Meteorology:

**GOES Channel
Selection v2**

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S-NPP & JPSS

**Introduction to VIIRS Imagery
and Applications**



**ADVANCES IN
SPACE-BASED NIGHTTIME
VISIBLE OBSERVATION**



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**IMAGING WITH VIIRS:
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AND EXPERIENCE, 2nd Edition**



Multispectral Apps

**Multispectral Satellite
Applications:**



RGB PRODUCTS



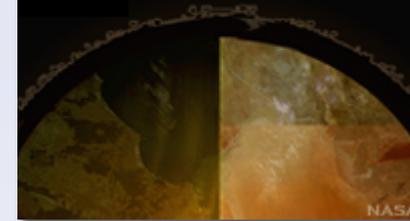
**MONITORING THE CLIMATE
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**SATELLITE MONITORING
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ATMOSPHERIC DUST

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MW Remote Sensing

Microwave Remote Sensing: Overview, 2nd Edition

Land and Ocean Surface Applications

Clouds, Precipitation, & Water Vapor

Microwave Resources

Polar Satellite Products for the Operational Forecaster: Microwave Analysis of Tropical Cyclones

Advances in Microwave Remote Sensing: Ocean Wind Speed and Direction

JASON 2: USING SATELLITE ALTIMETRY TO MONITOR THE OCEAN

© THE COMET PROGRAM

Atmospheric Sounding

ADVANCED SATELLITE SOUNDING:

Suomi NPP: A New Generation

An Introduction to the EUMETSAT Polar System

FORMOSAT-3/COSMIC

Toward an Advanced Sounder on GOES?

Satellite Meteorology: Introduction to Using the GOES Sounder

MSC – Water Vapour Interpretations

Inferring Three Dimensions from Water Vapour Imagery

Satellite Feature Identification: Atmospheric Rivers

Satellite Feature Identification: Cyclogenesis

Satellite Feature Identification: Ring of Fire

Satellite Feature Identification: Blocking Patterns

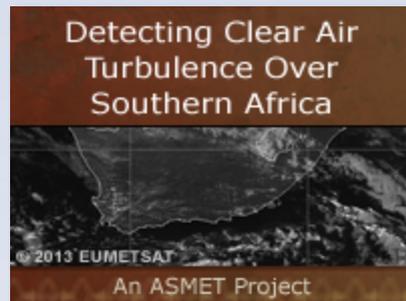
Recognition and Impact of Vorticity Maxima and Minima in Satellite Imagery

Dynamic Feature Identification: Vorticity Maxima and Comma Patterns

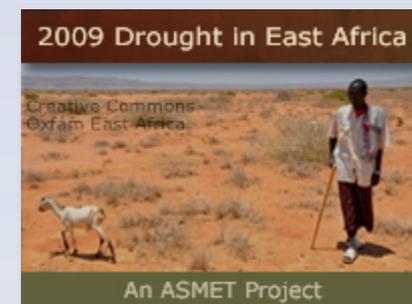
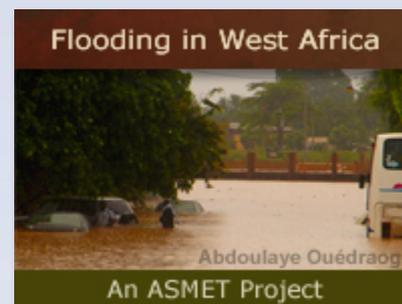
Dynamic Feature Identification: Deformation Zone Distribution

Blowing Snow Baker Lake, Nunavut Canada 04-10 February 2003

ASMET-7: Aviation Case Studies



ASMET-6: Precipitation



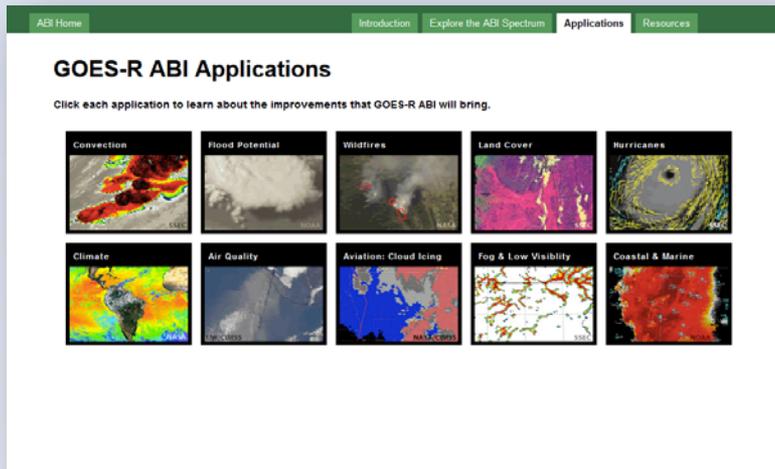
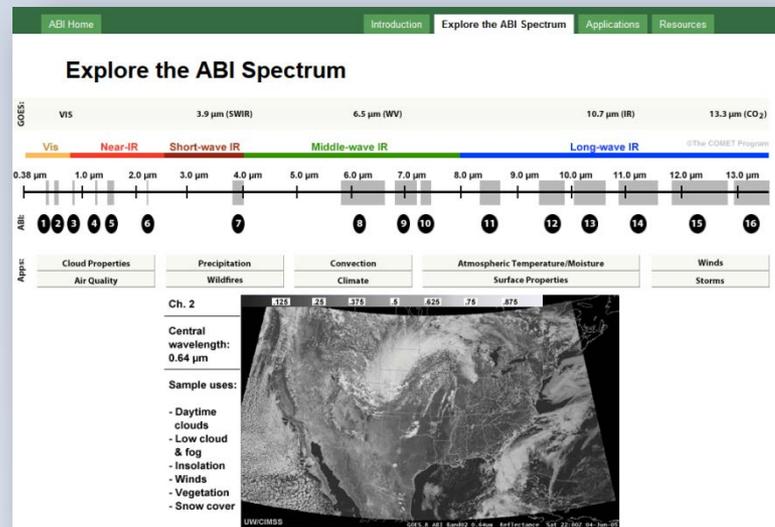
ASMET-5: Case Studies (2004-2006)

- Secondary Lows Behind Frontal Systems
- Dust storms
- Cloud Clusters

- ASMET-4: Tropical Cyclones over the SW Indian Ocean
- ASMET-3: Combining Satellite Imagery and Model Output in Weather Forecasting
- ASMET-2: Integrating Satellite Imagery of the ITCZ into Analyses
- ASMET-1: Basics of Visible and Infrared Remote Sensing (2014 update of 1997 module)

GOES-R ABI: Next Generation Satellite Imaging (Feb 2013)

- Interactive exploration of ABI's 16 bands, linking bands to observable phenomena
- Movies describing advancements in ten application areas (e.g. analysis, forecasting, NWP, climate and environmental monitoring)



Advances in Space-Based Nighttime Visible Observation (Apr 2013)

- Technical Improvements with Suomi NPP VIIRS Day-Night Band
- Lunar cycle & modeling, constant contrast techniques for normalized imagery
- Meteorological and other applications
- Future improvements in NT Vis imaging

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ADVANCES IN SPACE-BASED NIGHTTIME VISIBLE OBSERVATION

ADVANCES IN SPACE-BASED NIGHTTIME VISIBLE OBSERVATION
Produced by The COMET® Program

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About the Module
Nighttime Visible Imaging With the DNB
Lunar Phases and Modeling
Applications of Nighttime Visible Imaging
Future of Nighttime Visible Observation
Interpretation Guidelines
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Nighttime visible imaging was pioneered with the Defense Meteorological Satellite Program (DMSP) Operational Linescan System (OLS) in the 1960s. The VIIRS DNB was launched on the Suomi NPP polar orbiter in 2011, continuing the mission. The VIIRS DNB provides the same basic low-light sensitivities as the OLS but with a significant improvement in quantitative capacity and the ability to see detail in imagery. **HOVER OVER THE IMAGE AND MOVE THE SLIDER TO COMPARE THE DMSP OLS AND VIIRS DNB IMAGES. (ON TOUCH SCREEN DEVICES, TAP THE IMAGE SIDES TO TOGGLE.)**

NE Afghanistan, 29 Nov 2012: DMSP NPP VIIRS DNB Moonlit Night Visible

Nighttime visible imaging complements and, in many cases, improves upon infrared (IR) images. Although nighttime products made from multiple infrared channels have improved in recent years, they still have limitations.

ADVANCES IN SPACE-BASED NIGHTTIME VISIBLE OBSERVATION
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Lunar Model
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Illumination varies tremendously throughout the lunar cycle. For example, the full moon is about nine times brighter than a quarter moon and hundreds of times brighter than a crescent moon. To account for these huge variations in lunar illumination, some groups use a lunar model to normalize the data. This approach accounts for highly variable input lunar illumination and outputs constant illumination. This greatly improves the quality of imagery and the capacity to build quantitative products.

Here's a sample image before the lunar model is applied. The cities of South Africa are visible but we can't see many clouds because of the low illumination from the first quarter moon that's about 22 degrees above the horizon. Applying the lunar model brightens the data as if the moon were full and directly overhead. **HOVER OVER THE IMAGE AND MOVE THE SLIDER TO SEE THE NORMALIZED IMAGE. (ON TOUCH SCREEN DEVICES, TAP THE IMAGE SIDES.)** So many more clouds are evident! This is known as "near constant contrast" (NCC) imagery. It looks the same regardless of the lunar phase or elevation and enables us to process effective images even with marginal lunar conditions.

Suomi NPP VIIRS DNB Night Visible Over South Africa With Normalization
0659 Local Time 28 Jun 2012

First quarter moon
Depress Elevation

ADVANCES IN SPACE-BASED NIGHTTIME VISIBLE OBSERVATION
Produced by The COMET® Program

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Dust Storms
Air Pollution
Moonlight
Lightning
Gas Flares
Ships and Boats
Population/Economic Geography
Future of Nighttime Visible Observation
Interpretation Guidelines
References

This section explores the use of nighttime visible images and derived products to detect and monitor a variety of meteorological and other features at night. The derived products are made from VIIRS DNB visible images and infrared channels. As of 2013, some are currently available while others are still experimental.

Suomi NPP VIIRS DNB Nighttime Visible Images & Products

Ice Pack
Smoke Plume
Cloud Streets
Lightning
Low Level Strata Cloud Bands

If you are not familiar with RGB products, we recommend that you take COMET's Multispectral Satellite Applications: RGB Products Explained module at https://www.meted.ucar.edu/training_module.php?id=568.

Introduction to VIIRS Imaging and Applications (Sep 2013)

- VIIRS capabilities vs. earlier imagers
- Imaging strategy, 22 bands, resolution
- Key applications
- Introduction to the Day-Night Band

Introduction to VIIRS Imaging and Applications
Produced by The COMET* Program

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Tropical Cyclones
Volcanic Ash
Dust RCE for Volcanic Ash and Contrails
Multippectral Dust Enhancement
Ocean Color
Day Night Band
Summary
Lesson Summary

SNPP VIIRS True Color Composite From 15 Orbits 18 Jun 2012

NASA

Introduction to VIIRS Imaging and Applications
Produced by The COMET* Program

The extreme zoom below is of a shortwave infrared imaging channel of a nighttime fire using the 14 channel at 3.7 micrometers. Located near Ventura, California, the fire started inland and was blown toward the coast by offshore winds. At the time of this image, the fire had reached the coast. Notice the tiny 375-m pixels that make up the image. This channel is one of three VIIRS channels near this wavelength that are useful for fire detection. Pixels hotter than about 26 degrees C are colored red. Notice the fire-free corridor between two burning regions.

Suomi NPP VIIRS 0.375 km 3.74 μ m Channel 0949 UTC 03 May 2013

34.2°N
119.1°W
118.9°W

34.1°N
34°N

Between Santa Barbara and LA, CA

VIIRS Grid 0.37 km or better "Imaging" Resolution

0 10 20 30°C

NPP

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"Fog" or "low clouds at night" products have significantly improved the detection of stratus and fog. These products exploit the differential low cloud emissivities in two input infrared channels. When the channels are combined into a pixel-by-pixel image difference, low clouds and fog stand out distinctly, as we see in the images over Pennsylvania below. Use the slider to view both images.

Suomi VIIRS 10.8 - 3.74 μ m 0801 UTC 06 Jun 2012

10 0 10 20 30

0 0 10 20 30

With a spatial resolution of 0.37 km, the VIIRS "imaging" infrared channels enable much finer detail than AVHRR or MODIS. In the GOES comparison, the fog pixels are so "blocky" that it's hard to assess the extent and detail of fog coverage. In contrast, the detailed VIIRS product lets forecasters pinpoint the fog regions within individual valleys. For information on viewing fog at night, see COMET's Advances in Space-based Nighttime Visible Observation lesson at https://www.meted.ucar.edu/training_module.php?id=990.

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Introduction to VIIRS Imaging and Applications
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MODIS and VIIRS have special "ocean color" channels that provide spatial detail and have the ability to quantify and understand bio-optical properties of the ocean surface. Ocean color depends on the number of microscopic marine plants, called "phytoplankton." These plants contain chlorophyll, a green pigment. These images are season-long composites of ocean chlorophyll concentrations derived from visible measurements made by VIIRS. The purple and blue colors represent lower chlorophyll concentrations, the oranges and reds higher chlorophyll concentrations. The left composite shows summer in the Northern Hemisphere. The composite on the right shows summer in the Southern Hemisphere.

Suomi NPP VIIRS Global Chlorophyll Composite

Boreal Summer 21 Jun 2011 - 20 Sep 2012 Austral Summer 21 Dec 2011 - 20 Mar 2012

Chlorophyll (mg / m³)

0 10 20 30

NASA/Suomi NPP/Norman Kuring

Looking at the Northern Hemisphere summer (left image), which statements are true of the bio-optical activity in the Arctic Ocean? (Choose the best answer.)

a) The reds along the land areas indicate high concentrations of chlorophyll

b) The Arctic is covered with ice, suppressing biological activity

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The Environmental Satellite Resource Center provides...

easy access to a wide range of useful information, education, and training about low-earth orbit and geostationary satellites from trusted sources.

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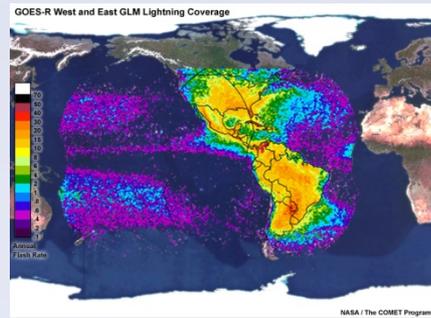
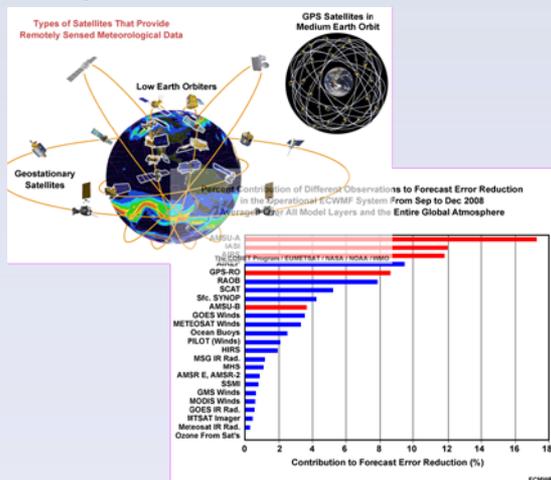
search

Categorical search (click to expand / collapse)

Guided keyword search (click to expand / collapse)

In Progress and Next Steps:

- Microwave Remote Sensing: Land and Ocean Surface Applications, 2nd Ed.
- COSMIC-2
- Marine Forecasting using Scatterometer and Altimeter Data
- SNPP applications for River and Lake Ice
- Short features on High Impact Events highlighting JPSS capabilities
- Himawari-8 AHI differences from ABI on GOES-R
- Input from SOO Satellite Team
- Spanish versions of ABI and GLM lessons



Land and Ocean Surface Applications

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Module Listing »

Topics: Languages:

In this topic area, find out how current and future satellites and their sensors work, how to interpret what they tell us, and how to make forecasts and other weather products from their data.

Modules Courses Sort by:

1 - 40 out of 60 results

Basics of Visible and Infrared Remote Sensing



This lesson presents the scientific and technical basis for using visible and infrared satellite imagery so forecasters can make optimal use of it for observing and forecasting the behaviour of the atmosphere. The concepts and capabilities presented are common to most... [Read more »](#)

Languages: English
Publish Date: 2014-01-07
Skill Level:
Completion Time: 1.50 - 2.00 h
Topics: Satellite Meteorology
★★★★★ (0 reviews)

Convective Weather and Aviation in West and Central Africa



The hazards associated with convective systems present some of the most dangerous conditions encountered by aircraft and pose many challenges to aviation operations. When convection is forecast to develop, aviation forecasters are required to issue a series of warnings... [Read more »](#)

ASMET 7: Convective Weather and Aviation in West and Central Africa
Languages: English
Publish Date: 2013-12-26
Skill Level:
Completion Time: 75 - 1.00 h
Topics: Aviation Weather, Satellite Meteorology
★★★★★ (0 reviews)

Detecting Clear Air Turbulence Over Southern Africa Case Study



Turbulence is a major concern for the aviation industry it often goes undetected in cloud-free areas, catching pilots off guard when they fly into it. Turbulence can injure passengers and crew, and cause structural damage to aircraft. This makes it critical for aviation... [Read more »](#)

ASMET 7: Detecting Clear Air Turbulence: South African Case Study
Languages: English
Publish Date: 2013-12-26
Skill Level:
Completion Time: 55 - 75 h
Topics: Aviation Weather, Satellite Meteorology
★★★★★ (0 reviews)

Tropical Fog: A Look at Fog That Impacts Aviation in Guyana



This module applies concepts covered in the module, Fog: Its Processes and Impacts to Aviation. It examines the fog processes at a tropical location: Guyana. A basic overview of the main fog types is provided, and then a detailed analysis is done for a representative fog... [Read more »](#)

Tropical Fog: A Look at Fog That Impacts Aviation in Guyana
Languages: English, Spanish
Publish Date: 2013-12-20
Skill Level:
Completion Time: 75 - 1.00 h
Topics: Aviation Weather, Fog and Low Stratus, Satellite Meteorology
★★★★★ (0 reviews)

Forecasting Fog for Aviation: Kenya Case Study



This lesson aims to improve aviation forecasts of fog in the African airspace by teaching forecasters to make more accurate forecasts using satellite imagery, numerical weather prediction, and other available data. A process for diagnosing and forecasting fog is presented... [Read more »](#)

ASMET 7: Forecasting Fog for Aviation: Kenya Case Study
Languages: English
Publish Date: 2013-11-05
Skill Level:
Completion Time: 75 - 1.00 h
Topics: Aviation Weather, Satellite Meteorology
★★★★★ (0 reviews)

Introduction to VIIRS Imagery and Applications



This lesson introduces the VIIRS imager that operates on the current U.S. Suomi NPP satellite and is planned for future JPSS environmental satellites. VIIRS has many advanced features that improve both spectral and spatial resolution and enable the delivery of consistent... [Read more »](#)

Introduction to VIIRS Imagery and Applications
Languages: English
Publish Date: 2013-09-30
Skill Level:
Completion Time: 75 - 1.00 h
Topics: Satellite Meteorology
★★★★★ (1 review)

Special Interest

More on Satellite Meteorology



The Environmental Satellite Resource Center (ESRC) provides easy access to a wide range of useful information, education, and training about low-earth orbit and geostationary satellites from trusted sources.

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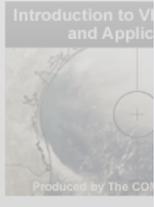
Our training consists of modules and courses. A module is targeted toward one focused subject, whereas a course is a collection of modules that pertain to a broader subject area. You can receive certificates of completion for both modules and courses. Courses are entirely self-paced and available for open enrollment.

Virtual Classroom

The COMET[®] Program's virtual classroom provides access to material in support of our residence and virtual courses. These courses are generally available by invitation only and are hosted at our UCAR facility in beautiful Boulder, Colorado.

Home Education
Teaching and Training

Recent Publications



Introduction to VIIRS Imagery and Applications
Produced by The COMET Program

News and

Share MetEd
Posted on: 2013-11-22

We recently added a



Courses: Spotter Training
★★★★★ (41 reviews)
[add reviews](#)
Media Gallery

MetEd?



MetEd? is a short video explaining the COMET program and its resources.

Join the community. Whether you are an experienced meteorologist looking to sharpen your skills or a student looking for new topics of interest, we have something for you. Learn more about MetEd in this short video.

Coming Soon

- Some upcoming courses:
- TAFs for Convective Weather, Africa Edition
- Climate Variability and Change Lectures
- Satellite Data Inform NWP

Feedback Form

Let us know of any problem that you are having by visiting our Support page.

Use FAQ

Quick URLs and Contact Info.

abshire@ucar.edu



URLs:

- <http://meted.ucar.edu>
- <http://meted.ucar.edu/esrc>

Satellite Liaison Perspective on Forecaster Training for GOES-R



Effective GOES-R Training Practices – National Centers

- All (almost) forecaster training is in person, either individually or in small groups (3-5 analysts/forecasters).
- Products that are identified have immediate benefit to NCEP Center.
- Presentations (20-25 minutes) and quick guides are created that include relevant product examples for each NCEP Center.
- Interactions with forecasters are ongoing after training is complete to...
 - Keep dialogue going between SME and forecasters
 - Show additional real-time examples (2-minute case studies)
- Satellite Liaison has a consistent presence in operations to continuously familiarize forecasters to GOES-R capabilities.



Effective GOES-R Training Practices – Weather Forecast Offices

- All (almost) forecaster training is remote (e.g., live teletraining).
- Live teletraining is offered to the WFO(s) and given by Satellite Liaison or the product developer.
- A recorded version of the live teletraining or prerecorded Articulate/VISIT version is provided to the WFO(s).
- Supplemental resources (e.g., quick guide or blog), if available, are provided to the WFO(s).
- Satellite Liaison is a resource and SME to the WFO(s).

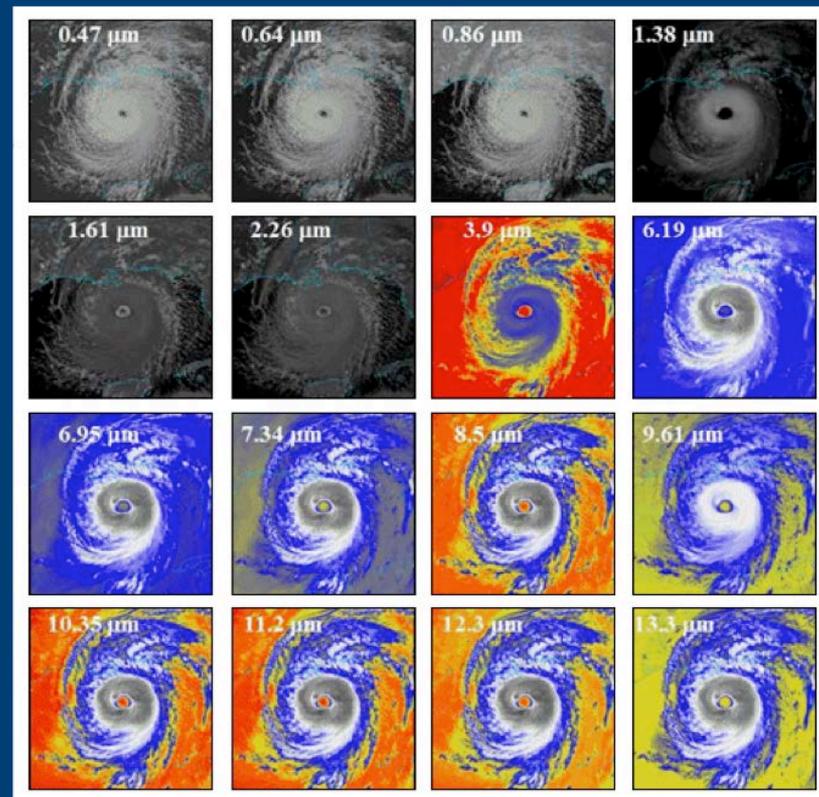


How Should NWS Users Be Trained?

- In-residence Satellite SMEs (i.e., SOO and Satellite FP) for each WFO/NCEP Center
- Dual-Pol Style Course for GOES-R (multi level)

1. Core Set of Articulate Presentations

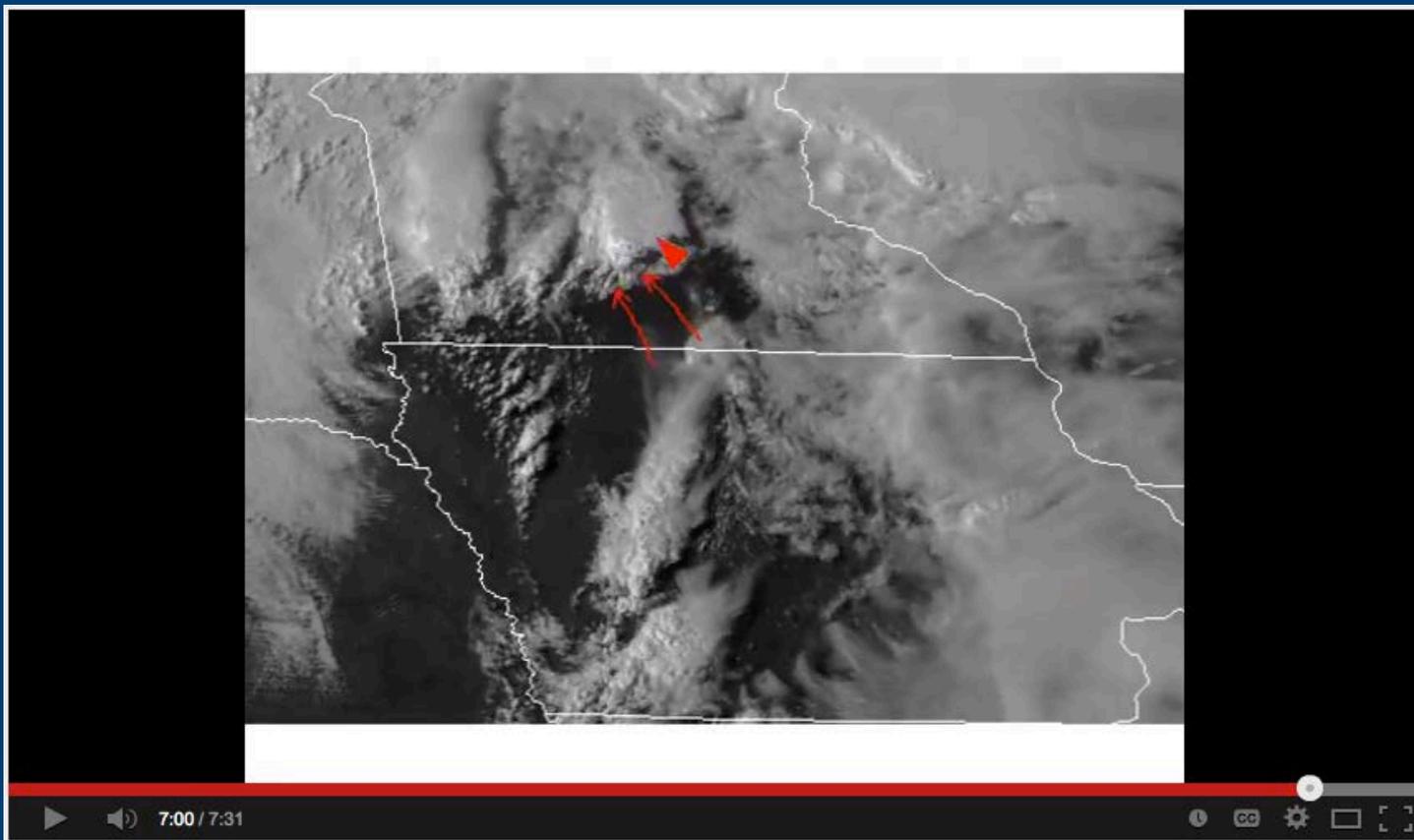
- (20-30 minutes each)
- Advanced Baseline Imager
- Geostationary Lightning Mapper
- Application/Track Centric (Convection, Winter Storms, Low Clouds and Fog, Fire Detection)





How Should NWS Users Be Trained?

- 2. Video Blog Posts of Near Real Time Events – YouTube Channel
 - Just-In-Time Training...4-6 minutes or even less



h/t Dan Bikos (CIRA)



How Should NWS Users Be Trained?

3. Supplemental In-Office and within AWIPS2 Resources

- Quick Guides
- Product Verification Statistics

Front

RGB Air Mass Quick Guide by NASA / SPoRT

Why is the Air Mass RGB imagery important?

There are numerous single channel imagery that provide information to assist the diagnosis and monitoring of synoptic and mesoscale features. The RGB Air Mass product is able to identify temperature and moisture characteristics of the air mass surrounding these features, allowing the user to infer some of the physical processes taking place.

Application: Comparison of the Air Mass RGB to NWP model short-term forecasts, allows forecasters to evaluate how well the model is forecasting the event, especially in rapid cyclogenesis cases.

RGB Air Mass Product - What is used in the combine and what does each color represent?

Color	Band / Band Diff.	Physically Relates to...	Little contribution to composite indicates....	Large contribution to composite indicates
Red	6.7 - 7.3	Vertical water vapor difference	Moist conditions high levels	Dry conditions at high levels
Green	9.7- 10.7	Estimate of tropopause height based on ozone. Polar (tropical) air has higher (lower) ozone concentrations	Tropopause height is low. Typically indicates a polar air mass, where 9.7 has very cold brightness temperature compared to 10.7	Tropopause height is high. Likely a tropical air mass where the two channels will have similar brightness temperature values
Blue	6.7	Water Vapor in layer from ~200 - 500 mb	Dry at upper levels Warm brightness temperatures have little blue	Moist at upper levels Cold brightness temperatures result in lots of blue

What should I be looking for in the imagery?

The Air Mass RGB identifies jet streaks and areas of high potential vorticity with red colors.

Vorticity / Jet Streak

The stratospheric intrusions associated with these features have dry, ozone rich air resulting in mostly red and little to no green or blue. Red colors result from very dry upper levels compared to mid-levels. Little green in this area occurs because the 9.7 channel brightness temperature is much colder than the 10.7 channel due to the increased ozone concentration and lowering (warming) of the tropopause height from the stratospheric intrusion. The blue scale is inverted so that warm brightness temperatures result in less blue (i.e. dry at ~400mb)

Warm air with moisture at upper levels tend to have green coloring while this same air with moisture at mid-levels tends to have an olive color (nearly equal red and

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green contributions). Cold air with higher concentrations of ozone is more blue and purple.

Warm, mid moisture Warm, high moisture

Thick, high-level clouds have high intensity values of each color and therefore appear white while other mid-level clouds have light pink colors depending on their characteristics.

What are the things to watch out for?

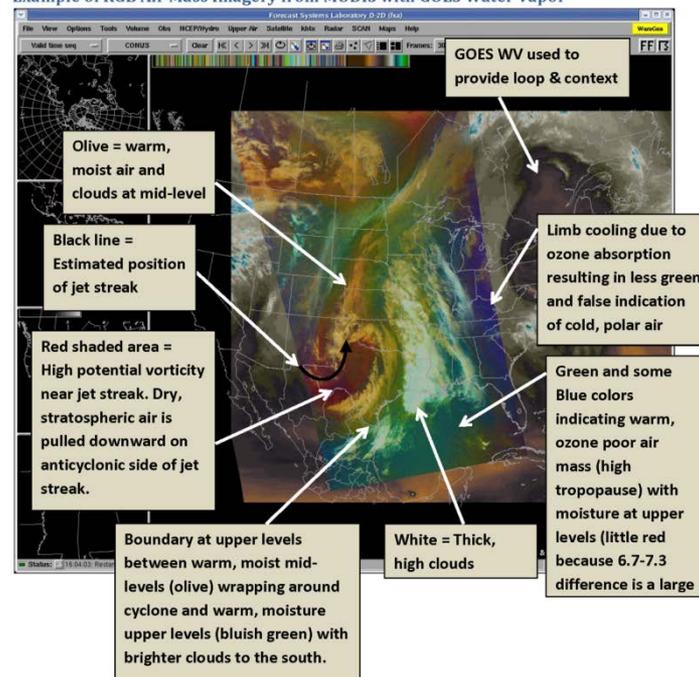
The edges of the MODIS swath tend to have less green due to limb cooling of the 9.7 ozone channel, resulting in false influence of the red and blue colors near the edge.

When is it available?

A hybrid style with the GOES water vapor channel is used to provide context every 15 minutes. The MODIS swath showing the actual Air Mass RGB is inserted as available ~4-6 times per day.

Back

Example of RGB Air Mass Imagery from MODIS with GOES Water Vapor



Resources:

This guide provides a highlight of the Air Mass RGB product as quick reference. Operational applications of RGB imagery can be seen on SPoRT's blog site (<http://nasasport.wordpress.com/>). A primer of the RGB imagery concept can be found at the UCAR/COMET MetEd website (<https://www.meted.ucar.edu>). More in depth information can be found at EUMETRAIN's website (<http://eumetrain.org/>).

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Training Resources Need to...

- ...be multi leveled and include training in person by the Satellite FP.
 - “Dual-Pol Style” Course
 - Real-time One-On-One Training...SME/forecaster interactions
 - Inter-Office Mentoring...forecasters teach each other (i.e., situational training)
- ...include product background information with strengths/weaknesses.
- ...have relevant (i.e., regional) examples and product verification.
- ...show how GOES-R incorporates with tools forecasters currently use...data fusion.
- ...show how GOES-R makes forecaster decision making easier.
- ...incorporate Decision Support Service examples.
- ...be incorporated into AWIPS-2.

Questions



- [Weather.gov/training](http://weather.gov/training)
- <http://meted.ucar.edu>