

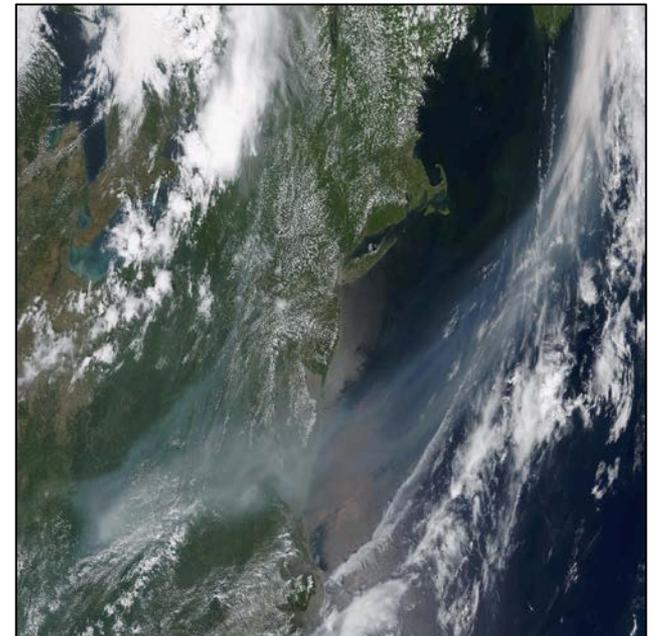
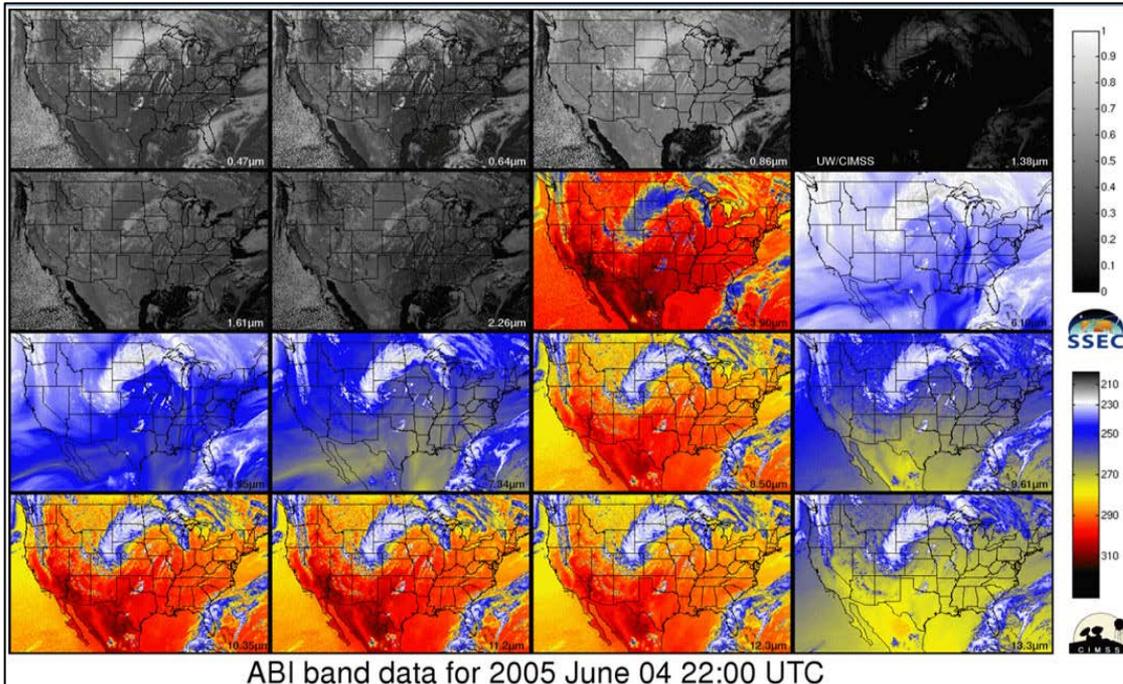


# 12.3 GOES-R Training Plan for NOAA National Weather Service Forecasters



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# NOAA/NWS Satellite Training Plan



## Contributors:

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Regional Scientists

Satellite Liaisons

GOES-R Program

SOOs – Satellite Training Advisory Team (STAT)

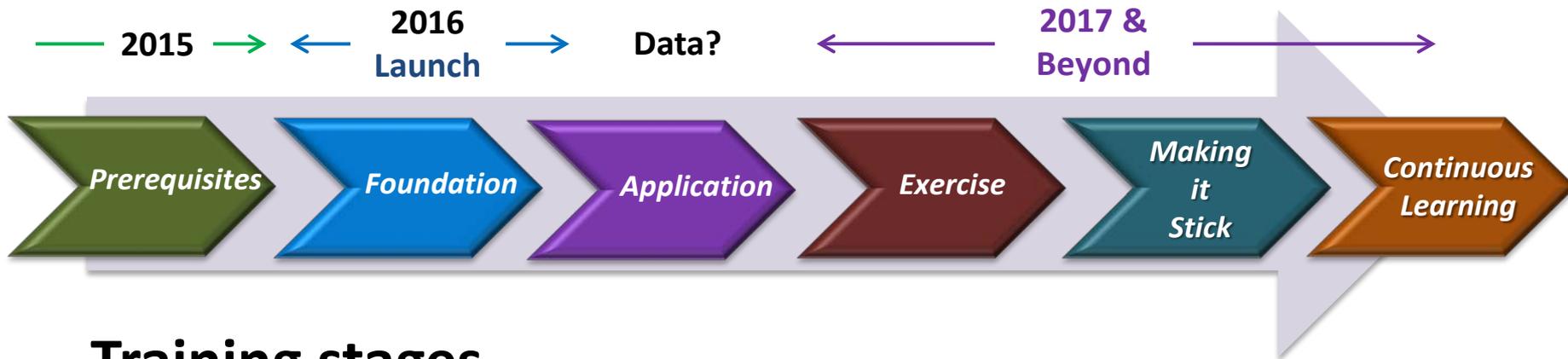
Coop Institutes: CIMSS, CIRA, CIMMS (VISIT)

COMET

NASA/SPoRT, WMO, and others



# GOES-R Training Timeline



## Training stages

Prerequisites – overall basics

Foundation – satellite specifics

Application – operational setting

Exercise – simulations, practice

Making it Stick – multi-situational, sharing

Continuous Learning – evolve and update



# NOAA/NWS GOES-R Training Plan

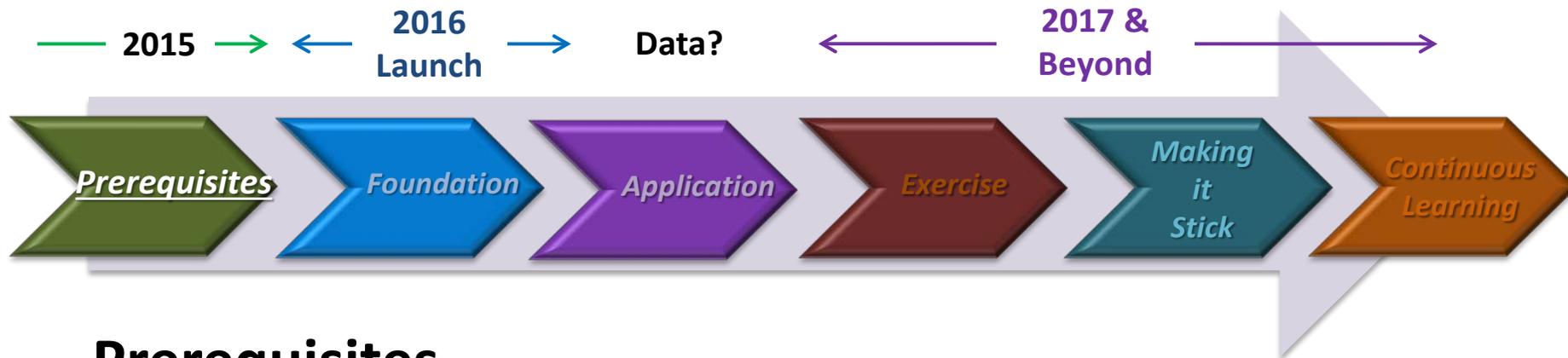


## Learning Objectives

1. Understand differences between legacy GOES & GOES-R and satellites
2. Use GOES-R for NWS forecasts and warnings & Decision Support Services
3. Utilize satellite-based total lightning detection sources in forecast & warning operations (GOES Lightning Mapper - GLM)
4. Understand fundamental RGB and other satellite products



# Satellite (GOESR) Training Timeline



## Prerequisites

Topics: Satellite Assessment on Basic Remote Sensing, Characteristics of Satellites

Who: COMET & SPORT, CIMSS, CIRA, Liaisons, SOOs, ...

What: Set of Assessment questions SOOs can use to baseline existing understanding of satellite remote sensing

Where: COMET METED

When: Summer 2016



# NOAA/NWS Satellite Training Plan



## Education/Training on Fundamentals:

### **Launch Ready: Awareness of data, products, training**

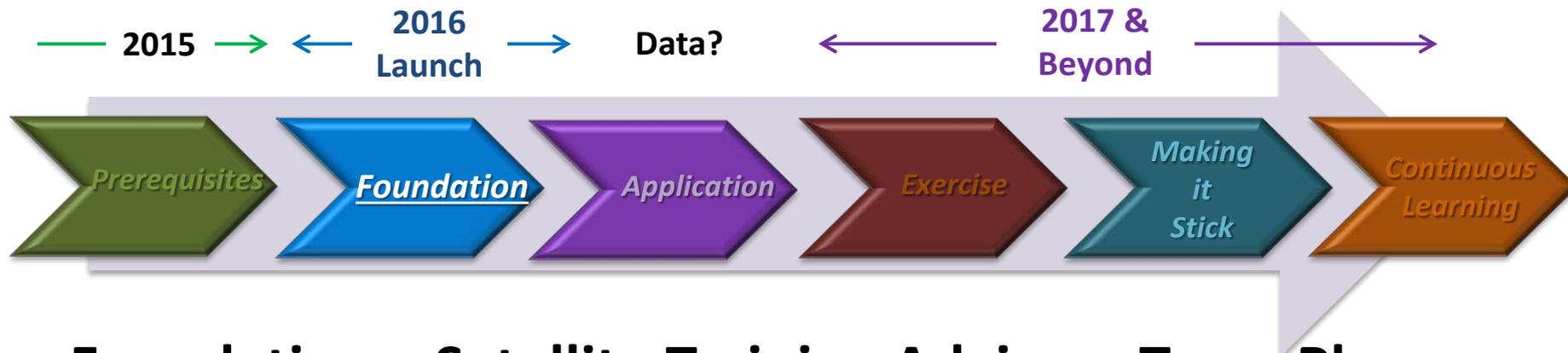
- 1 - 2 minute video series
- GOES-R Fact Sheets

### **GOES-R Basics:**

- Introduce new ABI & GLM capabilities
- Satellite remote sensing science & engineering
- Current geostationary and polar satellite comparisons
- NWP data assimilation, anticipated benefits/impacts
- Focused on NWS forecasters & AWIPS



# Satellite (GOESR) Training Timeline



## Foundation – Satellite Training Advisory Team Plan

Topics: NWS-specific development, GOES vs GOES-R, strengths and weaknesses (Himawari, MSG examples), Quick Guides

Who: OCLO, COMET, SPORT, CIMSS, CIRA, Liaisons, SOOs, ...

What: Update and shorten existing modules

Where: NWS Commerce Learning Center (CLC)

When: October 2016 - Immediately after successful launch



# Foundational Training

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- GOES-R Introduction and SatMet Background Track
  - Basic principles of radiation (15 minutes)
  - Basic operation of the GOES-R satellites (15 minutes)
  - Spectral bands (90 minutes)
  - Multichannel interpretation approaches (30 minutes)
  - Baseline products (90 minutes)
- Geostationary Lightning Mapper Track (40 minutes)
- Mesoscale/Convection Track (120 minutes)
- Synoptic Features Track (80 minutes)
- NWP/Data Assimilation Track (30 minutes)

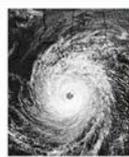


# GOES-R ABI Band Fact Sheets



## GOES-R ABI Fact Sheet Band 1 ("Blue" visible)

The "need to know" Advanced Baseline Imager reference guide for the NWS forecaster



Above: Simulated image of ABI Band 1 for Hurricane Katrina. This image was simulated via a combination of high spatial resolution numerical model runs and advanced forward radiative transfer models. Credit: CIMSS.

The 0.47  $\mu\text{m}$ , or "blue" band, one of the two visible bands on the ABI, will provide data for monitoring aerosols. Included on NASA's MODIS and Suomi NPP VIIRS instruments, there are a number of well-established benefits with this band. The geostationary 0.47  $\mu\text{m}$  band will provide nearly continuous daytime observations of dust, haze, smoke and clouds. Measurements of aerosol optical depths (AOD) will help air quality monitoring and tracking. This blue band, combined with a "green" band (which will be simulated from other bands and/or sensors) and a "red" band (0.64  $\mu\text{m}$ ), can provide "simulated natural color" imagery of the Earth. Measurements in the blue band may provide estimates of visibility. The 0.47  $\mu\text{m}$  band will also be useful for air pollution studies and improve numerous products that rely on clear-sky radiances (such as land and sea surface products). Other potential uses are related to solar insolation estimates. This band is essential for a natural "true color" RGB. Source: Schmit et al., 2005 in BAMS and the ABI Weather Event Simulator (WES) Guide by CIMSS.

### In a nutshell

GOES-R ABI Band 1 (0.47  $\mu\text{m}$  central, 0.45  $\mu\text{m}$  to 0.49  $\mu\text{m}$ )

Also Himawari-8/9 ABI Band 1, Suomi NPP VIIRS Band M2

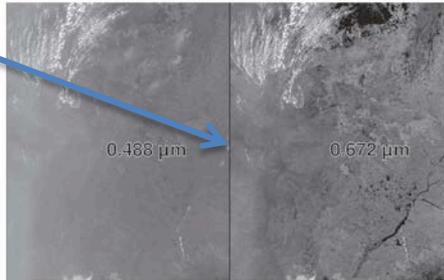
New for GOES-R Series, not available on current GOES

Nickname: "Blue" visible band

Availability: Daytime only

Primary purpose: Aerosols

Uses similar to: GOES-R ABI Band 2



Suomi NPP images of similar blue (left hand side) and red (right hand side) visible bands. Note how the smoke is more apparent in the 0.488  $\mu\text{m}$  band. The image is over part of South America (August 23, 2014). Image from CIMSS.



There are two baseline scan modes from the ABI. The first is the "flex" mode that consists of a full disk scan every 15 minutes, a continental U.S. (CONUS) image every 5 minutes, and two mesoscale (nominally 1,000 km by 1,000 km) images every minute. The second mode, continuous full disk, consists of only a sequential full disk scan every 5 minutes.

Uses similar to: GOES-R ABI Band 1, Band 2



ABI. Hence, this band will be approximated from other spectral bands for use in generating true color imagery. In the case of the ABI, this approach will be a look-up table using the blue (0.47  $\mu\text{m}$ ), red (0.64  $\mu\text{m}$ ) and "veggie" (0.86  $\mu\text{m}$ ) bands.



## GOES-R ABI Fact Sheet Band 2 ("Red" visible)

The "need to know" Advanced Baseline Imager reference guide for the NWS forecaster



Above: Simulated image of ABI Band 2 for Hurricane Katrina. This image was simulated via a combination of high spatial resolution numerical model runs and advanced forward radiative transfer models. Credit: CIMSS.

The second ABI visible band is the 0.6  $\mu\text{m}$  (or "red" band). During the daytime, it will assist in the detection of fog, estimation of solar insolation and depiction of diurnal aspects of clouds. It is called the red band because the center frequency of this band is near the red part of the visible spectrum. The 0.6  $\mu\text{m}$  visible band is also used for daytime snow and ice cover, detection of severe weather, low-level cloud-drift winds, smoke, volcanic ash, hurricane analysis, and winter storm analysis. A similar band on the current GOES imager has demonstrated many of these applications, although the ABI will offer improved spatial and temporal resolutions. This band is essential for a natural color RGB. Since there is no "green" ABI band on the GOES-R series, this band will be approximated from other spectral bands for use in generating "true color" imagery. In the case of the ABI, this approach will be a look-up table using the "blue" (0.47  $\mu\text{m}$ ), red (0.64  $\mu\text{m}$ ) and "veggie" (0.86  $\mu\text{m}$ ) bands. Source: Schmit et al., 2005 in BAMS, Miller et al. 2012 and the ABI Weather Event Simulator (WES) Guide by CIMSS.

### In a nutshell

GOES-R ABI Band 2 (approximately: 0.64  $\mu\text{m}$  central, 0.60  $\mu\text{m}$  to 0.68  $\mu\text{m}$ )

Also similar to the Suomi NPP VIIRS Band I1

Similar band available on current GOES imager

Nickname: "Red" visible band

Availability: Daytime only

Primary purpose: Clouds

Uses similar to: GOES-R ABI Band 1



True color with blue, synthetic green and red bands from ABI simulated data (from CIMSS). Image from Don Hillgen, BAMS.



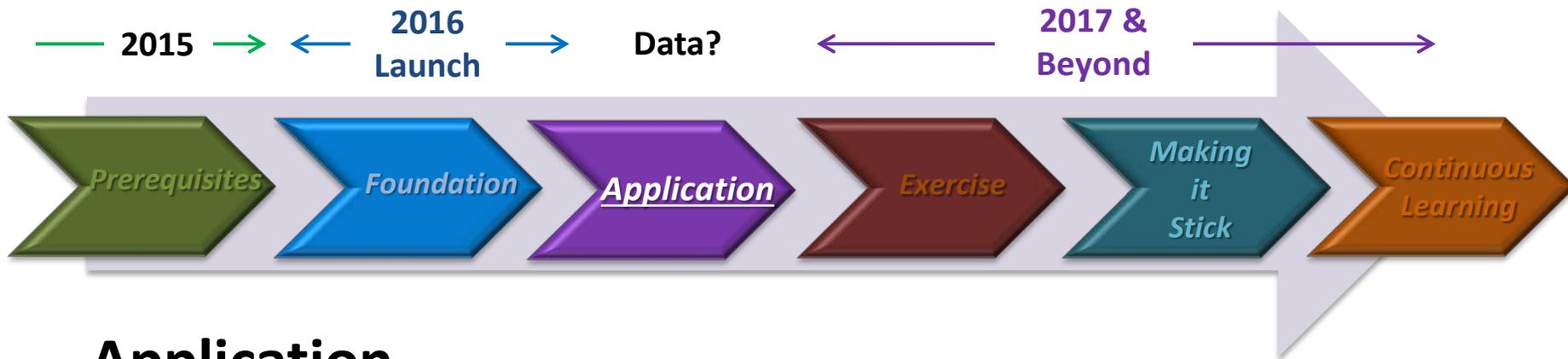
While many think that the visible band on the first geostationary imager on ATS-1 in December 1966 was a band centered at approximately 0.64  $\mu\text{m}$ , the band on ATS-1 actually peaked at approximately 0.52  $\mu\text{m}$ . The approximate resolution for this sensor was between 3 and 4 km. It was this imager that took the first full-disk Earth images from geosynchronous orbit and the first image of Earth and the moon together.

With examples from VIIRS

Thanks to Tim Schmit, George Tuggle, Michelle Smith, Carven Scott, and Bill Ward



# Satellite (GOESR) Training Timeline



## Application

Topics: Forecast/ warning process, phenomena-based, baseline products, multi-service areas (severe, winter, hydro, tropical, fire, aviation), 10-15 minute modules, highlight techniques, provide Quick Guides

Who: OCLO, COMET, SPORT, CIMSS, CIRA, Liaisons, SOOs, ...

What: Quick Guides, short 5-15 minute modules

Where: AWIPS-II and NWS CLC

When: Late 2017 – (After GOES-R post launch test)



# SatRGB Web Application

CIMSS Satellite Band WebApp | CIMSS ASPB Satellite Applets

cimss.ssec.wisc.edu/goes/webapps/satrgb/overview\_ahi.html

## First Light AHI Satellite RGB Webapp

Please note that all the applets on these pages use HTML5 and require an up-to-date browser!  
These are also "touch-friendly" and should run on mobile devices.

### Combine images from JMA's AHI to make an RGB

Maysak (30MAR2015) | Cyclone (13APR2015) | Guam (21APR2015)

S. Australia (21APR2015) | Alaska (21APR2015) | Hawaii (21APR2015)

American Samoa (21APR2015) | Russia (21APR2015) | Japan (21APR2015)

Southern Hemisphere (25JAN2015) | Russia (25JAN2015) | Japan (25JAN2015)

THE UNIVERSITY OF WISCONSIN MADISON | CIMSS | SSEC

### Combine Three Images into One Red-Green-Blue (AHI) Image

Select Image: 0.66 um (Red) | 0.86 um (Green) | 6.2 um (Blue)

Set Scale Factor: 2.2 | 1.0 | 1.0

Invert Image |  Invert Image |  Invert Image

Color: Oortona Channel |  Show Overlay

[http://cimss.ssec.wisc.edu/goes/webapps/satrgb/overview\\_ahi.html](http://cimss.ssec.wisc.edu/goes/webapps/satrgb/overview_ahi.html)



# NOAA/NWS Satellite Training Plan



## Training on Applications & Exercise:

### GOES-R Operations:

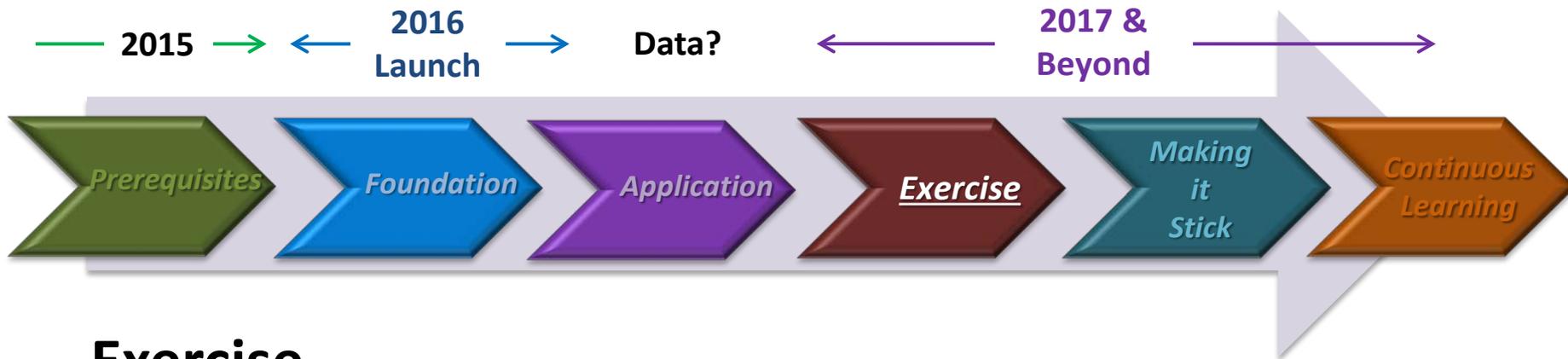
On AWIPS2 - Job aids, reference material – Virtual Lab – SPoRT demo

Weather Event Simulator (WES)

- 1: Imagery interpretation & environmental situational awareness (including 1-minute imagery)
- 2: GLM and total lightning data in forecast & warning processes
- 3: GOES-R algorithm products (Fog Low Stratus, Convective Initiation, etc.) in forecast process (diagnosis and forecast preparation)



# Satellite (GOESR) Training Timeline



## Exercise

Topics: Simulations, local training initiatives, “as it occurs” training, evolve initial satellite concept of operations

Who: OCLO, COMET, SPORT, CIMSS, CIRA, Liaisons, SOOs, ...

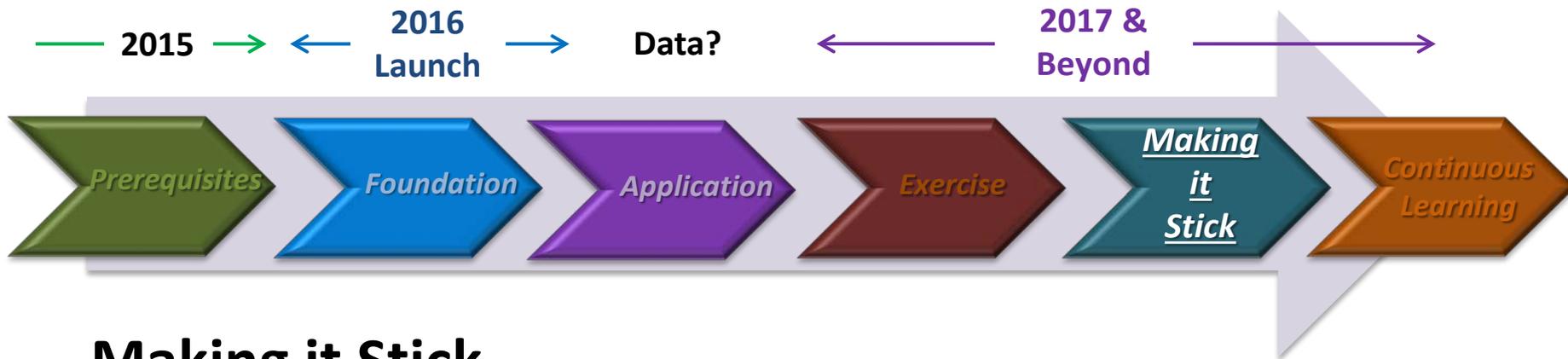
What: WES2 simulations

Where: AWIPS2

When: 2017+ GOES-R Operational



# Satellite (GOESR) Training Timeline



## Making it Stick

Topics: AWIPS references, repeat/practice, seasonal readiness, demonstrate performance, O2R, science infusion week, put in context of IDSS and WRN

Who: OCLO, COMET, SPORT, CIMSS, CIRA, Liaisons, SOOs, ...

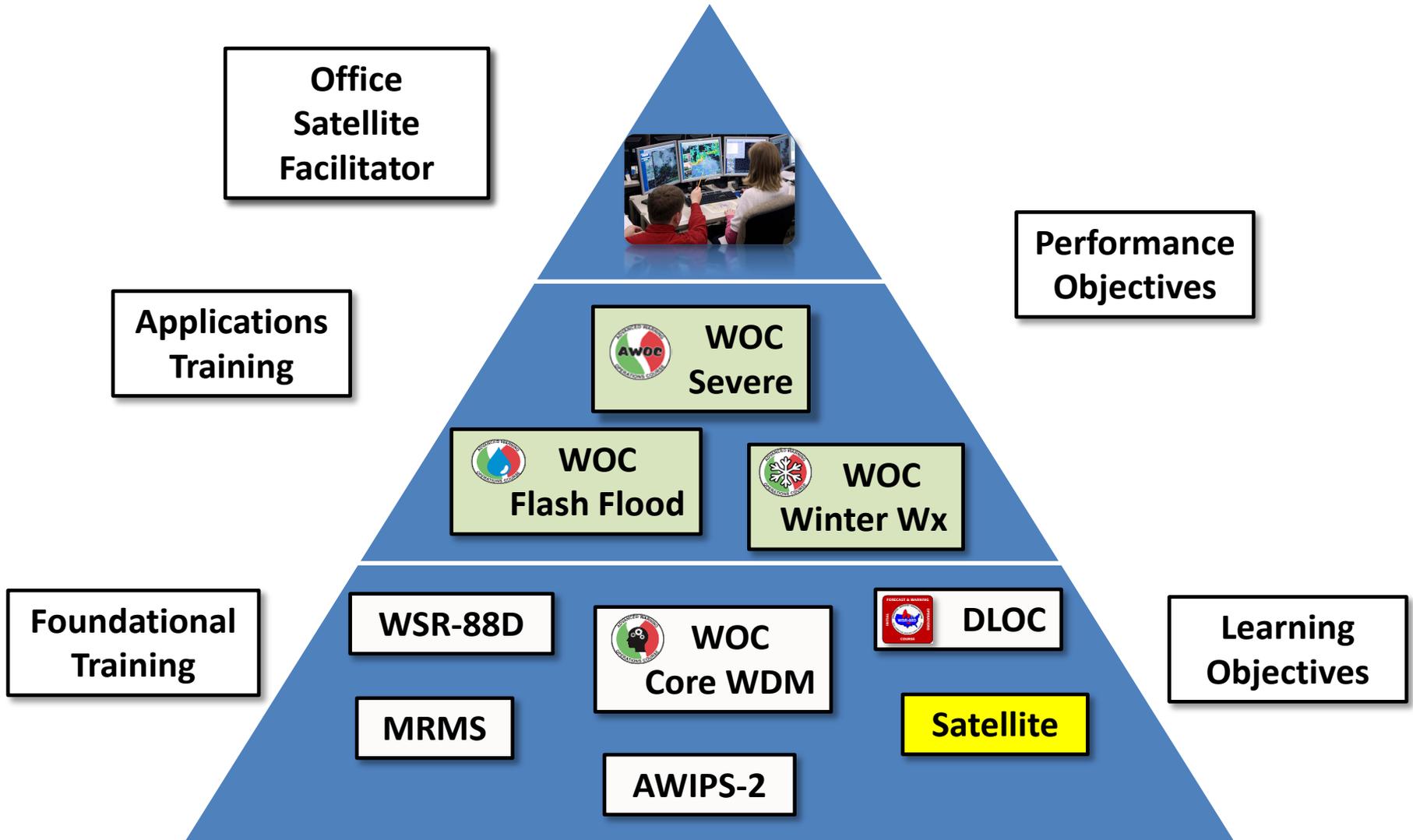
What: Blogs, peer-to-peer sharing, storm-of-the-month webinars

Where: Websites, AWIPS2, NWS CLC

When: 2017+ (GOES-S launch/checkout)



# Satellite Training Design Approach





# NOAA/NWS Satellite Training Plan



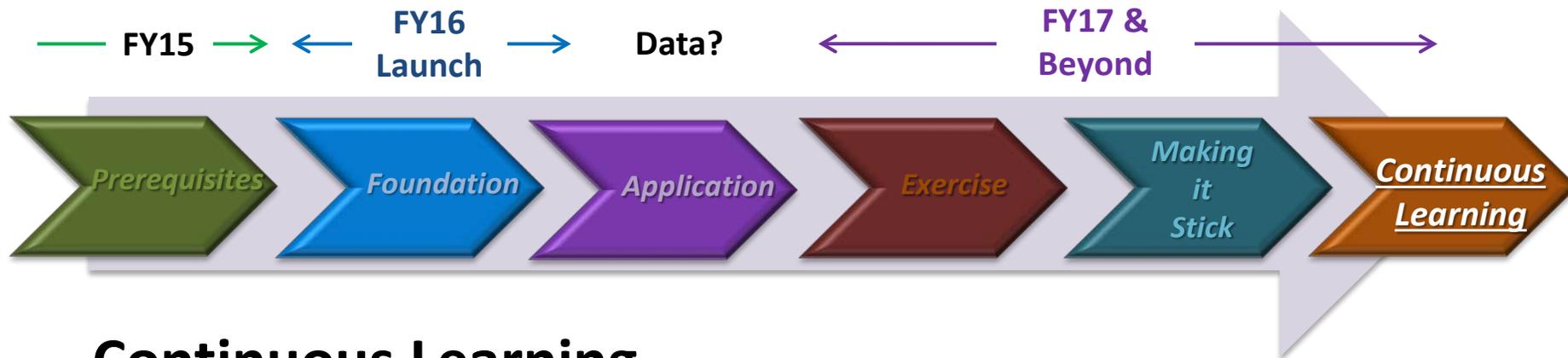
## Event of the Week/Month:

- Webinar promotes sharing of events/best practices
- Participation & collaboration with experts (R2O, O2R, R2A)
- Focus on interpretation of satellite data utilizing real events
- Builds credibility & understanding among forecasters
- Accomplished by leveraging expertise and satellite liaison

Note: Modeled after highly successful Dual-pol radar training “Storm of the Month”.



# Satellite (GOESR) Training Timeline



## Continuous Learning

Topics: Migrate new techniques in Research to Operations, Seasonal readiness, optimize operational implementation, update with science, services, user feedback

Who: R2O and O2R at National Centers, OPG, Testbeds

What: Blogs, peer-to-peer sharing, storm-of-the-month webinars, ...

Where: AWIPS2, NWS CLC, websites (COMET, VISIT, WMO)

When: Start in 2018 - Continues through GOES-S



# Summary



- NWS is working with all Training Partners to ensure all NOAA users are ready to use GOES-R
- Goal is Improved Operational Performance
- Accomplished via:
  - Foundational Training
  - Applications & Exercises
  - Blended Continuous Learning to Make-It-Stick

