Towards GOES-R Launch: An Update on GOES-R Algorithm and Proving Ground Activities

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Contributions from AWG Team Leads, members of the GOES-R AWG teams, GOES-R Proving Ground Satellite Liaisons

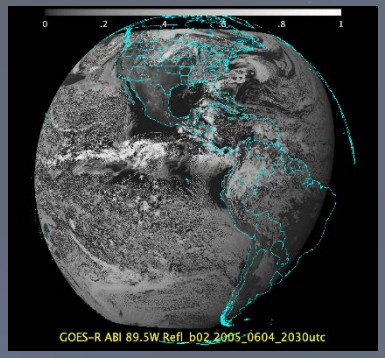
Outline

- GOES-R Instruments and products
- Preparing for GOES-R: Highlight Activities of the:
  - GOES-R Algorithm Working Group (AWG)
  - Proving Ground (PG) Program
- Summary

Expectations for GOES-R

The GOES-R series will provide significant improvements in the detection and observation of meteorological phenomena that directly impact public safety, protection of property, and our Nation's economic health and prosperity

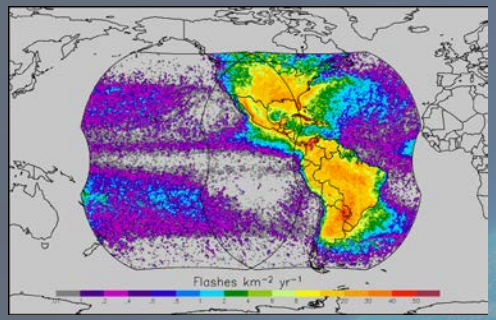
ABI



Visible & IR Imagery

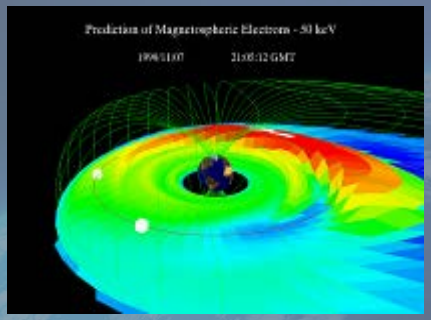
- ✓ Improves hurricane track & intensity forecasts
- ✓ Increases thunderstorm & tornado warning lead time
- ✓ Improves aviation flight route planning
- ✓ Data for long-term climate variability studies
- ✓ Low latency (30 sec ABI, 20 sec GLM)

GLM



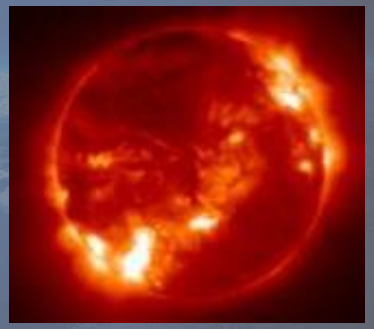
Lightning Mapping

SEISS, SUVI, EXIS, Magnetometer



Space Weather Monitoring

- ✓ Improves solar flare warnings for communications and navigation disruptions
- ✓ More accurate monitoring of energetic particles responsible for radiation hazards to humans and spacecraft
- ✓ Better monitoring of Coronal Mass Ejections to improve geomagnetic storm forecasting



Solar Imaging

GOES-R Products

Baseline Products

Advanced Baseline Imager (ABI)

- Aerosol Detection (Including Smoke and Dust)
- Aerosol Optical Depth (AOD)
- Clear Sky Masks
- Cloud and Moisture Imagery
- Cloud Optical Depth
- Cloud Particle Size Distribution
- Cloud Top Height
- Cloud Top Phase
- Cloud Top Pressure
- Cloud Top Temperature
- Derived Motion Winds
- Derived Stability Indices
- Downward Shortwave Radiation: Surface
- Fire/Hot Spot Characterization
- Hurricane Intensity Estimation
- Land Surface Temperature (Skin)
- Legacy Vertical Moisture Profile
- Legacy Vertical Temperature Profile
- Radiances
- Rainfall Rate/QPE
- Reflected Shortwave Radiation: TOA
- Sea Surface Temperature (Skin)
- Snow Cover
- Total Precipitable Water
- Volcanic Ash: Detection and Height

Geostationary Lightning Mapper (GLM)

- Lightning Detection: Events, Groups & Flashes

Space Environment In-Situ Suite (SEISS)

- Energetic Heavy Ions
- Magnetospheric Electrons & Protons: Low Energy
- Magnetospheric Electrons: Med & High Energy
- Magnetospheric Protons: Med & High Energy
- Solar and Galactic Protons

Magnetometer (MAG)

- Geomagnetic Field

Extreme Ultraviolet and X-ray Irradiance Suite (EXIS)

- Solar Flux: EUV
- Solar Flux: X-ray Irradiance

Solar Ultraviolet Imager (SUVI)

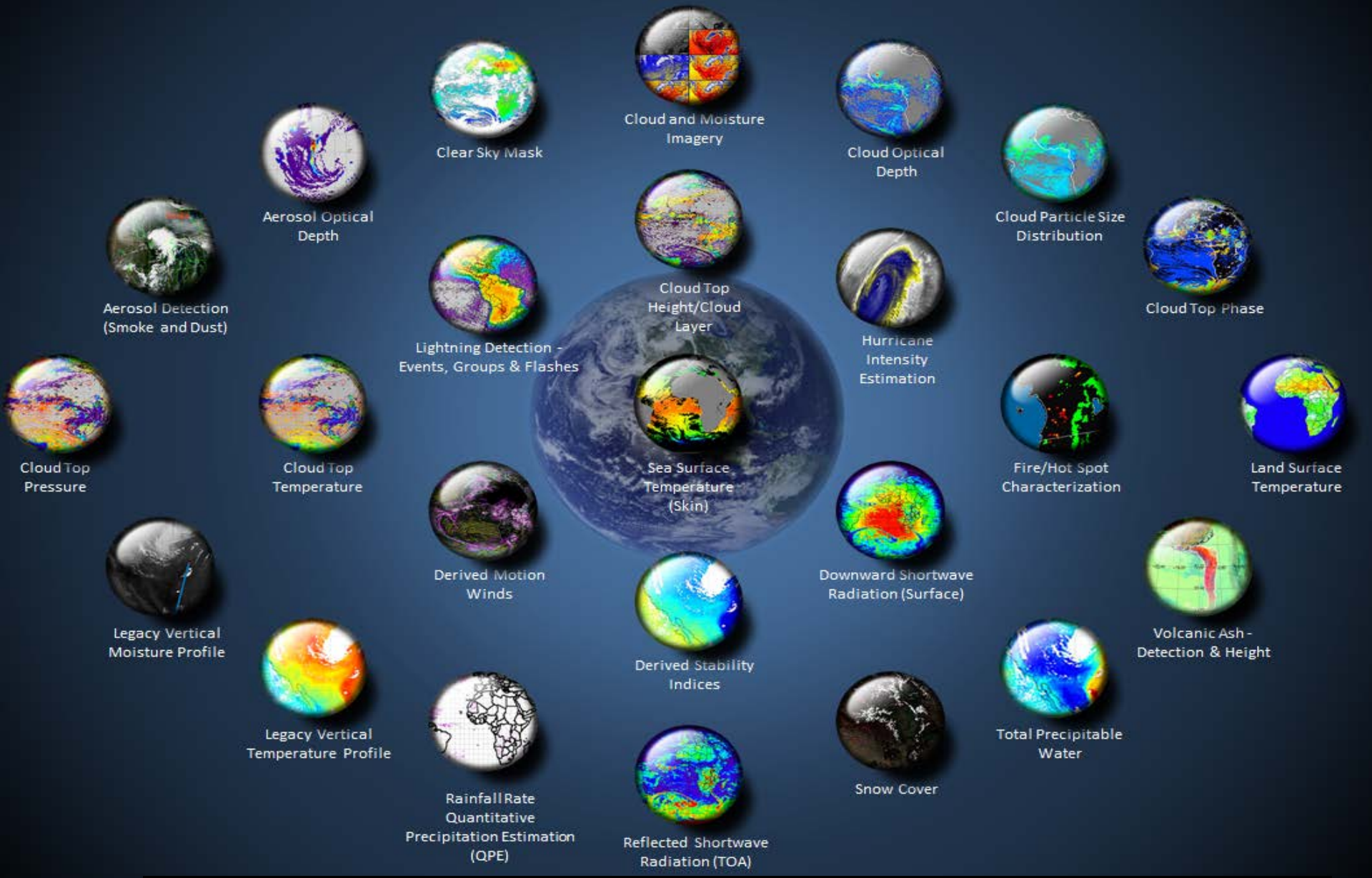
- Solar EUV Imagery

Future Capabilities

Advanced Baseline Imager (ABI)

- Absorbed Shortwave Radiation: Surface
- Aerosol Particle Size
- Aircraft Icing Threat
- Cloud Ice Water Path
- Cloud Layers/Heights
- Cloud Liquid Water
- Cloud Type
- Convective Initiation
- Currents
- Currents: Offshore
- Downward Longwave Radiation: Surface
- Enhanced "V"/Overshooting Top Detection
- Flood/Standing Water
- Ice Cover
- Low Cloud and Fog
- Ozone Total
- Probability of Rainfall
- Rainfall Potential
- Sea and Lake Ice: Age
- Sea and Lake Ice: Concentration
- Sea and Lake Ice: Motion
- Snow Depth (Over Plains)
- SO_2 Detection
- Surface Albedo
- Surface Emissivity
- Tropopause Folding Turbulence Prediction
- Upward Longwave Radiation: Surface
- Upward Longwave Radiation: TOA
- Vegetation Fraction: Green
- Vegetation Index
- Visibility

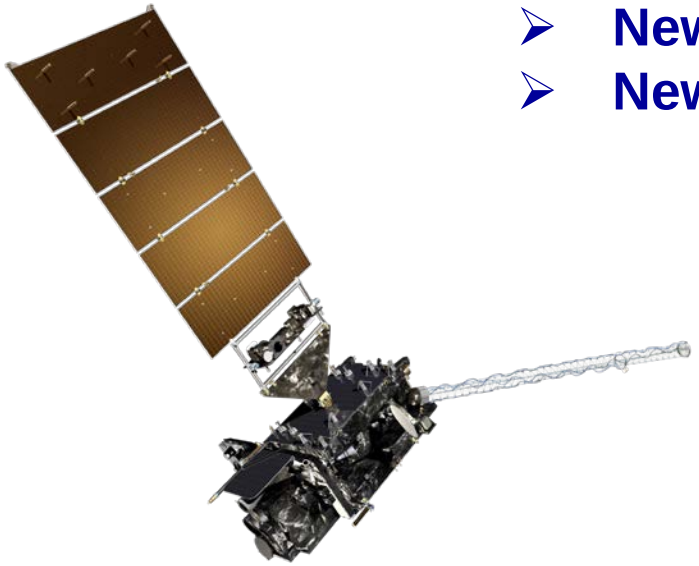
GOES-R Baseline Products



http://www.goes-r.gov/products/baseline.html

http://www.goes-r.gov/

GOES-R ABI and GLM Instruments

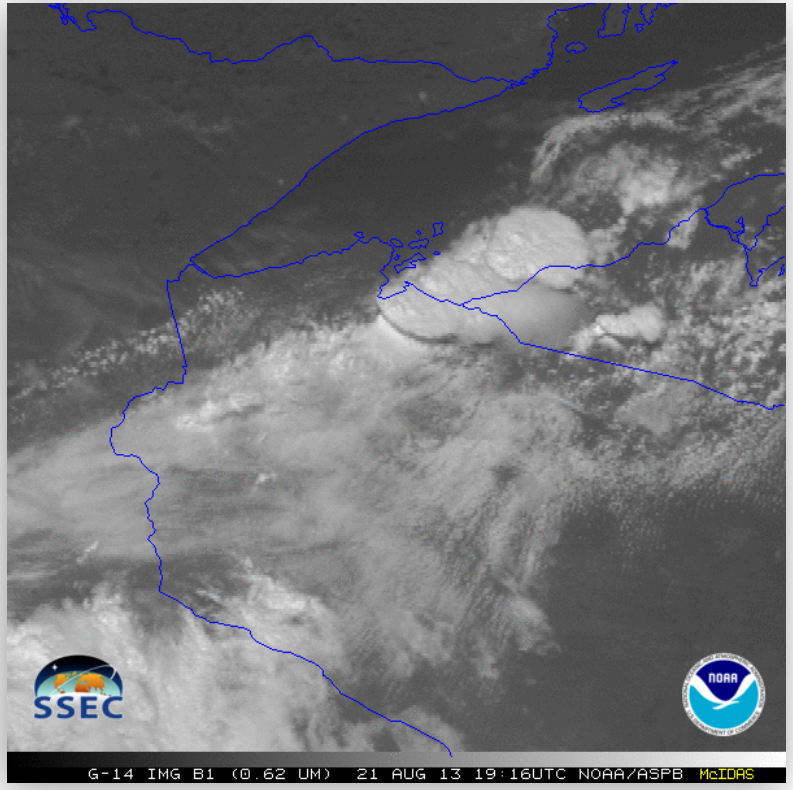


- New and enhanced capabilities
- New opportunities

GOES-R ABI Enhanced Capabilities Expected to Bring Improved Level-2 Products

- **Higher Spectral Resolution**
  - Can see and retrieve new phenomena
- **Higher Spatial Resolution**
  - Higher fidelity imagery and L2 products; information at smaller scales now observed
- **Higher Temporal Resolution**
  - Physical and dynamical processes are now captured; new information to exploit and be used by user community
- **Improved Radiometrics**
  - Translate to more accurate products
- **Improved Navigation and Registration**
  - More accurate products and improved utilization of them

All of these things contribute to one being able to observe and retrieve phenomenon not previously possible

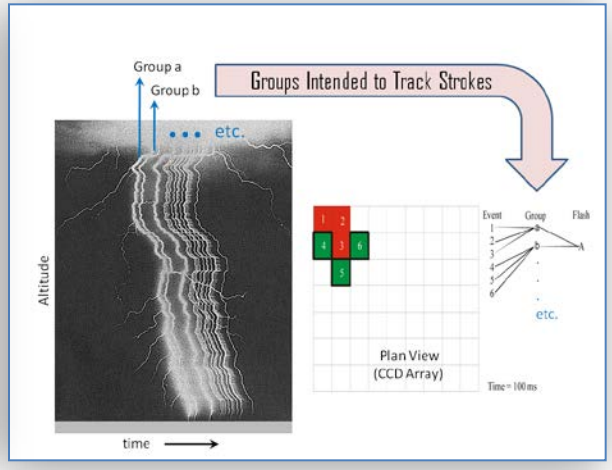


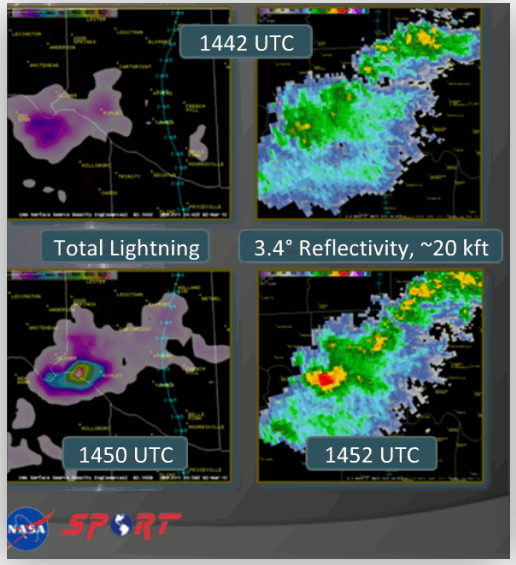
GOES-14 provided very unique information and offers a glimpse into the possibilities that will be provided by the ABI on GOES-R.

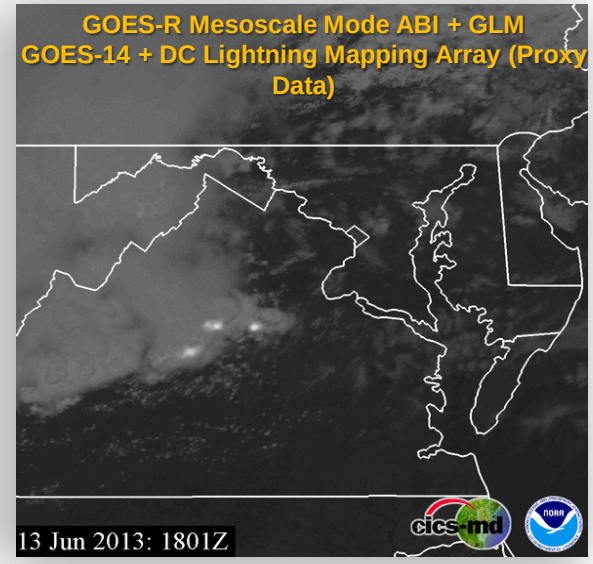
GOES-R Geostationary Lightning Mapper (GLM)

Totally new capability in a geostationary orbit!!

- GLM will observe intra-cloud (IC) and cloud-to-ground (CG) lightning at storm scale resolution across most of the Western Hemisphere with low latency (< 20 sec)
- GLM data is processed into lightning data products (Events, Groups, Flashes) that are more easily utilized by users
- Exciting new applications for improving severe weather forecasting and lightning awareness/safety

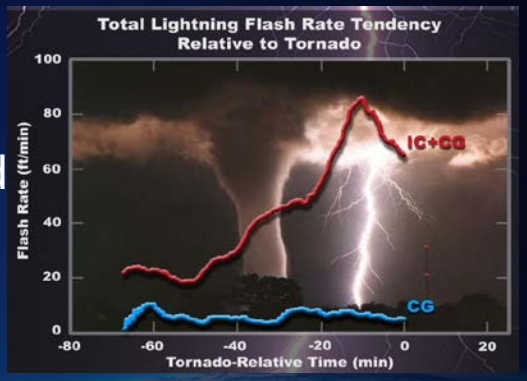


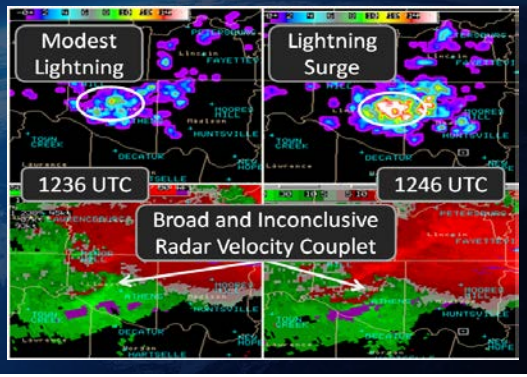


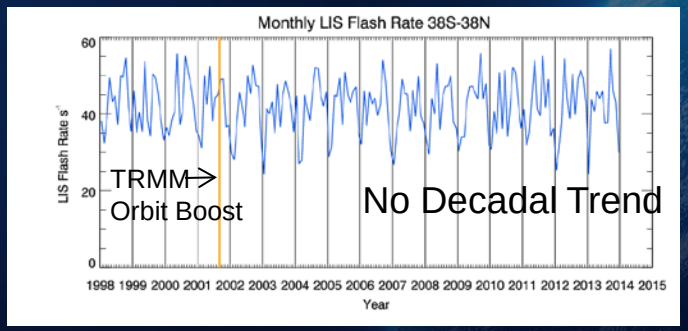


GLM Mission Benefits

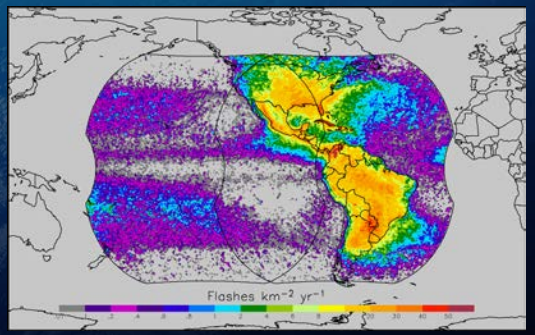
- Improved forecaster situational awareness and confidence resulting in more accurate severe storm warnings (improved lead time, reduced false alarms) to save lives and property
- Diagnosing convective storm structure and evolution
- Aviation and marine convective weather hazards
- Tropical cyclone intensity change
- Decadal changes of extreme weather – thunderstorms/ lightning intensity and distribution
- Extends 17-yr TRMM LIS Climate Data Set for 2+ decades
- GLM data latency only 20 sec



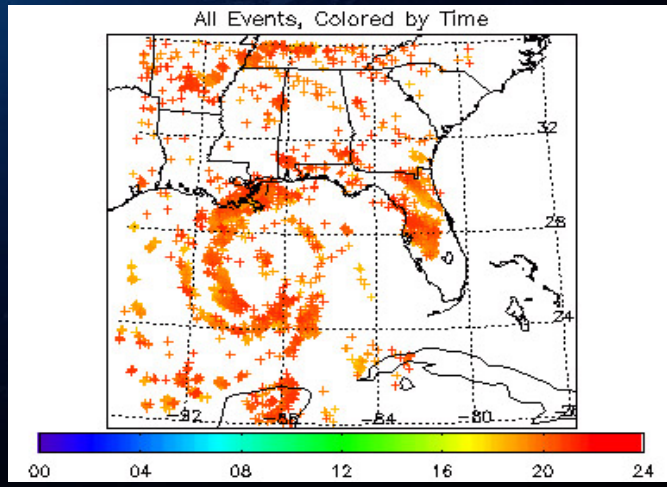




Global flash rate
from LIS/OTD (1995-2014)

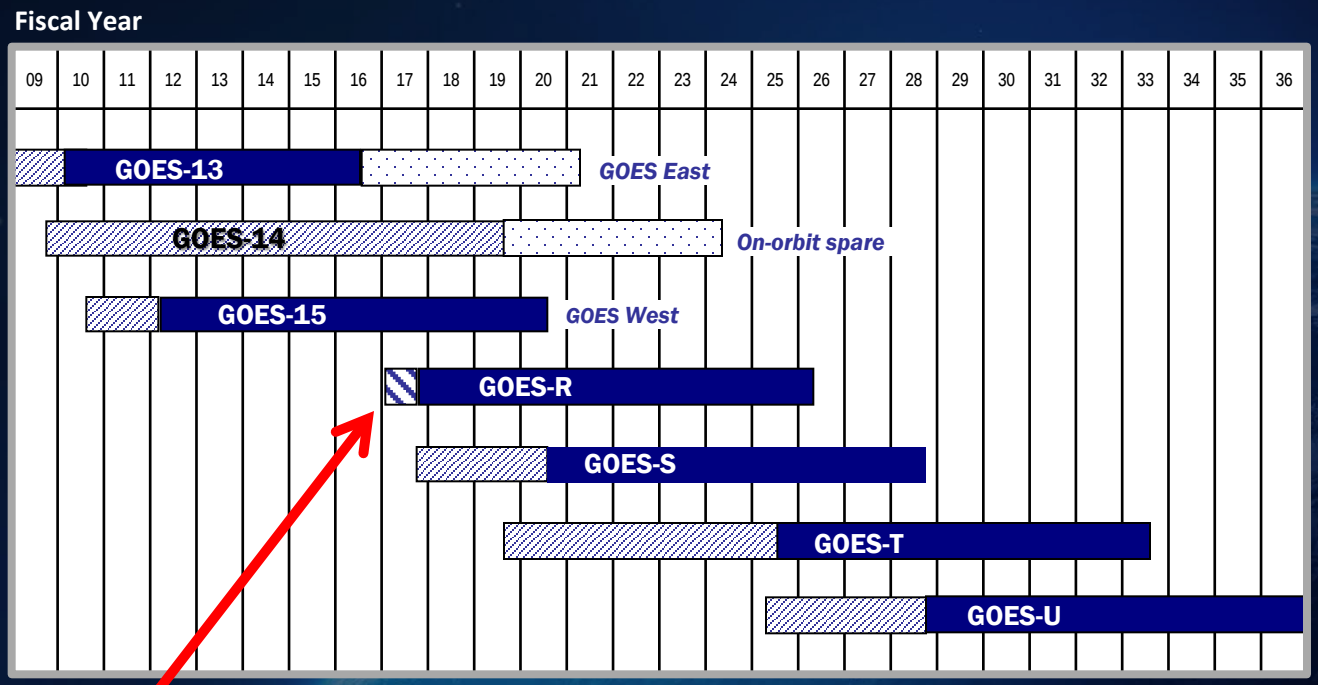


Lightning Climatology



Hurricane Katrina

Continuity of GOES Operational Satellite Program



Launch Date: October 2016

GOES: Geostationary Operational Environmental Satellite

- On-orbit storage
- Test & Checkout
- Operational
- Fuel-Limited Lifetime

Preparing for GOES-R launch

- Contributions of the AWG, GOES-R Proving Ground, and GOES-R Risk Reduction programs
- Creation and use of proxy data
- Preparing the user community
- Future capabilities and applications
- Importance of Proving Ground demonstrations and training

GOES-R Algorithm Working Group

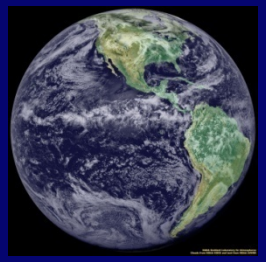
- **Mission:**
  - To select, develop, test, validate, and demonstrate Level-2+ algorithms that meet the GOES-R F&PS requirements and provide them to the GOES-R Ground Segment.
  - Provide sustained life cycle validation and Level-2 product enhancements

- **End-to-End Capabilities**
  - Instrument Trade Studies
  - **Proxy Dataset Development**
  - **Algorithm Development and Testing**
  - **Product Demonstration Systems**
  - **Development of Cal/Val Tools**
  - Integrated Cal/Val Enterprise System
  - Radiance and **Product Validation**
  - Algorithm and application improvements
  - **User Readiness** and Education

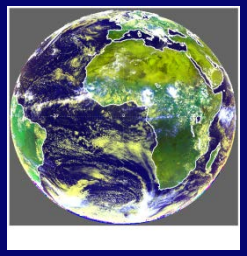
GOES-R Proxy Data Sources

"Real" PROXY Data Sources

Current GOES

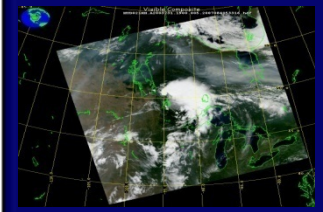


Meteosat/
SEVIRI



Himawari-8

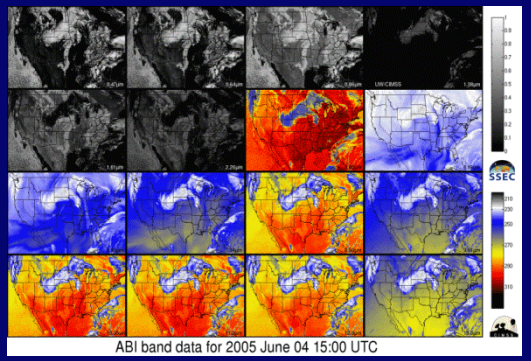
MODIS

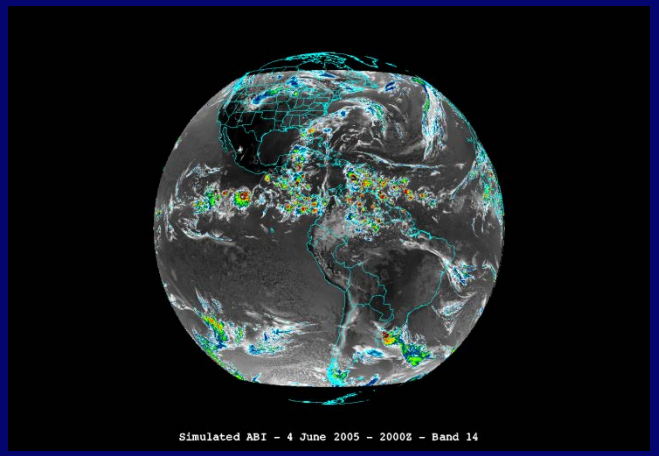


TRMM/LIS

Lightning Mapping Arrays

"Simulated" ABI Proxy Data Sources

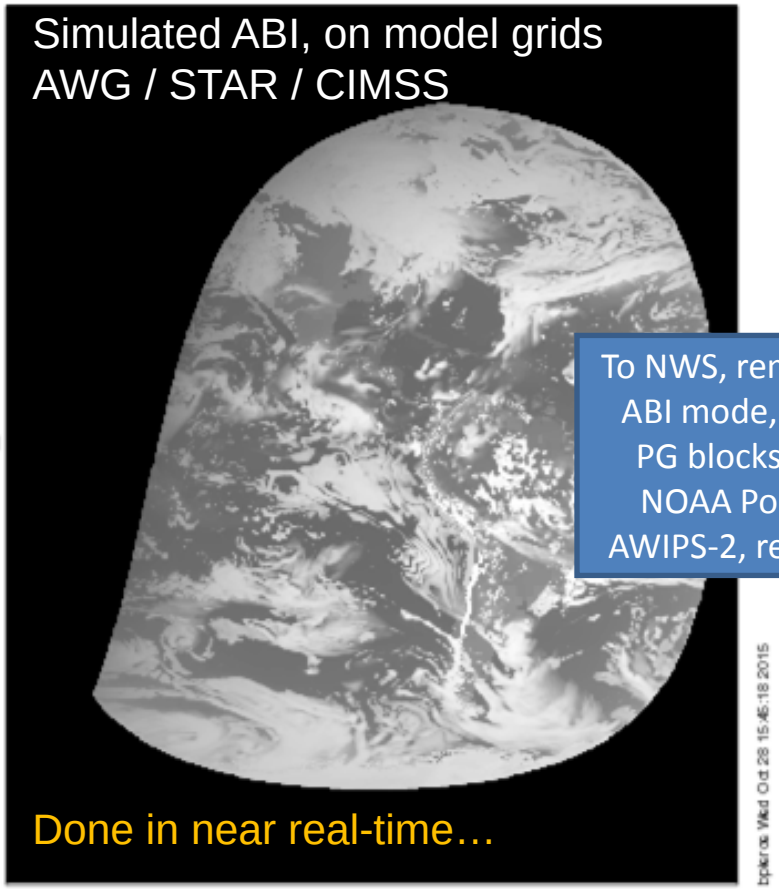




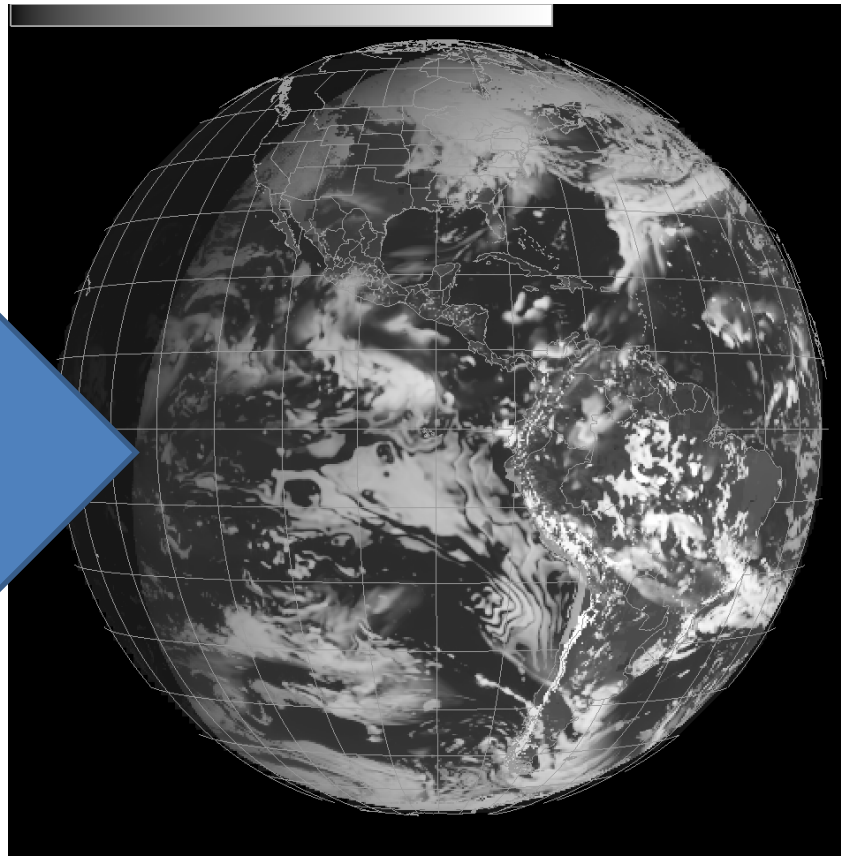
The AWG product teams use a variety of available proxy data for their pre-launch algorithm development and testing, case study analyses, and product assessment efforts…

GOES-R ABI Cloud and Moisture Imagery

Daily Real-time End-to-End Testing (from NWP to AWIPS-2)

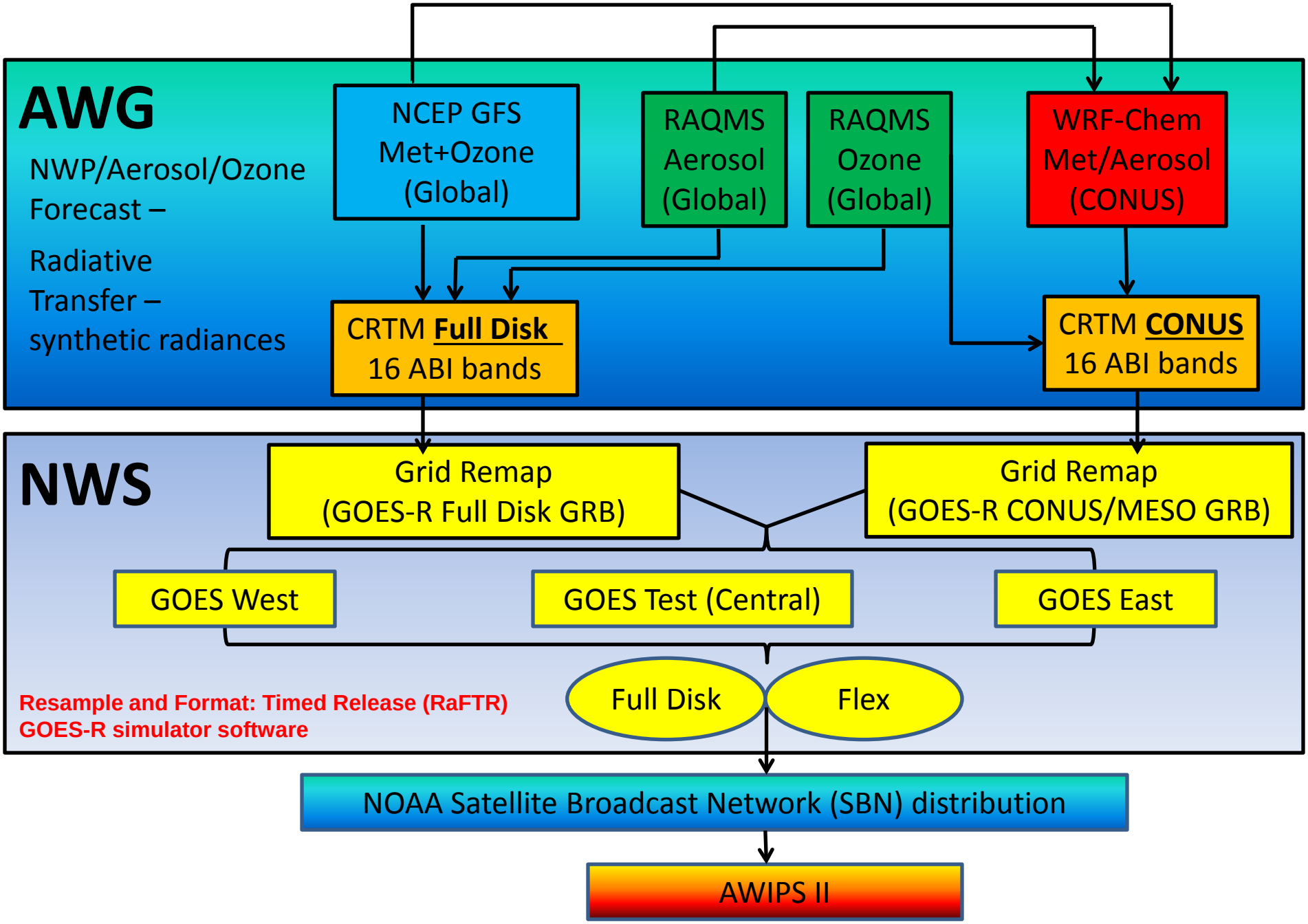


To NWS, remap, emulate ABI mode, released as PG blocks, sent over NOAA Port and into AWIPS-2, re-assembled.



Simulated GOES-R ABI Full Disk Imagery (Band 1) as displayed on a NWS AWIPS-2 Workstation

AWG GOES-R Simulated ABI Datasets

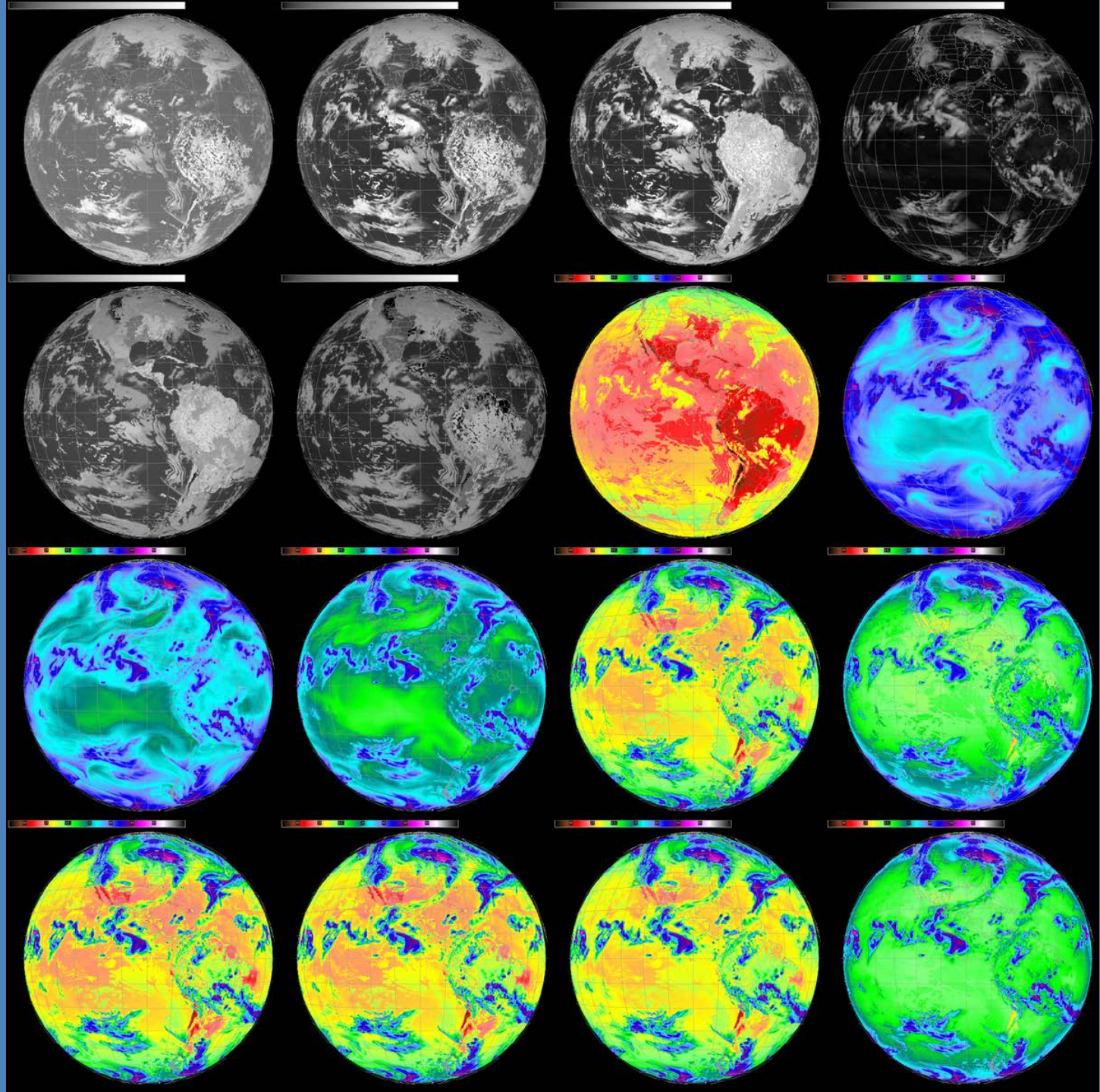


16 Simulated ABI Bands

- Visible (2)
- Near IR (4)
- IR (10)

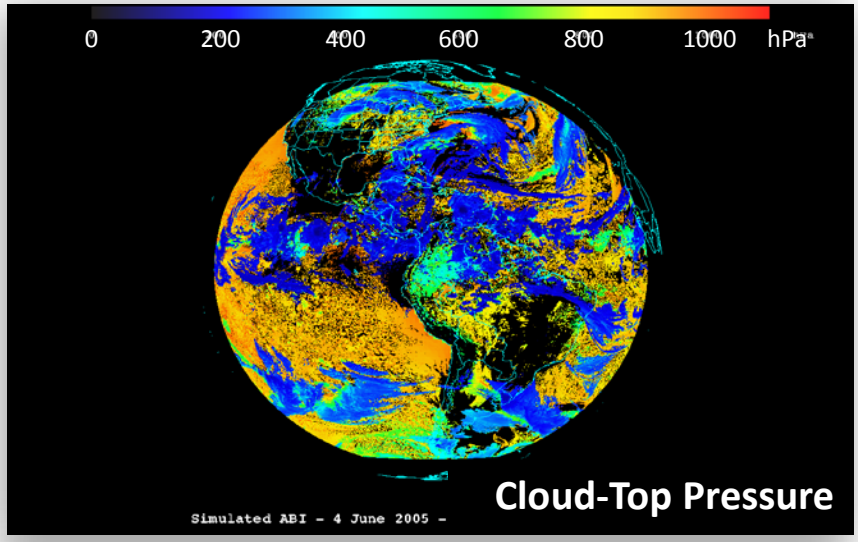
As Displayed in AWIPS-2

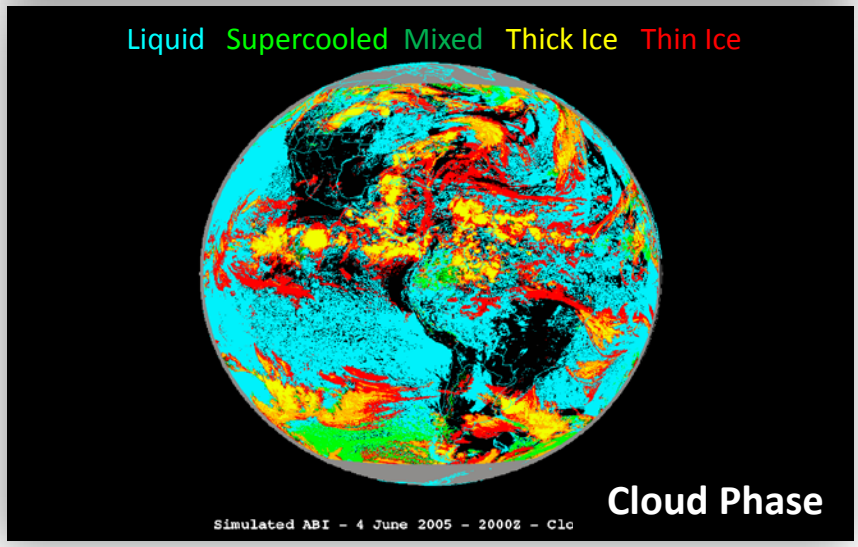
Full Disk
Central location
(Test)



Cloud Products

- **Algorithm Highlights**
  - Cloud algorithms take advantage of the ABI's spectral, spatial, and temporal resolution; and good radiometrics
  - ABI 7.3, 8.5, 11, 12 and 13.3µm channels are used to estimate cloud–top temperature, cloud emissivity, and cloud microphysical properties.
  - Cloud-top height algorithm uses an ***optimal estimation approach*** that provides retrieval error estimates; provides multi-layer solutions
  - Cloud pressure and height are computed using NWP forecast temperature profiles.
- **Operational Applications**
  - Aviation Terminal Aerodrome Forecasts (TAFs)
  - Severe storm nowcasting
  - Supplements Automated Surface Observing System (ASOS) with upper-level cloud information
  - Cloud initialization and cloud verification in NWP
  - Climate prediction
  - Height assignment of Derived Motion Winds





Andrew Heidinger (NESDIS/STAR/CIMSS)
Mike Pavolonis (NESDIS/STAR/CIMSS)

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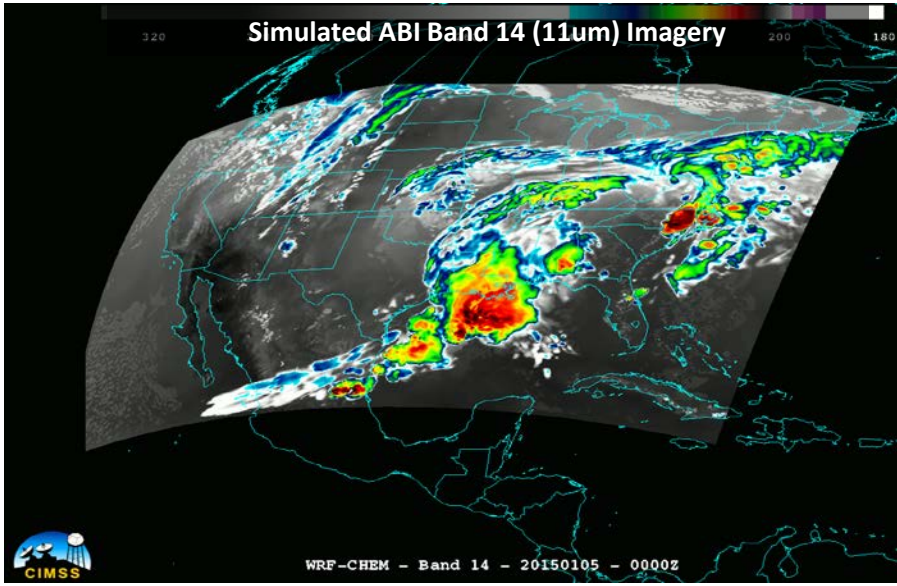
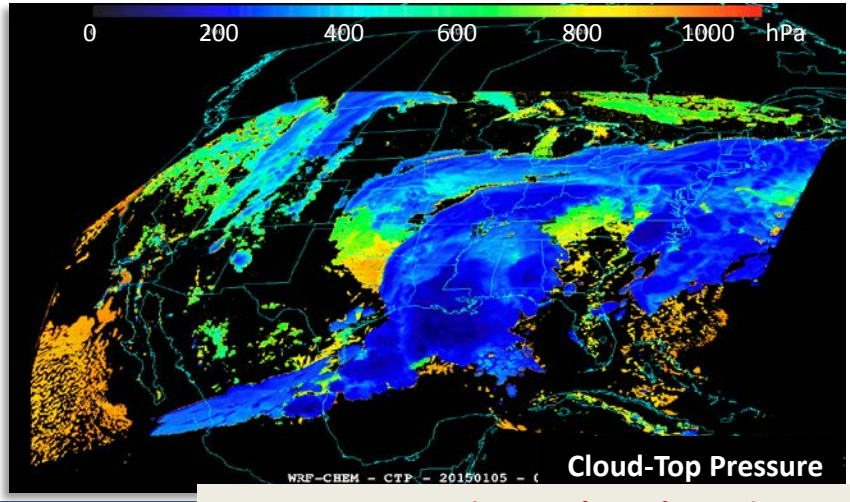
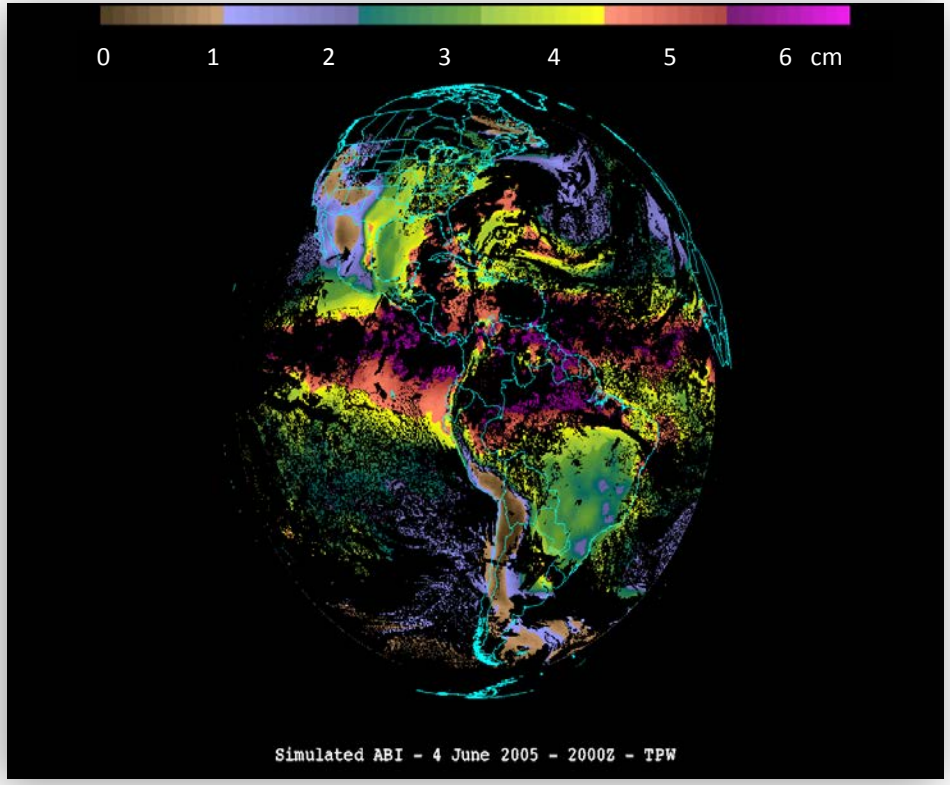




Andrew Heidinger (NESDIS/STAR/CIMSS)
Mike Pavolonis (NESDIS/STAR/CIMSS)

Total Precipitable Water (TPW)

- **Algorithm Highlights**
  - 1D-variational physical retrieval algorithm that has heritage with MODIS and current operational GOES sounder physical retrieval algorithms
  - Regression-based initial guess T/Q profiles
  - Utilizes the 6.15, 7.0, 7.4, 8.5, 9.7, 10.35, 11.2, 12.3, and 13.3 μm bands)
  - Exploits recent improvements in fast clear-sky radiative transfer models
- **Operational Nowcasting Applications**
  - Situational awareness for potential watch/warning scenarios for heavy rain and flash flooding
  - "Atmospheric Rivers" originating from the Pacific Ocean, Gulf of Mexico return flow, Southwest US monsoon
  - Future contributor to NESDIS' Blended TPW product



Tim Schmit (NESDIS/STAR/CIMSS)

Leveraging Himawari-8/AHI for GOES-R Readiness

- Himawari-8 was successfully launched October 7, 2014 and carries the AHI which is an almost identical instrument to the ABI
- Availability of AHI datasets brings an unprecedented opportunity to exercise the Level-2 algorithms developed for GOES-R
- NESDIS/STAR is routinely pulling full resolution AHI data (all bands) from JMA's Cloud Service and making it available to its Cooperative Institutes and other partners.
- GOES-R Algorithm Working Group (AWG) teams are working to test their product algorithms with AHI data
- Used in GOES-R Proving Ground Activities where users are exposed to real ABI-like data
- Special thanks to JMA for sharing data and collaborating with NOAA and NASA during their post launch checkout

Blue Marble, Himawari 8 True Color Composite
25-January-2015 02:30 UTC
Steve Miller (CIRA) - GOES-R AWG Imagery Team

Volcanic Ash

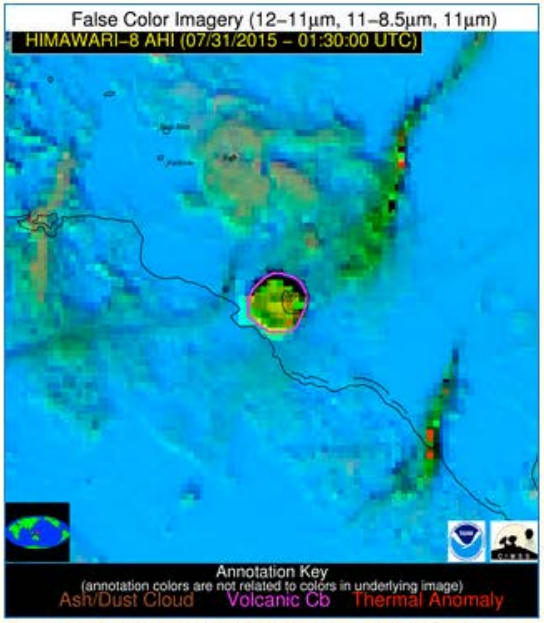
Himawari-8 testing has been excellent for GOES-R risk reduction and readiness

- **Determined best spectral channels to use; developed procedure for mitigating sub-pixel co-registration errors; exercised validation tools**
- **Real-time results showed enhanced capability to detect eruptions earlier**

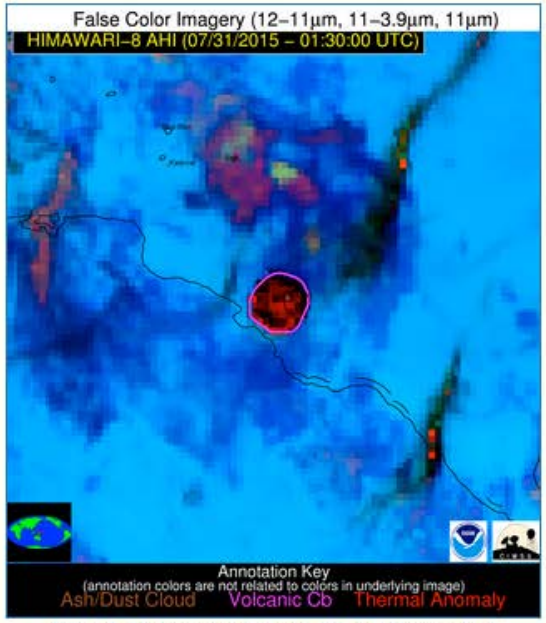
DATE:	2015-07-31
TIME:	01:30:00
Production Date and Time:	2015-07-31 02:01:32 UTC
PRIMARY INSTRUMENT:	Himawari-8 AHI

More details ▼

Possible Volcanic Cb



False Color Image (12-11, 11-8.5, 11) [zoomed-in]



False Color Image (12-11, 11-3.9, 11) [zoomed-in]

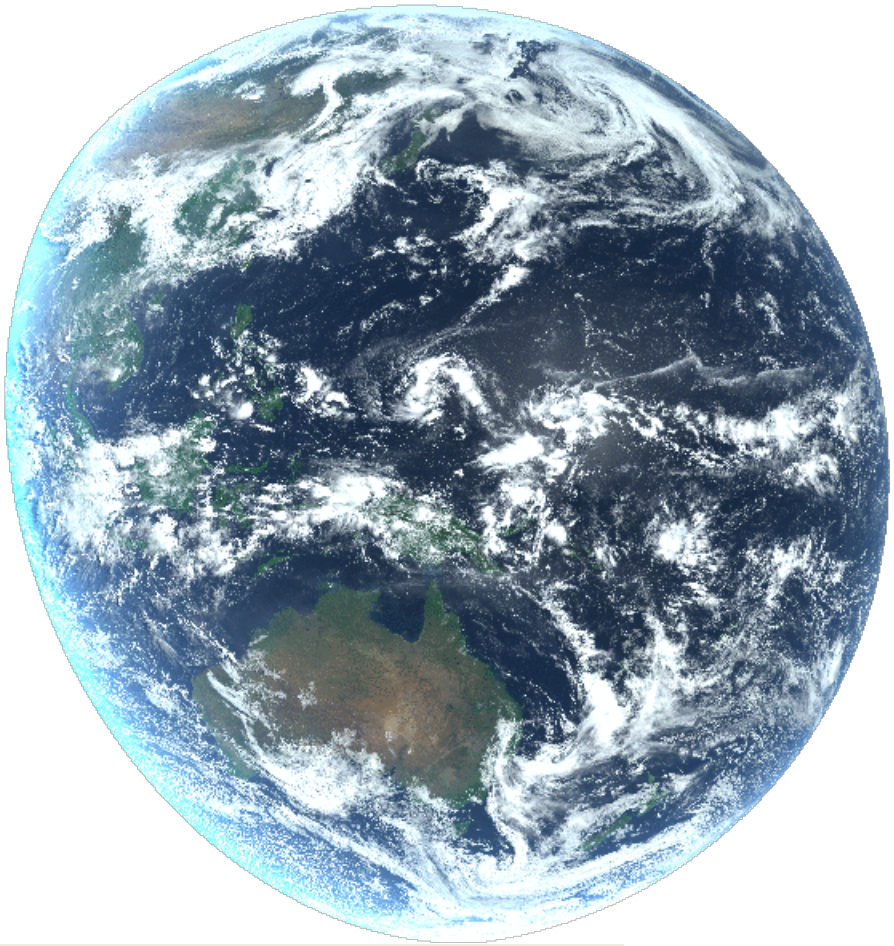
Basic Information

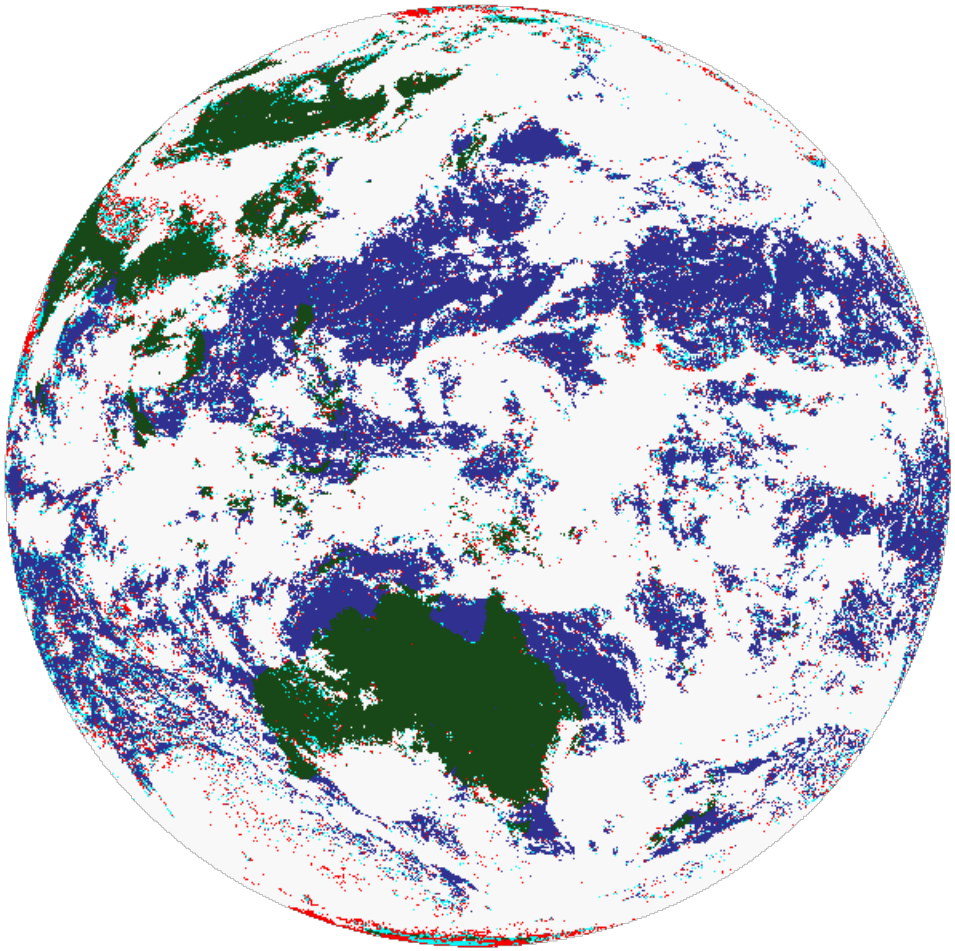
Volcanic Region(s)	Melanesia and Australia
Country/Countries	Papua New Guinea
Volcanic Subregion(s)	Northeast of New Guinea
VAAC Region(s) of Nearby Volcanoes	Darwin
Mean Object Date/Time	2015-07-31 01:35:14UTC
Radiative Center (Lat, Lon):	-4.080 °, 145.020 °
Nearby Volcanoes (meeting alert criteria):	Manam (0.60 km) Boisa (0.90 km)
Trend in IR Brightness Temperature	-62.10 °C
Vertical Growth Rate Time Interval	10 minutes
Vertical Growth Rate Anomaly	11.60 number of stddev above mean
Maximum Height [AMSL]	22.30 km; 73163 ft
90th Percentile Height [AMSL]	18.80 km; 61680 ft
Mean Tropopause Height [AMSL]	16.40 km; 53806 ft

Show More ▲ View all event imagery »

Cloud Mask (detection)

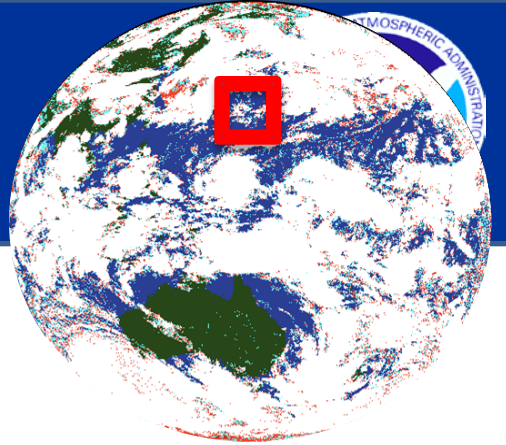
AHI 4-Level Cloud Mask



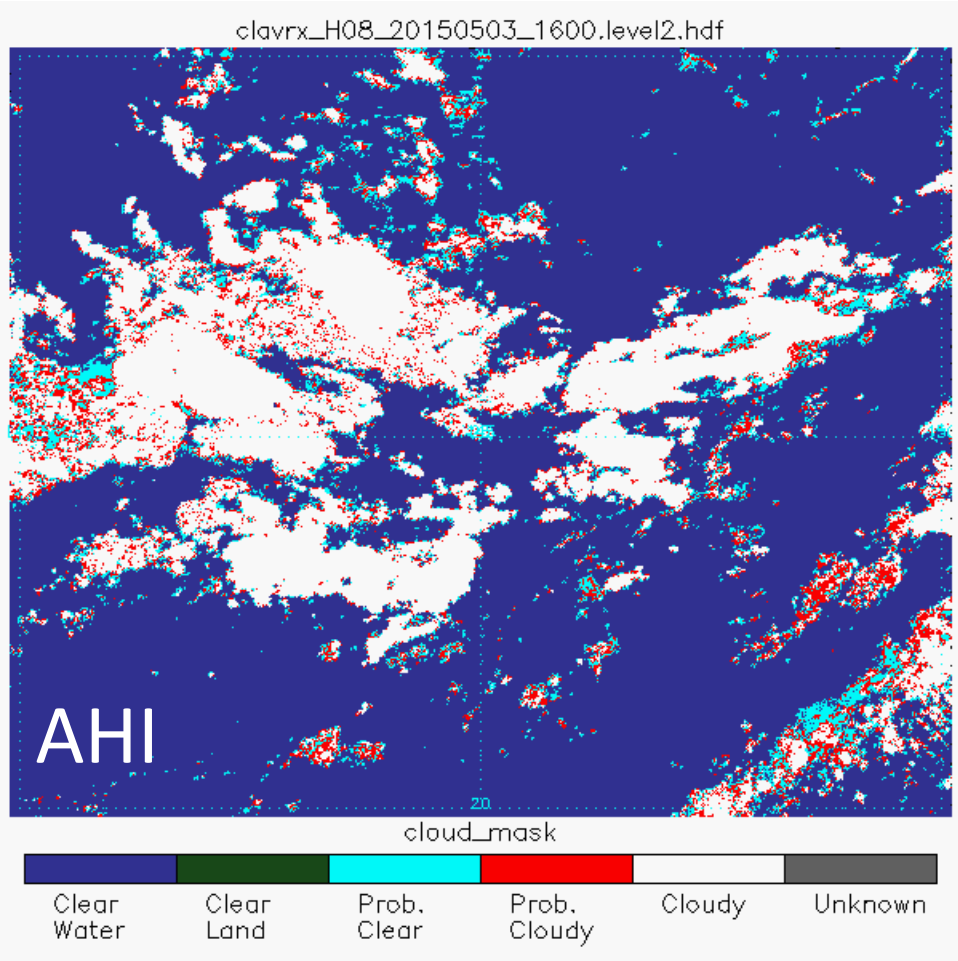


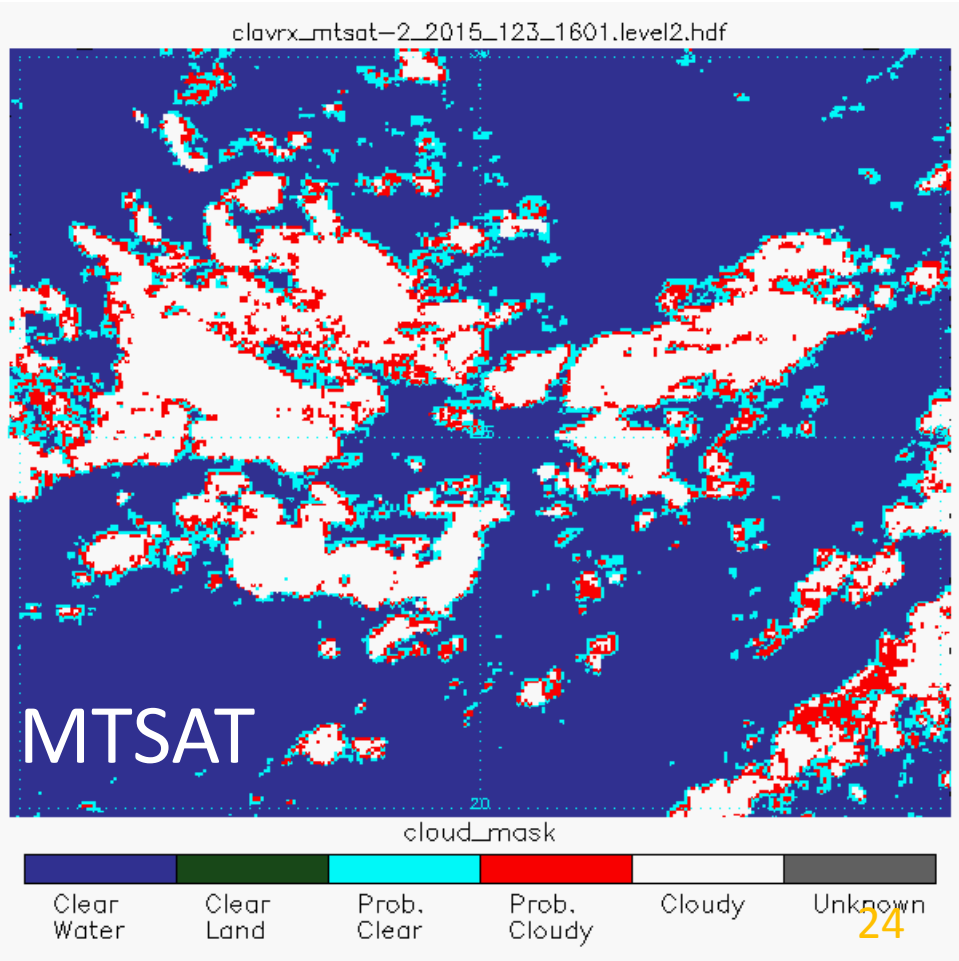
Andrew Heidinger (NESDIS/STAR/CIMSS)

Spatial Resolution Impacts

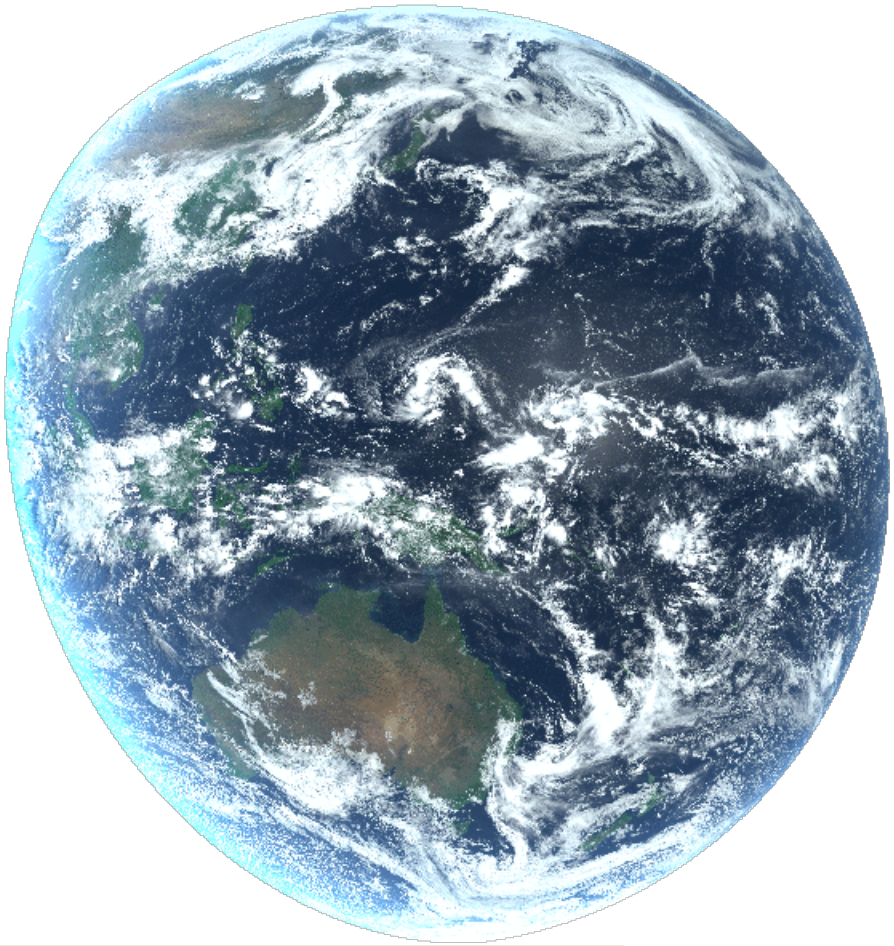


- We see a 50% reduction in the probably clear decisions
- Overall cloud fraction decreases and more holes detected
- MODIS-like resolution at AHI nadir in IR
- Example shows a nighttime animation (16Z - 17Z) on May 3

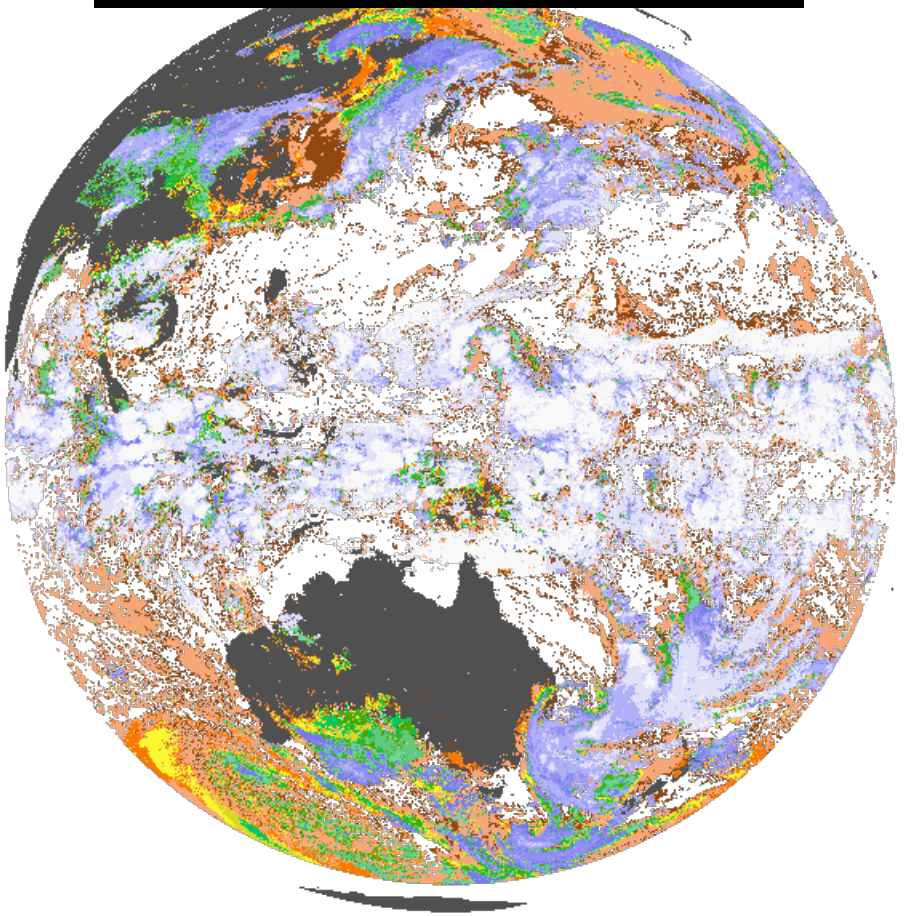




Cloud-top Pressure (vertical extent)



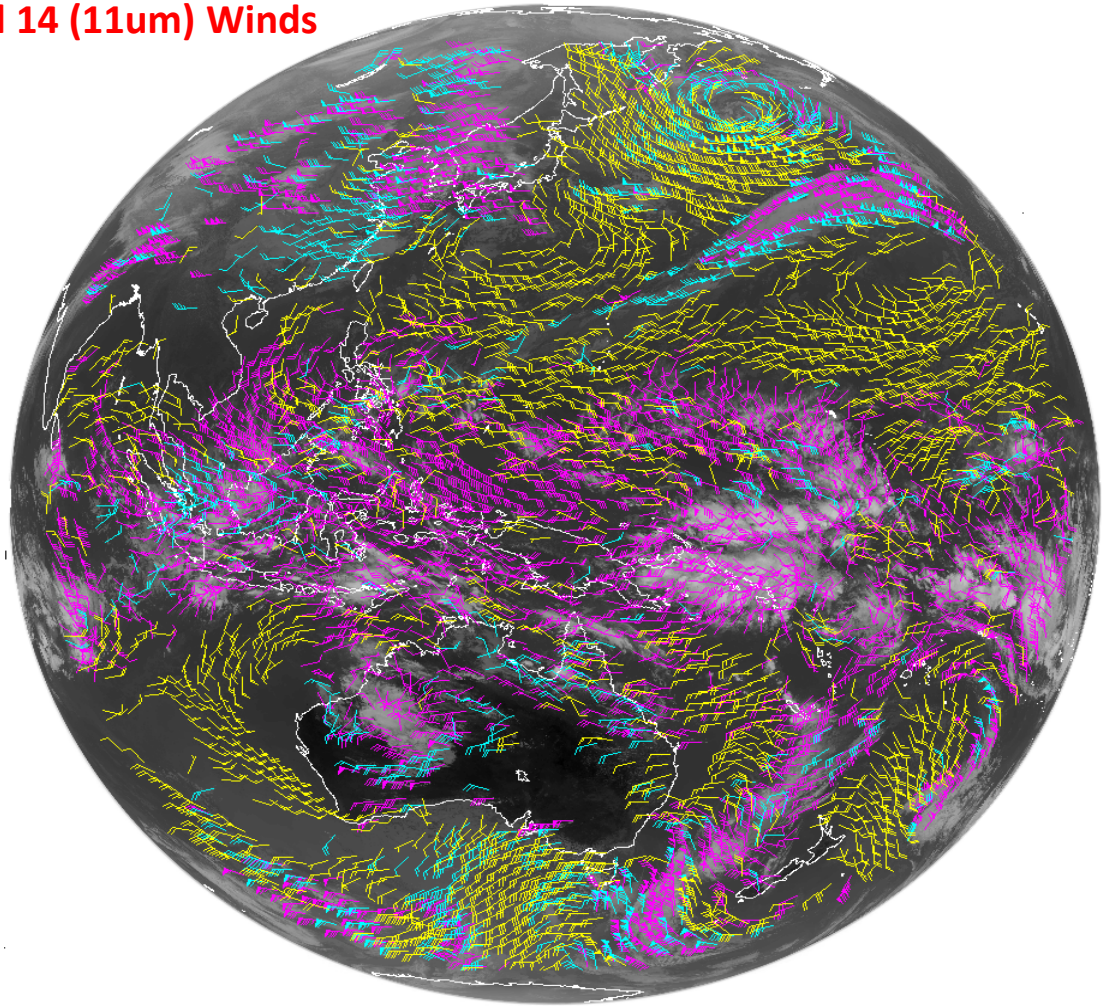
AHI Cloud-top Ptressure (hPa)



Andrew Heidinger (NESDIS/STAR/CIMSS)

H-8/AHI Winds

Band 14 (11um) Winds



High-Level 100-400 mb Mid-Level 400-700 mb Low-Level >700 mb

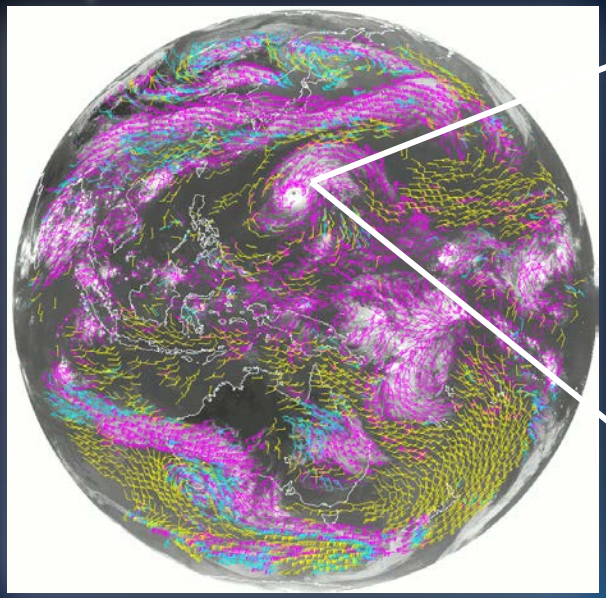
These winds were generated using 3 FD images separated by 10 minutes.

Good navigation/image registration

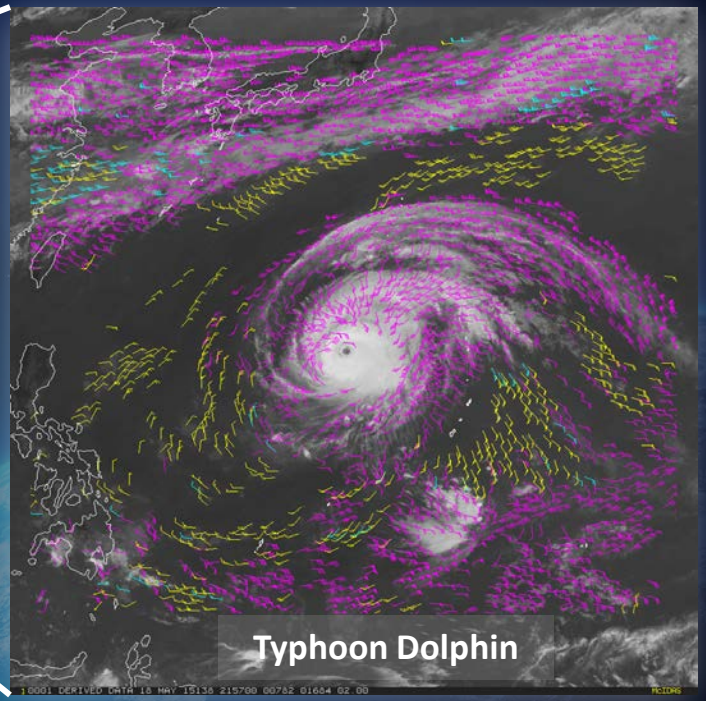
Over 50,000 AMVS were generated over the FD;
~ 4x increase from current GOES!

Expected to benefit NWP

Himawari-8 AHI as a Proxy for the GOES-R ABI – Derived Motion Winds



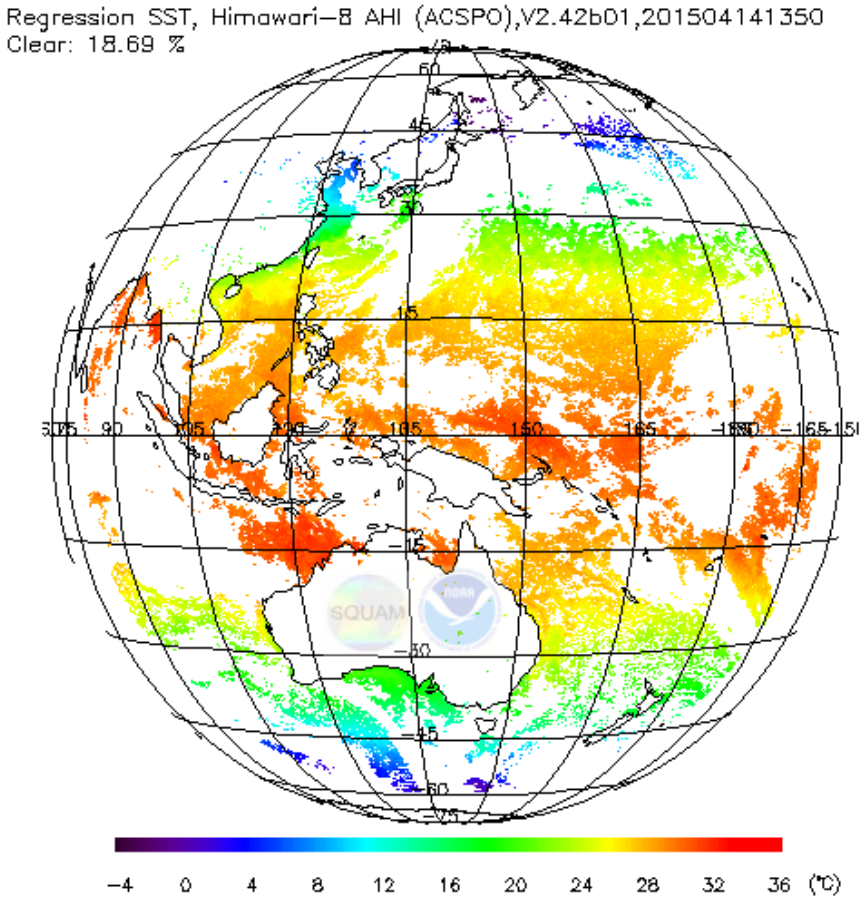
High-Level 100-400 mb | Mid-Level 400-700 mb | Low-Level >700 mb



- AHI data is the ideal ABI proxy data to perform pre-launch L2 algorithm testing and to assess L2 algorithm performance
- The AWG winds team began near real-time processing of H-8 AMVs on 8/12/2015 along with routine collocations with radiosonde observations. Work is ongoing to initiate routine collocations with aircraft wind observations .
- Exercised steps to read in L1b data for algorithm execution
- Exercised DMW validation tools
  - Visualization of DMW product over imagery
  - Collocation of DMW vs reference/ground truth wind observations (radiosondes, aircraft)
  - Computation of comparison statistics
- Will enable AWG teams to more precisely pin down the expected performance of the L2 products for both the baseline versions and most recent versions of the L2 algorithms

H-8/AHI SST

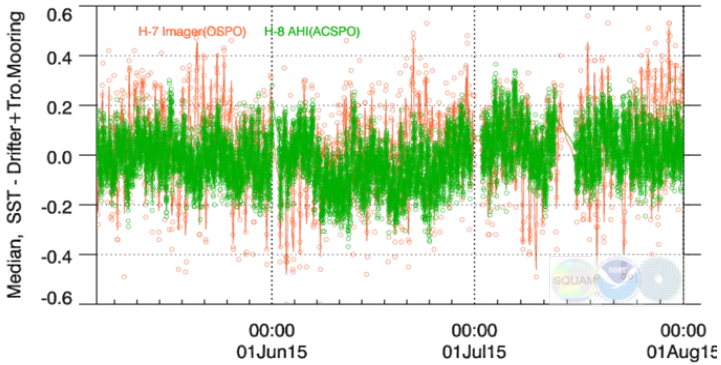
HIMAWARI-8 AHI 4/14/2015 1350 UTC



Coverage of H-8 SST is better than that of H-7 SST (Higher fraction of clear sky ocean with H-8/AHI

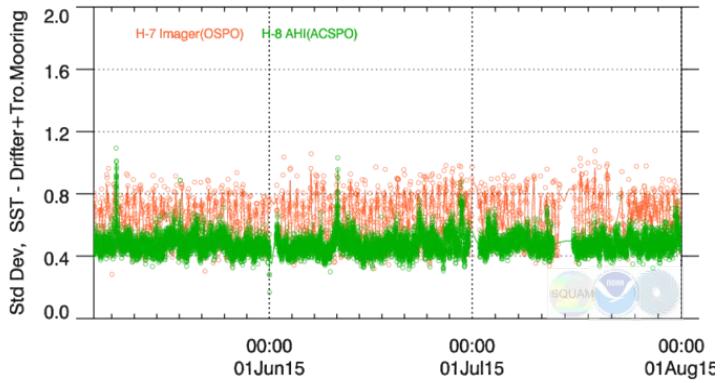
Comparison with In-situ SST

H-7 SST H-8 SST



Bias:

H-8: ±0.2K
H-7: : ±0.4K

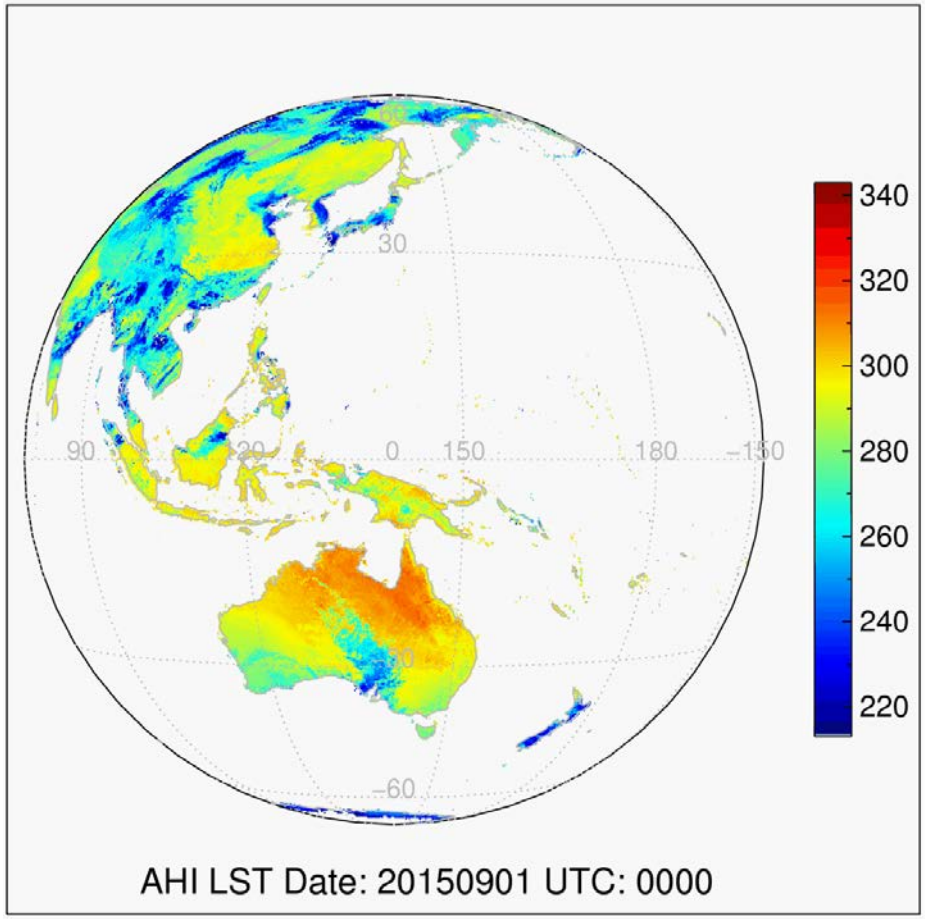


Std:

H-8: 0.5-0.6K
H-7: 0.5-1.0K

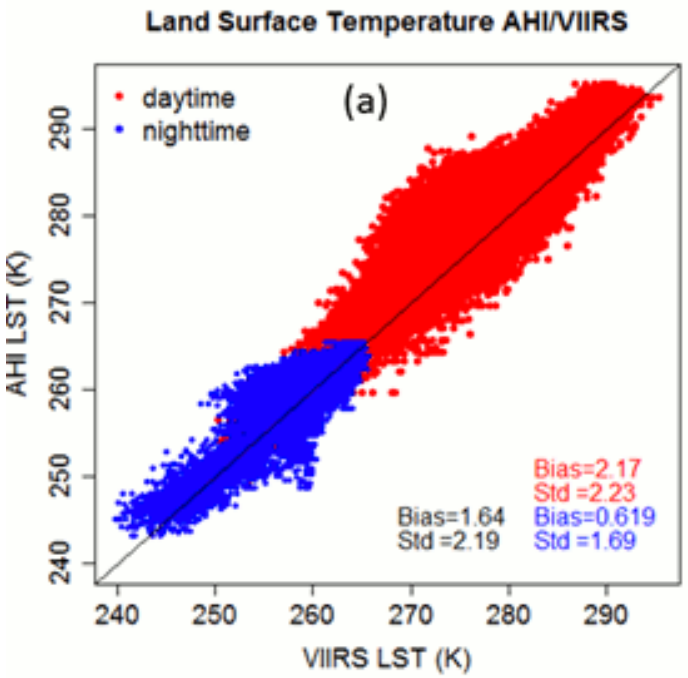
Alexander Ignatov (NESDIS/STAR)

Land Surface Temperature



H-8/AHI LST Product animation for date 2015.09.01

Cloud mask is not applied in this example.



Currently validating the ABI LST algorithm by comparing H-8 LST product with the VIIRS LST product since we do not have in-situ measurements for the validation yet.

Working to acquire in-situ LST measurements through China Meteorological stations

Bob Yu (NESDIS/STAR)

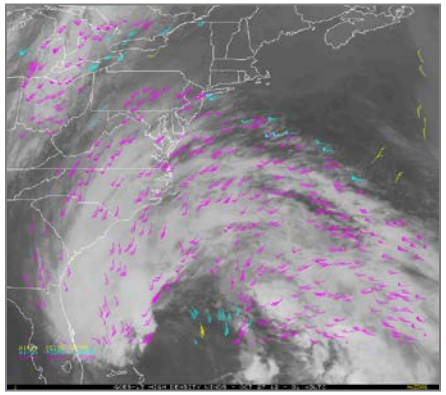
Satellite Proving Grounds

GOES-R and JPSS partner with NOAA labs and testbeds

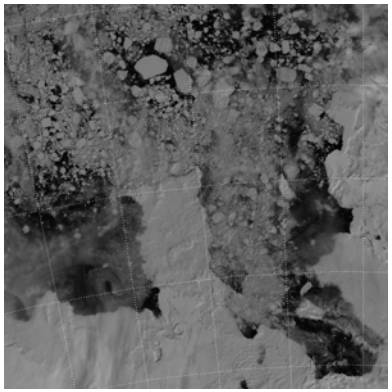
Supports demonstration and utilization of new capabilities by the end users

Facilitates the transition of GOES-R and JPSS research to applications

Incorporates user feedback for product improvements

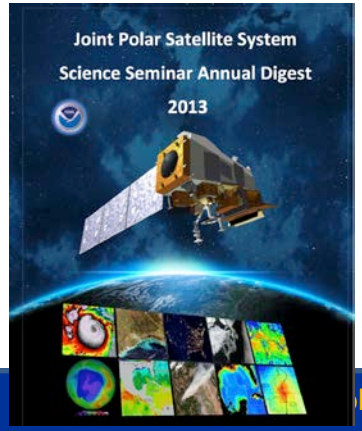


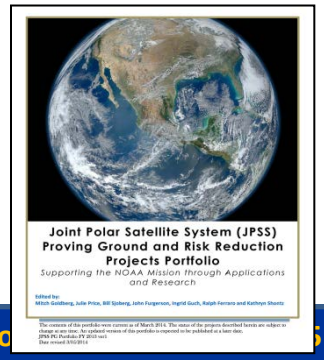
Hurricane Sandy-
GOES High Density
Atmospheric Motion Vectors

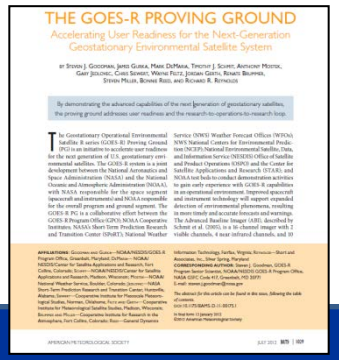


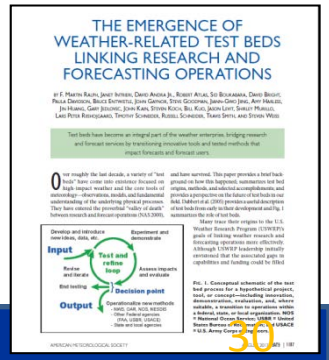
S-NPP Day/Night Band
Ice Detection

NOAA Hazardous Weather Testbed (HWT)

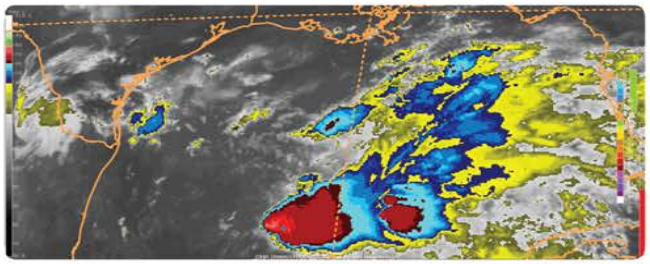




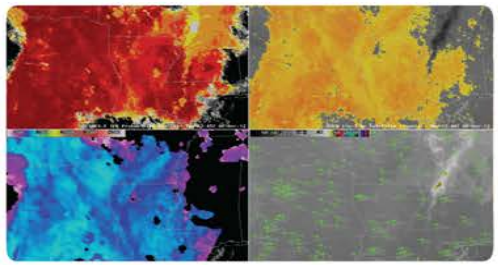




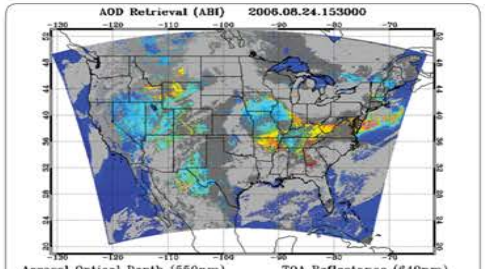
The GOES-R Proving Ground



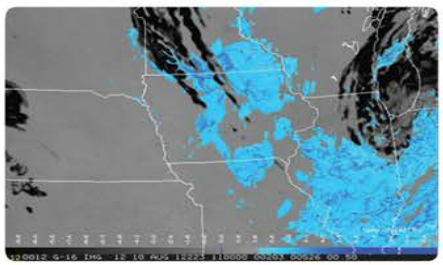
Aviation Weather Center (AWC) – Kansas City, MO
IR Imagery of Oceanic Storms



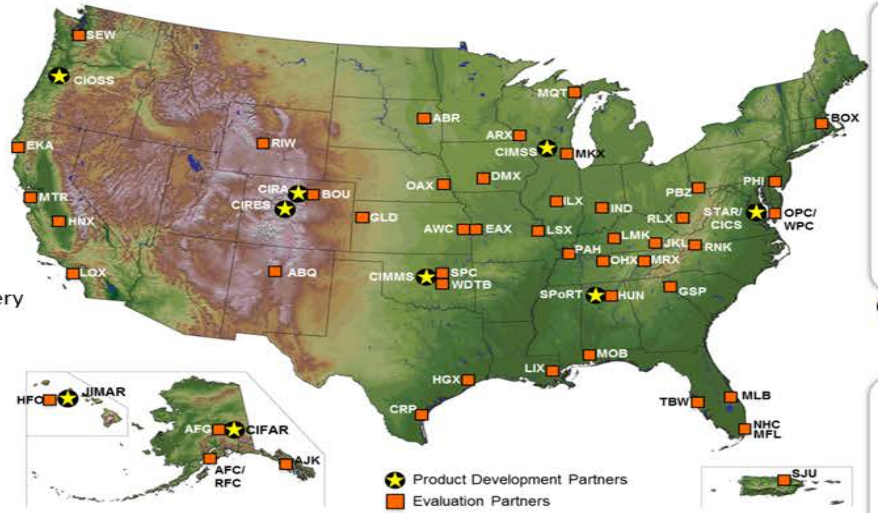
Cooperative Institute for Meteorological Satellite Studies (CIMSS)/Center for Satellite Applications and Research (STAR) – Madison, WI
Fog/Low Stratus Product

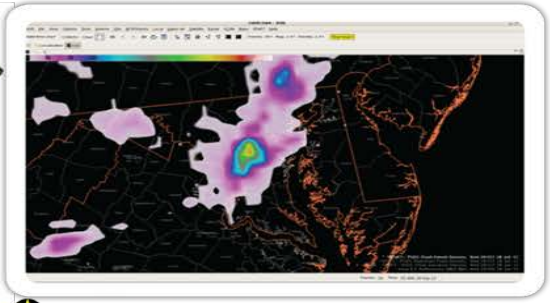


STAR/University of Maryland Baltimore County (UMBC)– College Park, MD
Aerosol Optical Depth

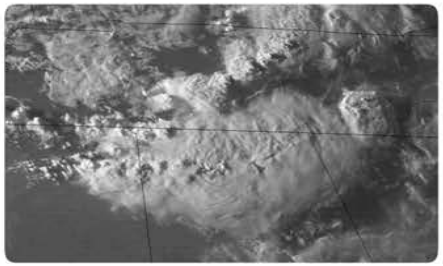


Cooperative Institute for Research in the Atmosphere (CIRA)/STAR – Ft. Collins, CO
ABI Synthetic Low Cloud Enhancement Imagery

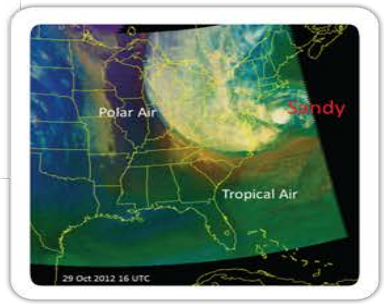




Short-term Prediction Research and Transition Center (SPoRT)/NASA – Huntsville, AL
GLM Lightning Density



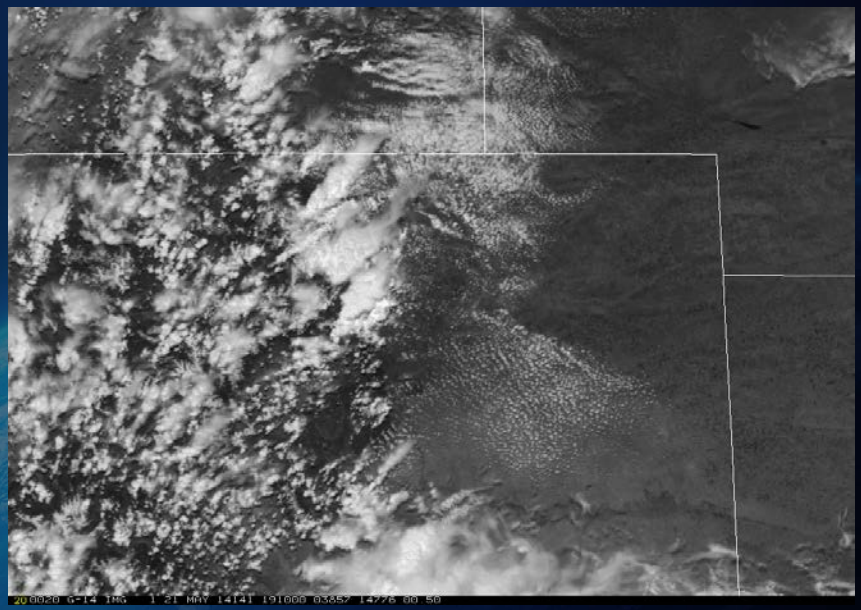
Storm Prediction Center (SPC) – Norman, OK
Severe Storms 1-Min Visible Imagery of Overshooting Tops



National Hurricane Center (NHC) – Miami, FL
RGB Air Mass for Hurricane Sandy

GOES-14 Super Rapid Scan Operations to Prepare for GOES-R (SRSOR)

DIA Tornadic Storm: 5/21/14



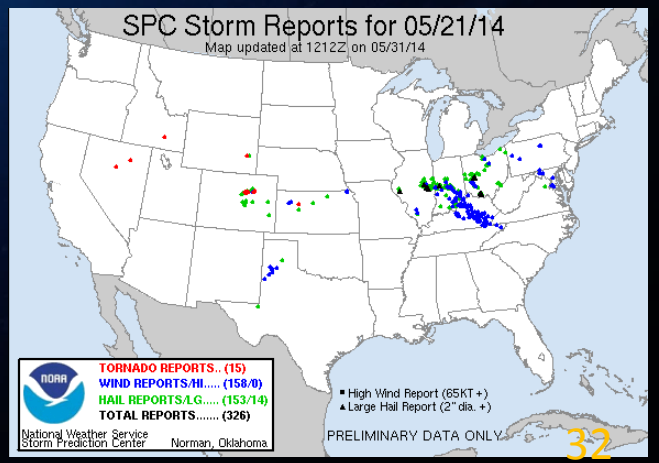
GOES-14 SRSO provided unique data and offered a glimpse into the possibilities that will be provided by the ABI on GOES-R in one minute mesoscale imagery

SRSOR for 2015 : May 18 - June 12, 2015
August 10 – 22, 2015

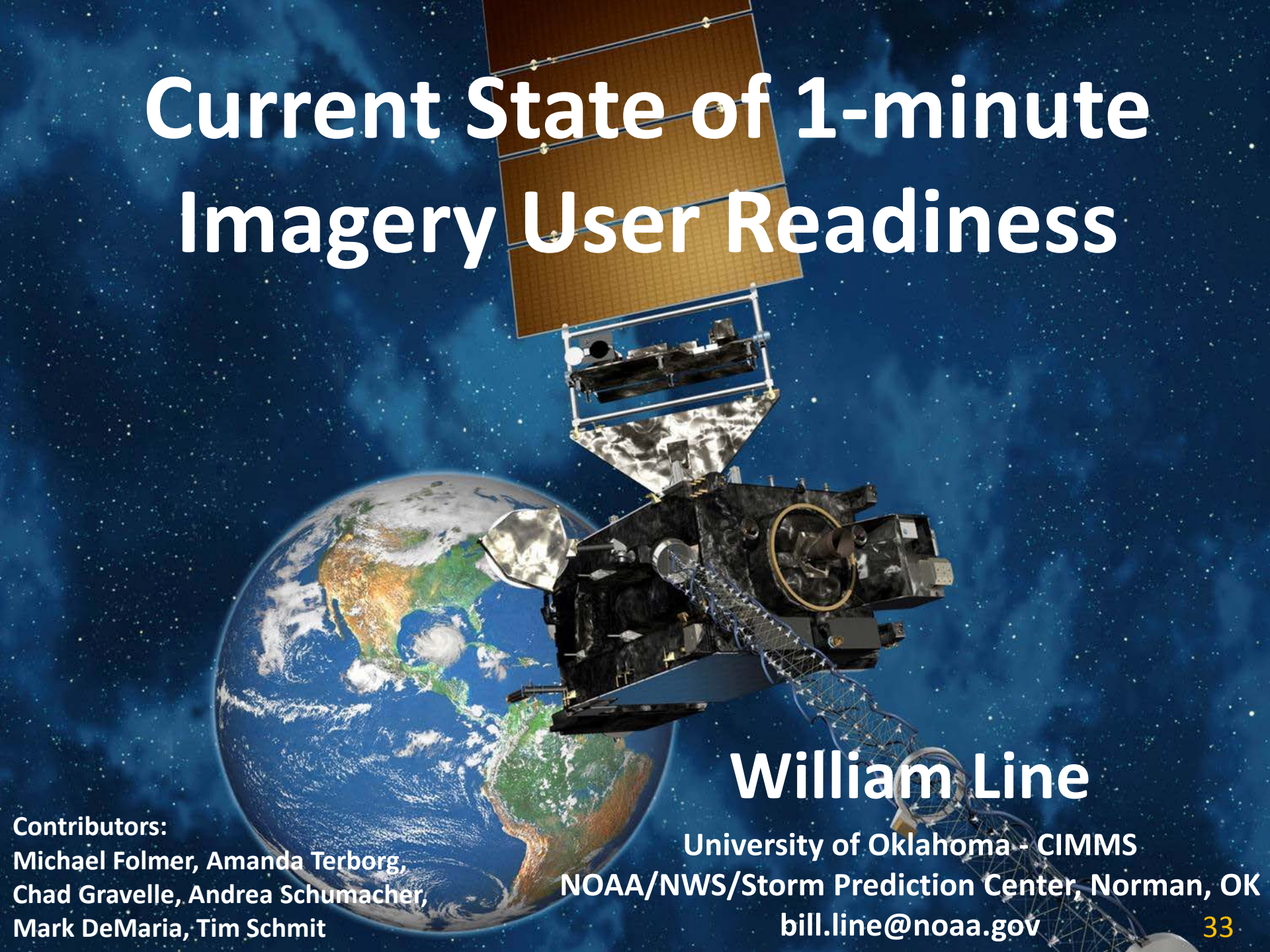
http://cimss.ssec.wisc.edu/goes/srsor2015/GOES-14_SRSOR.html

SRSOR data for 2012, 2013, and 2014 also available

Many case examples available; access to blogs



Current State of 1-minute Imagery User Readiness



William Line

University of Oklahoma - CIMMS
NOAA/NWS/Storm Prediction Center, Norman, OK
bill.line@noaa.gov

Contributors:
Michael Folmer, Amanda Terborg,
Chad Gravelle, Andrea Schumacher,
Mark DeMaria, Tim Schmit

Preparing the users for super rapid scan imagery

Weather Forecast Offices

Aviation Weather Center

National Hurricane Center

Ocean Prediction Center

Weather Prediction Center

Storm Prediction Center

Other

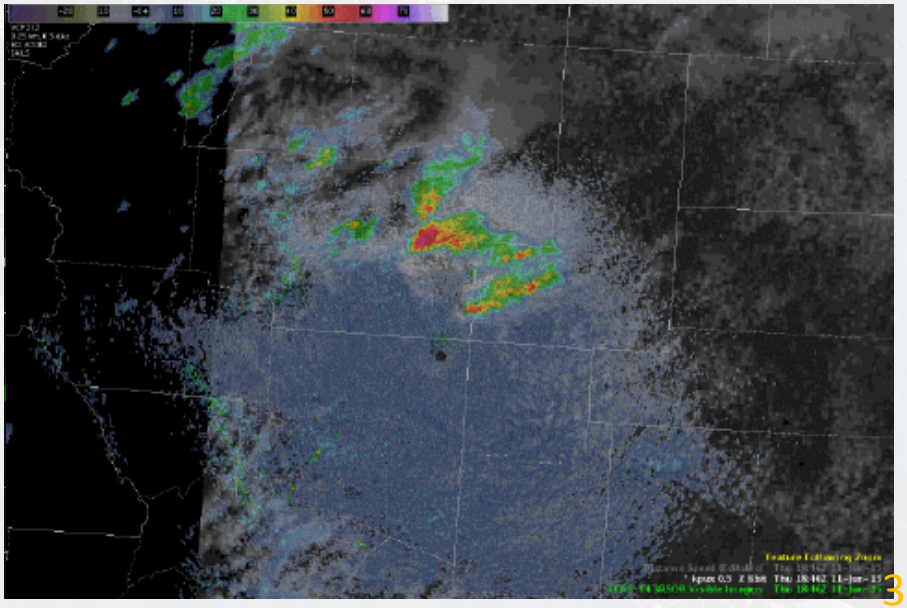
Hazardous Weather Testbed

- **G14 1-min imagery demonstrated in HWT during 2014 and 2015 Spring Experiments.**
  - NSSL Experimental Warning Program (EWP) (AWIPS-II) – Real-time experimental warning operations
    - 24 NWS Forecasters (22 WFO, 2 CWSU; all CONUS regions and AR)
    - 6 broadcast meteorologists – "viewers would love seeing this"
    - 91 SRSOR Blog posts: http://goesrhwt.blogspot.com/search/label/SRSOR
    - Operated in 32 unique CWA's during SRSOR 2015
  - HWT Experimental Forecast Program (EFP) (N-AWIPS) – Real-time experimental forecast/outlook
    - SPC, WFO forecasters, researchers
- **93% of days in 2015, forecasters found that the 1-min data provided them with significant information not captured in the routine satellite imagery.**
  - Monitoring cu development/evolution, moist inflow, i.d. of OTs and collapsing tops, i.d. and tracking of boundaries and gravity waves, boundary interaction, identifying new updrafts near mature storms, rapid cooling in IR, shear, features/processes under mid-upper clouds … all done quicker and with more confidence
  - See future utility for fire weather plume tracking, outflow/dust storm tracking, low cloud movement (esp. aviation), sea/lake breeze
  - 65% felt 1-min Overshooting Top overlay enhanced 1-min imagery

Forecaster Comments from the Hazardous Weather Testbed

- **All Forecasters agreed:**
  - 1-min satellite imagery NOT “overwhelming” at all
  - Will incorporate 1-min data into the warning process
  - There will be an operational use for it on most days in their CWA
  - What they most want to see in the GOES-R 1-min training are operational use examples from forecasters who experience with the data
  - Forecasters consider this base data (along with radar, lightning)
- **No AWIPS-II issues – forecasters loaded 100+ images alone or with OT, radar, lightning overlays**

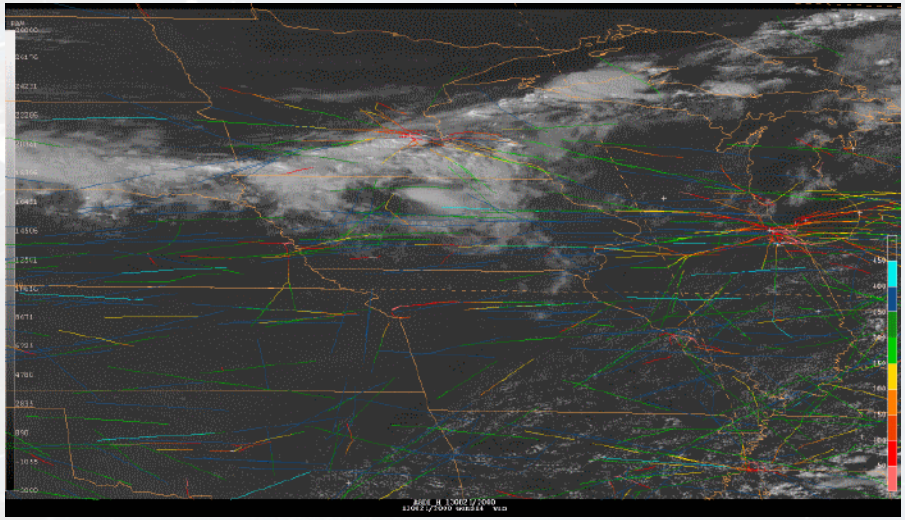
“I would love to have an Super Rapid Scan Satellite loop with reflectivity, and lightning somewhere on my D2D as a way to **stay grounded** with what is happening in real time during severe weather operations.” – WFO Forecaster



Aviation Weather Center

- GOES-14 SRSOR available to AWC forecasters in N-AWIPS since 2012
- Available during 2013 and 2014 AWT experiments
  - Participants have included: AWC, CWSU, FAA ops, airlines, Air Force, aviation researchers
- Primary uses thus far have included:
  - **Convective SIGMET desk:** Utilized when diagnosing convection and issuing products
  - **Area Forecast (FA) desk:** Monitoring ceiling and visibility (watching fog banks) and turbulence markers
  - **National Aviation Meteorologist (NAM) desk:** monitoring convection, ceiling and visibility (especially on west coast)

8/21/13 - Convection over Minneapolis airspace

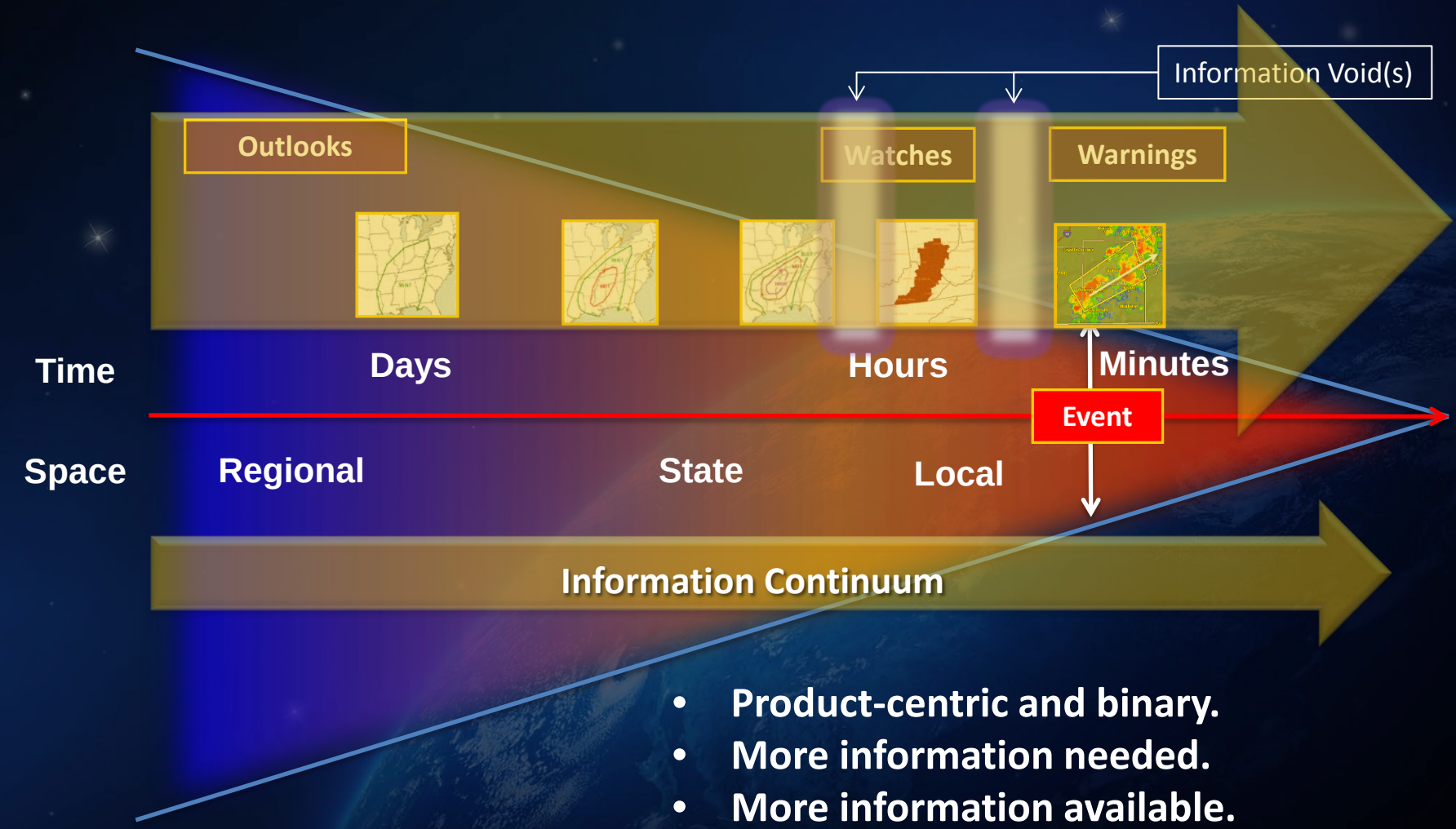


GOES-14 SRSOR in the Storm Prediction Center (SPC)

- "The one-minute imagery helped me to anticipate areas of new convective development as well, which was **useful** in developing short-term forecasts and mesoscale discussions for severe weather. "
- "… having the data available routinely would very likely, over time, allow forecasters to gain a **better understanding** of processes related to convective initiation, as these processes occurring within a cu field would be visually revealed in high temporal -resolution data in a way that 15- or 30-minute imagery cannot as clearly depict."
- "In the pre-storm environment, these data were **especially helpful** in monitoring the vertical growth of cumulus convection and in the identification of boundaries."
- "I found it to **be very useful** in… Using cloud character and trends to diagnose boundary locations and motion, and nowcast their potential for either CI or influences on upshear storms to interact therewith."
- "This has provided **extra confidence and lead time** for the issuance of two mesoscale discussions compared to the normal satellite update frequency/latency. … quite striking. It's analogous to the difference between watching high-def TVs vs. standard def, ... Satellite imagery at 1-min temporal resolution **needs to become the new standard for severe weather operations**."
- "Post-storm initiation, the high-resolution data allowed for **careful analysis** of overshooting and collapsing tops, the character of the storm anvils (ie. health of the storm) and the identification of convectively generated outflows."

http://satelliteliaisonblog.wordpress.com/category/spc/

Current Warning System "Challenges" Moving Towards Impact-based Decision Support System (DSS)



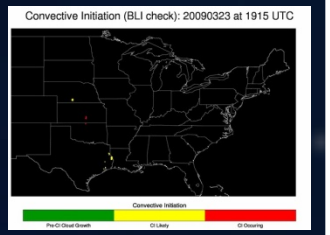
- Product-centric and binary.
- More information needed.
- More information available.

Adapted from Dr. Heather Lazrus (SSWIM)

NWS Vision to Integrate ABI and GLM Products with Other Data and Models

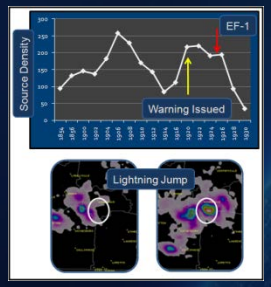
A Potential Operational Example: Convective Initiation/Severe Wx
How can we integrate the information in future tools?

CI

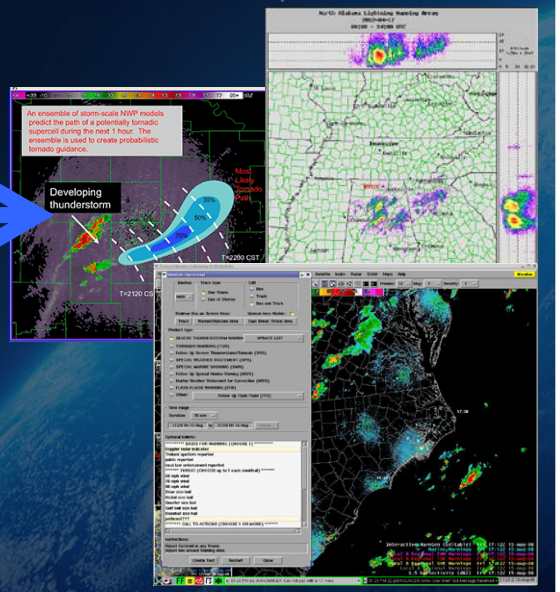


Over-shooting tops

Lightning Jumps



Next Generation Warning System



Why NWS needs this?

Situational Awareness
Warning confidence
Decision Support (venues)

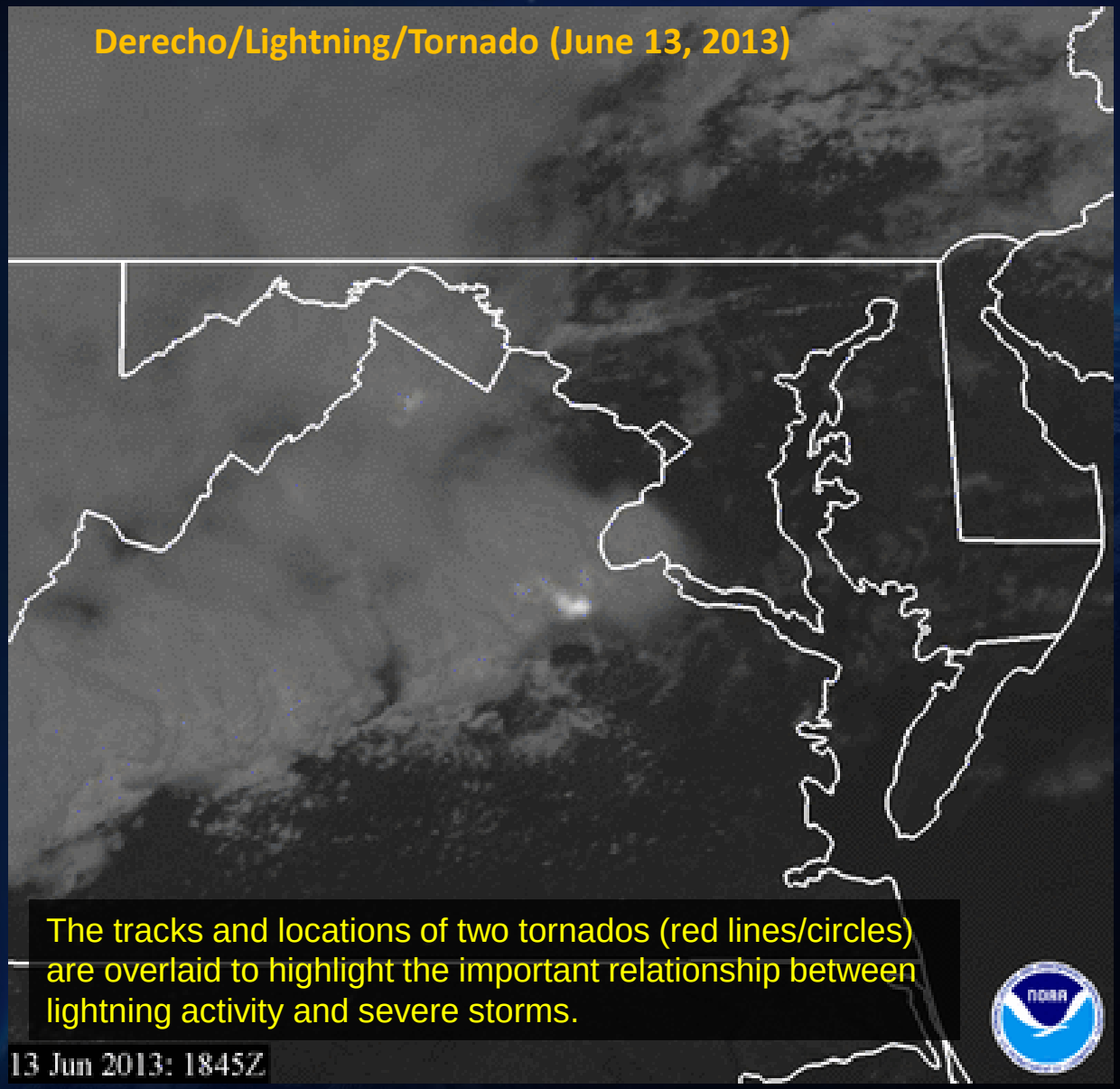
Situational Awareness:

User comment: 'Cloud Top Cooling product is an excellent source of enhancing the situational awareness for future convective initiation, particularly in rapid scan mode'.

AWC Testbed forecaster

(June 2012)

GOES-14 Rapid Refresh 1-min Imagery and Lightning



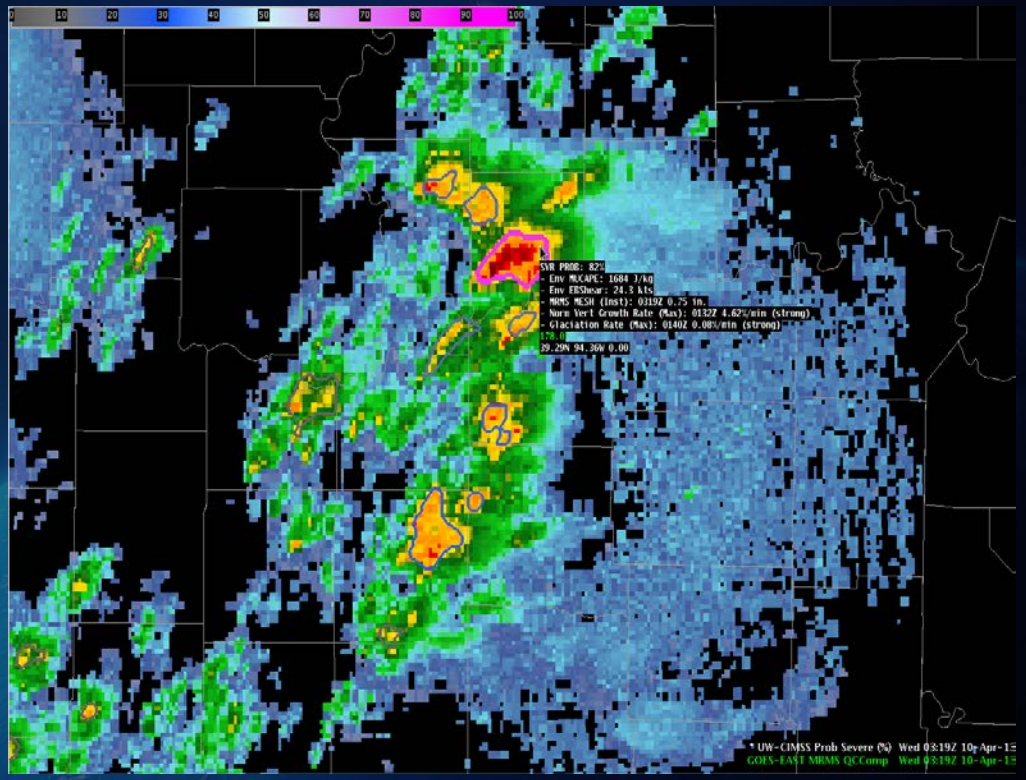
Source of Lightning Data:

DC Lightning Mapping Array (DCLMA)

Courtesy of Scott Rudlosky, CICS-MD

Probabilistic Forecasting of Severe Convection through Data Fusion

- GOES-derived cloud growth rates, NEXRAD-derived products, and NWP-derived fields are used as input into a Bayesian statistical model to compute the probability that a storm will first produce severe weather in the near-term
- Satellite and radar object-tracking are used to keep a history of storm development
- FY15-16 R3 project will investigate total lightning data and additional NWP sources, as well as advantages to be gained using super-rapid scan data
- The product display will complement NWS warning operations
- The product will be evaluated in testbeds and proving ground experiments

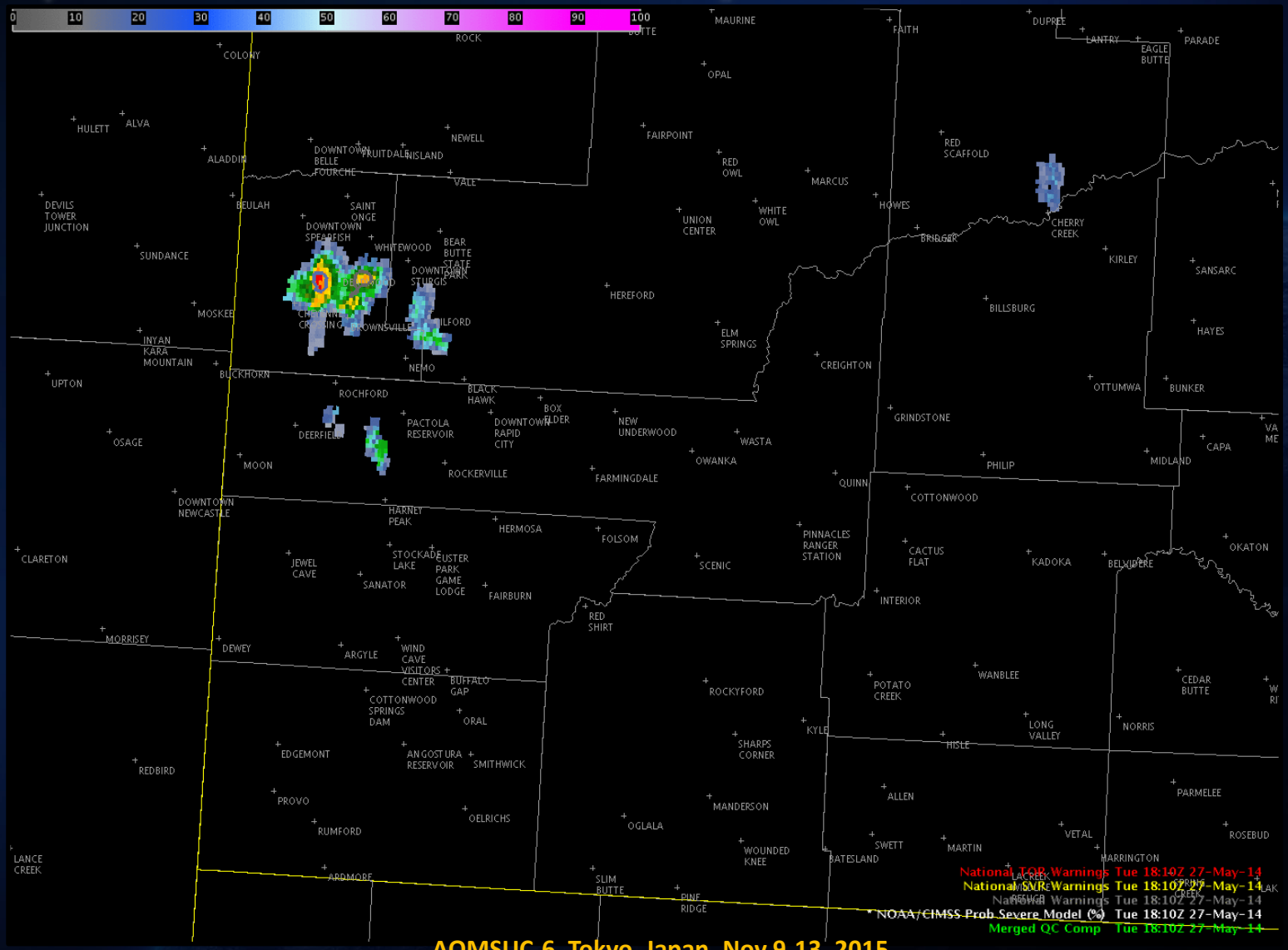


Merged radar reflectivity with model probability of severe contours. The highlighted storm had strong satellite growth rates, contributing to a high probability prior to severe hail occurrence. No warning was issued.

Help NWS forecasters skillfully increase warning lead time to severe hazards

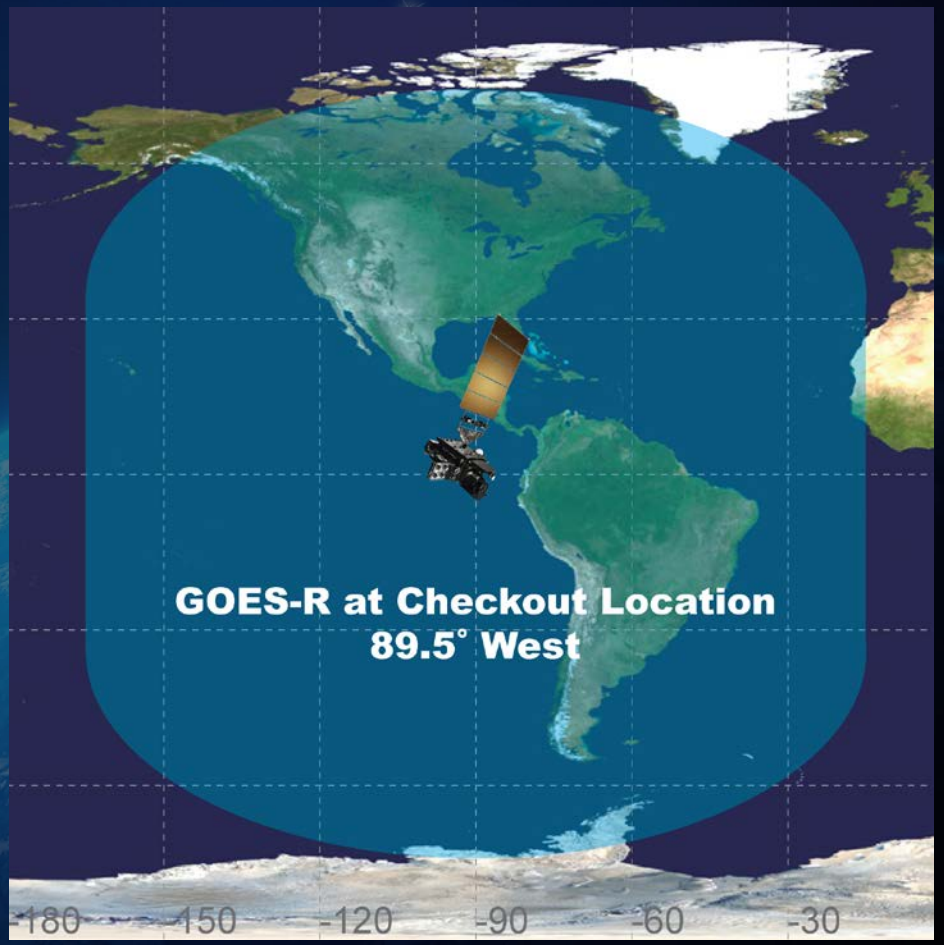
M. Pavolonis (STAR/ASPB) and J. Cintineo (UW-CIMSS), J. Sieglaff (UW-CIMSS), D. Lindsey (STAR/RAMMB), D. Bikos (CSU-CIRA)

Probability of Severe Convection



GOES-R Launch and Post-Launch Testing

- **GOES-R launch (October 2016)**
- Launch and orbit raising: 12 days
- Level 1b products will be validated during Post Launch Test (six months) and will be available through GOES-R Rebroadcast (GRB) service as products are certified
- Level 2+ product certification begins after L1b products and will be distributed on a product-by-product basis as they mature
- GOES-16 extended validation: 6 months beyond initial 6 month checkout period
- GOES-16 operational: Launch + 1 year at a TBD orbit location



Road to Launch

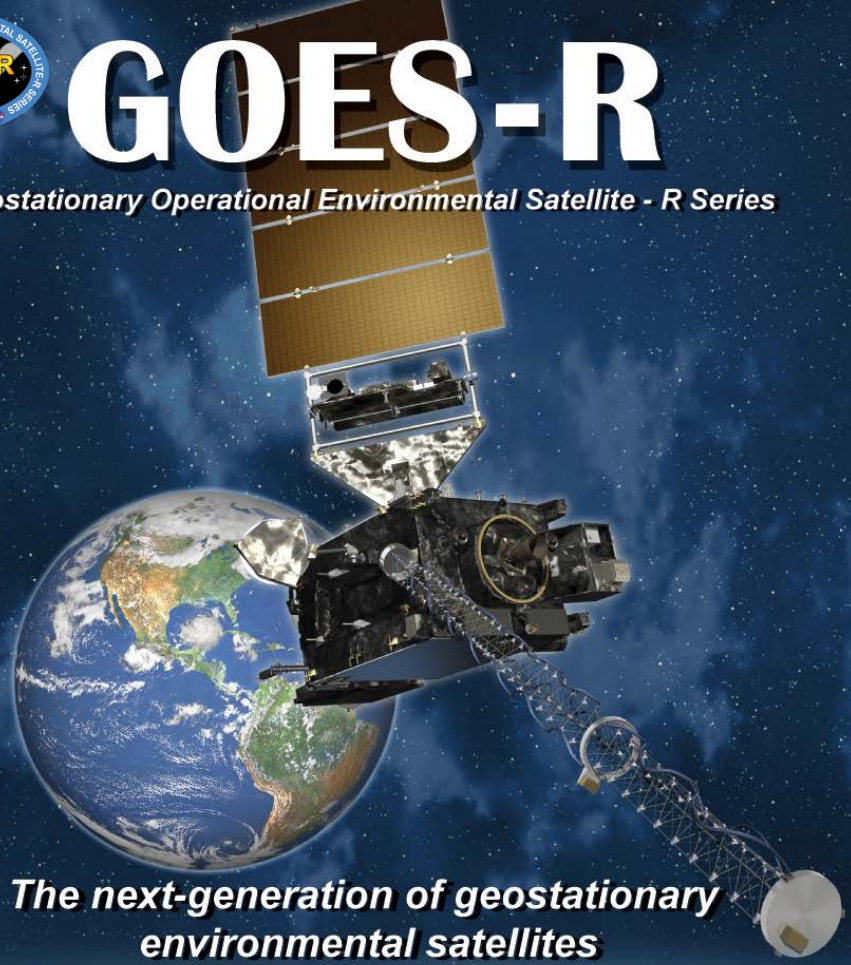
- Continue efforts to generate, demonstrate, and validate L2 products using Himawari-8/AHI data
- Complete refinements to L2 product validation tools needed for the Post Launch Test (PLT) period and for long-term monitoring
- Participate in GOES-R Program-led rehearsal exercises that test data flows, product generation, product monitoring and validation tools, and more
- Continue user engagement and readiness activities
- Learning and working with the new GOES-R core ground system and L2 product algorithm software
- Test process to transition L2 algorithm updates into the operational system

Summary

- GOES-R is coming - Launch October 2016
- New sensors, products, and services will help improve forecasts and increase lead times for warnings and decision makers
- Presents Challenges and Opportunities for model assimilation, data fusion and tools
- User preparation is essential to take advantage of the advanced capabilities to support a Weather Ready Nation - Hemisphere - World

GOES-R

Geostationary Operational Environmental Satellite - R Series



The next-generation of geostationary environmental satellites

Advanced imaging for accurate forecasts

Real-time mapping of lightning activity

Improved monitoring of solar activity

Spacecraft image courtesy of Lockheed Martin

Thank you!

For more information visit www.goes-r.gov

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