# The Anticipation of GOES-R and Meeting User Expectations

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Contributions from AWG Team Leads and members of the GOES-R AWG teams, GOES-R Satellite Liaisons, and others

# Outline

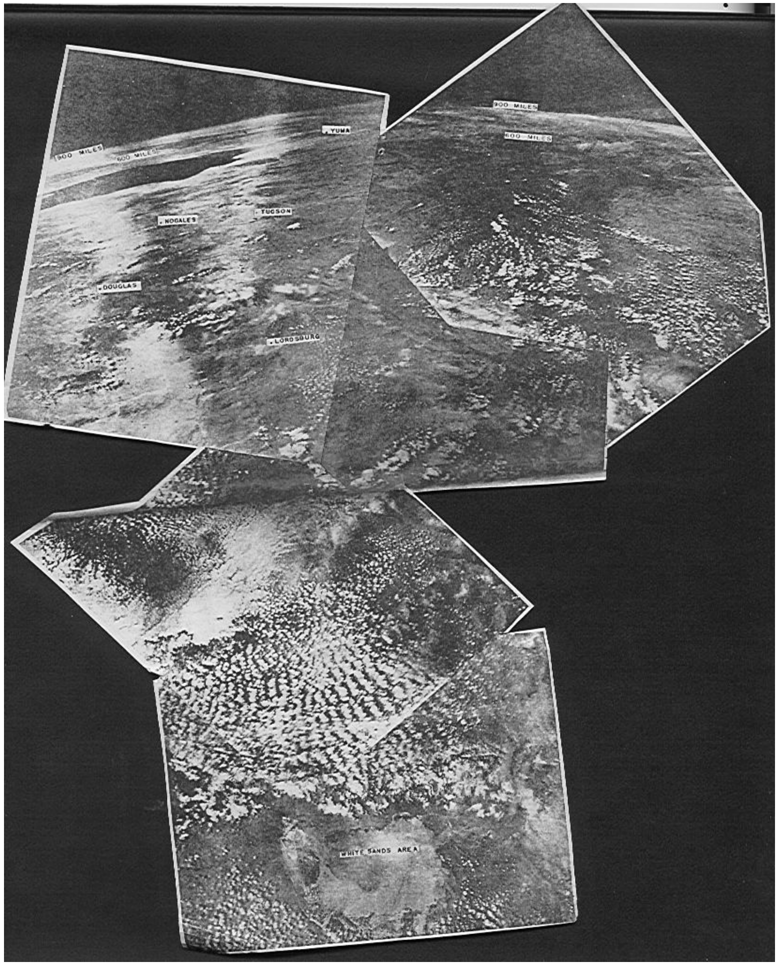
- Weather Satellites… A Historical Perspective
- NOAA Mission Priorities
- GOES-R Capabilities and Products
- Preparing for GOES-R launch

# Historical Perspective

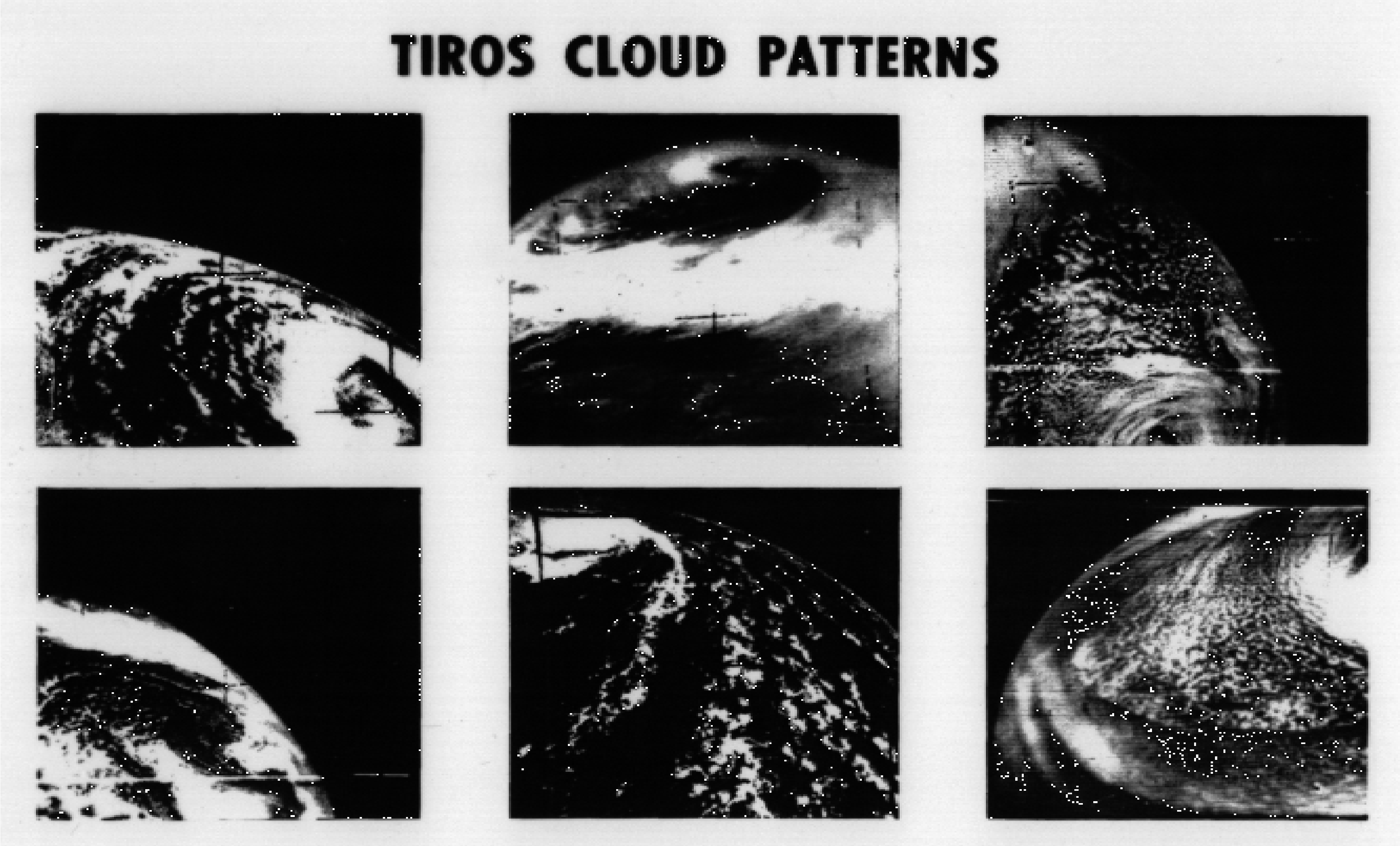
- Pioneers in modern atmospheric science, such as Jacob Bjerknes of UCLA, helped pave the way for satellite meteorology with the analysis of photographs taken from V2 Rockets

- Jacob Bjerknes performed synoptic analyses using pictures such as this in 1948: likely the first serious attempt to analyze the atmosphere from “space”

**V2 Rocket photographic montage**

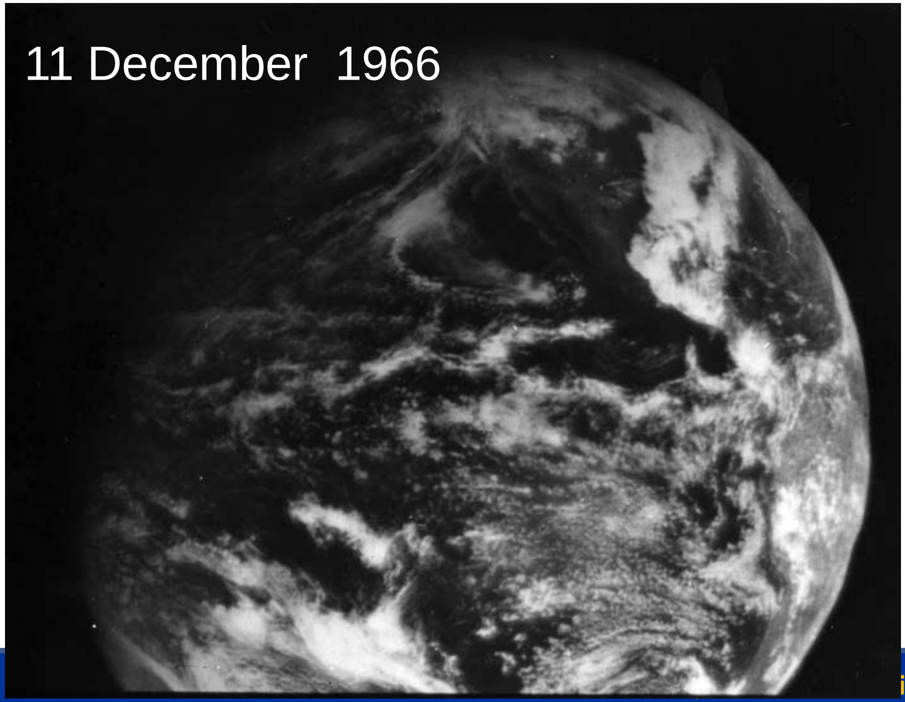


# Early images of clouds from the polar orbiting TIROS in 1960



# 1966: ATS-1 launched

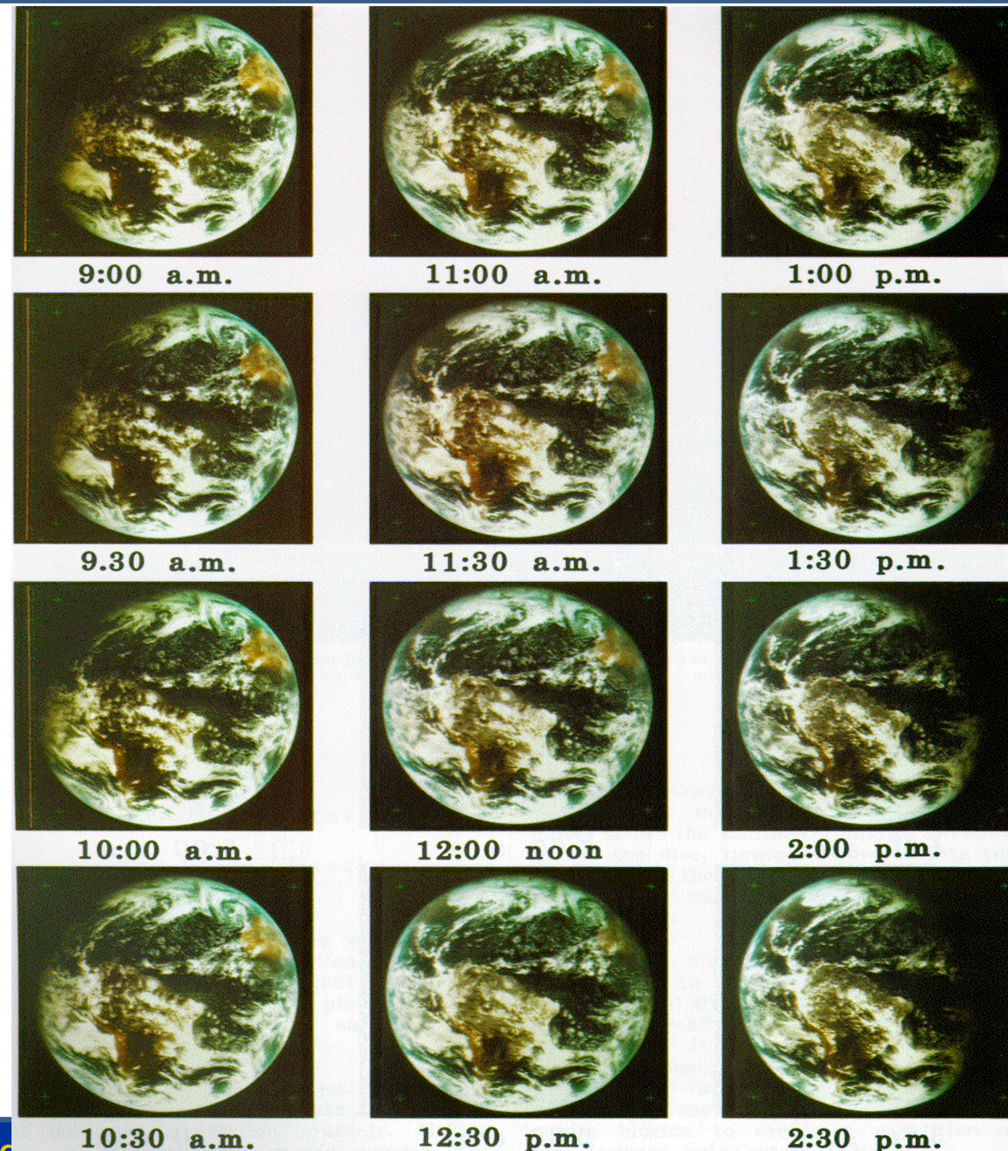
- Applications Technology Satellite (ATS)-1 was the first geostationary imager, launched 6 December 1966. Imaging instrument designer and SSEC co-founder, Verner E. Suomi, proclaimed, "*the clouds move, not the earth*".




# 1967: ATS-III Launched

Vern Suomi, Robert Parent, and Ted Fujita

- Create the first color movie of planet Earth with ATS-III pictures
- Color spin-scan camera principally developed by Verner Suomi



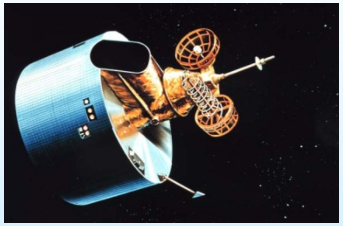
# Evolution of GOES

## GOES-1/3

Launched
1975
1977
1978

One visible and one infrared . Operational.

NASA's Synchronous Meteorological Satellites (SMS) 1 and 2 were prototypes for NOAA's GOES 1-3 satellites



## GOES-4/7

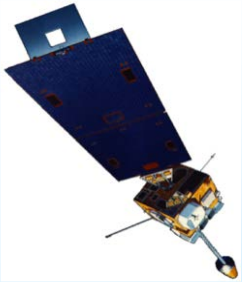
Launched
1980
1981
1983
1987

VISSR–VAS visible, 12 IR. MSI (visible, IRW, and 2 additional IR channels)

## GOES-8/12

Launched
1994
1995
1997
2000
2001

3-axis stabilized. Imager Bands: 4 IR; 1 visible. Operational Sounder
(18 IR bands)



## GOES-13/14/15

Launched
2005
2009
2010

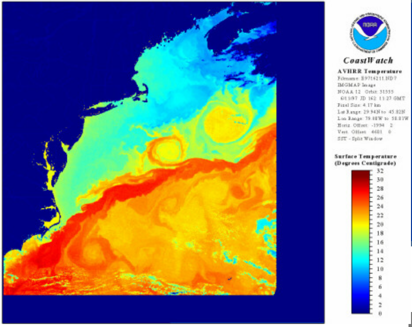
Better navigation and calibration.
No eclipse outages.
Better spatial resolutions for the 6.5 um on GOES-12+ and the 13.3 um band on GOES-14/15.
Operational Sounder

## GOES-R/S/T/U

Planned Launch
*2016*
*2017*
*2020*
*2025*

Faster coverage.
16 Imager Bands.
Improved spatial.
No sounder.
GLM

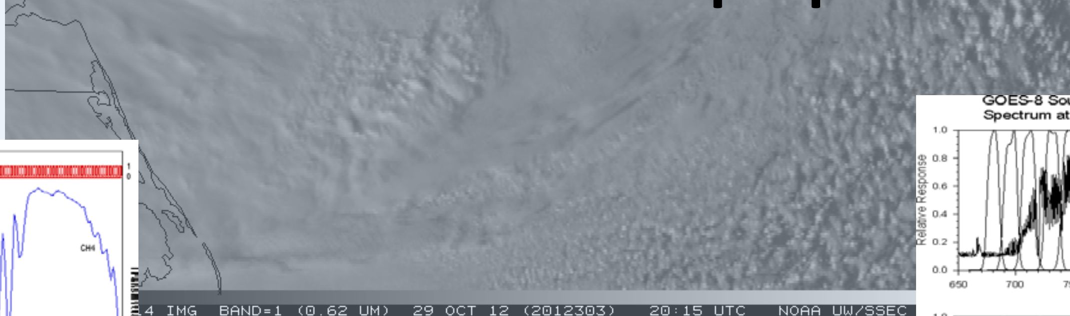
Increasing Capability

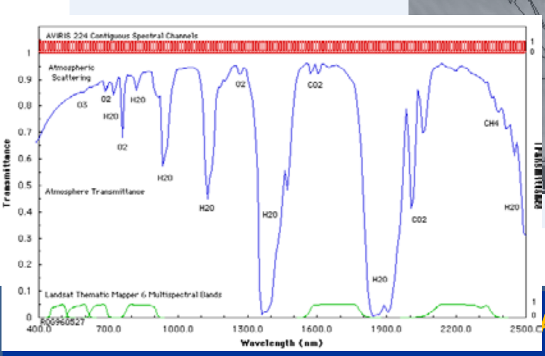


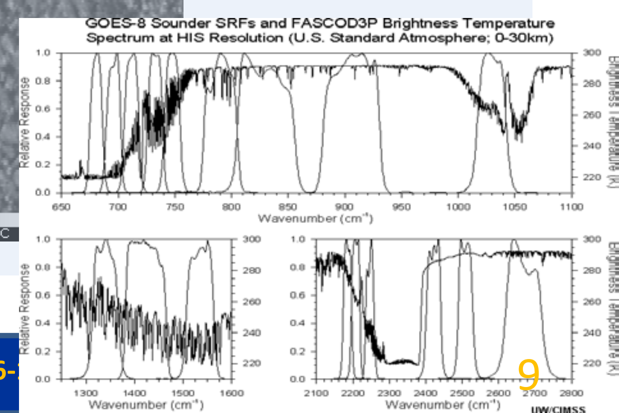

# 55 Years
# Since the Launch of TIROS-1

- **Meteorological satellites provide essential data for weather forecasting to national weather services across the globe**

- **Satellite data are high resolution digital renderings from a variety of spectral bands, whereby, both qualitative and quantitative information about the atmosphere, clouds, and land and sea surface properties are deduced**



# Supporting NOAA's Mission

*NOAA is a science-based services agency engaged with the entire Earth system science enterprise.*

**NOAA's Top Four Priorities:**

1. To provide information and services to make communities more resilient
2. To evolve the National Weather Service
3. To invest in observational infrastructure
4. To achieve organizational excellence

# GOES-R Supports NOAA Mission Areas

Improved understanding of a changing climate system that informs science, service, and stewardship

Improved coastal water quality support that enables coastal communities to effectively manage resources and improve resiliency

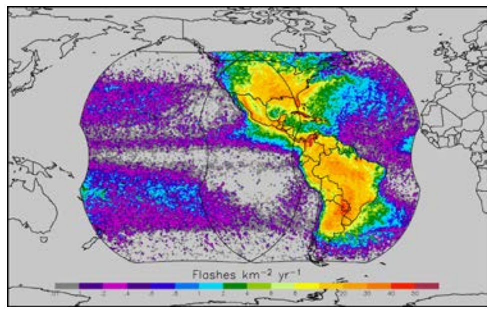

Reduced loss of life from high-impact weather events while improving efficient economies through environmental information

Improved understanding of ecosystems to inform resource management decisions

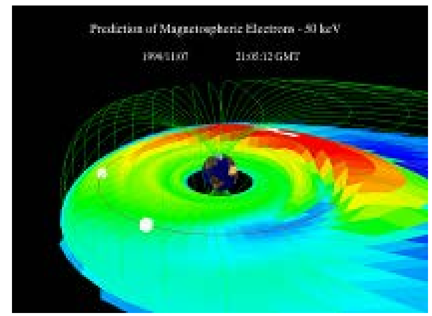
# Expectations for GOES-R

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

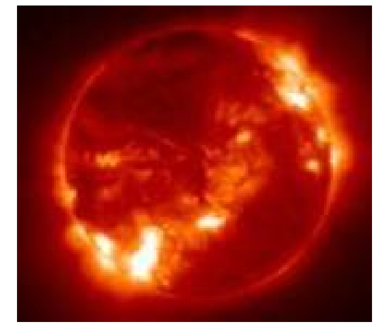
***Visual & IR Imagery***




***Lightning Mapping***




***Space Weather Monitoring***



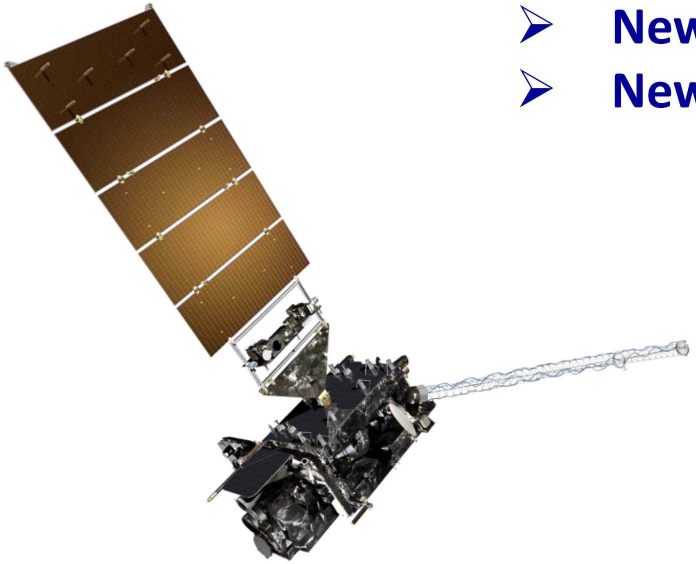
***Solar Imaging***

- ✓ 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)

- ✓ 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

# GOES-R ABI and GLM Instruments

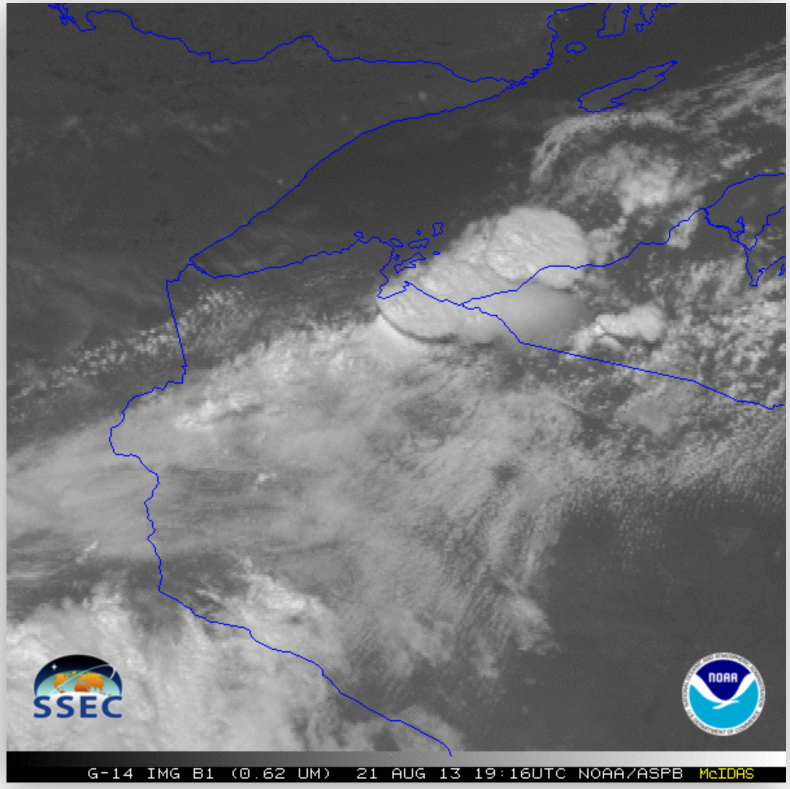
- New and enhanced capabilities
- New opportunities



# 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 observed before




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

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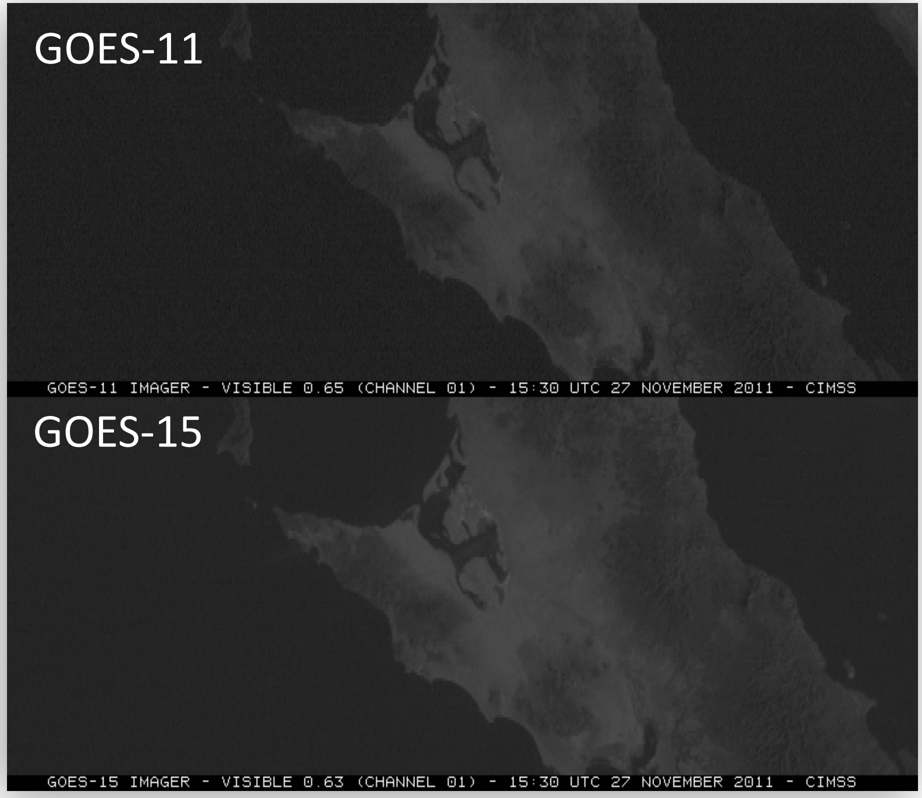
- **Improved Navigation and Registration**
  – More accurate products; improved utilization

GOES-15 provides a hint of ABI's INR quality…



# GOES-R ABI vs GOES Imager

| | ABI | GOES Imager |
|---|---|---|
| **Spectral Coverage** | | |
| | 16 bands | 5 bands |
| **Spatial resolution** | | |
| 0.64 μm Visible | 0.5 km | Approx. 1 km |
| Other Visible/near-IR | 1.0 km | n/a |
| Bands (>2 μm) | 2 km | Approx. 4 km |
| **Spatial coverage** | | |
| Full disk | 4 per hour | Scheduled (3 hrly) |
| CONUS | 12 per hour | ~4 per hour |
| Mesoscale | Every 30 sec | n/a |
| **Visible (reflective bands)** | | |
| On-orbit calibration | Yes | No |

# ABI Visible/Near-IR Bands

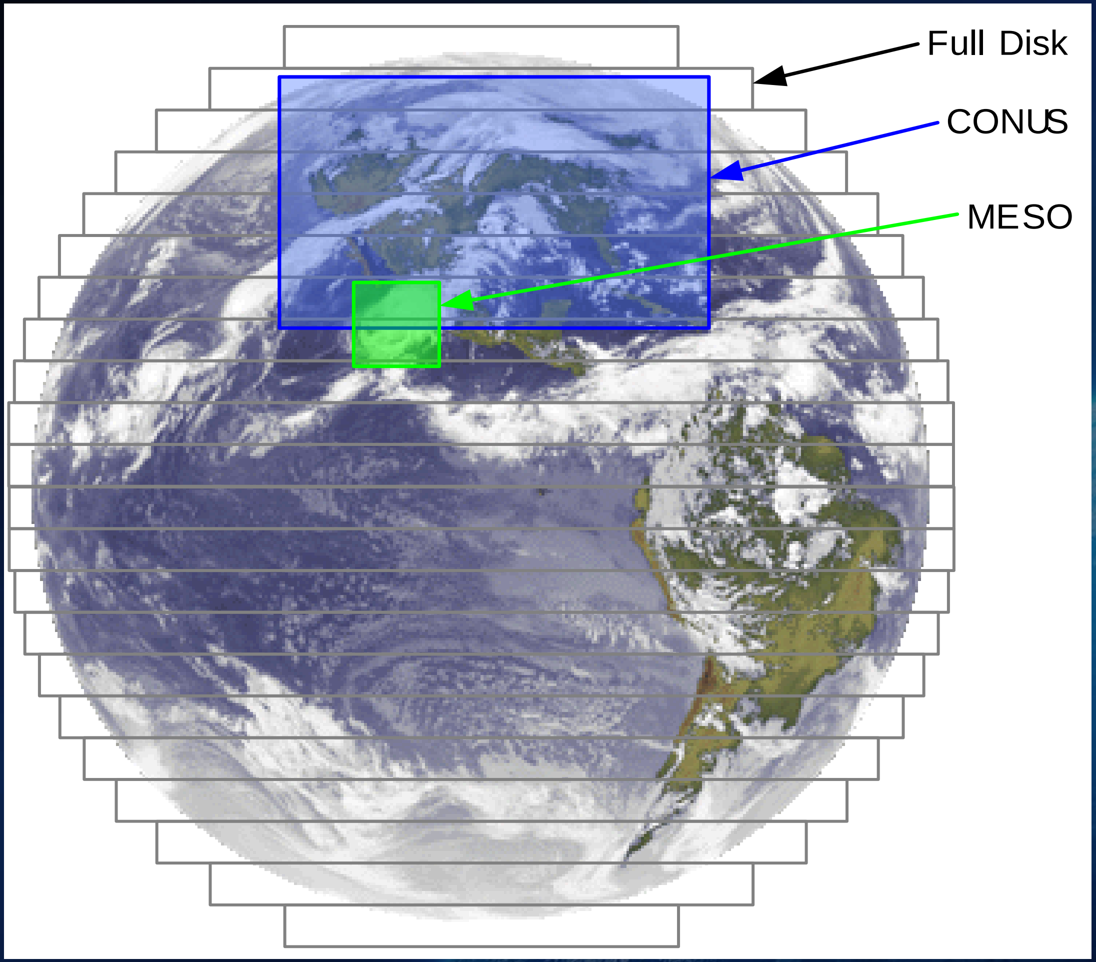
| Future GOES imager (ABI) band | Wavelength range (µm) | Central wavelength (µm) | Nominal subsatellite IGFOV (km) | Sample use |
|---|---|---|---|---|
| 1 | 0.45–0.49 | 0.47 | 1 | Daytime aerosol over land, coastal water mapping |
| 2 | 0.59–0.69 | 0.64 | 0.5 | Daytime clouds fog, insolation, winds |
| 3 | 0.846–0.885 | 0.865 | 1 | Daytime vegetation/burn scar and aerosol over water, winds |
| 4 | 1.371–1.386 | 1.378 | 2 | Daytime cirrus cloud |
| 5 | 1.58–1.64 | 1.61 | 1 | Daytime cloud-top phase and particle size, snow |
| 6 | 2.225–2.275 | 2.25 | 2 | Daytime land/cloud properties, particle size, vegetation, snow |

Schmit et al, 2005

# ABI IR Bands

| Future GOES imager (ABI) band | Wavelength range (µm) | Central wavelength (µm) | Nominal subsatellite IGFOV (km) | Sample use |
|---|---|---|---|---|
| 7 | 3.80–4.00 | 3.90 | 2 | Surface and cloud, fog at night, fire, winds |
| 8 | 5.77–6.6 | 6.19 | 2 | High-level atmospheric water vapor, winds, rainfall |
| 9 | 6.75–7.15 | 6.95 | 2 | Midlevel atmospheric water vapor, winds, rainfall |
| 10 | 7.24–7.44 | 7.34 | 2 | Lower-level water vapor, winds, and $SO_2$ |
| 11 | 8.3–8.7 | 8.5 | 2 | Total water for stability, cloud phase, dust, $SO_2$ rainfall |
| 12 | 9.42–9.8 | 9.61 | 2 | Total ozone, turbulence, and winds |
| 13 | 10.1–10.6 | 10.35 | 2 | Surface and cloud |
| 14 | 10.8–11.6 | 11.2 | 2 | Imagery, SST, clouds, rainfall |
| 15 | 11.8–12.8 | 12.3 | 2 | Total water, ash, and SST |
| 16 | 13.0–13.6 | 13.3 | 2 | Air temperature, cloud heights and amounts |

# Advanced Baseline Imager (ABI)




Scan modes for the ABI:

Mode 3:

Full disk images every 15 minutes
CONUS images every 5 minutes
Mesoscale images (2) every 1 minute

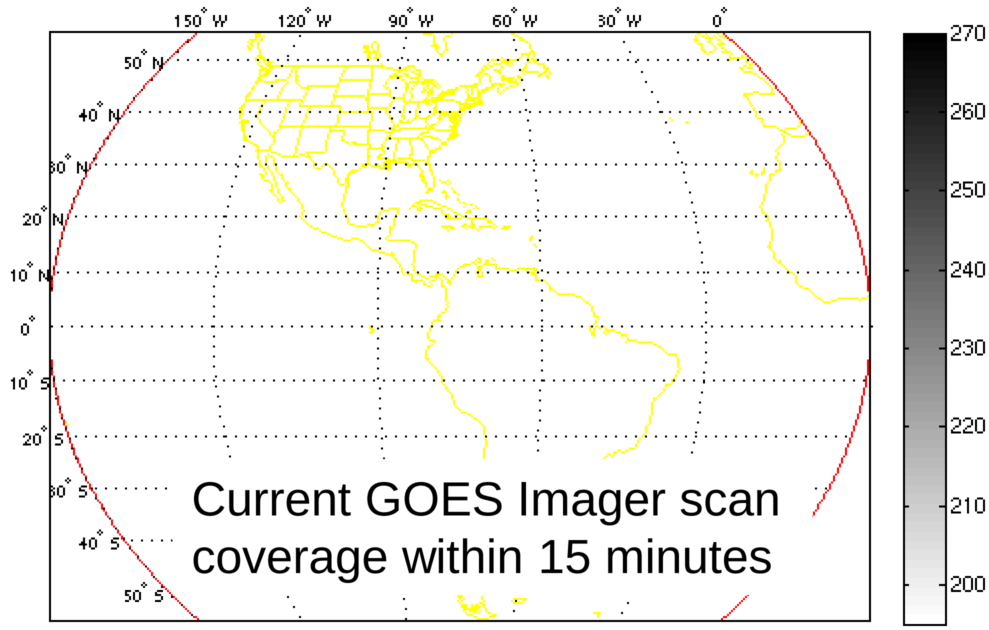
Mode 4:

Full disk images every 5 mins

## In 15 Minutes

Current GOES Imager can scan:

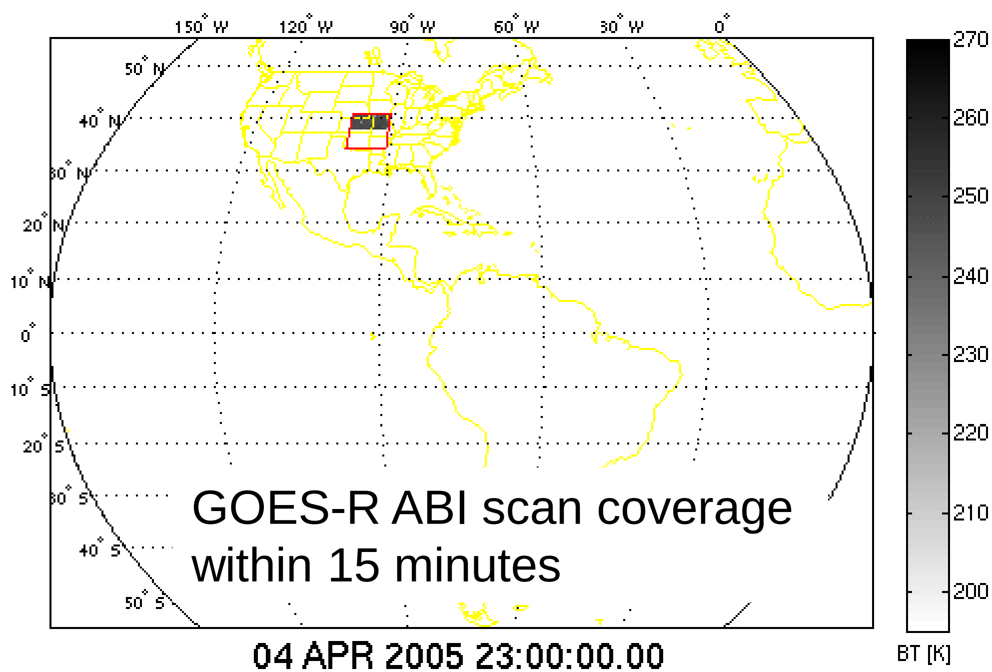
- Most (3/5) of a Full Disk Image




## In 15 Minutes

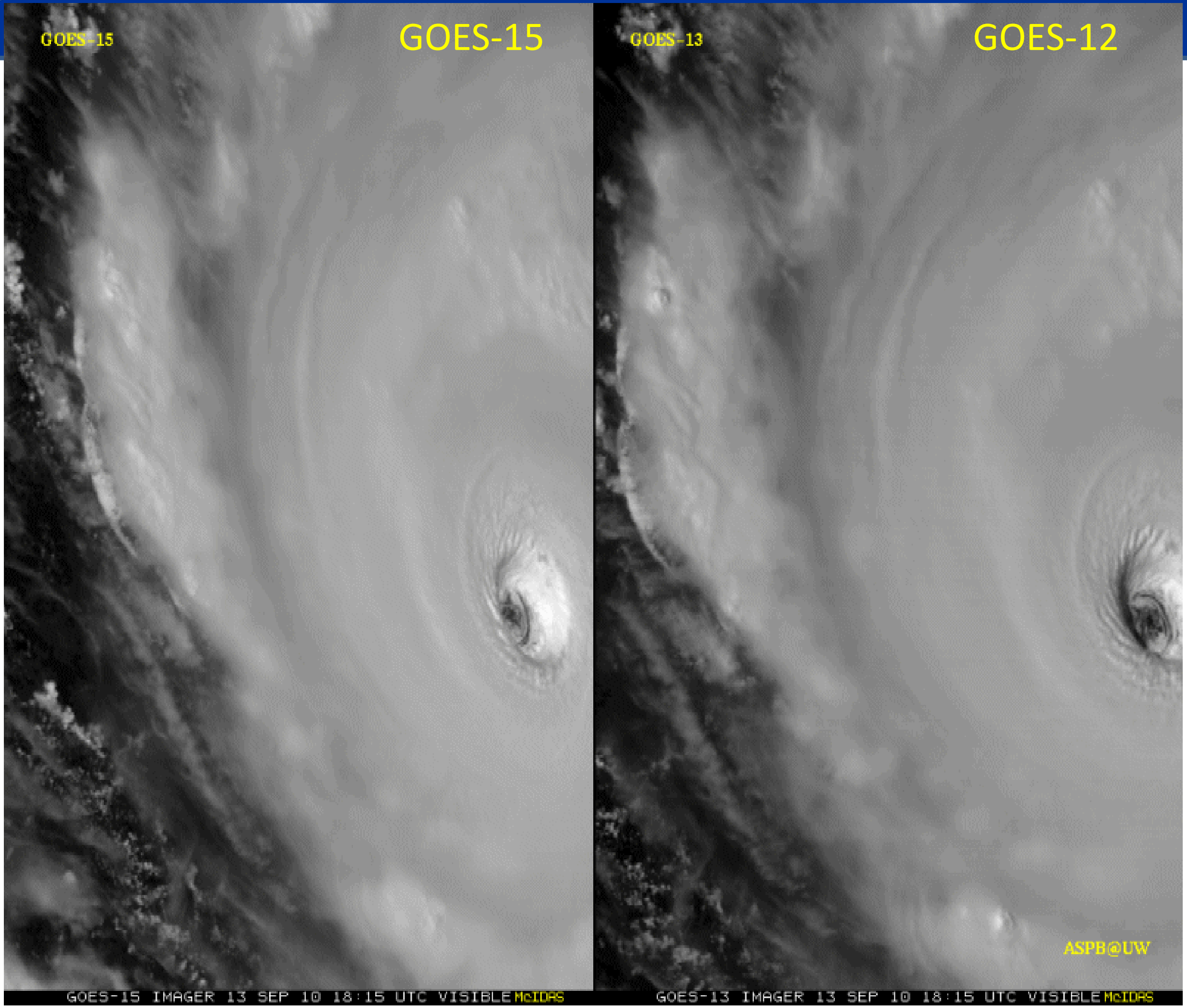
ABI ("Flex Mode") will scan:

- 30 Mesoscale Images
- 3 CONUS Images
- 1 Full Disk Image



# GOES-15: Sample "1-min" imagery

*A hint of what GOES-R will routinely provide…*



# Future vs Current GOES Imagery

*A hint of what GOES-R will routinely provide…*

**GOES-14 (SRSOR)**

**GOES-13 (RSO)**

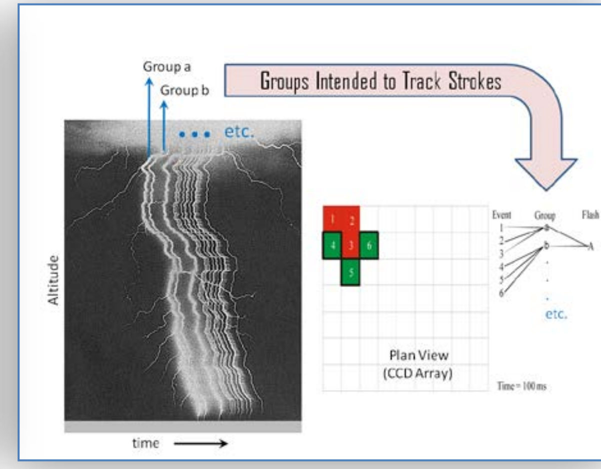
# Assembled GOES-R Spacecraft

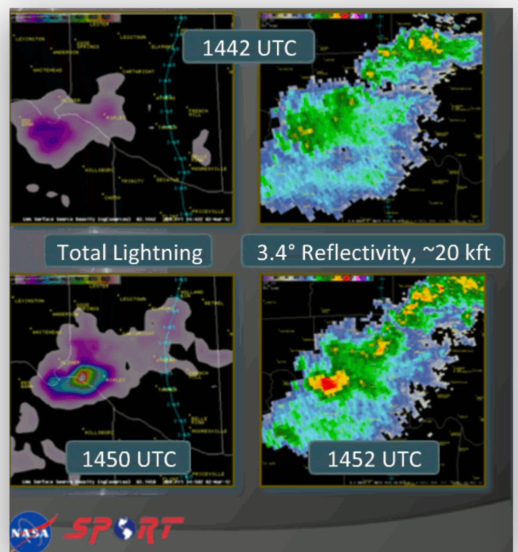
Solar Array Deployment at Lockheed Martin on May 5, 2015

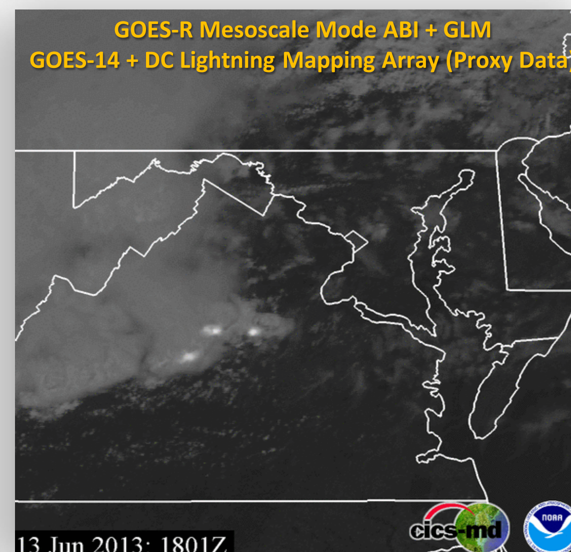
# GOES-R Geostationary Lightning Mapper (GLM)

Totally new capability in a geostationary orbit!!

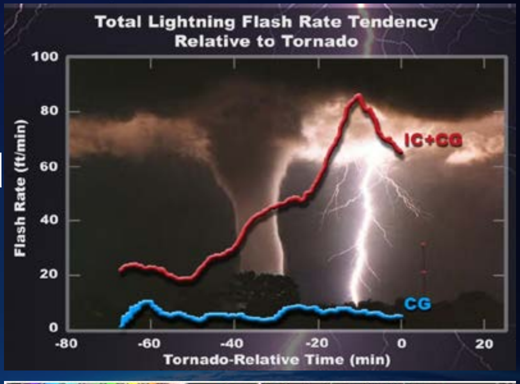
- GLM will observe intra-cloud (IC) and cloud-to-ground (CG) lightning at spatial and temporal resolutions that are currently unavailable
- GLM data is processed into lightning data products (Events, Groups, Flashes) that are more easily utilized by users
- Exciting new applications for improving severe weather forecasting and lightning awareness/safety



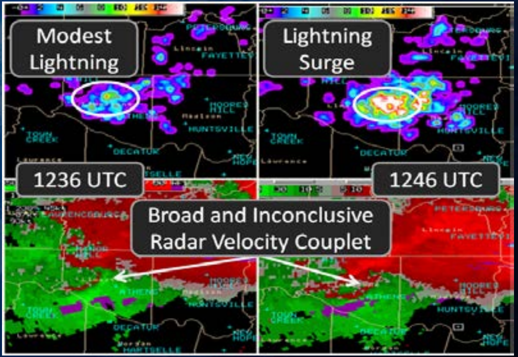



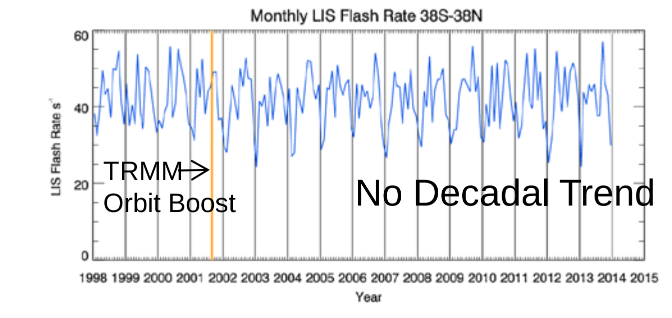



# GLM Mission Benefits

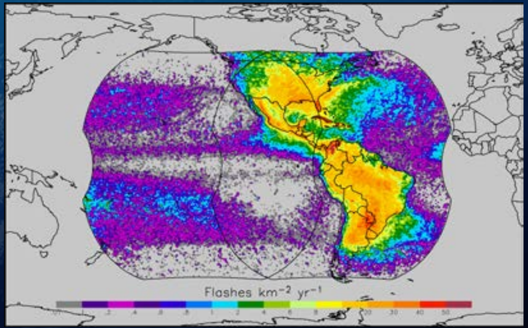



- Improved forecaster situational awareness and confidence resulting in more accurate severe storm warnings (improved lead time, reduced false alarms) to save lives and property
- Diagnosing convective storm structure and evolution
- Aviation and marine convective weather hazards
- Tropical cyclone intensity 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

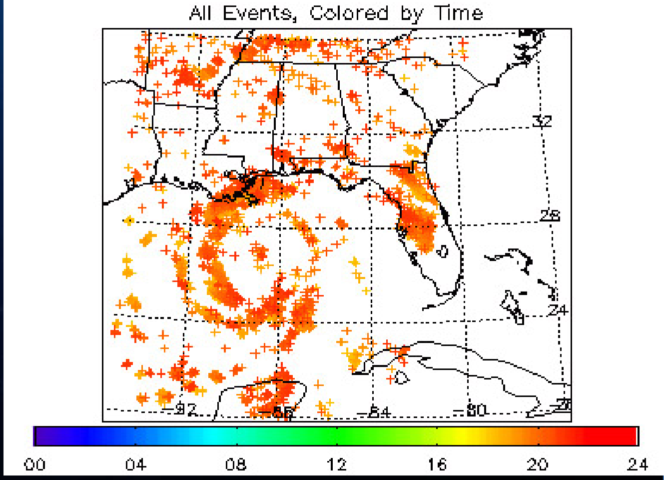



Global flash rate
from LIS/OTD (1995-2014)




Lightning Climatology




Hurricane Katrina

# GOES-R Product
# Examples and Algorithm Highlights

- Use of proxy data for product development
- Product Illustrations
- Algorithm highlights
- ABI attributes leveraged
- Operational applications

# GOES-R ABI 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 |

## 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 |

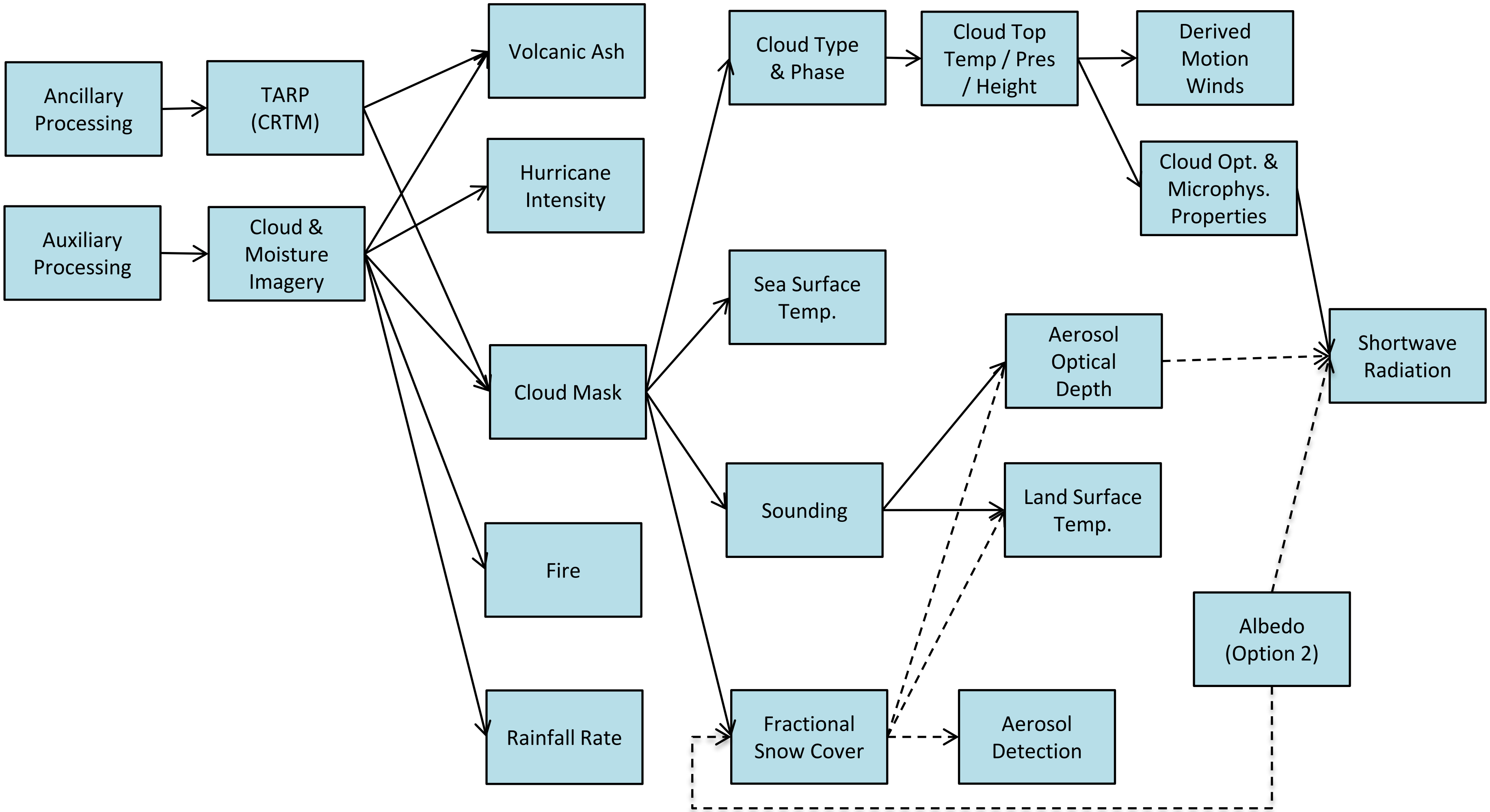
+ others

# ABI “Baseline” L2 Products Take Advantage of ABI Spectral Information

ABI Baseline L2 Products

| Wavelength Micrometers | 0.47 | 0.64 | 0.865 | 1.378 | 1.61 | 2.25 | 3.90 | 6.185 | 6.95 | 7.34 | 8.5 | 9.61 | 10.35 | 11.2 | 12.3 | 13.3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Channel ID | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| Baseline Products | | | | | | | | | | | | | | | | |
| Aerosol Detection | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | | ✓ | ✓ | |
| Aerosol Optical Depth | ✓ | ✓ | ✓ | | ✓ | ✓ | | | | | | | | | | |
| Clear Sky Masks | | ✓ | | ✓ | ✓ | | ✓ | | ✓ | ✓ | ✓ | | | ✓ | ✓ | |
| Cloud & Moisture Imagery | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Cloud Optical Depth | | ✓ | | | | ✓ | ✓ | | | | | | | ✓ | ✓ | |
| Cloud Particle Size Dist. | | ✓ | | | | ✓ | ✓ | | | | | | | ✓ | ✓ | |
| Cloud Top Phase | | | | | | | | | | ✓ | ✓ | | | ✓ | ✓ | |
| Cloud Top Height | | | | | | | | | | | | | | ✓ | ✓ | ✓ |
| Cloud Top Pressure | | | | | | | | | | | | | | ✓ | ✓ | ✓ |
| Cloud Top Temperature | | | | | | | | | | | | | | ✓ | ✓ | ✓ |
| Hurricane Intensity | | | | | | | | | | | | | ✓ | | | |
| Rainfall Rate/QPE | | | | | | | | ✓ | | ✓ | ✓ | | | ✓ | ✓ | |
| Legacy Vertical Moisture Profile | | | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Legacy Vertical Temp Profile | | | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Derived Stability Indices | | | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Total Precipitable Water | | | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Downward Solar Insolation Surf | ✓ | ✓ | ✓ | | ✓ | ✓ | | | | | | | | | | |
| Reflected Solar Insolation TOA | ✓ | ✓ | ✓ | | ✓ | ✓ | | | | | | | | | | |
| Derived Motion Winds | | ✓ | | | | | ✓ | ✓ | ✓ | ✓ | | | | ✓ | | |
| Fire Hot Spot Characterization | | ✓ | | | | | ✓ | | | | | | | ✓ | ✓ | |
| Land Surface Temperature | | | | | | | | | | | | | | ✓ | ✓ | |
| Snow Cover | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | | | | | | ✓ | | | |
| Sea Surface Temperature | | | | | | | ✓ | | | | ✓ | | ✓ | ✓ | ✓ | |
| Volcanic Ash: Detection/Height | | | | | | | | | | ✓ | ✓ | | | ✓ | ✓ | ✓ |
| Radiances | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

# ABI L2+ Product Precedence

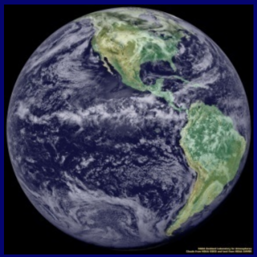


# GOES-R Proxy Data Sources

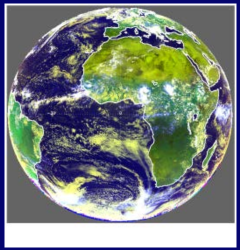
**"Real"** PROXY Data Sources

**"Simulated"** ABI Proxy Data Sources

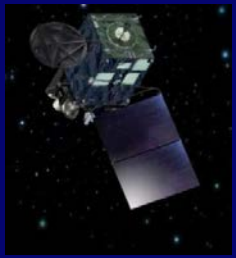
Current GOES



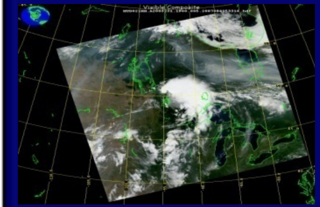
Meteosat/
SEVIRI



Himawari-8

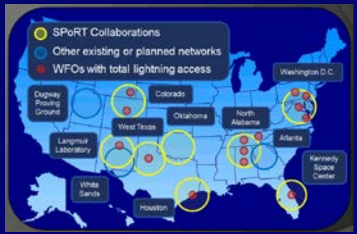


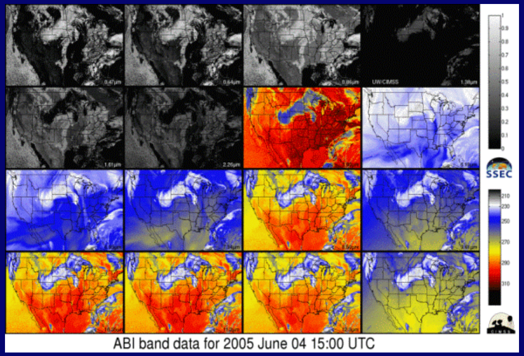
MODIS

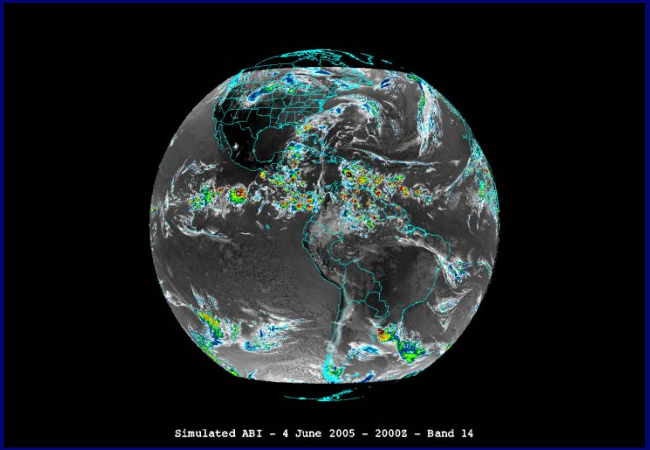


TRMM/LIS

Lightning Mapping Arrays



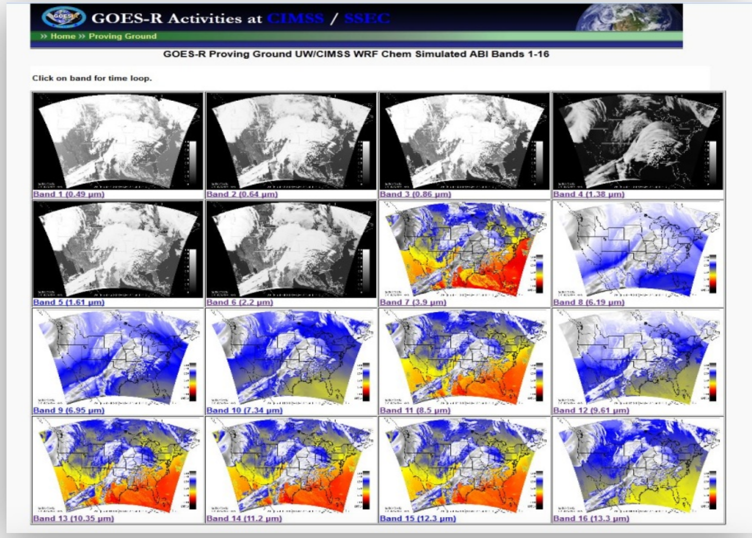



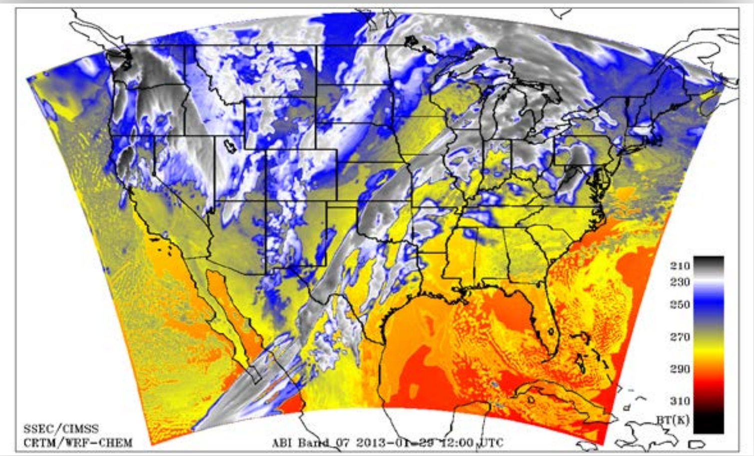




**The AWG product teams use a variety of <u>available proxy data</u> for their <u>pre-launch</u> algorithm development and testing, case study analyses, and product assessment efforts…**

# GOES-R ABI High Fidelity Simulated Datasets

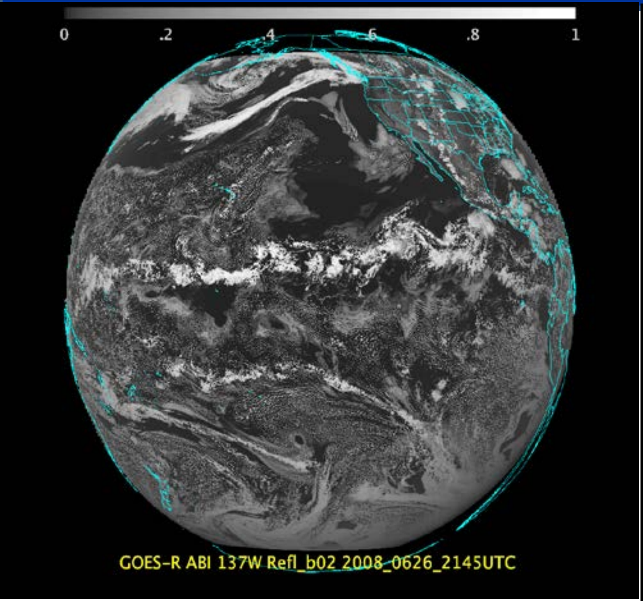
- **Atmospherically realistic data** generated via combination of high spatial resolution numerical model runs and advanced ‘forward’ radiative transfer models
- All 16 bands, various coverages (FD, CONUS, Meso), spatial resolutions, and formats (GOES-R Fixed Grid Format, NetCDF)
- Used by AWG product teams and in a number of GOES-R Proving Ground demonstrations
- Used to support ABI waiver analyses
- Planned use in GOES-R Ground System verification testing activities

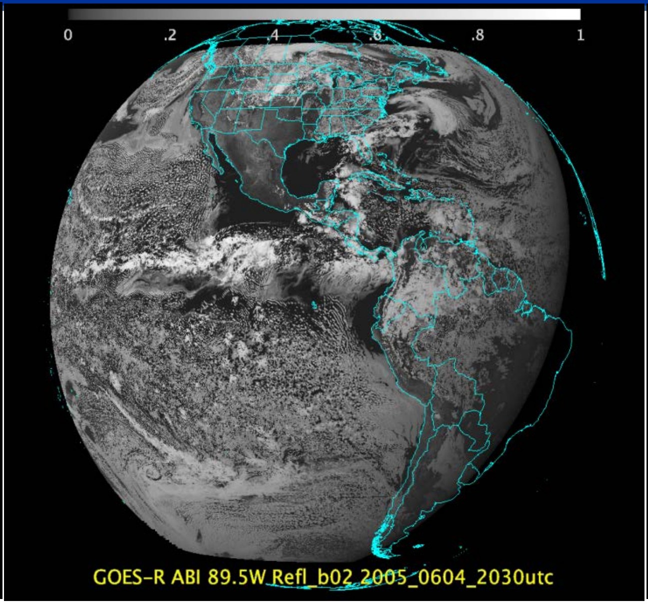


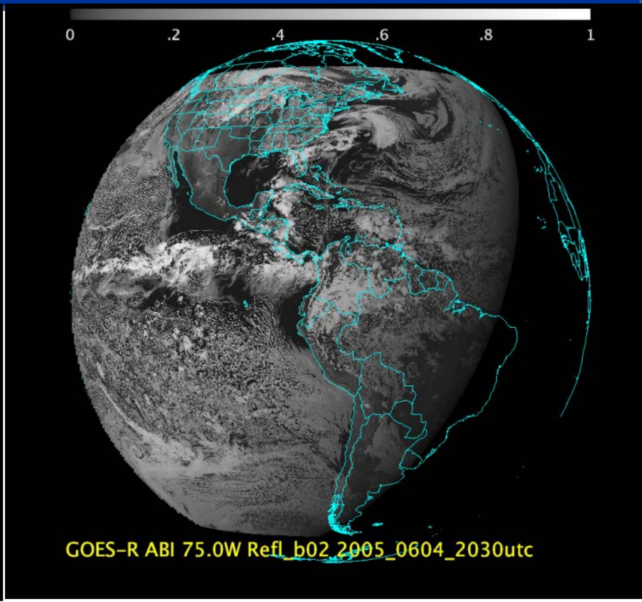




*AWG Proxy Team at CIMSS*

# ABI Image Triplet Test Datasets Delivered to the GOES-Program



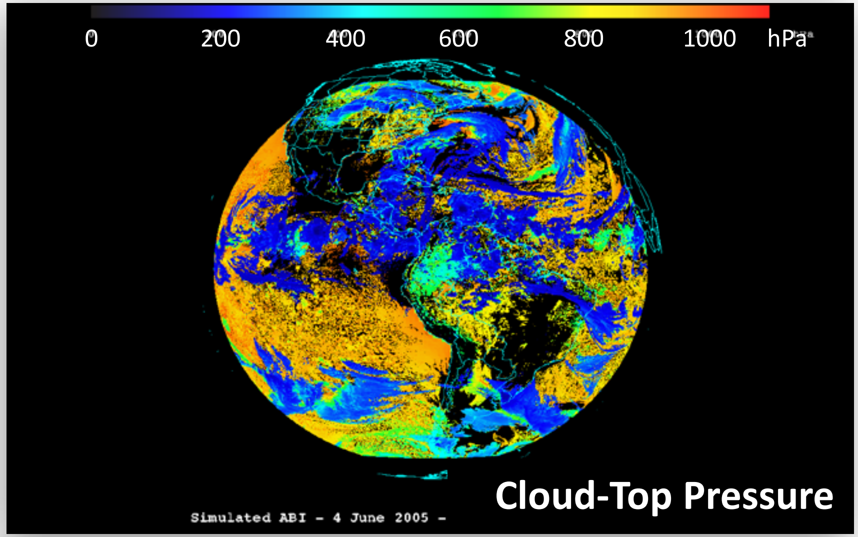



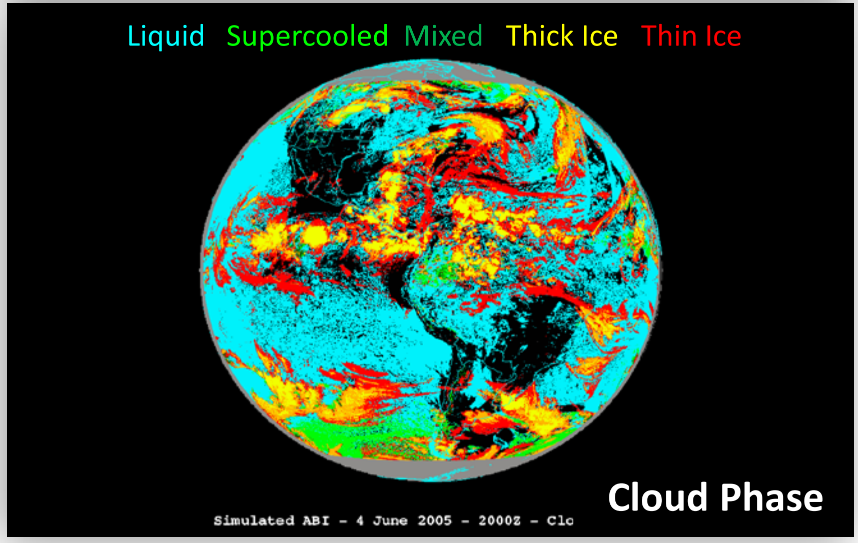

| ABI Image Triplet | 137W | 89.5W | 75W |
|---|---|---|---|
| **Model** | WRF | WRF | WRF |
| **Number of times** | 7 | 7 | 7 |
| **Time range** | 20:00-20:30UTC | 20:00-20:30UTC | 20:00-20:30UTC |
| **Day** | 04-Jun-2005 | 04-Jun-2005 | 04-Jun-2005 |
| **Sectors** | FD, CONUS, MESO | FD, CONUS, MESO | FD, CONUS, MESO |
| **Types** | GRB, VAL | GRB, VAL | GRB, VAL |
| **Navigation** | FGF | FGF | FGF |

# ABI Level-2 Products

# 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 microphysics.
  - 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.
  - Use of the new ABI 8.5um band, together with the 11um band, enables extraction of cloud microphysical properties.
- **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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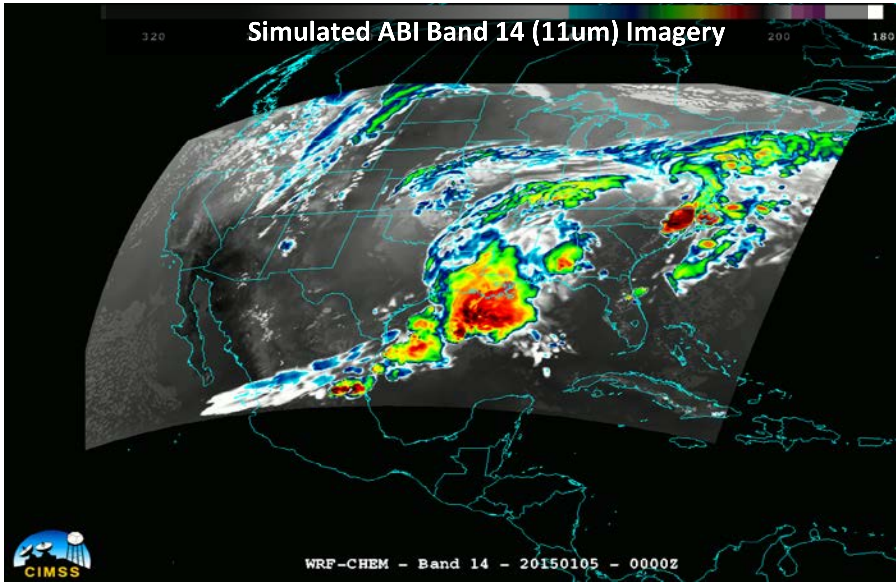
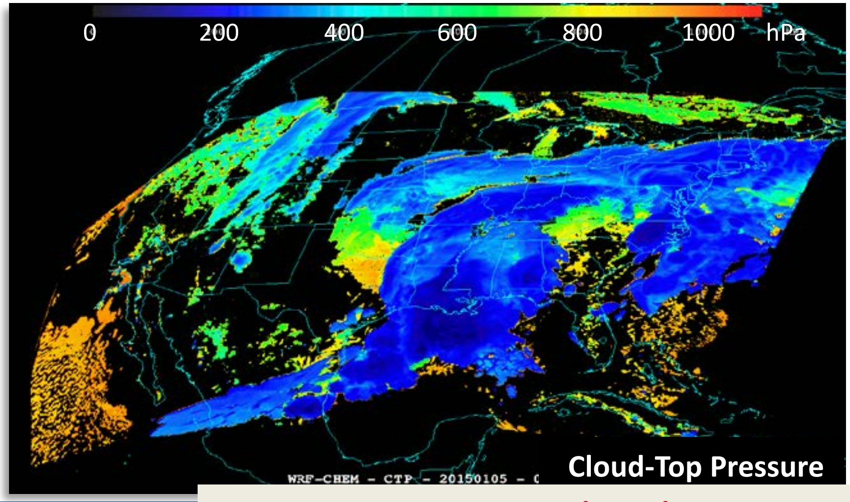


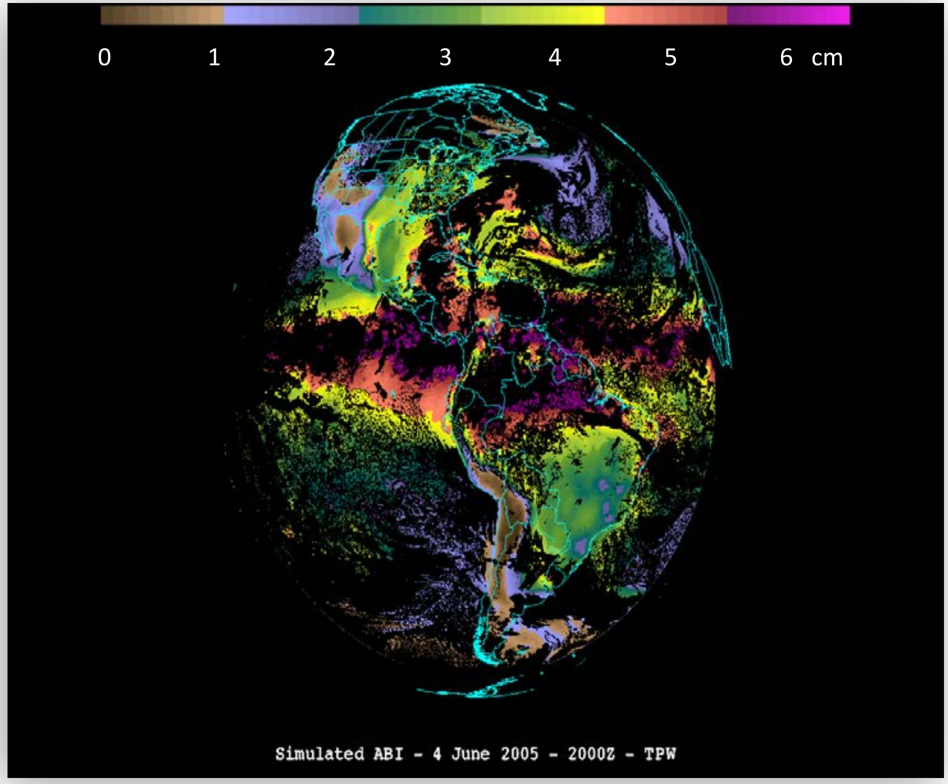






*Andrew Heidinger (NESDIS/STAR/CIMSS)*
*Mike Pavolonis (NESDIS/STAR/CIMSS)*

# 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

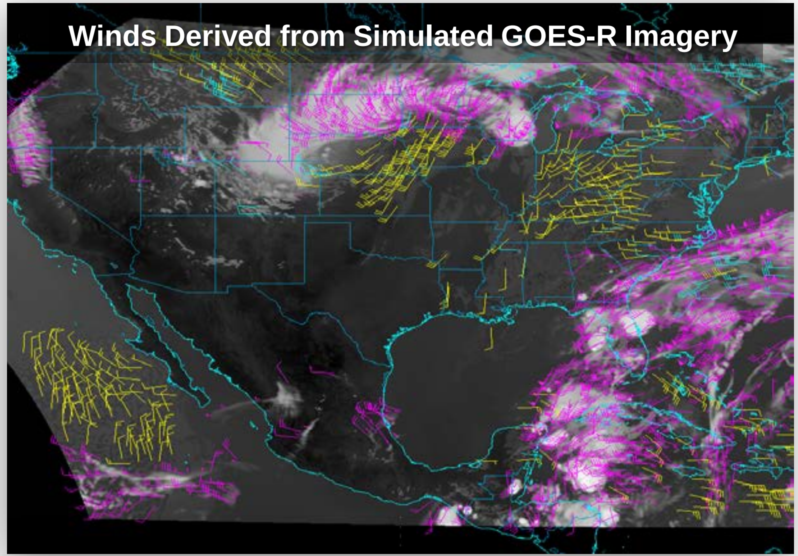


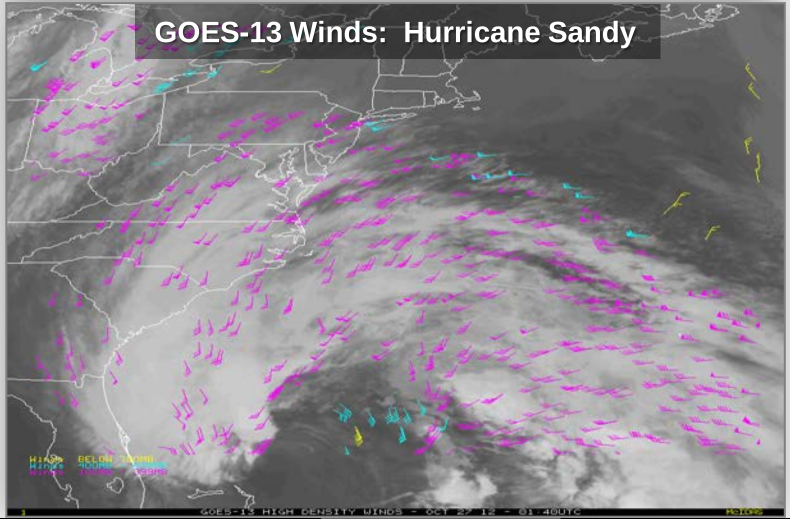

*Tim Schmit (NESDIS/STAR/CIMSS)*

# Derived Motion Winds

- **Algorithm Highlights**
  - New nested tracking algorithm improves feature tracking; reduction of speed bias
  - Wind height assignment relies on utilization of pixel level cloud heights generated upstream
  - Leverages ABI's higher spatial and temporal resolution data;  image navigation and registration

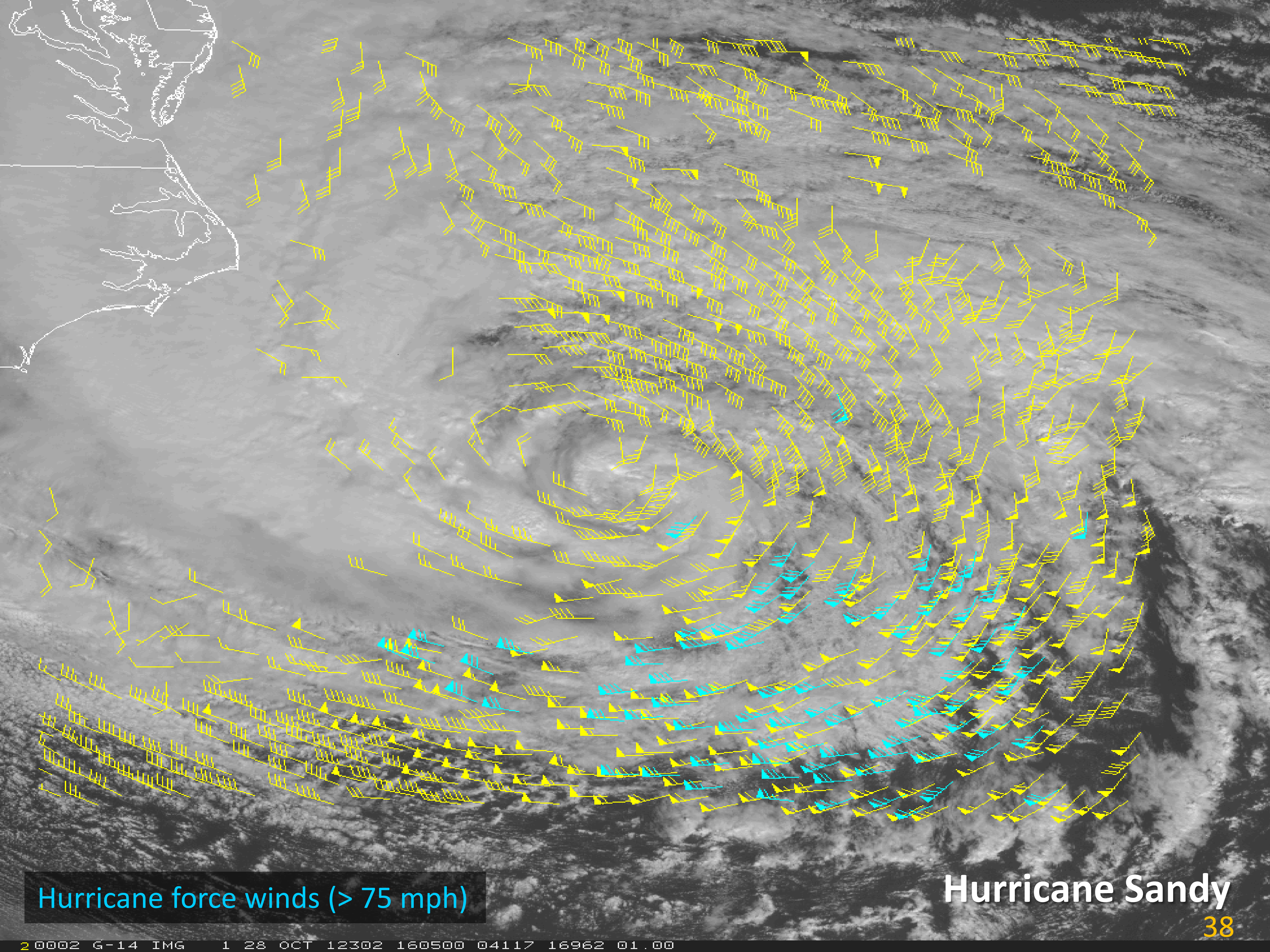
- **Operational Applications**
  - Field Forecasters (NWS WFOs and National Centers)
    - Situational awareness of the atmospheric wind field
    - Verification of model guidance
    - Atmospheric monitoring
  - Numerical Weather Prediction Centers
    - Satellite winds used to support the initialization of the atmospheric wind field in global and regional models



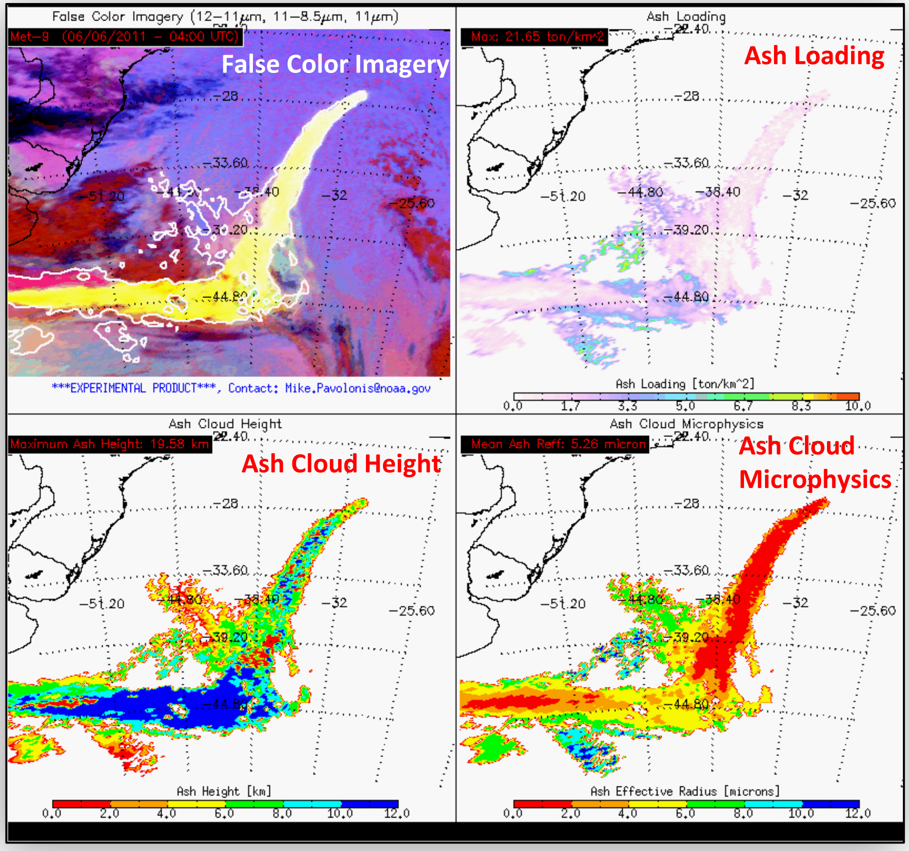

High-Level 100-400 mb   Mid-Level 400-700 mb   Low Level > 700 mb

*Jaime Daniels (NESDIS/STAR/CIMSS)*


Hurricane force winds (> 75 mph)
Hurricane Sandy
2 00002 G-14 IMG 1 28 OCT 12302 160500 04117 16962 01.00

# Volcanic Ash

- **The VolAsh height detection and product is a big step forward for operations**
  - The impacts to aircraft operations and the associated costs should be reduced with this capability alone
  - Automated alerts will aid forecasters in the production of warning products
- **The GOES-R Proving Ground provides near real-time volcanic ash retrieval products (Meteosat SEVIRI proxy for the ABI)**
  - to the London Volcanic Ash Advisory Center (VAAC) during the eruption of Eyjafjallajökull in Iceland in May 2010 impacting aviation operations with many cancelled flights..
- **GOES-R VolAsh algorithm implemented at JMA in 2013 in preparation for Himawari 8.**

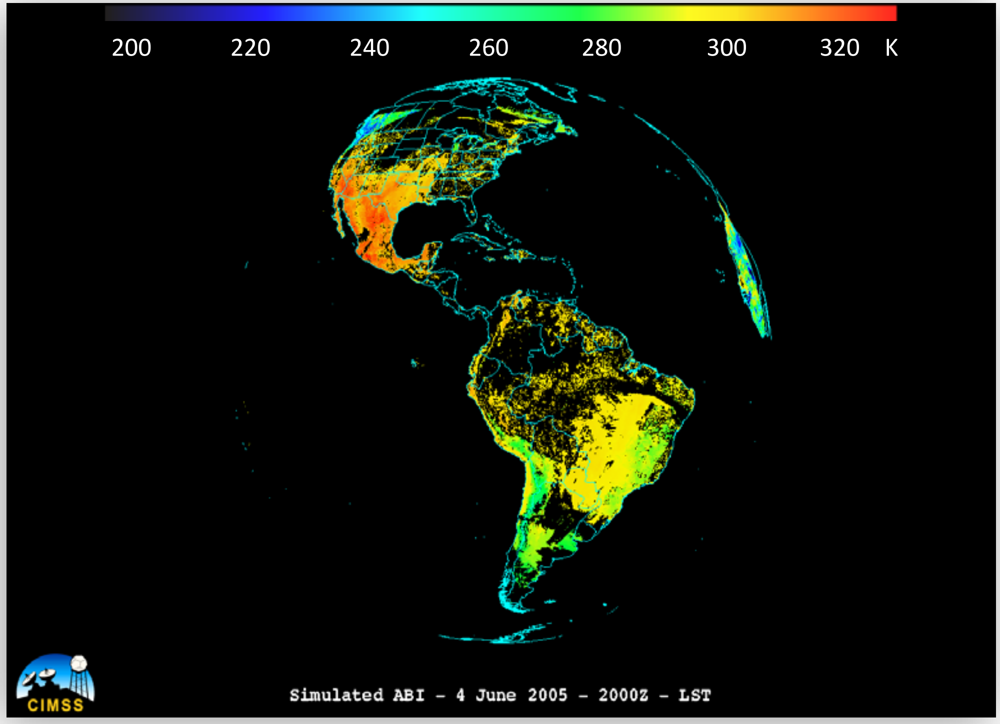



Chile's Puyehue-Cordón Caulle Volcano erupted on June 4, 2011, forming a tall ash plume above the Andes Mountains

*Mike Pavolonis (NESDIS/STAR/CIMSS)*

# Land Surface Temperature

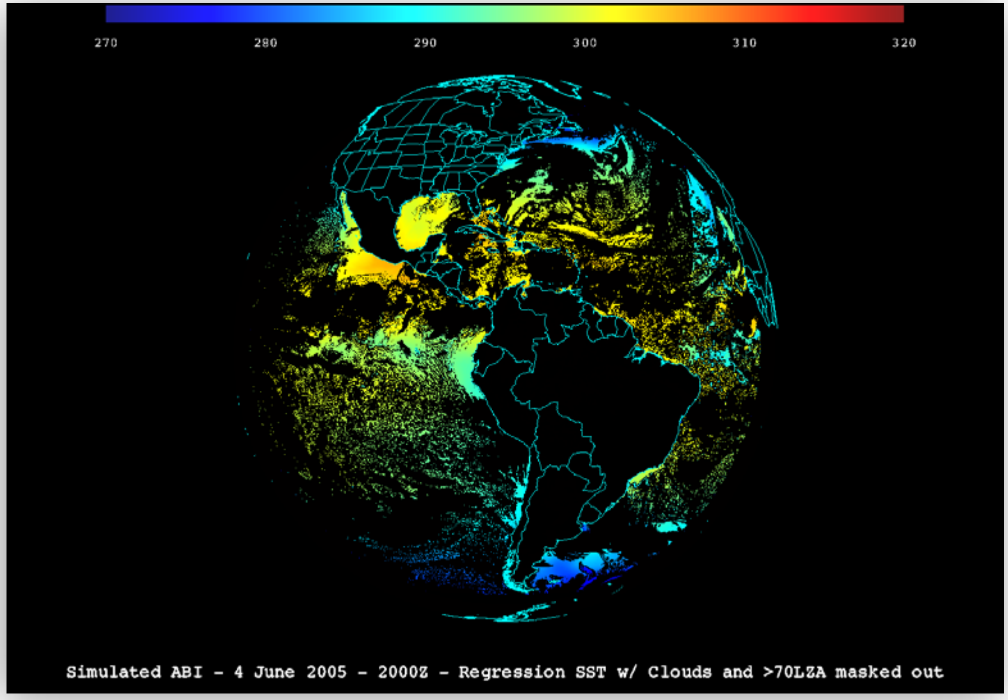
- **Algorithm Highlights**
  - Utilizes ABI clear sky mask product
  - Regression-based algorithm that uses the 11.2 and 12.3 µm channels
  - Split-window algorithm has significant heritage (GEO & LEO)
  - Leverages ABI's higher spatial resolution data
- **Operational Applications**
  - Fog forecasting
  - Frost/freezing temp forecasting
  - Assimilation into land surface models
  - Assimilation into mesoscale and climate NWP models
  - Climate prediction




*Bob Yu (NESDIS/STAR/CIMSS)*

# Sea Surface Temperature

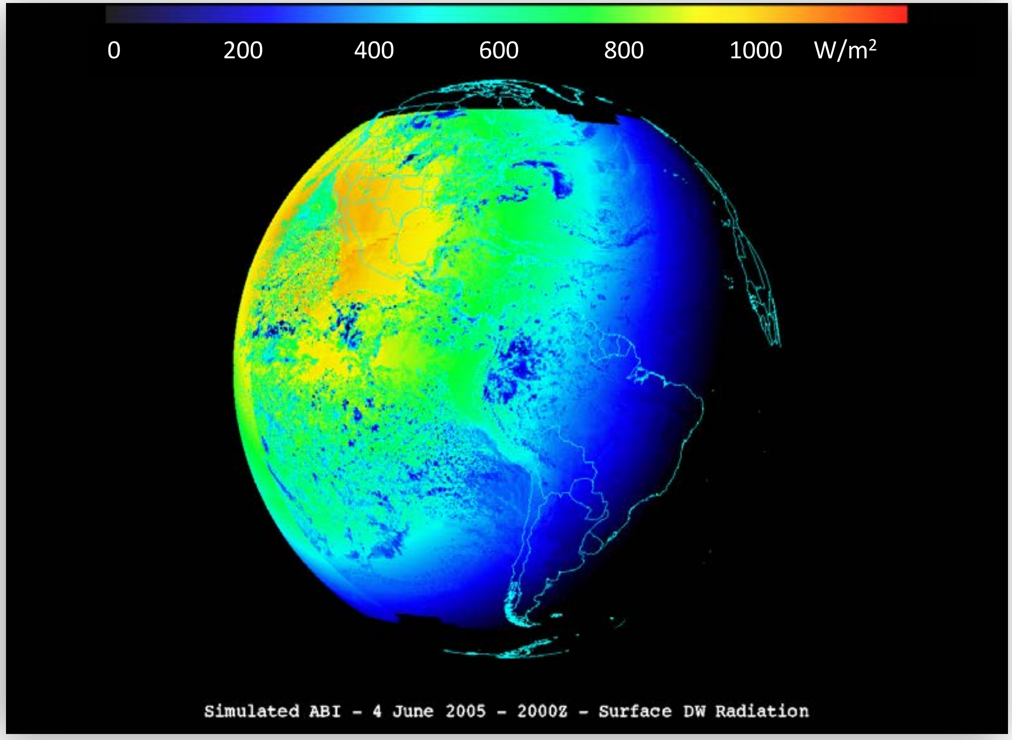
- **Algorithm Highlights**
  - Hybrid approach that combines the advantages of regression (heritage approach) with a physical retrieval approach (optimal estimation)
  - Utilizes the 3.9, 8.5, 10.35, 11.2, 12.3µm bands
  - Exploits recent improvements in fast clear-sky radiative transfer models
  - Leverages increased ABI spectral, spatial, and temporal resolution
- **Operational Applications**
  - Assimilation into atmospheric,oceanic models
  - Contributor to blended SST product
  - Climate monitoring/forecasting
  - NOAA' Coast Watch Program
  - Harmful Algal Bloom monitoring
  - Sea turtle tracking
  - Upwelling identification
  - Commercial fisheries management
  - NOAA's Coral Reef Watch Program
  - Coral bleach warnings and assessments




*Alexander Ignatov (NESDIS/STAR)*

# Downward Shortwave Radiation: SFC

- **Algorithm Highlights**
  - Hybrid algorithm that combines the merits of NASA ("direct path") and STAR/UMD ("indirect path") algorithms
  - Physically-based retrieval by using a Look-Up Table (LUT) representation of the RTM
  - Based on the NASA/CERES, NOAA/GOES and GEWEX/SRB heritages
  - Leverages ABI's higher temporal resolution data and spectral coverage (VIS/near IR)




- **Operational Applications**
  - Climate studies
  - Surface (land and ocean) energy budget models
    - Assimilation into
    - Independent verification of
  - Crop modeling
  - Fire risk assessment
  - Earth energy budget studies

*Istvan Laszlo (NESDIS/STAR)*

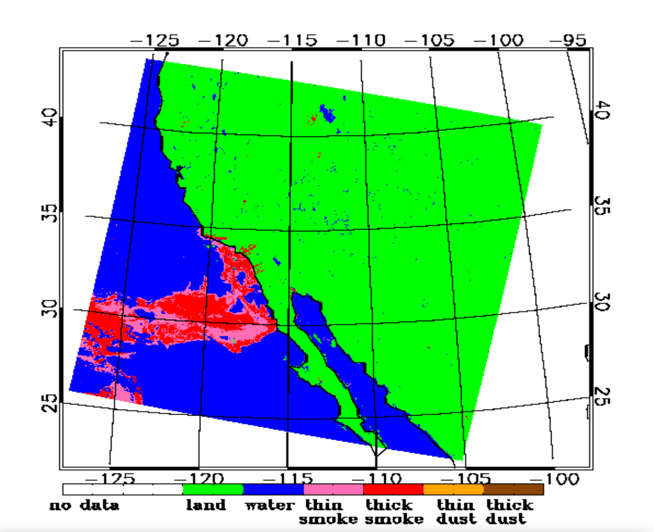
# Aerosol Detection Product

- ## Algorithm Highlights
  - Spectral threshold algorithm that uses spectral (wavelength dependent) characteristics of surface, aerosols, and clouds to identify aerosols
  - Heritage derived from AVHRR and MODIS-based aerosol detection algorithms
  - Synergy with VIIRS aerosol retrieval algorithm
  - Leverages ABI's higher spectral (VIS/near IR portion) coverage data

- ## Operational Applications
  - Air quality forecasting
  - Air quality assessment and management
  - Climate studies

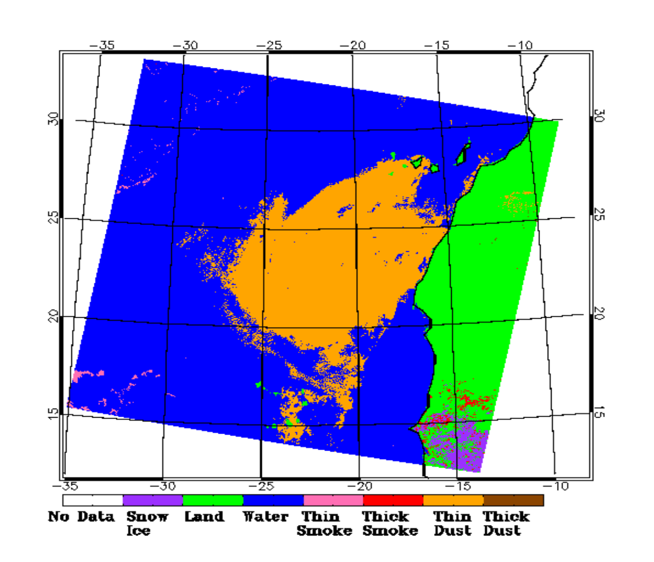
**GOES Imager**

Smoke from fires in California on October 28, 2003



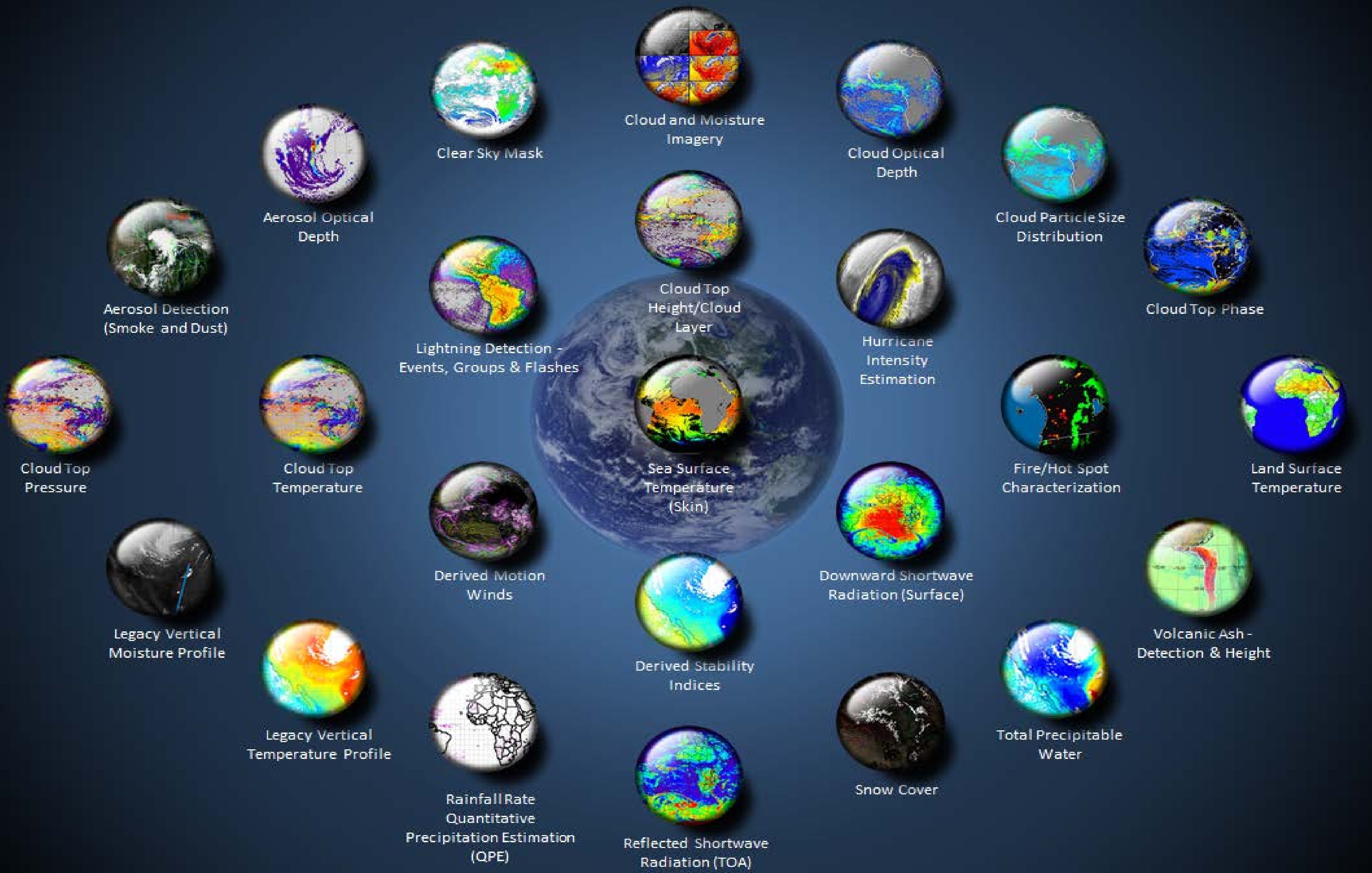

**Meteosat/SEVIRI**

Saharan dust storm off of Africa on September 4, 2005




*Shobha Kondragunta (NESDIS/STAR)*

# GOES-R Baseline Products




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

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