GOES-R is Coming- Are You Ready!

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GOES-R Mission Overview

Mission

The launch of the first in the series of next generation NOAA geostationary environmental satellites, the GOES-R series, is only one year away with the launch of the first satellite planned for March 2016. The NOAA Administrator announced at the 2015 AMS Annual Meeting that GOES-R will continue observations during its extended post-launch testing through the 2016 Atlantic Hurricane Season and transition immediately into operations afterward (March 2017). The instruments are all integrated on the satellite; the new ground processing system is deployed and undergoing integration testing; and the training plan for forecasters is rapidly coming into focus. The GOES-R Proving Ground has long been preparing forecasters, through the use of proxy data, for the new capabilities of GOES-R.

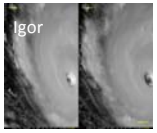
Measurement and Products

Compared to the current GOES imager, the new 16-band Advanced Baseline Imager (ABI) has twice the spatial resolution, three times more spectral information, four times greater coverage, and five times faster refresh (5 or 15 min full disk, 30 sec mesoscale), as well as a new Geostationary Lightning Mapper (GLM) to detect total lightning with 8 km spatial resolution and < 20 sec latency.

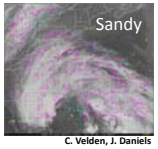
Future GOES imager (ABI) band	Wavelength range (μm)	Central wavelength (μm)	Nominal subsatellite IGFOV (km)	Sample use
1	0.45–0.49	0.47	1	Daytime aerosol over land, coastal water mapping
2	0.59–0.69	0.64	0.5	Daytime clouds fog, insolation, winds
3	0.846–0.885	0.865	1	Daytime vegetation/burn scar and 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
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	Mid-level 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

GOES-R PRODUCTS

Advanced Baseline Imager (ABI)	Geostationary Lightning Mapper (GLM)
1. Aerosol Detection (Including Smoke and Dust)	1. Lightning Detection: Events, Groups & Flashes
2. Aerosol Optical Depth (AOD)	**Space Environment In-Situ Suite (SEISS)**
3. Clear Sky Masks	2. Energetic Heavy Ions
4. Cloud and Moisture Imagery (KPP)	3. Magnetospheric Electrons & Protons: Low Energy
5. Cloud Optical Depth	4. Magnetospheric Electrons: Med & High Energy
6. Cloud Particle Size Distribution	5. Magnetospheric Protons: Med & High Energy
7. Cloud Top Height	6. Solar and Galactic Protons
8. Cloud Top Phase	**Magnetometer (MAG)**
9. Cloud Top Pressure	7. Geomagnetic Field
10. Cloud Top Temperature	**Extreme Ultraviolet and X-ray Irradiance Suite (EXIS)**
11. Derived Motion Winds	8. Solar Flux: EUV
12. Derived Stability Indices	9. Solar Flux: X-ray Irradiance
13. Downward Shortwave Radiation: Surface	**Solar Ultraviolet Imager (SUVI)**
14. Fire/Hot Spot Characterization	10. Solar Imagery (X-ray): coronal holes, solar flares, coronal mass ejection source regions
15. Hurricane Intensity Estimation	
16. Land Surface Temperature (Skin)	
17. Legacy Vertical Moisture Profile	
18. Legacy Vertical Temperature Profile	
19. Radiances	
20. Rainfall Rate/QPE	
21. Reflected Shortwave Radiation: TOA	
22. Sea Surface Temperature (Skin)	
23. Snow Cover	
24. Total Precipitable Water	
25. Volcanic Ash: Detection and Height	



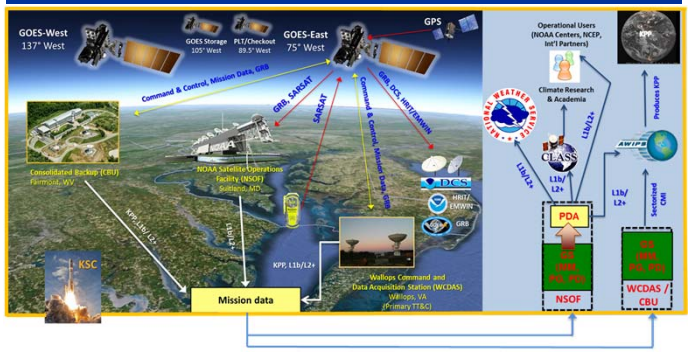
ABI Mode 3
30 sec imagery



Atmospheric Motion Vectors (AMVs)

C. Velden, J. Daniels

Ground System Architecture

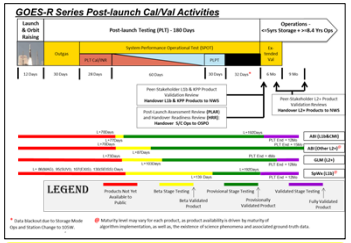


User System Readiness and Data Operations Exercises (DOEs)

- DOEs provide incremental readiness to prepare systems, operators, processes, and teams to support mission operations
- Conducted in a "rehearse like we fly" manner
- Both nominal and anomalous conditions are exercised; Some long duration DOEs are planned to satisfy consumers' needs
- Provide risk reduction for scripted GSIT (Ground Segment Integration & Test team) requirement (functionality and capability) verification tests
- OSPO-approved Product Distribution & Access (PDA, the Enterprise GUI-based customer data access portal) users can use DOEs to validate their requirements
- NWS and PDA are engaged in the planning and execution of the DOEs
- Coordination with NWS is on-going to extend the exercises through the NWS system
- Goal is to ultimately exercise the entire ground system by processing data from end-to-end, from L0 through L2+, including PDA

Product Validation, Pre- and Post-Launch Testing

- **Primary focus is "Day-one Readiness"** for GOES-R observatory post-launch tests and data post-launch product tests. This readiness includes: Planning of observatory and data product tests; Software analysis tool development and testing; Cal/Val Operational Concept development and rehearsals; and Core Ground Segment training for cal/val personnel using GS capabilities.
- **Pre-Launch:** L1b and L2+ algorithm implementation in the Ground Segment (GS) is verified by comparing data products produced by the GS with expected results provided by instrument vendors (L1b) and the Algorithm Working Group (ABI and GLM L2+)
- **Post-Launch:** The Post-Launch Testing period includes a traditional observatory checkout, but also contains a period of Post-Launch Product Tests (PLPTs) designed for limited product quality assessment before Spacecraft Handover (Launch + 6 mo). After Handover, a period of Extended Validation (Launch + 12 mo) is planned to enhance product science validation maturity.
- **At Spacecraft Handover:** the expectation is that all L1b products and Cloud & Moisture Imagery will be Provisionally Validated, while all other products will be Beta Validated

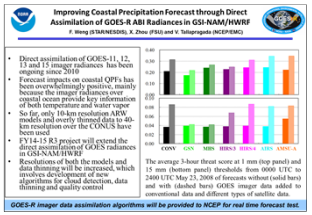


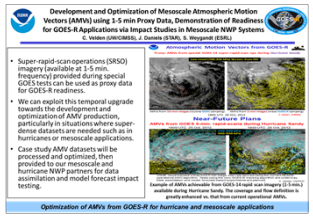
Beta - Product is minimally validated, and may still contain significant errors (identified and unidentified).

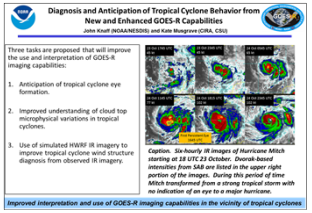
Provisional - Product performance (L1b or L2+) has been demonstrated through analysis of a large, but still limited (i.e., not necessarily globally or seasonally representative) number of independent measurements obtained from selected locations, time periods, or field campaign efforts.

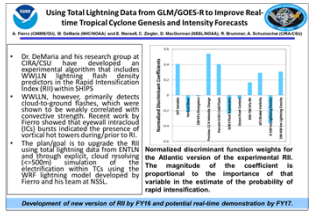
Validated - Product performance has been demonstrated over a large and wide range of representative conditions (i.e., global, seasonal).

Risk Reduction Research and New Applications



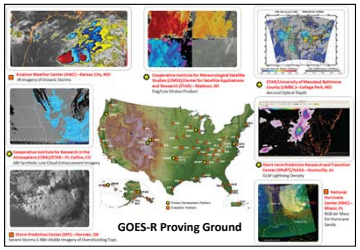






User Readiness- Proving Ground Demonstrations and Training

- Supports the demonstration and utilization of new capabilities by the end users thus facilitating the early transition of GOES-R to operations (R2O)
- Infuses GOES-R products and techniques into NWS operations with emphasis on AWIPS and transitioning to AWIPS-II
- Incorporates user feedback for product improvements
- Bridges the gap between research and operations using current systems (satellite-MODIS, VIIRS, Himawari, terrestrial, model, synthetic) to emulate GOES-R capabilities.



Training and User Education

NHC Proving Ground Product	Category	Evaluation Goals
GOES-R natural color	Mature	Included in NHC PG for several years Continue to obtain feedback, time permitting
RGB air mass		
RGB dust		
Saharan Air Layer (SAL)		
Pseudo natural color imagery product		
Hurricane Intensity Estimate (HIE)	Quantitative	Continue to obtain feedback, quantitative verification
Rapid Intensification Index (RII)		
RGB daytime microphysics	Introductory	Emphasize and obtain feedback on tropical applications – all were introduced in late 2013, little exposure
RGB nighttime microphysics		
RGB convective storms		
S-NPP Day/Night Band		
CIRA RGB Dust (DEBRA)	Comparison	Encourage forecasters to display comparison products w/ originals, provide strengths and weaknesses
Lightning density		
Super rapid scan imagery	Underutilized	Continue to be included, modified, or given less emphasis?
Tropical overshooting tops (TOT)		