GOES-R Baseline Instruments

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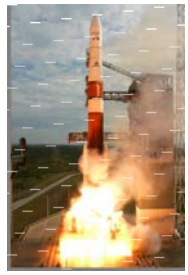


GOES-R Baseline Instruments:

ABI Advanced Baseline Imager
GLM Geostationary Lightning Mapper
SUVI Solar UV Imager
EXIS Extreme UV/X-Ray Irradiance Sensor
SEISS Space Environmental In-Situ Suite
MAG Magnetometer

Unique Payload Services:

LRIT--Low Rate Information transmission
EMWIN--Emergency Managers Weather Information Network
DCS--Data Collection System
SAR-- Search and Rescue
GRB-- GOES Re-Broadcast

Parameter	Current GOES Imager	Future GOES Imager	Comments
Number of Visible bands	1	2	Cloud cover, plant health and surface features during the day, etc.
Number of Near IR bands	0	4	Cirrus clouds, Low cloud/fog and fire detection, etc.
Number of Infrared bands	4	10	Upper-level water vapor, clouds, SO_2, SST, etc.
Coverage Rate	26 minutes for full disk	15 minutes for full disk, plus CONUS images every 5 minutes, plus meso-scale scans	ABI is approximately five times faster
Spatial resolutions of the 0.6 um visible band	Approximately 1 km	0.5 km	At the sub-satellite point
Spatial resolutions of the infrared bands	Approximately 4-8 km	2 km	At the sub-satellite point
On-orbit visible calibration	No	Yes	

Payload Services

Additional GOES-R services include GOES-R ReBroadcast (GRB), Search and Rescue (SAR), Data Collection System (DCS), Emergency Managers Weather Information Network and Low Rate Information Transmission (LRIT).

Cougar Ace incident off of Alaska (24 rescued) was detected by GOES-11 at 0830UTC (and NOAA-17 at 0831UTC). Figure courtesy of Thomas. M. Wrublewski.

"More than one-half of the currently operating [streamflow] stations have equipment that permits immediate transmission of data by means of satellite from the data-collection site. By using the telemetry, data are transmitted around the clock by means of two geostationary operations environmental satellites (GOES)." *http://water.usgs.gov/nsip/ http://pubs.usgs.gov/circ/circ1123/collection.html#HDR12*

Isabelle. Figure courtesy of C. Schmidt, CIMSS

NOAA Goals

Protect, restore, and manage the use of coastal and ocean resources through ecosystem-based management

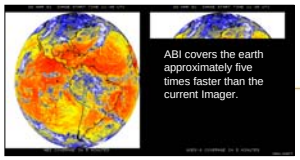
Serve society's needs for weather and water information

Understand climate variability and change to enhance society's ability to plan and respond

Support the Nation's commerce with information for safe, efficient, and environmentally sound transportation

GOES-R measurements can help fulfill each goal

ABI – Advanced Baseline Imager



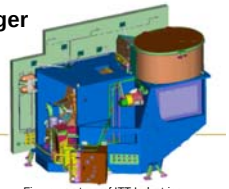
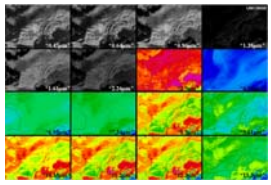
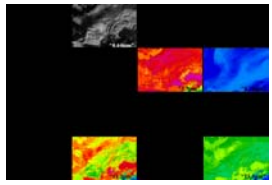


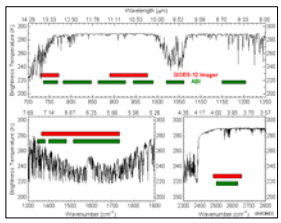
Figure courtesy of ITT Industries

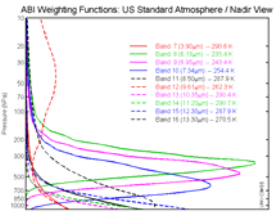
Simulated "ABI" Spectral Bands:



Corresponding Simulated GOES Imager Bands:







The great amount of information from GOES-R will both offer a continuation of current product and services, but also allow for improved or new capabilities. These products will cover a wide range of phenomena, relating to: weather, climate, ocean, land, hazards, solar and space. The instruments and services on GOES-R will enable much improved monitoring compared to current capabilities.

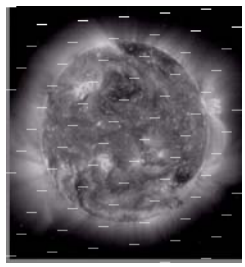
GOES-R Space Weather Instruments

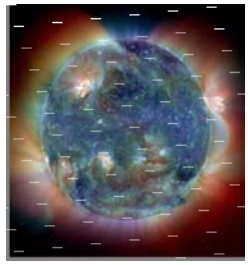
Space Environmental In Situ Suite (SEISS)
– proton, electron, and heavy ion fluxes
Extreme UV/ X-Ray Irradiance Sensor (EXIS)
– solar X-ray flux magnitude
– solar EUV flux from 5 to 129 nm
Solar extreme UV Image (SUVI)
– coronal holes locations
– solar flares
– coronal mass ejections
Magnetometer

GOES-R Improvements

– Solar UV image dynamic range, resolution, and sensitivity
– EUV measurements using 3 channels in improved modeling of ionosphere and thermosphere
– Low energy radiation environment responsible for spacecraft charging.

Simulated SUVI (Solar extreme UV Imager)
GOES-R will produce multi-band "color" images at the same rate as GOES N/P produces single band images.

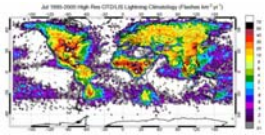




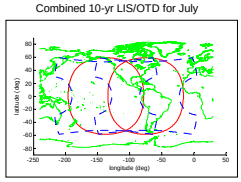
Images courtesy of SOHO EIT, a joint NASA/ESA program

GLM – Geostationary Lightning Mapper

- Detects Total Strikes: In Cloud, Cloud To Cloud, And Cloud To Ground
  - Complements land based Systems that only measures cloud to ground (about 15% of the total lightning)
- Increased Coverage Over Land and Ocean
  - Currently limited land coverage in "dead zones", and no ocean coverage



Combined 10-yr LIS/OTD for July



The potential GLM full-disk coverage area with two satellites.

GLM Applications and Benefits

- Predict the onset of tornadoes, hail, microbursts, flash floods;
  - Tornado lead time -13 min national average, improvement desired
- Track thunderstorms and warn of approaching lightning threats;
  - Lightning strikes responsible for >500 injuries per year, 90% of victims suffer permanent disabilities and long term health problems, chiefly neurological in nature
  - Lightning responsible for 80 deaths per year (second leading source after flooding)
- Improve airline routing around thunderstorms; improving safety, saving fuel, and reducing delays;
- Provide real-time hazardous weather information, improving the efficiency of emergency management;
- NWP/Data Assimilation;
- Locate lightning strikes known to cause forest fires and reduce response times;
- Multi-sensor precipitation algorithms;
- Thunderstorms and deep convection in global climate; Seasonal to interannual variability
- Provide a new data source to improve air quality / chemistry forecasts.

GOES-R Observational Requirements:

Aerosol Detection (including Smoke and Dust)	Geomagnetic Field	Surface Albedo
Aerosol Particle Size	Probability of Rainfall	*Surface Emissivity **
Suspended Matter / Optical Depth	Rainfall Potential	Vegetation Fraction: Green
*Volcanic Ash **	Rainfall Rate / QPE	Vegetation Index
Aircraft Icing Threat	*Legacy Atm. Vertical Moisture Profile **	Currents
Cloud Imagery: Coastal	*Legacy Atm. Vertical Temperature Profile **	Sea & Lake Ice / Age
Cloud & Moisture Imagery	*Derived Stability Indices **	Sea & Lake Ice / Concentration
*Cloud Layers / Heights & Thickness **	*Total Precipitable Water **	Sea & Lake Ice / Extent & Edge
*Cloud Ice Water Path **	*Total Water Content **	Sea & Lake Ice / Motion
Cloud Liquid Water	Clear Sky Masks	Ice Cover / Landlocked
Cloud Optical Depth	*Radiances **	Snow Cover
Cloud Particle Size Distribution	Absorbed Shortwave Radiation: Surface	Snow Depth
Cloud Top Phase	Downward Longwave Radiation: Surface	Sea Surface Temps
*Cloud Top Height **	Downward Solar Insolation: Surface	Energetic Heavy Ions
*Cloud Top Pressure **	Reflected Solar Insolation: TOA	Mag Electrons & Protons: Low Energy
*Cloud Top Temperature **	Upward Longwave Radiation *: Surface & TOA	Mag Electrons & Protons: Med & High Energy
Cloud Type	*Ozone Total **	Solar & Galactic Protons
Convection Initiation	*SO_2 Detection **	Solar Flux: EUV
Enhanced "V" / Overshooting Top Detection	*Derived Motion Winds **	Solar Flux: X-Ray
Hurricane Intensity	Fire / Hot Spot Characterization	Solar Imagery: extreme UV / X-Ray
Low Cloud & Fog	Flood / Standing Water	
Lightning Detection	*Land Surface (Skin) Temperature **	
Turbulence		
Visibility		

** = Products degraded from original GOES-R requirements (e.g.; now no HES)*

ABI – Advanced Baseline Imager | Continuity of GOES Legacy Sounder Products from ABI | SEISS – Space Env. In-Situ Suite | EXIS – EUV and X-Ray Irradiance Sensors | GLM – Geostationary Lightning Mapper | Magnetometer | SUVI – Solar extreme UltraViolet Imager