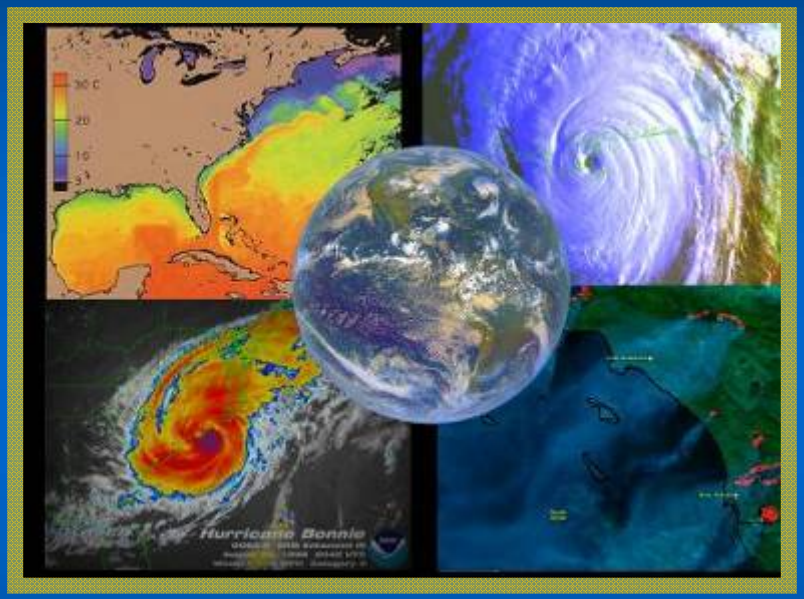
Geostationary Operational Environmental Satellite R- Series

GOES-R Overview and Status



Greg Mandt

System Program Director

89th AMS Annual Meeting

January 13, 2009

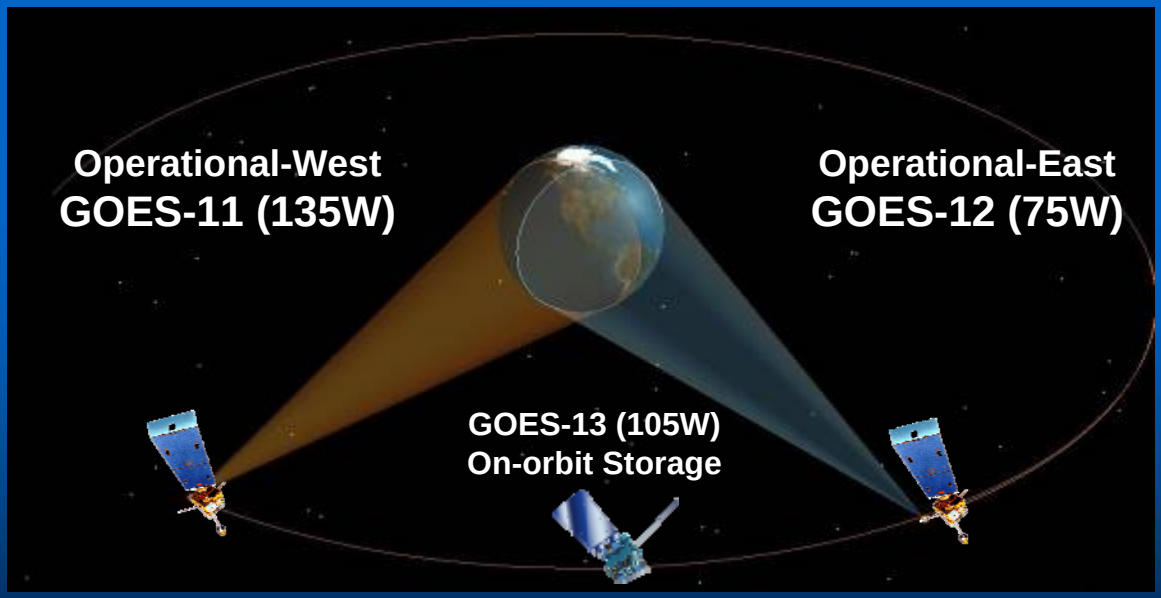
Joint Session 7:
The Fifth Annual Symposium on Future Operational Environmental Satellite Systems - NPOESS and GOES-R and The 16th Conference on Satellite Meteorology and Oceanography

Stages of Program Management

- 1. Wild enthusiasm
- 2. Dissillusionment
- 3. Confusion
- 4. Panic
- 5. Search for the guilty
- 6. Punishment of the innocent
- 7. Reward the non-participants

GOES Constellation

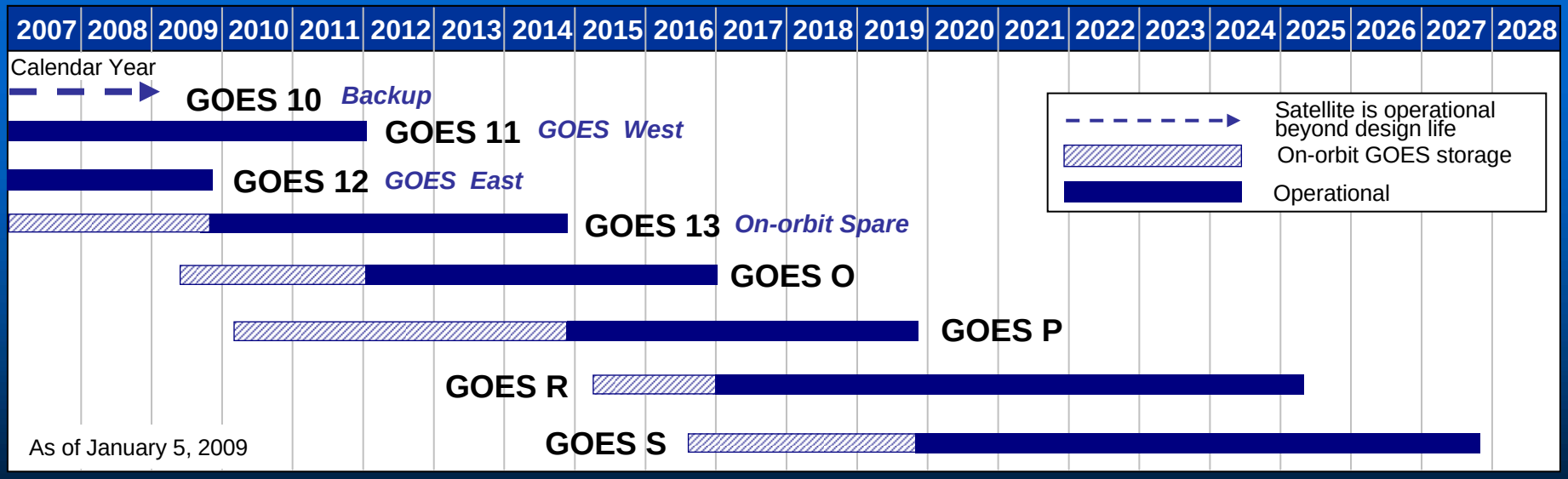
- GOES mission requires two on-orbit operational satellites and one on-orbit spare
- GOES-West location in GOES-R series to be 137°W instead of current 135°W - eliminates conflicts with other satellite systems in X-band frequency at 135°W



Note: Satellites are labeled with letters on the ground and changed to numbers on-orbit

Launch Schedule

- GOES R series is a follow-on to the existing line of NOAA's geostationary weather satellites
  - **GOES I series [8-12]: Operational since 1994**
  - **GOES N series [13]: N launched May 24 2006, O planned launch April 2009, P planned launch late 2009**
- Based on an availability analysis of the current GOES I and N-series, a GOES-R launch is required in the 2015 timeframe to maintain mission data continuity



Why GOES-R?

- Continuation of NOAA capability required to observe, protect and manage the earth's resources to promote environmental stewardship
- Enhance ability to predict and track storms; plan routes for airlines and ship traffic, identify demands for natural resources such as gas and water, and assess space weather impacts on sensitive electronics such as satellites and terrestrial communications
- Improve:
  - Hurricane track & intensity forecast
  - Thunderstorm & tornado warning lead time
  - Aviation flight route planning
  - Solar flare warnings for communications and navigation
  - Power blackout forecasts due to solar flares
  - Energetic particle forecasts

GOES-R Instruments:

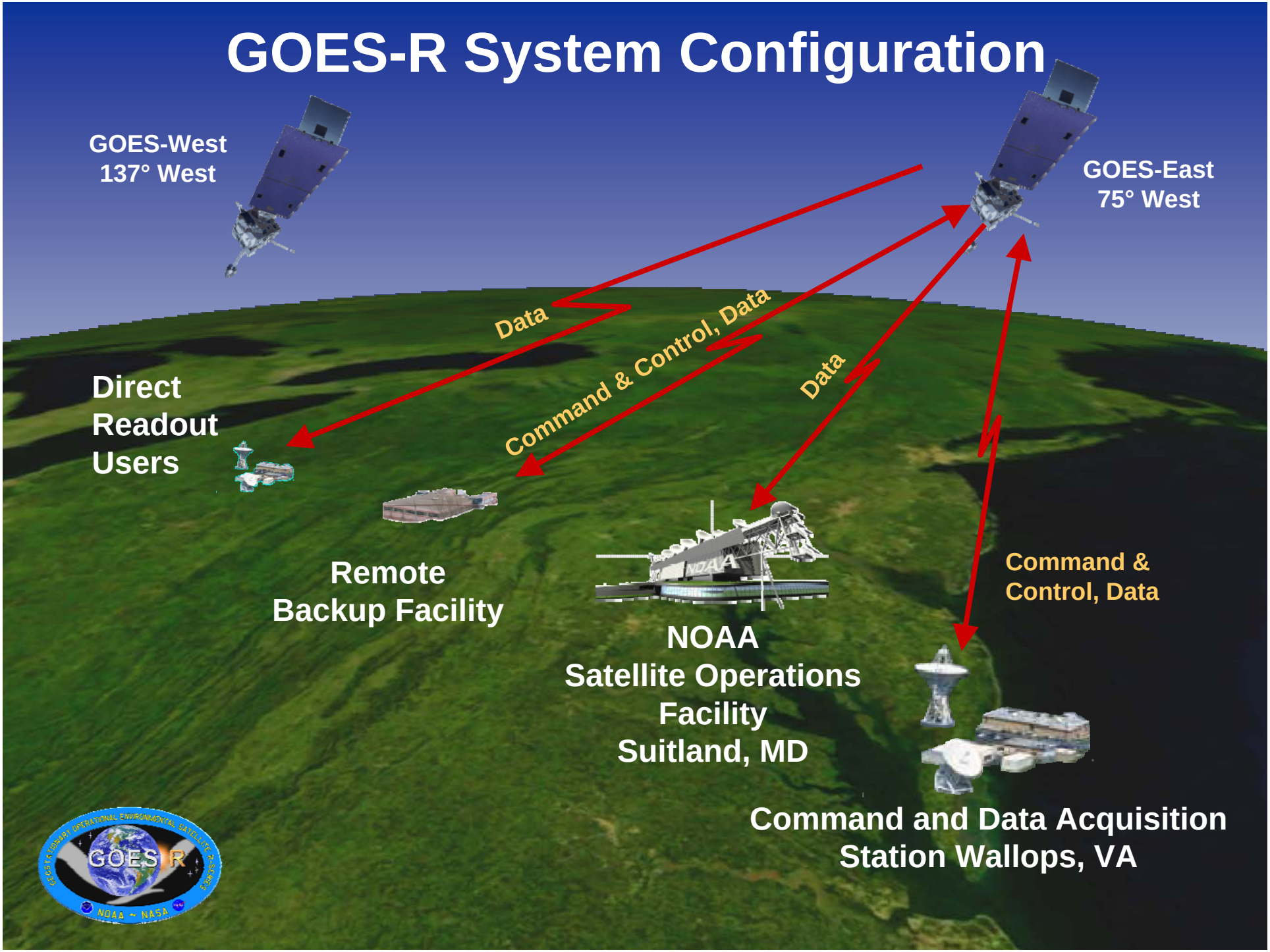
- Advanced Baseline Imager (ABI) & Geostationary Lightning Mapper (GLM) ← Thunderstorm & tornado warning lead time
- Extreme Ultra Violet Sensor/X-Ray Sensor Irradiance Sensor (EXIS) ← Solar flare warnings for communications and navigation
- Solar Ultra Violet Imager (SUVI) ← Power blackout forecasts due to solar flares
- Space Environmental In-Situ Suite (SEISS) ← Energetic particle forecasts

GOES-R Improvements

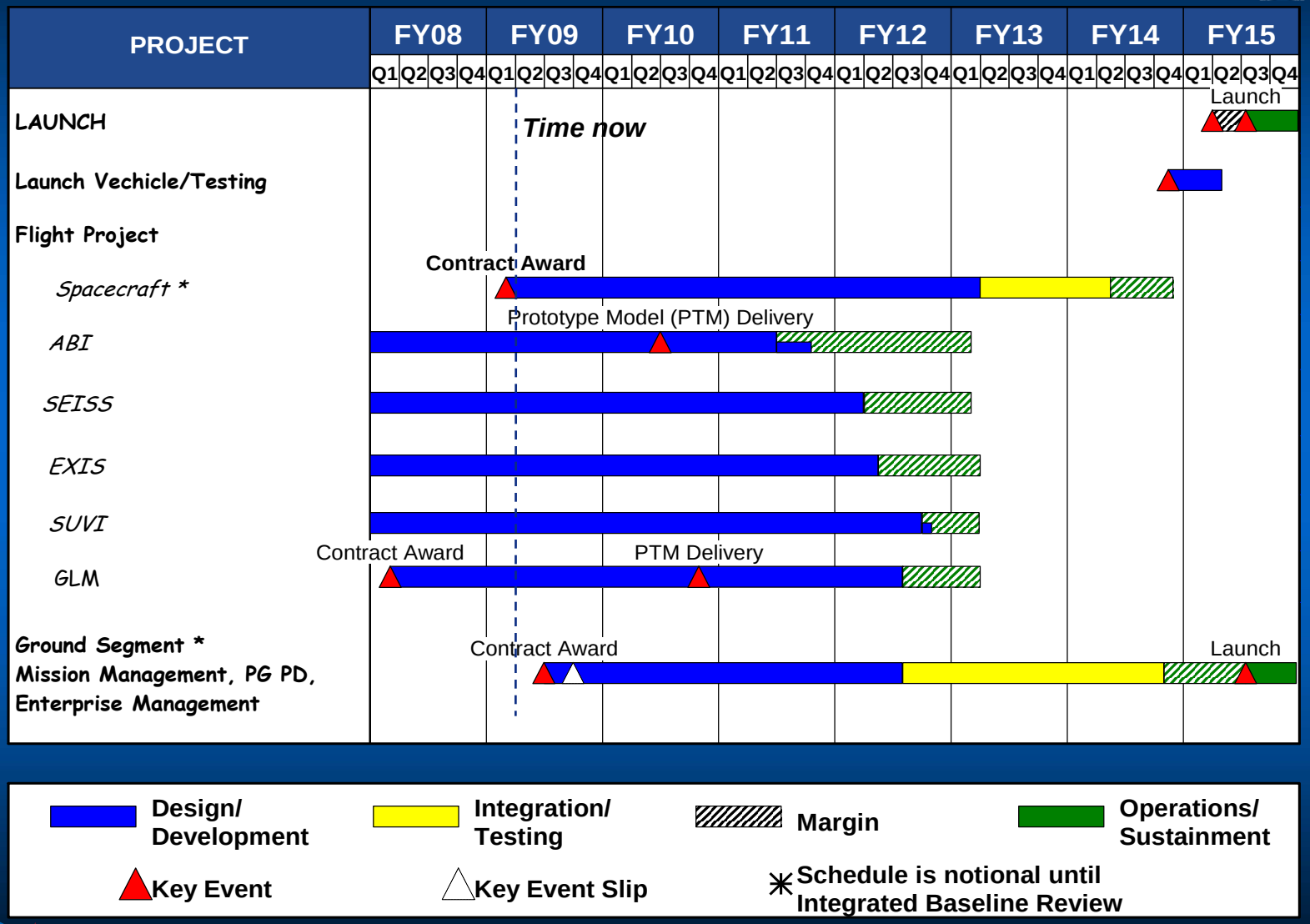
- GOES-R maintains continuity of the GOES mission
- GOES-R also provides significant increases in spatial, spectral, and temporal resolution of products

Performance Capability	GOES I-M	GOES N-P	GOES R
Imaging			
Visible Resolution	1 km	1 km	0.5 km
IR Resolution	4-8 km	4-8 km N 4 km O/P	1-2 km
Full Disk Coverage Rate	30 min	30 min	5 min
# of Channels	5	5	16
Solar Monitoring	GOES-M only	Yes	Yes
Lightning Detection	No	No	Yes (8km)
Operate through Eclipse	No	Yes	Yes
Ground System Backup	Limited	Limited	Limited
Archive and Access	Limited	Limited	Yes
Raw Data Volume per spacecraft	2.6 Mbps	2.6 Mbps	75 Mbps

GOES-R System Configuration

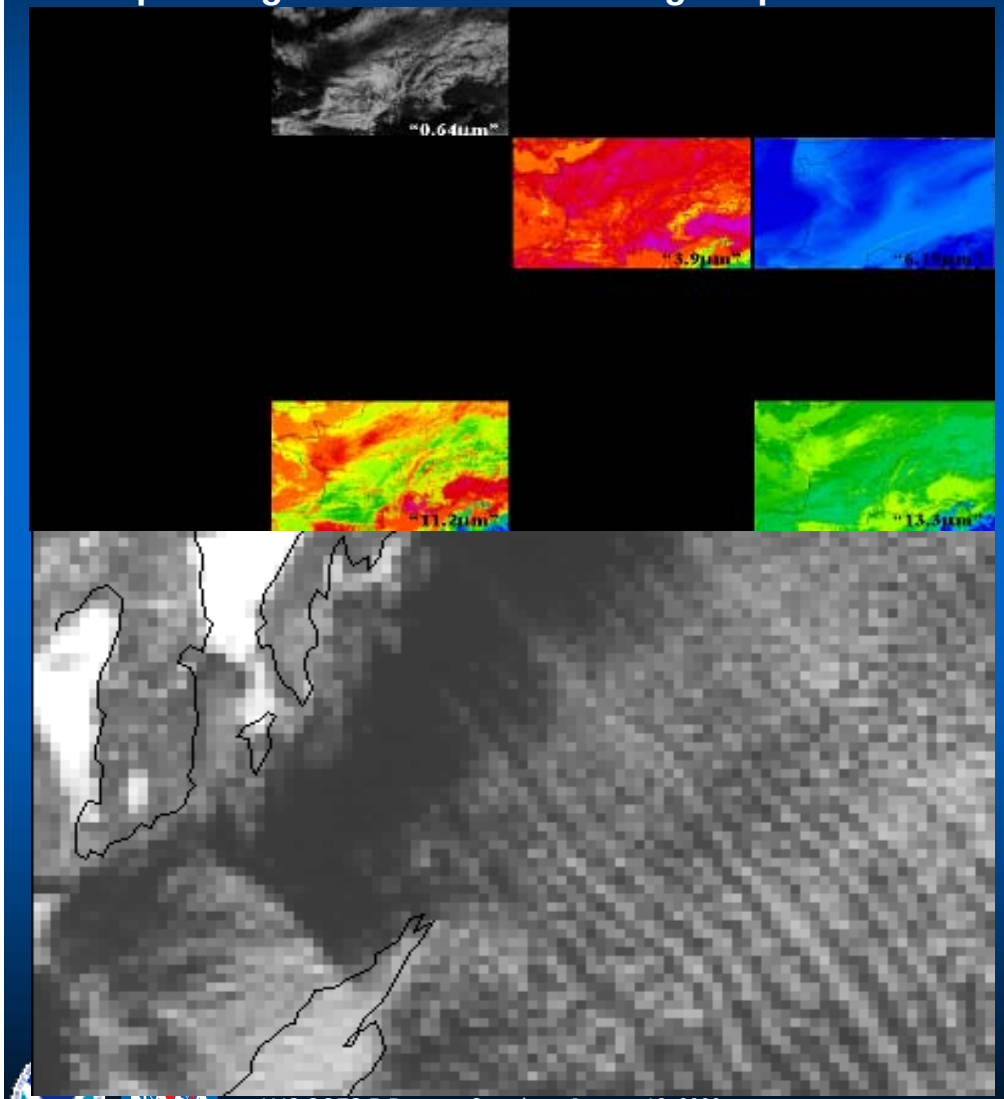


GOES-R Program Schedule

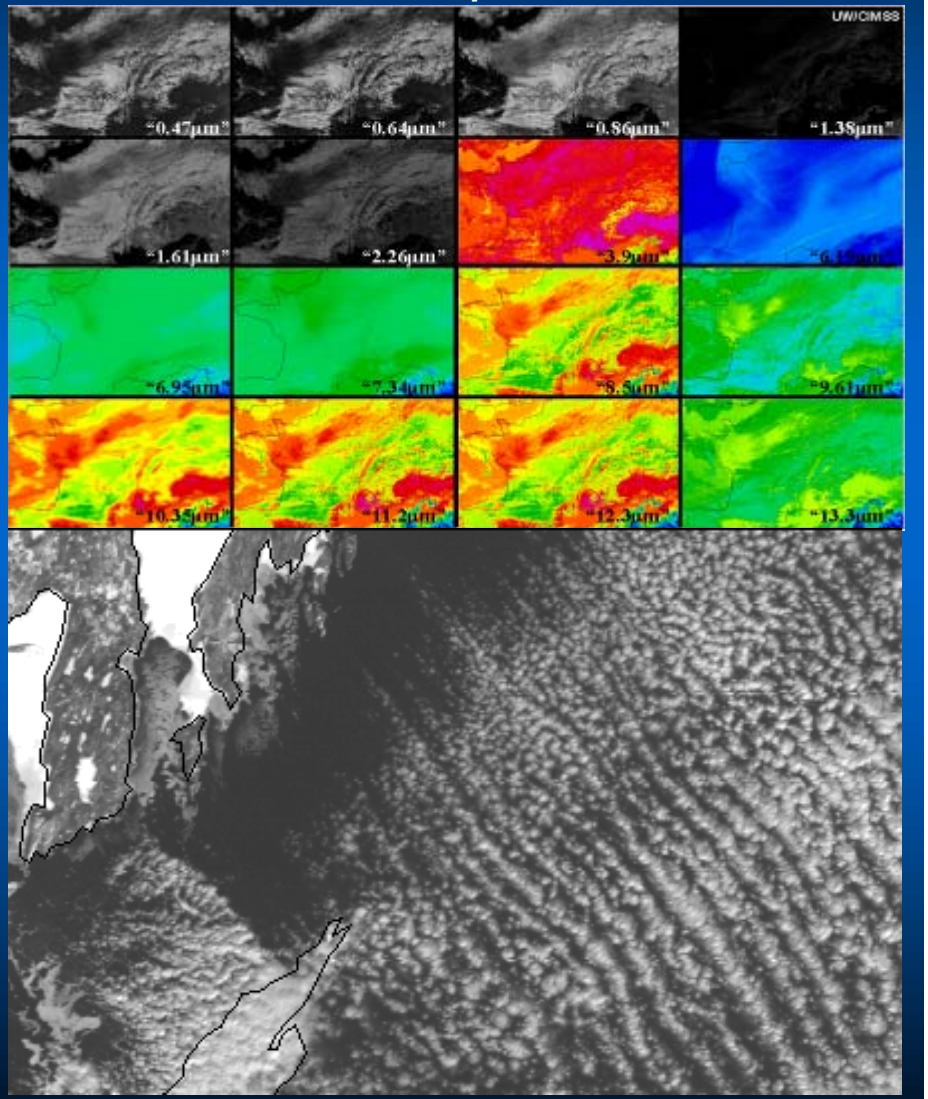


ABI: Improved Resolution

Corresponding Simulated GOES Imager Spectral Bands

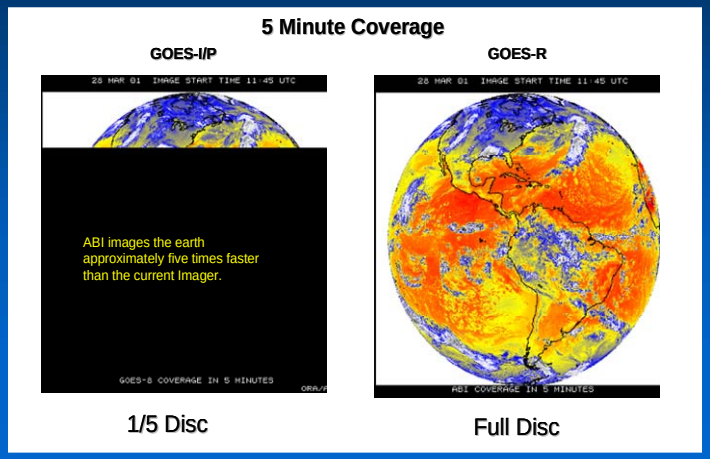


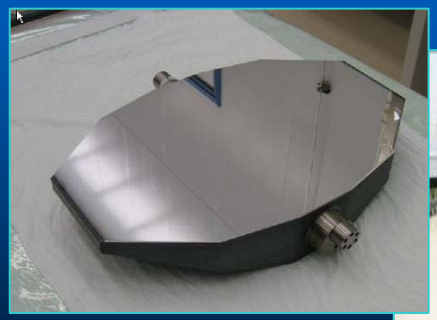
Simulated "ABI" Spectral Bands

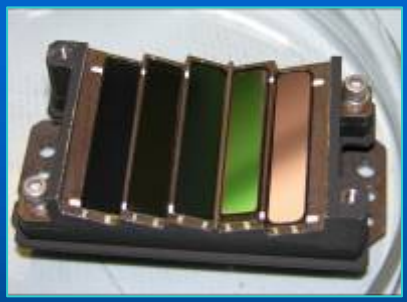


ABI Prototype Model (PTM)

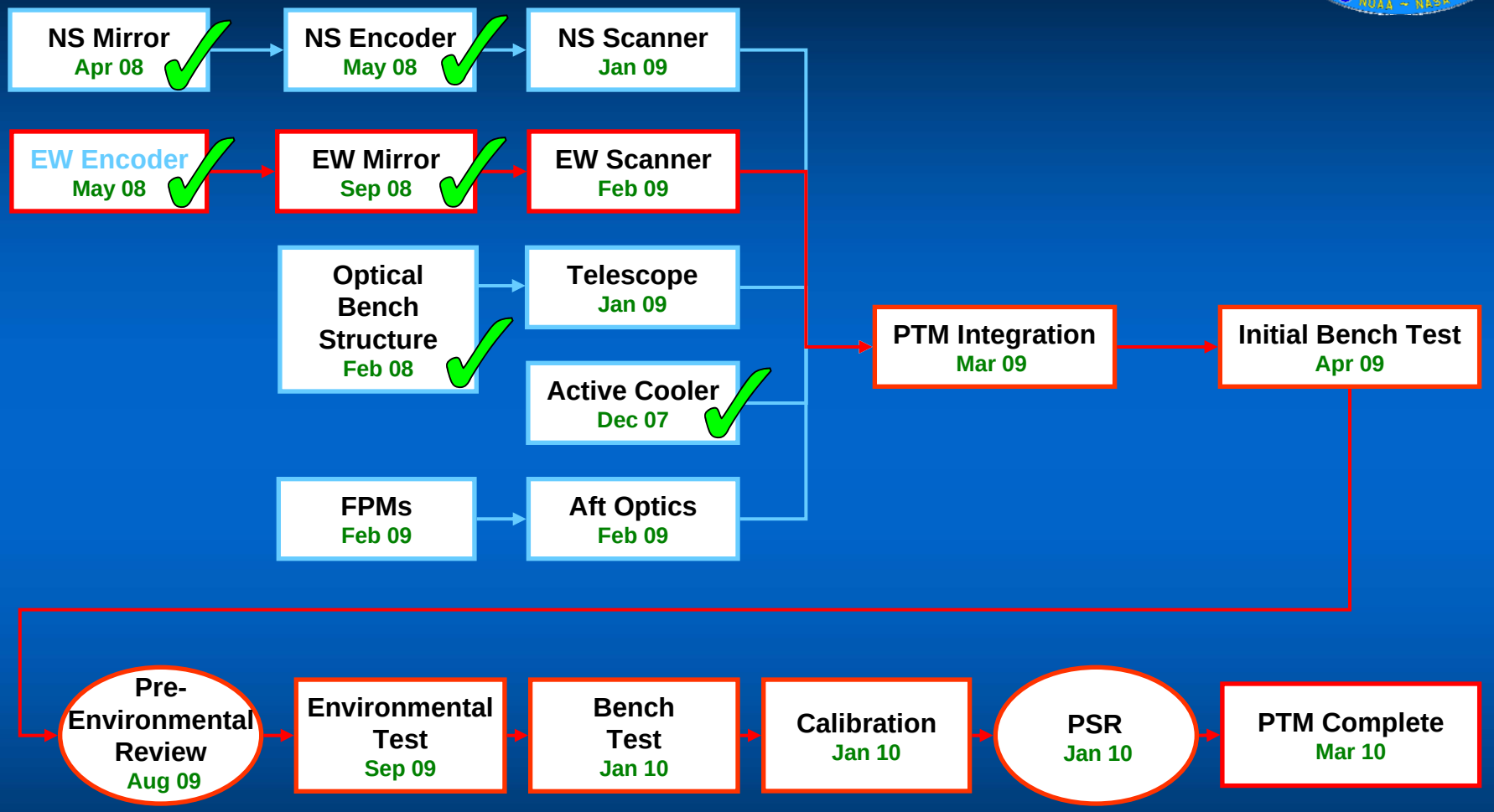
- Critical path East/West scan mirror on delivered
- East/West scanner integration progressing on schedule
- PTM Focal Plane Modules progressing
  - VNIR module delivered
- Telescope environmental testing complete
- Completed fit-checking the telescope structure in the PTM optical bench





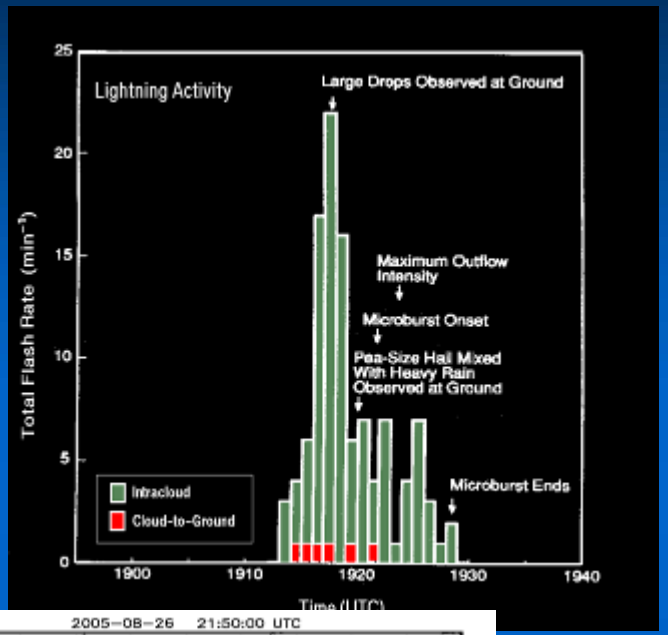


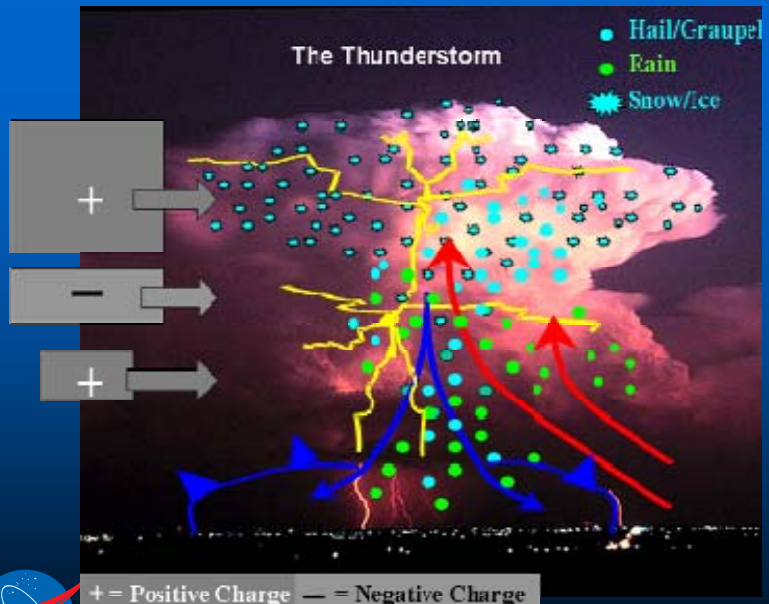
ABI Prototype Model Integration Flow

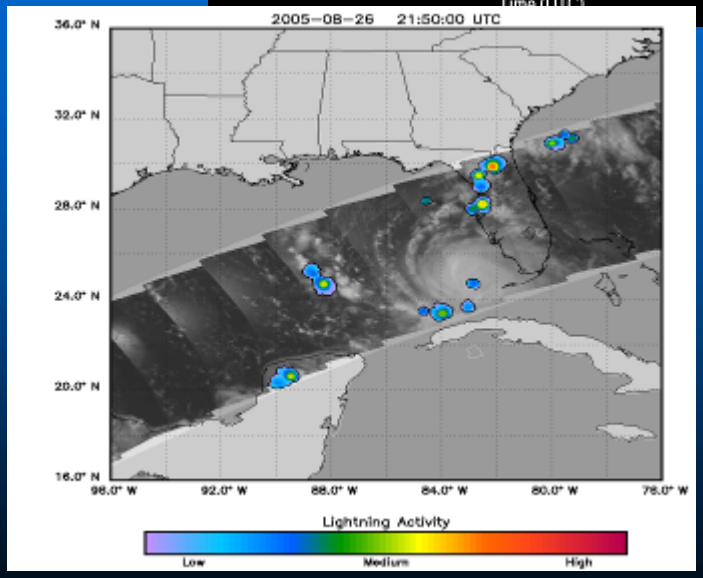


GLM

- Detects total strikes: in cloud, cloud to cloud, and cloud to ground
  - Complements today's land based systems that only measures cloud to ground (about 15% of the total lightning)
- Increased coverage over oceans and land
  - Currently no ocean coverage, and limited land coverage in dead zones

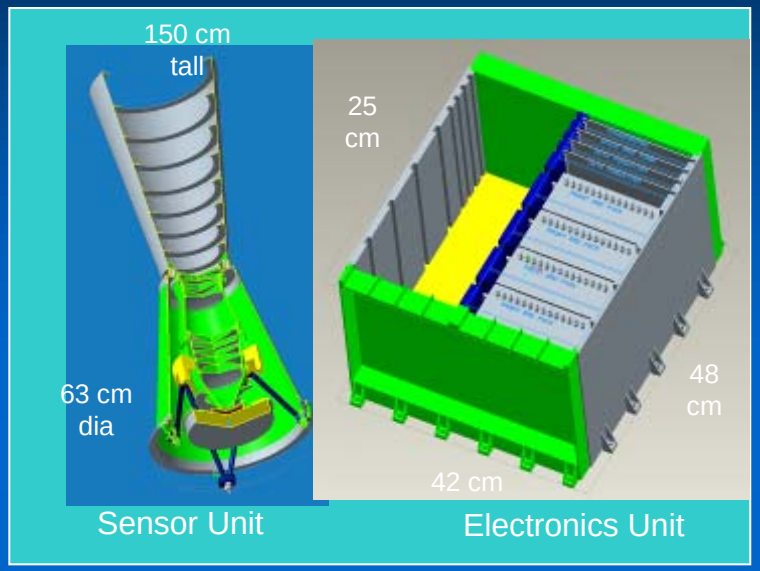


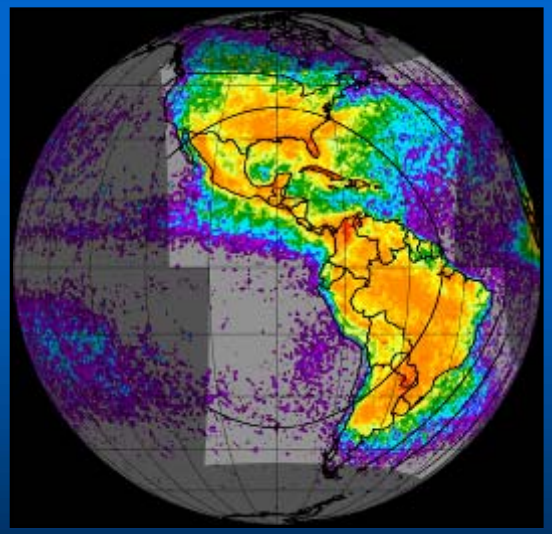


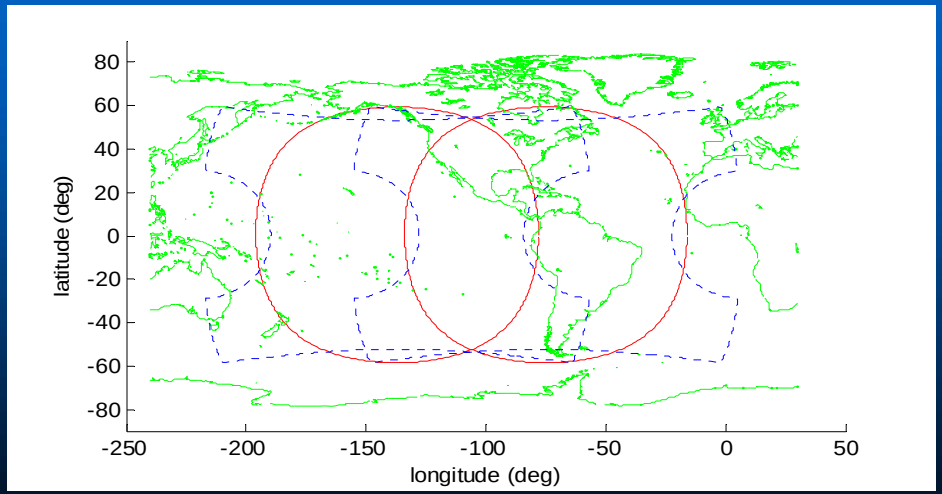


GLM

- Awarded subcontracts for detector and telescope
- Electronics architecture trades continuing
- PDR planned for March 2009

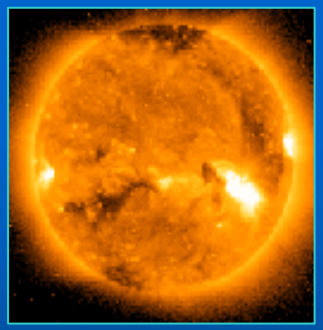


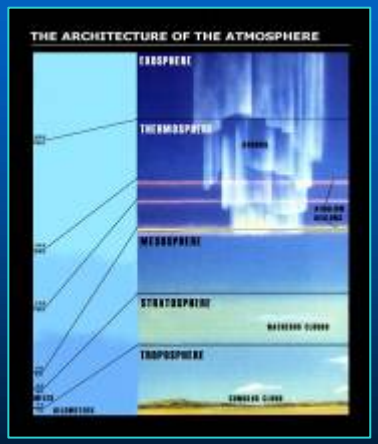


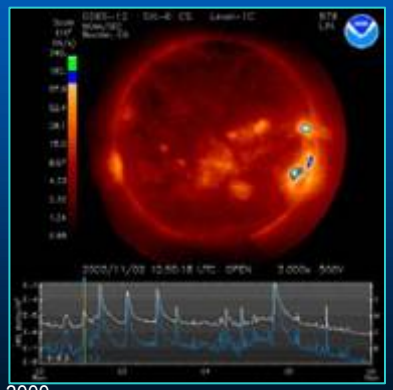


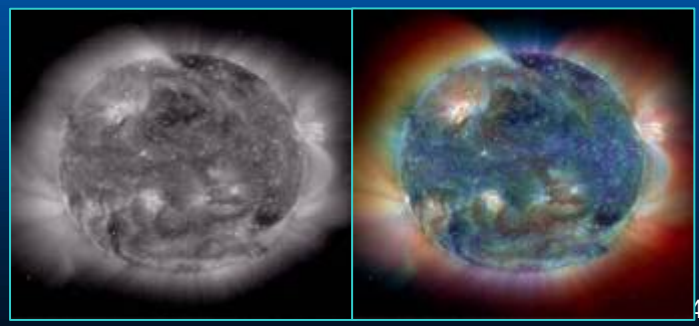
Space Weather Instruments

- Space Environment impacts Earth
  - Instruments provide early warning
  - Communications satellites / power grids
  - Voice and data blackouts over poles
    - Communications blackouts
    - Aviation routing
  - Astronaut safety
    - Solar storms can expose astronauts to equivalent of 8 chest X-rays







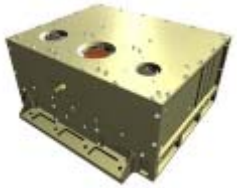


SEISS

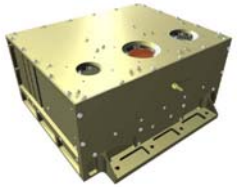
- Design updates continuing based upon breadboard telescope test results
- Successful PDR held in December 2008

MPS-Lo

MPS-Hi



SGPS-1



SGPS-2

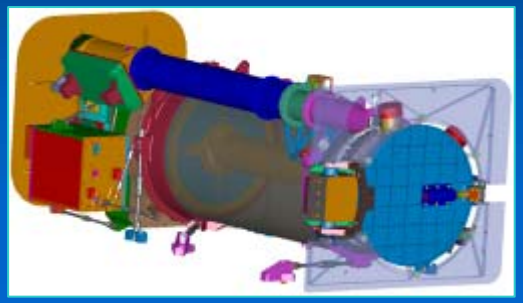
EHIS

DPU

SEISS Components

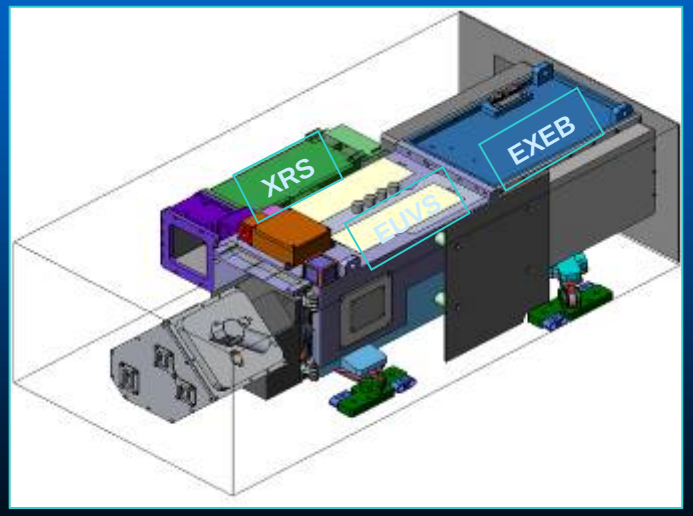
SUVI

- Successful Preliminary Design Review completed October 2008



EXIS

- Successful Preliminary Design Review completed November 2008



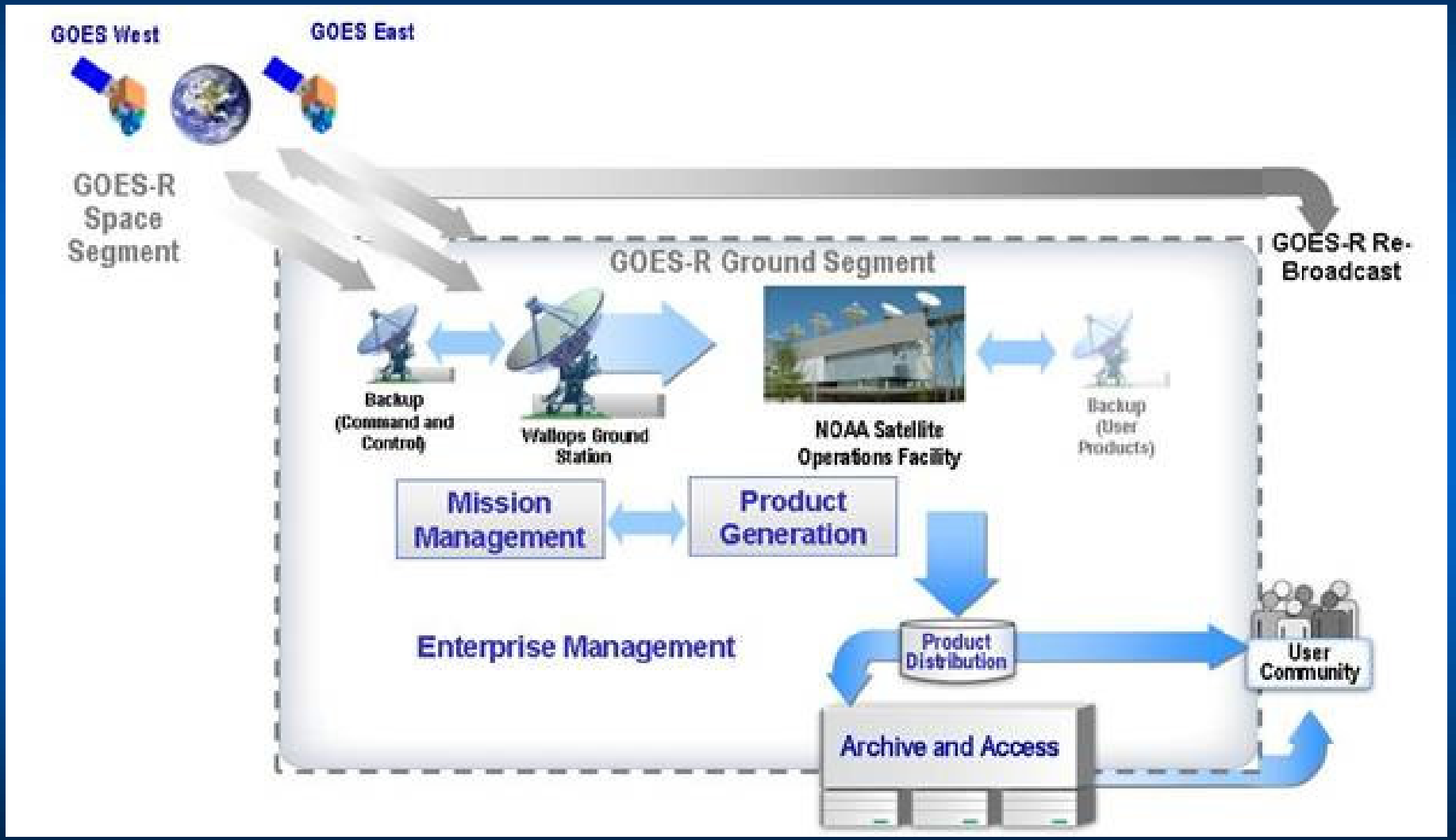
Unique Payload Services (UPS)

- High Rate Information Transmission/Emergency Managers Weather Information Network (HRIT/EMWIN)
- Data Collection System (DCS)
- Search and Rescue Satellite Aided Tracking (SARSAT) service
- GOES-R Re-Broadcast (GRB) - follow on of L-Band GVAR

Cougar Ace incident off of Alaska (24 rescued) was detected by GOES-11 at 830z (and NOAA-17 at 831z while it was within view of Hawaii). Figure courtesy of Thomas.M.Wrublewski.

Higher Data Rates for HRIT, EMWIN, DCS, and GRB

GOES-R End-to-End Architecture

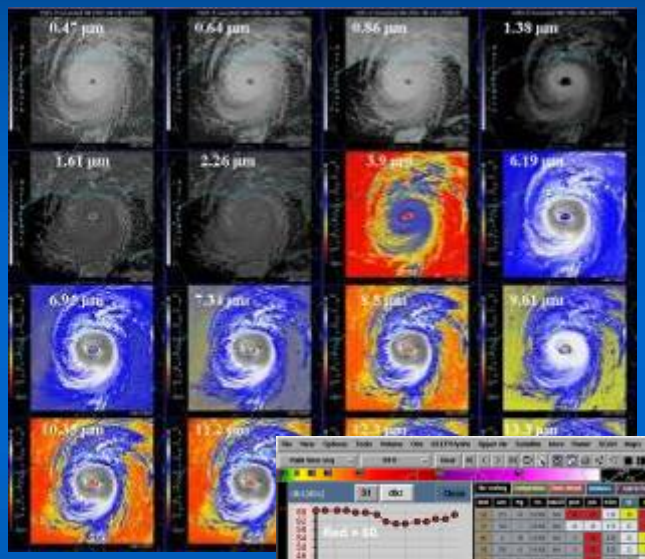


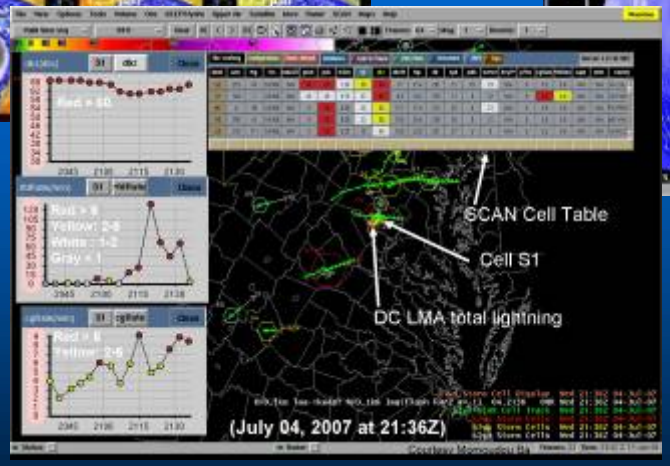
Ground Segment Critical Milestones

GOES-R Ground Segment Critical Milestones	2008			2009									
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Antenna Request for Information Issued				▲									
CLASS Upgrades Systems Design Review									▲				
Ground Segment Contract Award										▲			
Complete Lease for RBU Facilities Site										▲			
AWG L2+ Baseline Algorithms Delivery (80%)												▲	
Current Milestone ▲													

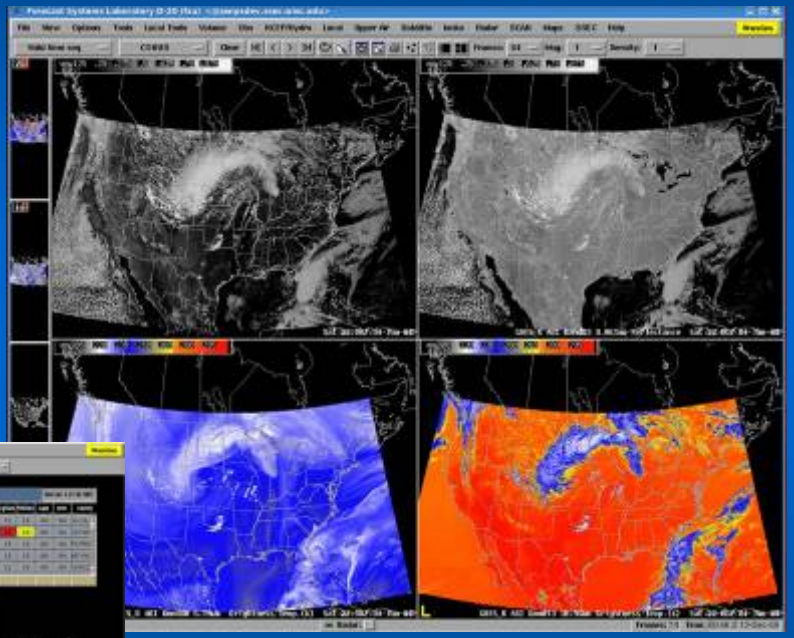
GOES-R Proving Grounds

AWG Proxy ABI Simulations of Hurricane Katrina





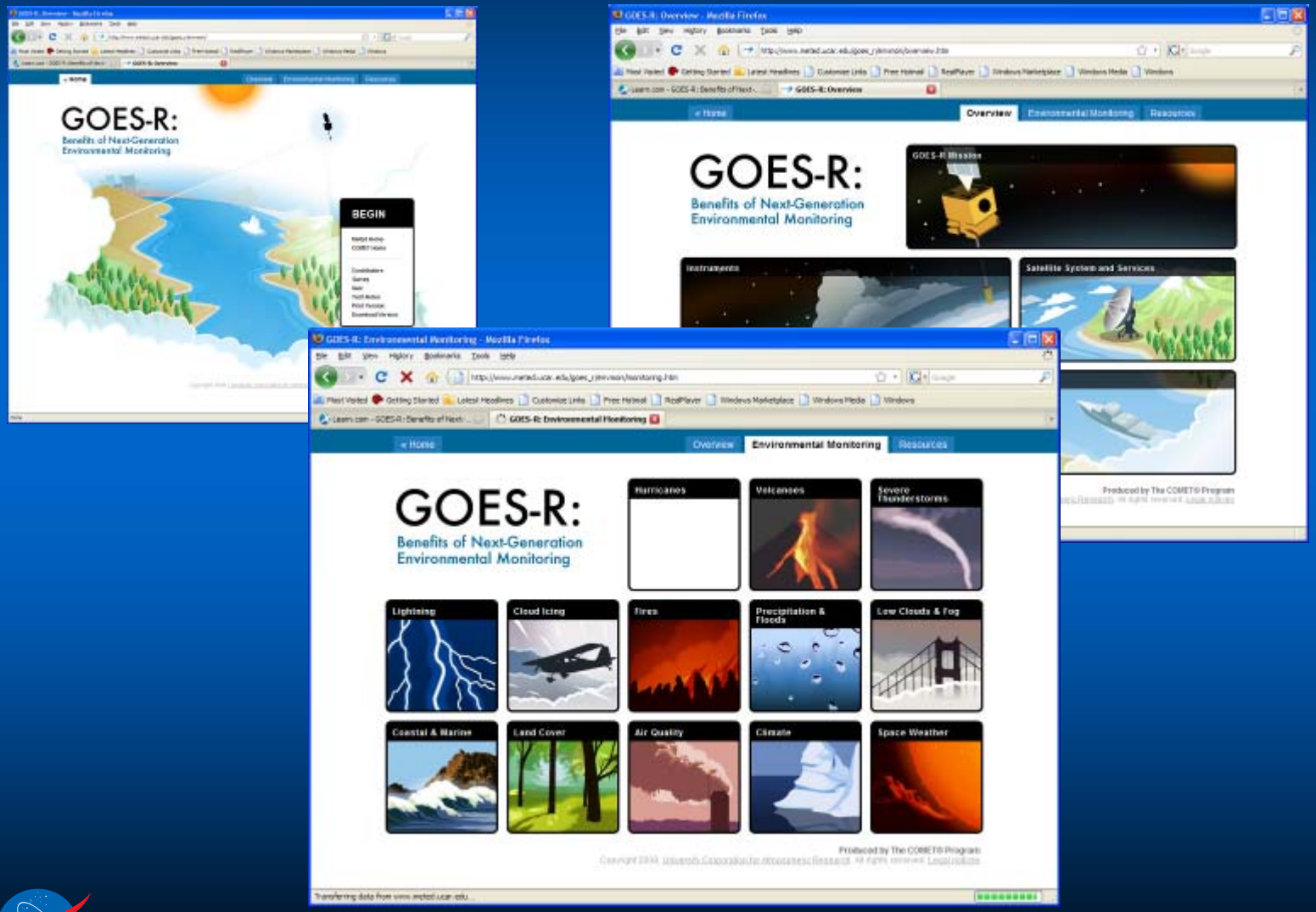
Animation of sample ABI visible and near-IR bands in AWIPS



GLM Lightning Jump Algorithm:
Experimental Trending Implementation in AWIPS/SCAN

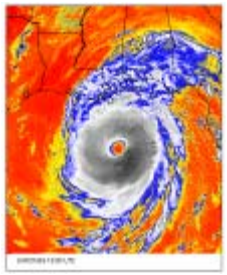
GOES-R Training Series

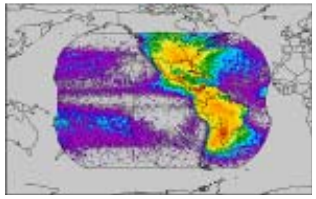
http://meted.ucar.edu/goes_r/envmon/

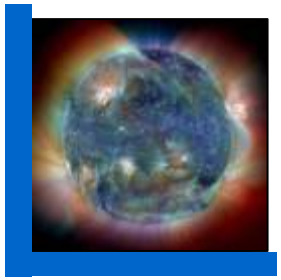


6TH GOES USERS' CONFERENCE

http://cimss.ssec.wisc.edu/goes_r/meetings/guc2009/







Geostationary Operational Environmental Satellites: http://www.goes-r.gov

Special Event on 2 November: 50th Anniversary of the 1st Meteorological Satellite Experiment