GOES-R Communication Subsystem (Geostationary Operational Environmental Satellite R-Series)

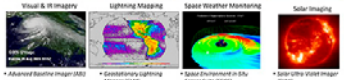
Presented by H. Silverman and T. Milbourne; Session W-83 Current and Future Programs and Systems

GOES-R Mission Overview

GOES-R is the next generation of GOES satellites that will provide a major improvement in quality, quantity, and timeliness of data collected.

Earth Pointing | In-Situ | Sun Pointing

Visual & IR Imagery | Lightning Mapping | Space Weather Monitoring | Solar Imaging



- Advanced Baseline Imager (ABI)
- Geostationary Lightning Mapper (GLM)
- Space Environment In-Situ Sensor Suite (SEISS)
- Magnetometer
- Solar Ultra-Violet Imager (SUVI)
- Extreme UV/X-Ray Irradiance Sensors (EXIS)

New and Improved Capabilities for:

- Decreased lead times for severe weather warnings
- Better storm tracking capabilities
- Solar, space weather, and climate analyses
- Advanced products for aviation, transportation, commerce

Image Credit: NASA

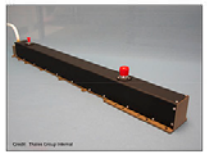
Data Collection System (DCS)

- Collection Platform data uplinked at UHF and down linked at L-band on DCPR (Data Collection Platform Report) transponder
- Examples
  - Water Temperature
  - Tsunami Detector
- Platforms programmable for things like report back time interval using DCPC (Data Collection Platform Command) transponder

GOES-R Instruments

L-Band Traveling Wave Tube Power Amplifier

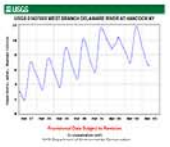
- Amplifier provides up to 148 Watts radio frequency power
- Provides HRIT/EMWIN Service at 1694.1 MHz and GRB Service at 1686.6 MHz



Communications

- One High-Rate Downlink and Six Transponders
  - High-rate Downlink transmits Imager and GLM raw data to ground on Raw Data Downlink at 120 Mbps
  - Data Relays
    - Supports remote land and ocean-based Data Collection Platforms (DCP)
    - Relays High-Rate Information Transmission (HRIT) data
    - Relays GOES Variable (GVAR) reformatted Imager and GLM data—now Global Rebroadcast (GRB) at 1686.6 MHz. Two transponders—data divided into RHCP and LHCP polarizations each with 15.5 MBPS to double the service rate to 31 MBPS
    - Relays Emergency Managers Weather Information Network (EMWIN/HRIT) broadcasts
    - Participates in the international COSPAS-Search and Rescue Satellite-Aided Tracking (SARSAT) system

Data Collection System (DCS)
River Water Temperature Station Example



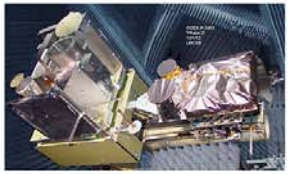
Collection Platform data uplinked at UHF and down linked at L-band

Data available: http://waterdata.usgs.gov/usa/nwis/uv?site_no=01427000

GOES-R Antennas

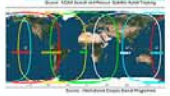
Dual-Frequency Use L- and S-Band Antenna to Receive and Transmit HRIT/EMWIN Signals at 2037 MHz and 2884.1 MHz, respectively, and Transmit Data Collection Platform Report Signal at 1670 MHz

Full-Scale Model including Antenna Wing Assembly

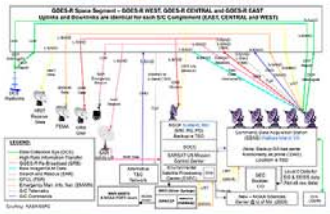


SARSAT

- GEO Satellites provide almost full Earth coverage to distress beacons at 406 MHz
- Transponded at 1544 MHz to Local User Terminal (LUT)
- LUT notifies Mission Control Center (MCC) to initiate rescue
- Instant alerts from GEO Satellites used together with Doppler information from LEO Satellites to provide location data
- Future beacons may provide GPS coordinates

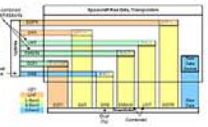


GOES-R Physical RF Interface Architecture



Comm Subsystem Overview

- Raw data downlink to Wallops Island, VA, and Fairmont, WV, backup ground site
  - X-band gimbaled antenna spot beam accommodates one flip
  - 150 Mbps data rate (115 Mbps after LDPC coding from CBDH)
- Dual polarized X-band uplink to dual polarized L-band Earth coverage downlink GRB transponder — 12 MHz bandwidth x qty 2 (RCP and LCP)
- One S-band uplink to L-band Earth coverage downlink narrow bandwidth transponder (EMWIN/HRIT)
- Two UHF uplink to L-band Earth coverage downlink narrow bandwidth transponders
  - SAR
  - DCPR
- S-band uplink to UHF Earth coverage downlink narrow bandwidth DCPC transponder
- TT&C and Antennas covered in separate packages



Raw data downlink and five unique transponders

GOES R — GEOSTATIONARY OPERATIONAL ENVIRONMENTAL SATELLITE R-SERIES — NOAA – NASA

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