Overview of Climate Observational Requirements for GOES-R

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Outline of Presentation

- Importance of climate observations from GOES
- Scientific basis for climate requirements
- What's new for GOES-R?
- General climate requirements
- Specific climate requirements
- The requirements process
- Source documents for climate requirements

Importance of Climate Observations from GOES

- Climate forcing has strong diurnal component.
- More accurate daily average possible.
- Region observed from same direction.
- Intercalibration with polar satellites possible.

Scientific Basis for Climate Requirements

- Need to measure small climate change signals
  - **Global temperature - tenths of a degree/decade**
  - **Solar irradiance - 0.1%/decade**
- Climate models predict doubling CO_2 in 70 years
  - **Leads to forcing of climate system approximately 0.6 w/m^2/decade**

Scientific Basis for Climate Requirements (Continued)

- How much should climate variables change to offset the forcing?
  - **Cloud fraction - 0.015/decade**
  - **Reflected radiation by surface - 5%/decade**
- Long-term stability required
  - **Cloud fraction - 0.003/decade**
  - **Reflected radiation by surface - 1%/decade**

What's New for GOES-R?

- Advanced Baseline Imager (ABI)
  - **10 IR and 6 visible/near IR channels**
  - **Well calibrated and stable**
- **Hyper-spectral Environmental Suite**
  - Number of spectral bands ~ 1600

General Requirements

- Minimize orbit drift
- Maintain some satellite overlap
- Replace prior to failure
- Conduct thorough pre-launch characterization
- Conduct adequate on-board calibration

General Requirements (Continued)

- Plan for product reprocessing
- Ensure access to products
- Continue observations on decommisioned satellites
- Include in-situ observations
- Monitor network performance

Specific Requirements

Climate Variables Dependent on Geostationary Observations

Atmosphere	Aerosols, clouds, precipitation, water vapor, CO_2, Earth radiation budget, radiances, temperature, and winds
Land	Skin temperature and snow cover
Ocean	Sea surface temperature and ocean color
Space	Total solar irradiance

The Requirements Process

- NOAA-wide with a regional and global perspective
- Dependent on science requirements stated in well-known source documents
- Formal validation and approval process
  - **Review by NOAA climate scientists and data users**
  - **Approval by NOAA line offices**
- GOES-R Product Requirements Document
  - **Updated periodically**

Source Documents for Climate Requirements

- GOSIC Web Site, 2004: AOPC Satellite Requirements for GCOS
- NIST, 2004: Satellite Instrument Calibration for Measuring Global Climate Change: Workshop Report. *NISTIR 7047*, College Park, MD
- GCOS, 2003: The Second Report on the Adequacy of the Global Observing Systems for Climate in Support of the UNFCCC.
- NPOESS, 2001: Integrated Operational Requirements Document (IORD) II

Source Documents for Climate Requirements (Continued)

- NAS, 1999, Committee on Earth Studies - Workshop on IPO/NPOESS and NASA/ESE Capabilities for Climate Research, Washington, DC
- NPOESS, 1997: Climate Measurement Requirements for the National Polar-orbiting Operational Environmental Satellite System (NPOESS): Workshop Report. *UCAR*, College Park, MD