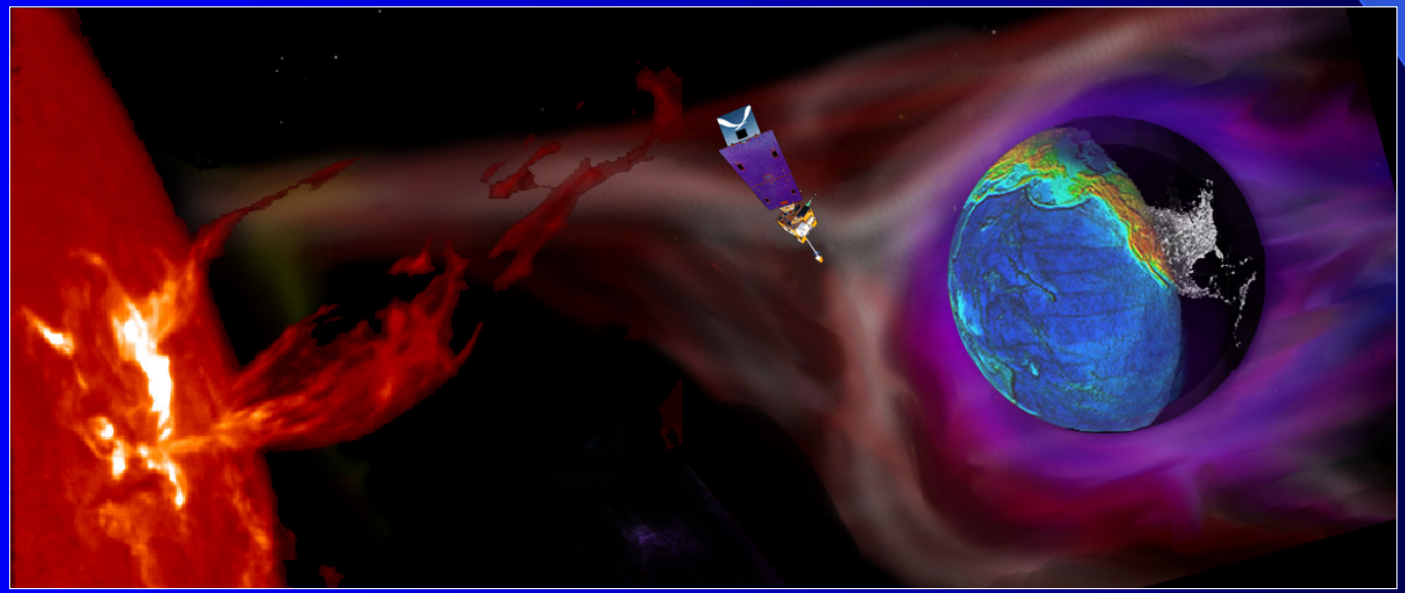
Looking Ahead to the GOES-R Satellite Series Space Weather Data Archive, Access, and Services

Daniel.C.Wilkinson@noaa.gov & William.Denig@noaa.gov -- National Geophysical Data Center

The first of the GOES-R series of satellites is scheduled for launch in 2014 and will carry onboard several instrument suites to monitor space weather: **Solar Ultra-Violet Imager** (SUVI), **Space Environment In-Situ Suite** (SEISS), **Extreme Ultraviolet and X-ray Irradiance Sensors (EXIS),** and a **Magnetometer** (MAG).

NOAA is making preparations to insure that the data and products from the GOES-R series will be meeting mission goals and user needs as soon as the first satellite becomes operational. Those preparations include the areas of archive, access and data services for the space weather monitoring instrument suites. The goal of this presentation is inform the space weather user community about the capabilities of GOES-R and to engage potential data users in the preparation phase so that the maximum benefit can be obtained from the space weather instruments.



5th GOES Users' Conference 2008 (P1.93)

GOES-R Series Overview

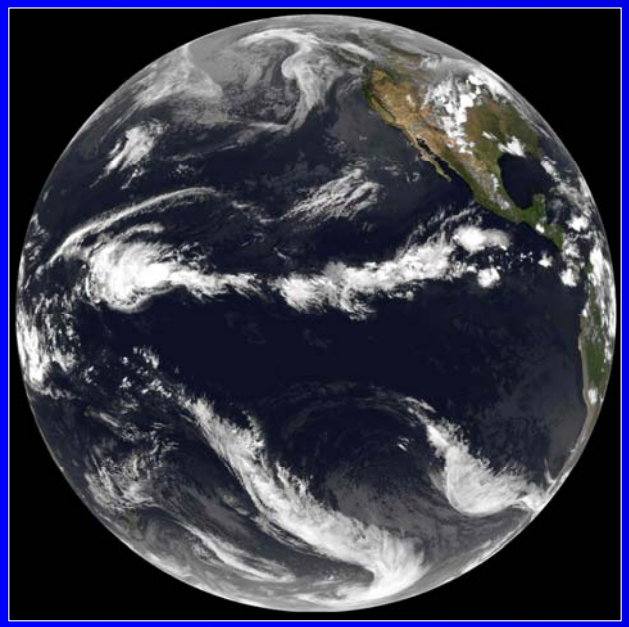
GOES-R Platform

GOES-R is a 3-axis stabilized spacecraft with a designed on-orbit lifetime of 15 years - 5 years of on-orbit storage and 10 years of operational life. The GOES-R mission orbits will be geostationary at 137°W and 75°W. The on-orbit storage location is at 105°W.

GOES-R Space Weather Mission

Space Weather instrumentation planned for GOES-R continues a long history of observations from GOES that extends back to 1974. These observations have provided the basis for alerts and forecasts crucial to those systems that are adversely impacted by variable conditions in the near-Earth space environment.

GOES West 137°W



GOES East 75°W

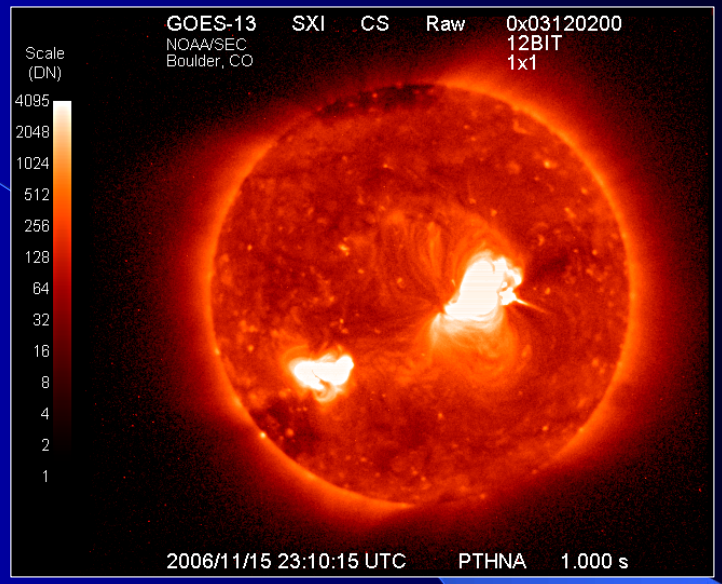
GOES-R Payloads

- Advanced Baseline Imager (ABI)
- Geostationary Lightning Mapper (GLM)
- GOES Rebroadcast (GRB)
- Emergency Managers Wx Information Network (EMWIN)
- Low Rate Information Transmission (LRIT)
- Search and Rescue (SAR)
- Data Collection System (DCS)
- **Solar Ultraviolet Imaging Suite** (SUVI)
- **Space Environment In-Situ Suite** (SEISS)
- **Extreme Ultraviolet and X-ray Irradiance Sensors (EXIS)**
- **Magnetometer** (MAG).

Solar Ultraviolet Imager (SUVI)

Should be: SUVI provides narrowband imaging in the soft X-ray to EUV wavelength range (9.4 nm - 30.4 nm) at a cadence of up to 3 images per minute. The SUVI will monitor the entire dynamic range of solar x-ray features including coronal holes and solar flares and will provide data regarding the rapidly changing conditions is the Sun's atmosphere. These data are used for geomagnetic storm forecasts and for observations of solar energetic particle events related to flares.

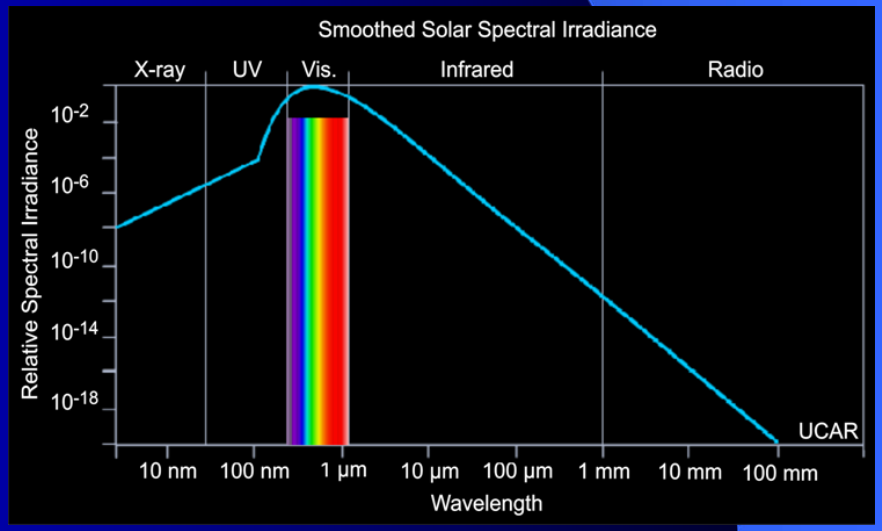
SUVI will continue the mission performed by the Solar X-Ray Imager on the current NOAA GOES-M/P series of spacecraft.



Extreme Ultraviolet and X-ray Irradiance Sensors (EXIS)

EXIS contains two full disk instruments, the EUV Sensor (EUVS) and the X-Ray Sensor (XRS). The EUVS is a full disk detector measuring EUV flux in the 5 - 127 nm range as compared to the 10 – 126 nm range for GOES-N. EUV radiation plays a key role in heating the thermosphere and creating the ionosphere.

GOES-R XRS will monitor two wavelength bands: 0.05 - 0.4 nm, and 0.1 - 0.8 nm similar to GOES-N. XRS provides a highly effective means of detecting the onset and evolution of solar flares and has been an important part of the GOES series payloads since 1974.



Space Environment In-Situ Suite (SEISS)

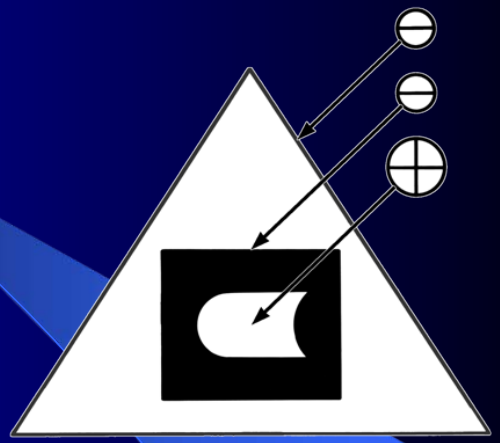
The SEISS will measure electron, proton, and heavy ion fluxes at energy levels that represent particle populations trapped in the magnetosphere, emanating from solar activity, and composing the galactic background. Knowledge of this energetic particle environment is important for assessing the risk of radiation hazard to humans at high altitudes and in space as well as fluxes capable of causing surface charging, deep dielectric charging, and single event upsets onboard satellite systems. Energetic particle precipitation into Earth's ionosphere can cause disruption of radio communications and navigation systems.

The sensors are designated as the magnetospheric particle sensor (MPS), the energetic heavy ion sensor (EHIS), and the solar and galactic proton sensor (SGPS).

SEISS will measure electrons over the range of 30 eV to 4 MeV as on GOES-N.

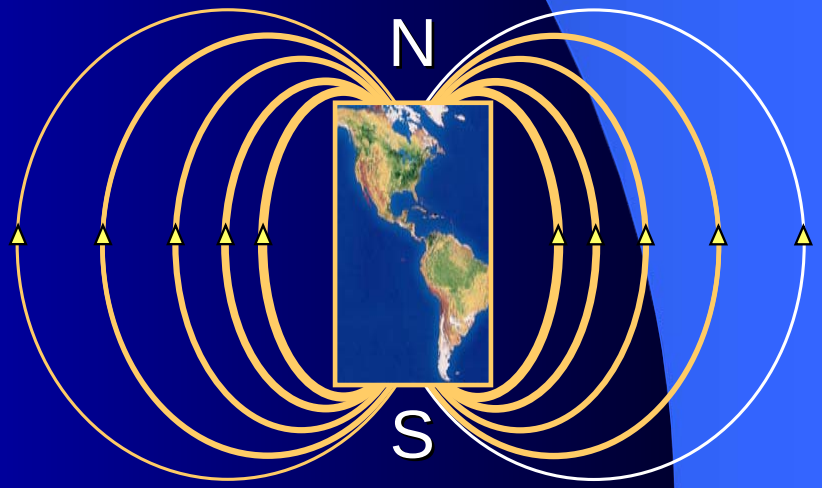
Protons will be measured over the range 30 eV to 500 MeV and over 500 MeV as compared to the GOES-N measurement range of 80 KeV to 700 MeV.

Heavier ions will be measured in four mass groups: He, C-N-O, Ne-S, and Fe. GOES-N only monitors alpha particles (He).



Magnetometer (MAG)

The Magnetometer will measure the earth's geomagnetic field at geosynchronous orbit in three vector components that will provide information on the general level of geomagnetic activity and current systems in space. This information will facilitate the detection of sub storms, magnetopause crossings and sudden magnetic storm commencements. GOES-R's magnetometer will be similar to that onboard GOES-N.

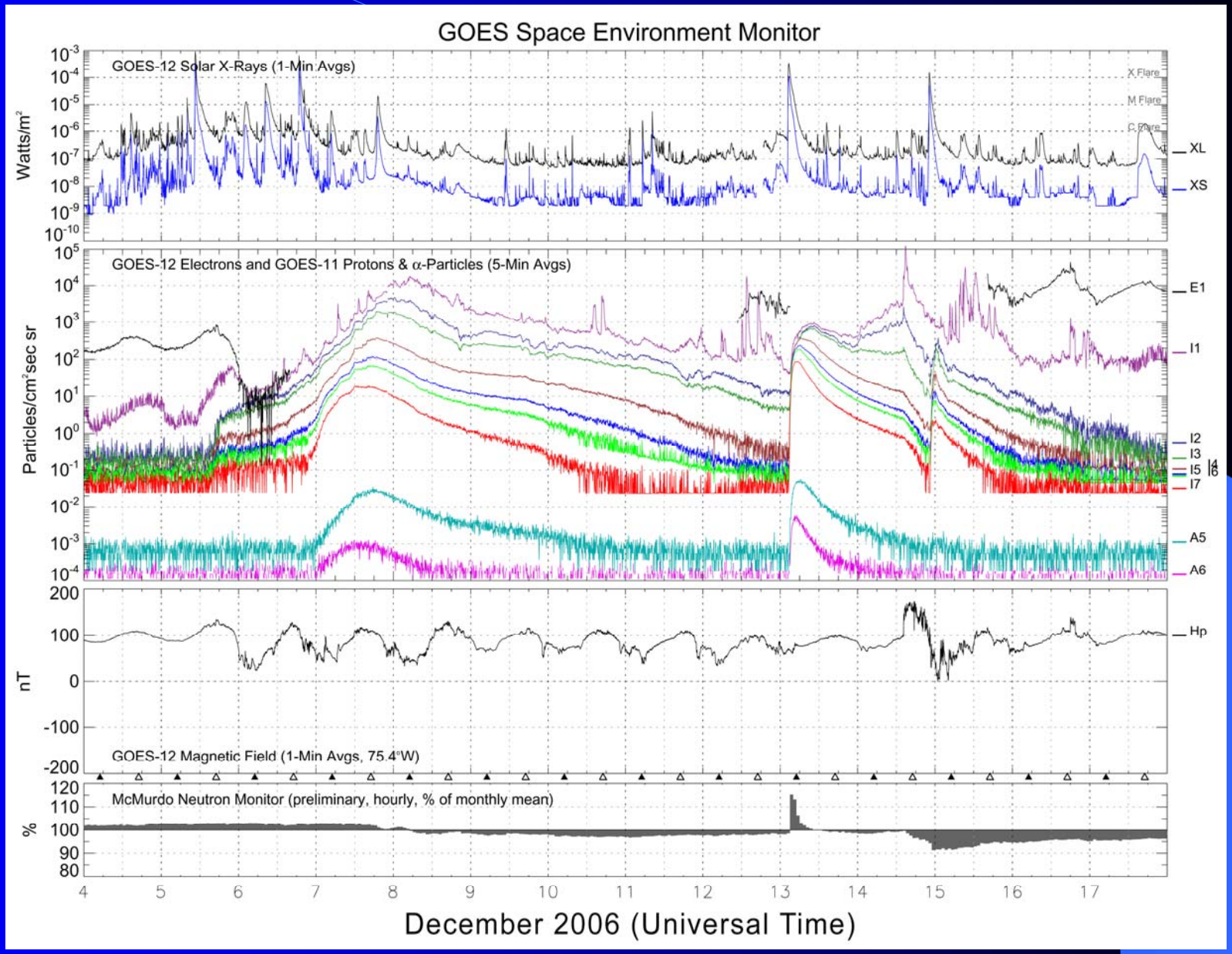


This display of GOES-12 space weather data represents some of the GOES-R capability.

EXIS will include an XRS similar to previous GOES but will add EUVS.

SEISS will better meet customer coverage requirements than previous GOES.

GOES-R will monitor the magnetic field similar to previous GOES.



Maximizing GOES-R Data Usefulness

Data Processing

The GOES Program Office (GPO) will provide real-time processing of the data streams from the SEISS, SUVI, EXIS, and magnetometer instruments and will deliver Level-0 data to CLASS and Level-1b data to the Space Weather Prediction Center (SWPC) and the Comprehensive Large Array-data Stewardship System (CLASS). SWPC will utilize these data in their real-time alerts and forecasts.

Data Archive and Access

The ultimate repository for the SEISS, SUVI, EXIS, and magnetometer data will be NOAA's Comprehensive Large Array-data Stewardship System (CLASS). This system does not provide real-time data services, however, and SWPC will provide user access to data during the time lag between data collection and their availability in CLASS. Retrospective users will be able to download subsets of these data from CLASS in the native netCDF format as well as a variety of other formats. User input regarding these deliverable data formats is encouraged.

Data Products Serving the User's Needs

The success of the GOES-R Space Weather Mission depends strongly on getting early input from the user community regarding products that would maximize the value of the GOES-R monitoring systems. A good way to do that is to attend a GOES-R User's Conference – congratulations!

Another excellent way to provide input concerning these data is by contacting NGDC directly: 303-497-6137, Daniel.C.Wilkinson@noaa.gov, http://sxi.ngdc.noaa.gov/goesr_looking_ahead.html