

Global-scale Observations of the Limb and Disk (GOLD): Continuous, Global-Scale Ultraviolet Observations of Earth

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LWS Geospace

ABSTRACT

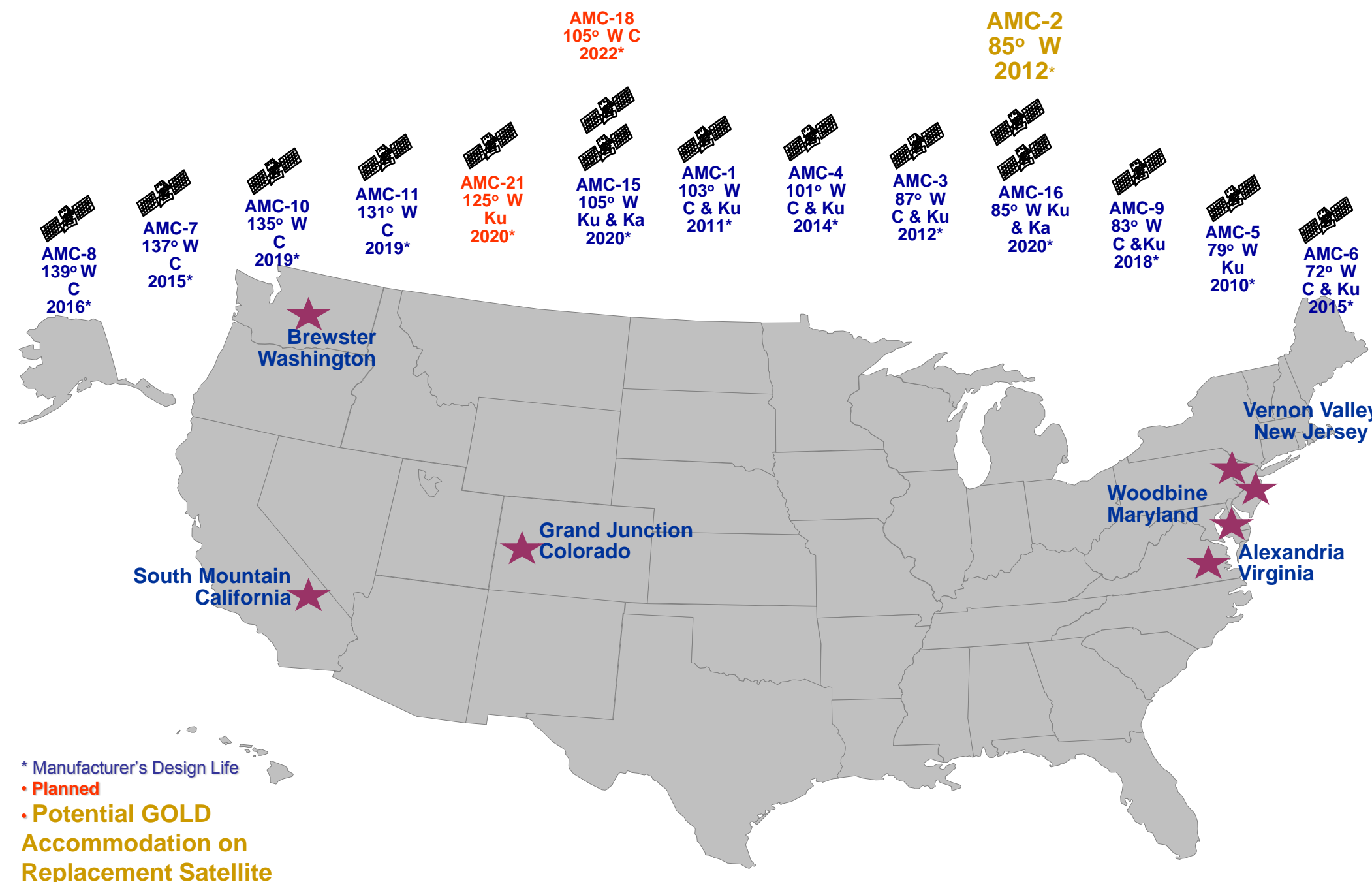
Observations by the Global-scale Observations of the Limb and Disk (GOLD) mission of opportunity will provide both context for *in-situ* measurements made on the "Radiation Belt Mappers" and information necessary for understanding changes in the radiation belts. GOLD will produce ultraviolet (UV) images of the Earth from a geostationary satellite. It will give near real-time information, on time scales of an hour to a day, about the response of the ionosphere-thermosphere to the influence of the magnetosphere and to variations in solar irradiance. Examples of information GOLD can provide include the boundaries in the magnetosphere from auroral locations and the electric field strengths (throughout the day) in the equatorial region from observations of the equatorial arcs. Such information is needed for understanding variability in the radiation belts.

1. Concept

The Global-scale Observations of the Limb and Disk (GOLD) mission of opportunity will fly an ultraviolet (UV) imager on a geostationary satellite to measure densities and temperatures in the thermosphere and ionosphere. The goal of the investigation is to answer the central question of the LWS program: **What is the global-scale response of the thermosphere and ionosphere to forcing in the integrated Sun-Earth system?** Until this question is answered, we are vulnerable to changes in the geospace environment resulting from the Sun's variability.

2. Mission

- Mission Of Opportunity proposed in response to RBSP AO
- Chosen for competitive Phase A study
- Approach
 - Fly in geostationary orbit on commercial satellite (below)
 - Continuous coverage over Americas
 - Launch in 2012 on second in series of satellites

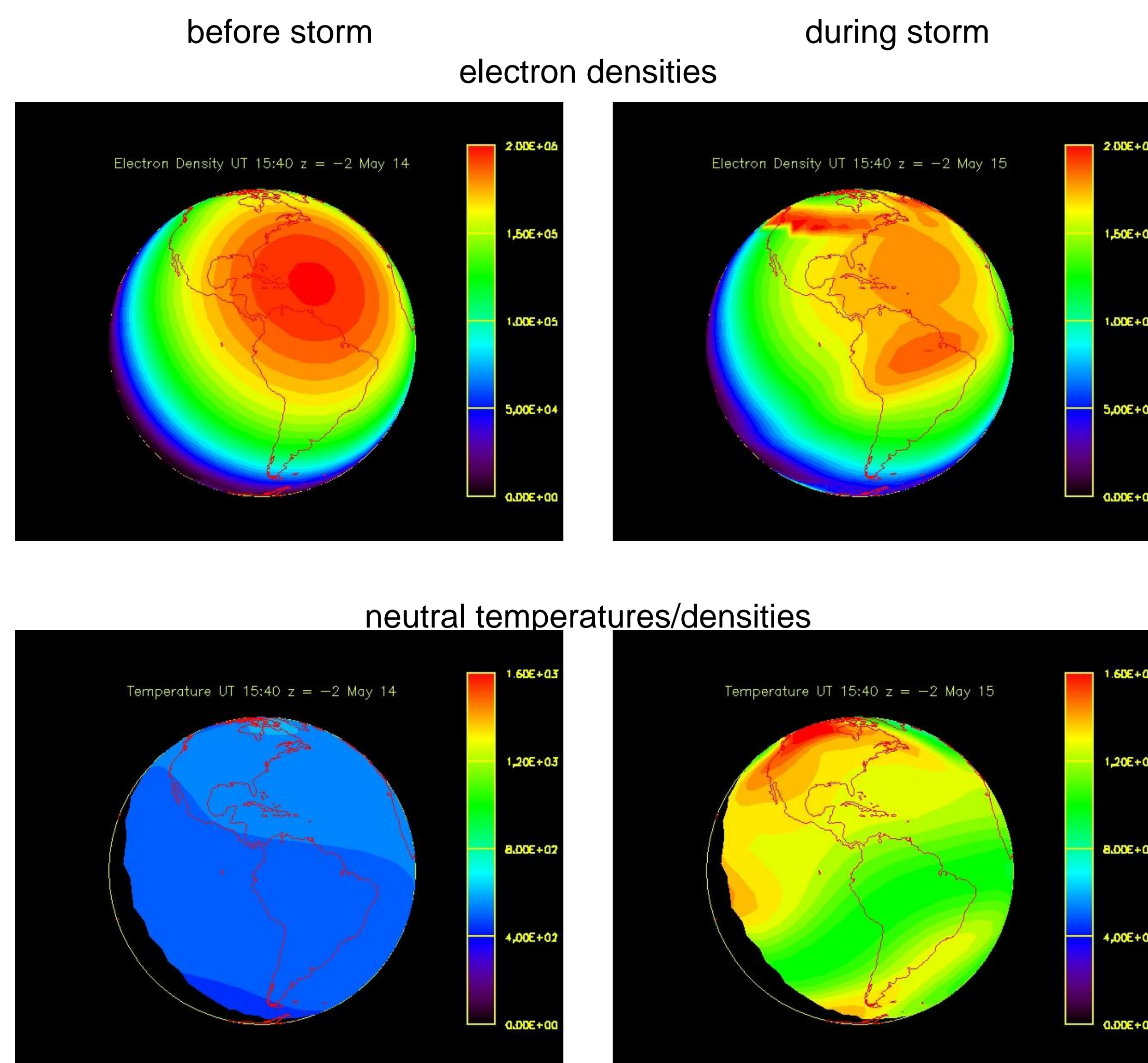


* Manufacturer's Design Life
• Planned
• Potential GOLD Accommodation on Replacement Satellite

3. Science Questions

GOLD observations will significantly advance our understanding of global-scale changes in the thermosphere and ionosphere, and consequently, improve space weather forecasting capabilities. GOLD will answer four science questions:

1. What is the global-scale response of the thermosphere and ionosphere to geomagnetic forcing?
2. What is the global-scale response of the thermosphere and ionosphere to changing EUV radiation?
3. What are the solar & geospace causes of small-scale ionospheric density irregularities?
4. What are the global-scale tidal amplitude and phase variations?



Calculations from CISM-CMIT model at ~170 km during May 1997 storm. (Radiation belts affected by auroral boundaries.)

4. Observations

- First global-scale temperatures in thermosphere
- Global-scale observations of O and N₂ emissions
- O₂ density profiles fixed longitudes
- Real time observations for Space Weather
- First global-scale observations of changes in thermosphere-ionosphere in a geographic region throughout day

5. Measurements

The GOLD Ultraviolet (UV) imager will measure:

- On the disk -
1. First global-scale neutral temperatures
 2. O/N₂ column density ratios
 3. Electron density variations in latitude and longitude
 4. Auroral locations and conductivities
- On the limb -
4. O₂ density profile at altitudes of 150-240 km
 5. O emission profiles (day)
 6. Electron density vertical profile (night)

6. Derived Information

- | | | |
|------------------------------------|-----------------|---------------------|
| Equatorial Ionosphere | Aurora | Thermosphere |
| 1. Electric fields | 1. Location | 1. Temperature |
| 2. Ionospheric density (nighttime) | 2. Conductivity | 2. Density |
| | | 3. Composition |
| | | 4. Tides |

7. Instrument

- Low Spectral Resolution Channel**
Disk Imaging & Limb Altitude Profiles (1 nm resolution)
- High Spectral Resolution Channel**
Disk Imaging (0.1 nm resolution)
Stellar Occultation (1 nm resolution)

8. Data Flow, Models & Results

Shown below is the flow of information from the observations to the results. Measurements made by each of the two channels is included, as is the information derived from those measurements, some of the models that will be used, and the results.

