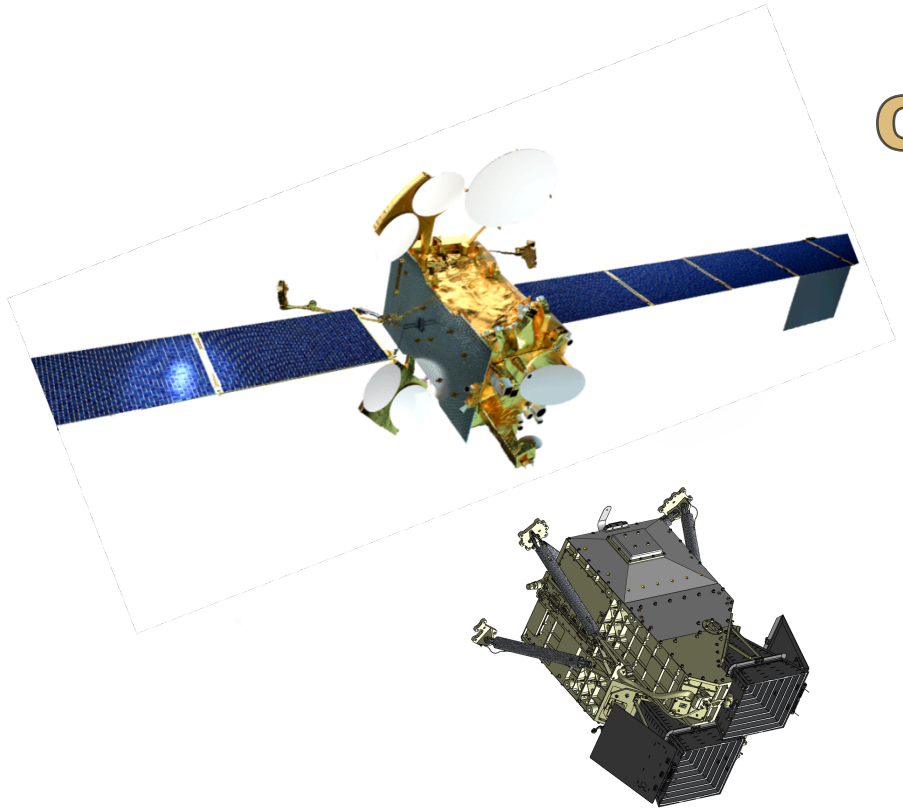
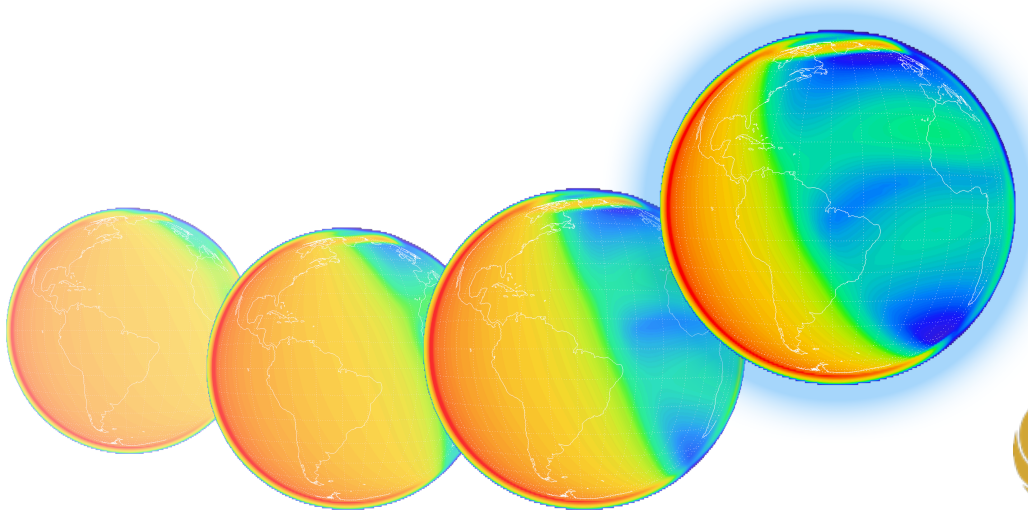


Global-scale Observations of the Limb and Disk (GOLD) – First Light Observations

William McClintock

Laboratory for Atmospheric and Space Physics

University of Colorado



Laboratory for Atmospheric and Space Physics
University of Colorado **Boulder**

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SES Government Solutions

GOLD Mission Overview

- **GOLD Provides a new Perspective for I-T Science**
  - NASA Explorers Mission of Opportunity
  - LEO missions enabled the characterization of the I-T system 'climate'
  - GOLD, at GEO, enables the first characterization of the I-T system 'weather'
- **Host Mission**
  - SES-14, in geostationary orbit at 47.5˚ west
- **Measurements**
  - Earth's disk
    - Daytime: Spatial-spectral image cubes of O-135.6 nm and N_2-LBH emission
    - Nighttime: Spatial-spectral image cubes of O-135.6 nm emission
  - Earth's limb
    - Altitude profiles of N_2-LBH emission
    - Stellar occultations

SES Government Solutions

LASP Laboratory for Atmospheric and Space Physics University of Colorado Boulder

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Implementing the GOLD Mission

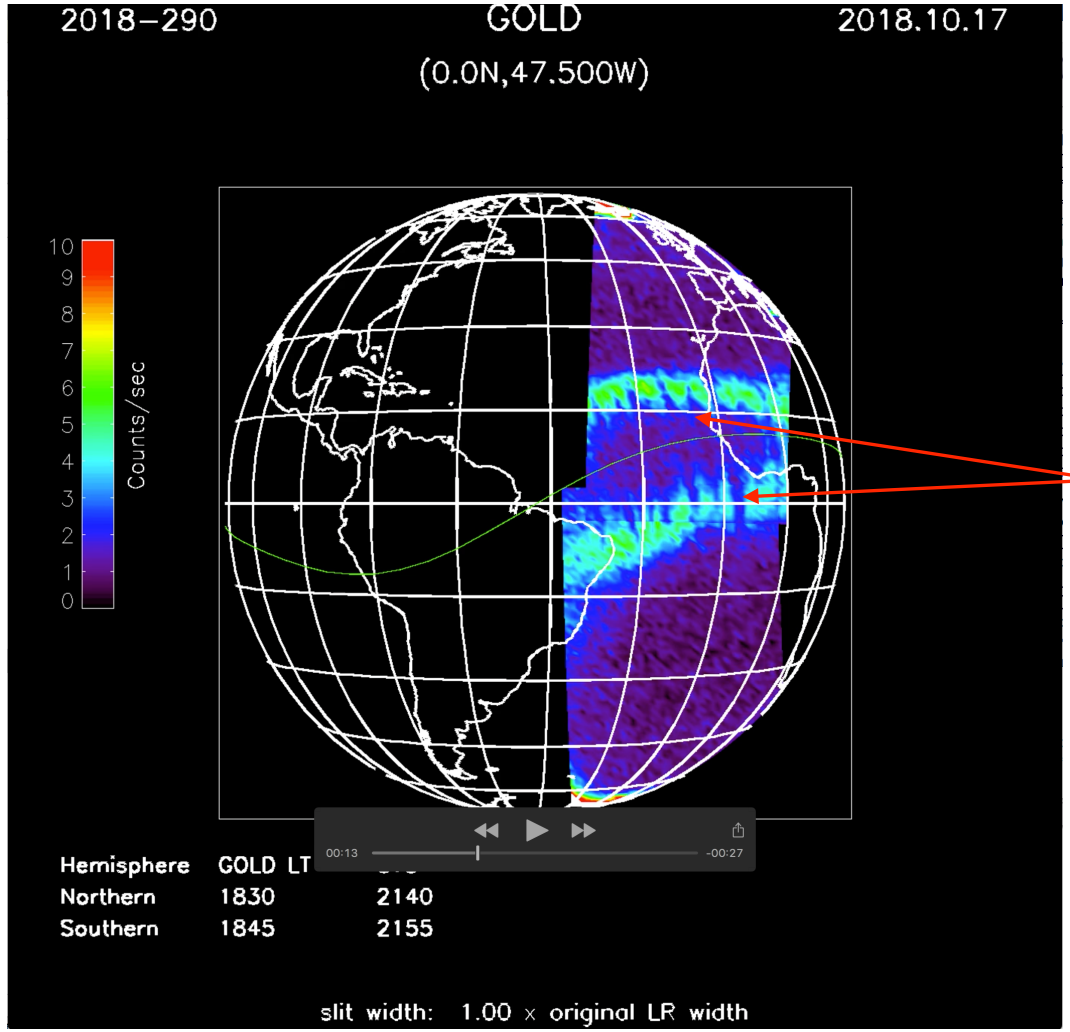
- **Global Scale Imaging of the Ionosphere – Thermosphere**
  - In 2005, viewing from geostationary orbit was clearly the preferred approach
  - For > 2019, constellations of cube-sats might provide complementary/ more-comprehensive data
- **Propose GOLD as a Mission of Opportunity (MOO)**
  - Cost of a dedicated NASA mission was beyond the resources available in the SMEX Program
- **Programmatic Approach**
  - **GOLD's approach: partner with a Com-Sat Owner-Operator for proposal submission. The ride was procured as a subcontract from LASP to SES Government Solutions (USA company)**
  - Other models we chose not to employ:
    - Partner with a Com-Sat builder to provide a satellite-hosted payload to a Com-Sat Owner-Operator at reduced cost
    - Manage the procurement of the accommodation through the Explorers Office or through the Airforce HOPS program
- **Technical Considerations**
  - SES selected the ride just before PDR. Having a very complete interface requirements document for spacecraft vendors was absolutely key in avoiding proposal cost uppers.
  - **We were able to use simple approaches to defy conventional wisdom and integrate an ultraviolet remote sensing instrument on what the world thinks is a 'dirty class of spacecraft'**

O-135.6 nm Emission Nightime Movie

The morphology and rapid evolution of plasma bubbles was a surprise to the team

Image Cadence

- 30 minutes 1700:2000 hrs
- 15 minutes 2000:2045 hrs



Plasma density depletions (bubbles) produce O-135.6 nm emission ‘bite-outs’ perpendicular to the equatorial arcs

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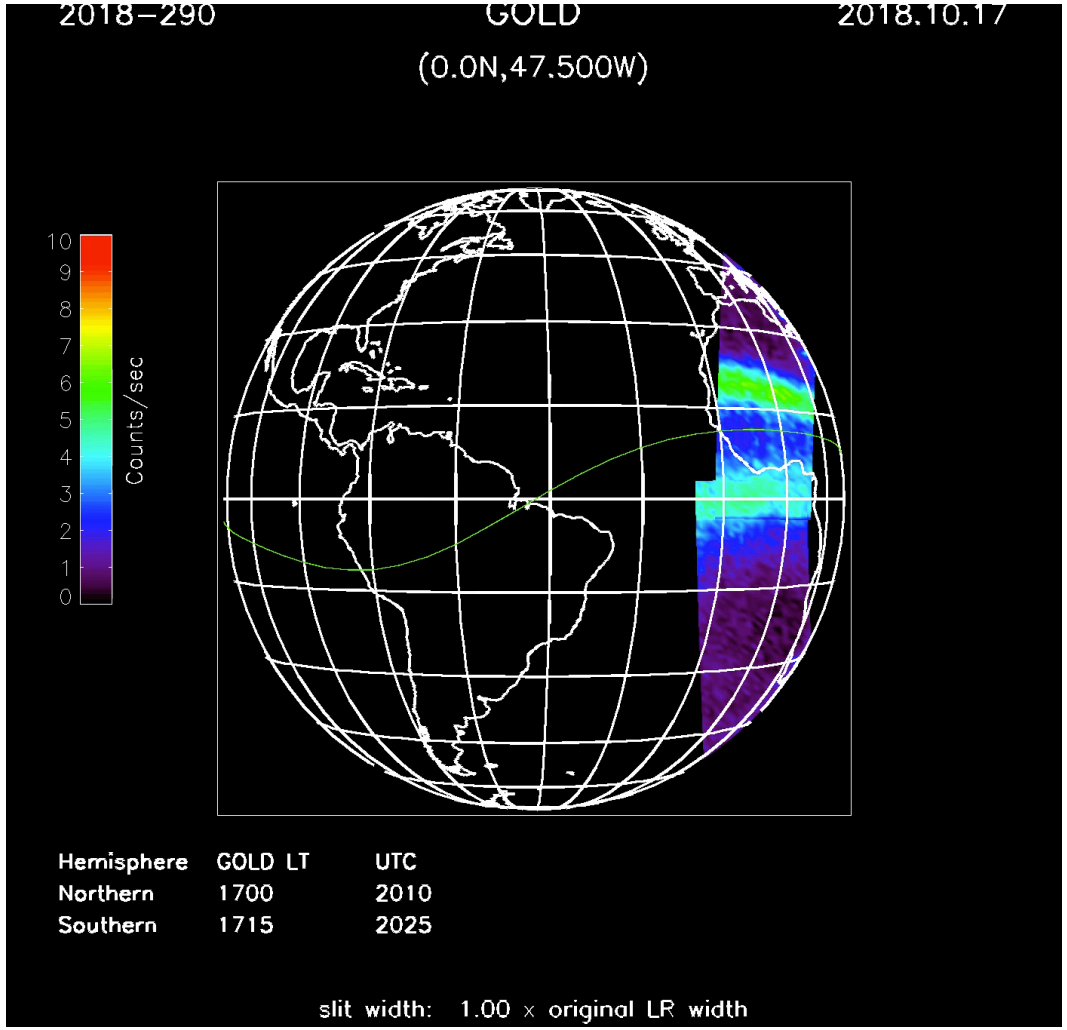
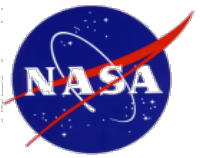


Plasma density depletions (bubbles) produce O-135.6 nm emission ‘bite-outs’ perpendicular to the equatorial arcs

What's Next?

- GOLD is a pathfinder for science investigations to study the global-scale behavior of the I-T system on short timescales.
- Programmatically, GOLD has demonstrated that a partnership with a Com-Sat Owner-Operator is a viable approach for delivering a science payload to GEO. There were people at NASA who never believed that this was possible.
- Technically, GOLD has demonstrated that it is straight forward to integrate a NASA science instrument with Com-Sat spacecraft even though the provider was headquartered in Toulouse, France. There were people at NASA who never believed that this was possible.
- The number of future programs that can build on GOLD's experience is limited only by people's ingenuity. I hope everyone at NASA believes this is possible.

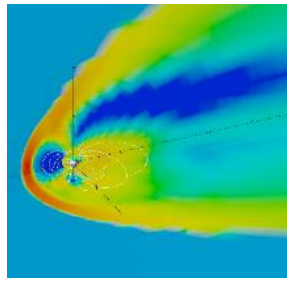


Thank You

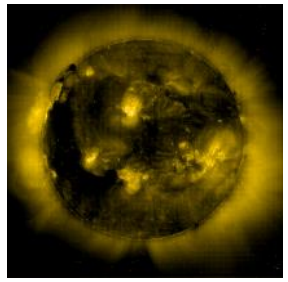
Forcing of the Thermosphere-Ionosphere

Four Scientific Questions Frame the Mission

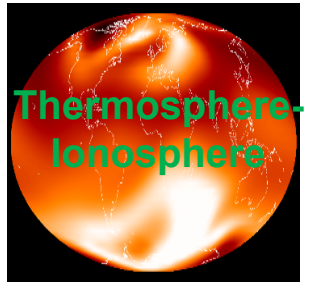
Forcing from Above



Science Question 1 (Q1). ***How do geomagnetic storms alter the temperature and composition structure of the thermosphere?***

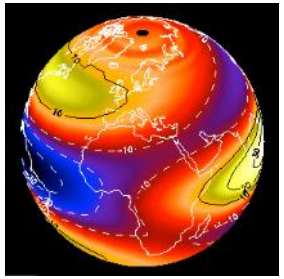


Q2. ***What is the global-scale response of the thermosphere to solar extreme-ultraviolet variability?***



Q4. ***How does the nighttime equatorial ionosphere influence the formation and evolution of equatorial plasma density irregularities?***

Q3. ***How significant are the effects of atmospheric waves and tides propagating from below on thermospheric temperature structure?***



Forcing from Below