The GOLD Mission – Real-time Imaging of the Space Weather in Earth’s Ionosphere and Thermosphere from Geostationary Orbit

R. Eastes (& the GOLD Team)

Laboratory for Atmospheric and Space Physics
University of Colorado
Space Weather at the Boundary Between Earth’s Atmosphere and Space

- **Thermosphere**
  - Neutral part of the space environment in boundary region

- **Ionosphere**
  - Ionized part of the space environment in boundary region

- **Ionosphere and thermosphere are coupled, I-T system**

- **GOLD observes near 160 km, near lower boundary of system**
Q1. How do geomagnetic storms affect the thermosphere?  
Q2. How does the thermosphere respond to solar ultraviolet variability?  
Q3. How do atmospheric waves and tides affect temperature of the thermosphere?  
Q4. How does the nighttime equatorial ionosphere respond?
The View from Geostationary Orbit

Imaging from geostationary orbit revolutionized terrestrial weather forecasting

GOLD is first mission to image space weather from geostationary orbit

Full images at 30-minute cadence
GOLD Mission Overview

**NASA Mission of Opportunity, Imaging I-T System from GEO**

- **Host Mission**
  - SES-14, in geostationary orbit over mouth of the Amazon River (47.5° W)

- **GOLD Instrument**
  - Two identical, independent imagers
  - Each observes disk and limb in UV

- **Data**
  - Earth’s disk images
    - Daytime: Temperature and composition of thermosphere
    - Nighttime: Density of ionosphere
  - Earth’s limb
    - Temperature and densities in the thermosphere
- Geostationary orbit, satellite stays over same location
- *Observing same locations for 18 hours each day*
- Data transmitted to GOLD ground station in real-time (24/7)
- Simulated GOLD image of oxygen emissions
- **GOLD simultaneously images** $N_2$ emissions on **dayside**
- Emissions provide key data for thermosphere and ionosphere
Modeled Perturbations in Temperature (T) at 160 km due to Tides

Typical temperatures are 625K near 160 km

(K. Greer, Univ. Colorado/LASP)
GOLD Status & Summary

• Launched on SES-14 - Jan 25, 2018
  - Ariane 5 rocket from French Guiana

• Detector doors opened - Jan 29, 2018

• Transfer to GEO in progress

• Two year mission operations to begin October 2018

GOLD Launch (Jan 25th, 2018)
Thank You!

https://gold.cs.ucf.edu