

Thermospheric temperature and density variations from observations and models

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Abstract

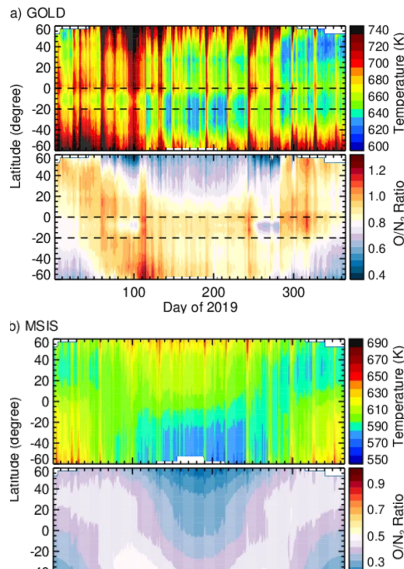
The Global-scale Observations of the Limb and Disk (GOLD) mission in geostationary orbit provides a near synoptic (i.e. concurrent, globally unified, and spatially resolved) view of the thermosphere and ionosphere, allowing to unambiguously distinguish temporal and spatial variations. We have analyzed the thermospheric daytime temperature and column integrated O/N₂ ratio data from GOLD, and compared these observations with the simulation results by NCAR's WACCM-X model and NRL's MSIS2.0 model. A seasonal pattern is seen, and there are also significant differences between the observations and simulations. We aim to understand the physical processes for producing the

1. Introduction

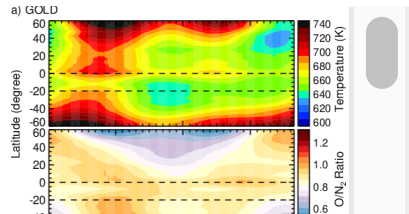
The thermosphere is dominated by atomic oxygen (O) and molecular nitrogen (N₂), and both play a significant role in atmospheric and ionospheric processes. Specifically, O affects the production rate of O⁺ in the ionosphere, and the electron loss rate is proportional to mainly N₂. The column integrated density ratio ΣO/N₂ has been used to represent the composition change in the thermosphere. The O/N₂ ratio can be determined using the daytime FUV airglow observations of O at 135.6 nm and N₂ in LBH band. The emission rate ratio directly yields to column integrated O/N₂ density ratio down to the altitude level corresponding to N₂ column density of 10¹⁸ cm⁻², which is normally at ~150 km.

The GOLD mission operates on the SES-14 telecommunications satellite in geostationary orbit over the mouth of the Amazon River at 47.5°W longitude (Eastes et al., 2017). This mission employs two identical imaging spectrographs at ~132-162 nm to measure the emissions from the limb and disk. ~68 disk scans with separate scans for the northern and southern hemispheres are made each day during daytime at ~30 minute cadence since late

2. GOLD Data and Model Results



3. Discussion



References

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