Geophysical Research Abstracts
Vol. 20, EGU2018-7395, 2018
EGU General Assembly 2018
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Global-scale Observations of the Limb and Disk (GOLD): Science Implementation

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The Global-scale Observations of the Limb and Disk (GOLD) is a NASA mission of opportunity that will image the Earth's thermosphere and ionosphere from geostationary orbit. GOLD will investigate how the thermosphere-ionosphere (T-I) system responds to geomagnetic storms, solar radiation, and upward propagating tides. Launched by an Ariane 5 rocket aboard SES 14, GOLD will be placed into orbit at 47.5° West longitude, where it will begin routine operations in the fall of 2018. The mission is framed by four scientific questions: How do geomagnetic storms alter the temperature and composition structure of the thermosphere? What is the global-scale response of the thermosphere to solar extreme-ultraviolet variability? How significant are the effects of atmospheric waves and tides propagating from below on the thermospheric temperature structure? How does the structure of the equatorial ionosphere influence the formation and evolution of equatorial plasma density irregularities? GOLD will address these questions using data from a pair of identical imaging spectrographs that will observe emissions from atomic oxygen and molecular nitrogen in the the far-ultraviolet from 132 to 162 nm. During the day, images of composition and temperature will be made from molecular nitrogen Lyman-Birge-Hopfield (LBH) band and atomic oxygen 135.6 nm emissions. On the limb, exospheric temperature will be obtained from altitude profiles of LBH emission, and molecular oxygen density will be measured using stellar occultations. Electron density will be derived from 135.6 nm emission at night. These are obtained by using internal instrument scan mirrors to image both the disk and limb with a 30-minute cadence. This presentation describes the GOLD mission science implementation including nominal observing scenarios and predicted instrument measurement performance. It also describes the forward modeling approaches used by the GOLD team to validate that the instrument and observing plan will return adequate data to answer the science questions.