Comparing the Low and the Mid Latitude Ionosphere and Electrodynamics of TIE-GCM and the Coupled GIP- TIEGCM

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Abstract

The ionosphere is a layer of electrons and ions which stretches from around 80 km to over 1000 km. The ionosphere is highly variable even under geomagnetic quiet time conditions. It consists of different layers due to solar radiation acting on different compositions starting with the D-region about 50-90 km, the E-region approx. 90-120 km, and the F-region around 120-400 km. The F-region is the top layer and is responsible for radio wave propagation, and is therefore extensively studied. The thermosphere interacts with the ionosphere by neutral winds pushing the conducting medium through the Earth's magnetic field, which creates a electromotive force driving current and setting up an electric field. During the daytime an eastward electric field at the equator is present which will generate an upward $\frac{ExB}{B^2}$ drift, moving the ionosphere up. At the High Altitude Observatory thermosphere ionosphere electrodynamics general circulation model (TIE-GCM) was developed, and coupled to the plasmasphere model GIP. We will test and examine the new coupled model GIP-TIEGCM by comparing with TIE-GCM to see the effects of including a plasmasphere model. We are also using the International Reference Ionosphere (IRI) which is an empirical standard model of the ionosphere based on all available data sources to make comparisons. Since this is the first time the coupled GIP-TIEGCM is tested we focus on the geomagnetic quiet time and the low and mid latitude region.