Impact of ionospheric electrodynamics on the thermosphere at both low and high latitudesImpact of ionospheric electrodynamics on the thermosphere at both low and high latitudes

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The ionospheric electrodynamics plays an important role in modulating the motion of plasma and further changing the neutral winds and density due to the neutral-ion friction. Specifically, at low latitudes the effects of vertical ion-drag force on the vertical winds in the equatorial region may contribute to the generation of the crests of the equatorial thermosphere anomaly (ETA). However, such effect has not been well studied by most general circulation models (GCMs) currently due to the hydrostatic assumption carried by most GCMs. In this study, the non-hydrostatic global ionosphere and thermosphere model (GITM) has been fully coupled with the newly developed 3D ionospheric electrodynamo model to improve the electrodynamics of GITM at low latitudes. The variations of vertical winds, neutral density in GITM after introducing the electrodynamics have been examined. Meanwhile, at high latitudes, the fast flow bursts observed within the auroral zone, which have scale sizes ~100 km and typically last ~15 minutes, can reach more than 1000 m/s and the enhancements of electron precipitation associated with auroral streamers are often observed within the flow burst. Such localized strong flow is a significant meso-scale momentum and energy source to the thermosphere that is not contained in present empirical models of plasma convection. GITM has been run with high resolution to evaluate the influence of such a localized strong enhancement of forcing on the global dynamics of upper atmosphere.

Keywords: ionospheric electrodynamics, vertical ion-drag force , fast flow bursts

