

Continual initialization of the TING model with GAIM electron densities: ionospheric effects on the thermosphere

Geonhwa Jee^{1,2}, A. G. Burns², W. Wang², S. C. Solomon²,
R. W. Schunk³, L. Scherliess³, D. C. Thompson³, J. J. Sojka³,
and L. Zhu³

¹*Korea Polar Research Institute*

²*High Altitude Observatory, National Center for Atmospheric Research*

³*Center for Atmospheric and Space Sciences, Utah State University*

In order to study the effects of ionospheric plasma densities on the thermosphere, electron and O⁺ densities in the Thermosphere Ionosphere Nested Grid (TING) model are replaced by electron densities from the Global Assimilation of Ionospheric Measurements (GAIM) model at pressure level $z=0$ (about 230 km altitude) and above during April 1-4, 2004. There was an extended quiet period during this interval followed by a moderate geomagnetic storm. The ingestion of the GAIM electron densities had little effect on the neutral temperature and composition during the quiet period before the storm, but there were noticeable global effects on the neutral winds that most probably resulted from changes in ion drag. During disturbed periods, the changed electron densities produced much more significant effects on the global thermosphere. The increased auroral electron densities enhanced the Joule heating rate, in addition to the ion drag, which resulted in significant global changes not only in the neutral winds, but also in the neutral temperature and composition. The results of our study substantiate that having correct ionospheric plasma densities are critical to accurately predicting the thermosphere in the coupled thermosphere ionosphere model and also indicates that coupled ionosphere and thermosphere need to be improved at the same time in coupled thermosphere ionosphere model.