Geophysical Research Abstracts
Vol. 20, EGU2018-15990, 2018
EGU General Assembly 2018

Comparison between thermospheric neutral density and ionospheric electron density from TIEGCM and empirical models

Ganesh Lalgudi Gopalakrishnan and Michael Schmidt

Deutsches Geodätisches Forschungsinstitut der Technischen Universität München (DGFI-TUM), München, Germany (ganesh.lalgudi-gopalakrishnan@tum.de)

The atmosphere consists of multiple layers of neutral particles, charged particles, plasma, particles with different molecular compositions, mass, and other physical properties such as velocity, temperature etc. The precise knowledge of the density within these atmospheric layers is important in many applications, e.g. positioning, navigation and satellite orbit determination.
In this contribution, the neutral density is considered for analysis of thermosphere characterization using Thermosphere Ionosphere Electrodynamics General Circulation Model (TIEGCM) software and compared with the neutral densities derived from empirical models such as NRLMSISE, JB2008 under the same initial conditions. Different empirical models use slightly different (but comparable) input configurations for the representation of space weather conditions. This leads to the fact that even among different empirical models, there are minor differences in the magnitude of both the neutral density and the electron density under moderate space weather conditions.
It is widely known that during high solar weather conditions, there is an enhancement of the neutral density in the thermosphere. Traditionally, the empirical thermosphere models (NRLMSISE, JB2008) are using proxy indices (F10.7, Ap, Kp, etc…) for representing space weather activities. However, thermospheric density variations are depending on latitude and are not always reflecting the space weather conditions represented by the corresponding proxy indices.
This work evaluates the role and impact of space weather events of varying magnitudes and their observable impact on the thermosphere through the comparisons between empirically derived and physically derived (TIEGCM) thermosphere neutral densities along with the involvement of ionosphere electron density maps. It is expected that the fine structures in neutral density from TIEGCM can be compared with the variations in the corresponding electron density maps. By analysis and interpretation of these comparisons, this work aims to establish a consistent relationship between space weather events of a given magnitude and the corresponding enhancements in neutral and electron density. Thereby, the coupled ionosphere - thermosphere mechanisms can be studied.