Abstract:

Thermosphere-ionosphere coupling plays an important role in determining the predictability of the ionosphere. In this study, the ensemble Kalman filter (EnKF) is employed as an assimilation scheme to initialize a coupled model of the thermosphere and ionosphere. Comparative observing system simulation experiments are conducted for ground0based and space-based GNSS observations to examine the efficacy of coupled thermosphere-ionosphere approaches to ionospheric specification and forecast under different solar activities and seasons. Different combinations of thermospheric state variables, including neutral compositions, winds, and temperature, and inferred along with ionospheric state variables such as electron and ion densities from the GNSS observations in the EnKF. After each ensemble data experiment, an ensemble of the coupled thermosphere-ionosphere model simulations is launched by using resulting data assimilation analyses as their initial condition. Experiments show that estimating neutral compositions along with ionospheric state variables by data assimilation can extend the ionospheric predictability more than 10 days. On the other hand, estimating neutral winds and neutral temperature can also improve the ionospheric forecast, however, the behavior is complex and diverse under different conditions