



Global response of the thermosphere-ionosphere system to the minor and major SSW events during prolonged minimum of solar activity

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The prolonged continuous minimum of solar and geomagnetic activity of 2007-2009 allows more carefully examine the relationship between processes in the middle and upper atmosphere during SSW events. This is due to exclude solar and magnetospheric source of ionospheric variability. This report presents our study of thermospheric and ionospheric response to the recent minor and major SSW events. Our research was conducted with use of the Global Self-consistent Model of Thermosphere, Ionosphere, and Protonosphere (GSM TIP). The SSW events were modeled by specifying the temperature and density perturbations at the lower boundary of the GSM TIP (80 km altitude) by 2 different ways: (1) according to the morphological features and particular observations of mesospheric disturbances during SSW events; (2) using output of the middle atmosphere's models. We have done comparative analysis of the model-derived results with the global maps of GPS TEC and ionosonde data from Irkutsk, Kaliningrad and several low latitude ionospheric stations. GSM TIP simulation gives the reproduction of the lower thermosphere temperature disturbances (the occurrence of the quasi-wave structure at 80-130 km altitude with a vertical scale of ~ 40 km), the negative response of F2 region electron density and the positive response of electron temperature at 300 km during SSW event. The main formation mechanism of the global ionospheric response is due to the disturbances (decrease) in the $n(O)/n(N_2)$ ratio. The change in zonal electric field is another important mechanism of the ionospheric response at low latitudes. In addition, we consider in details the variability of the sporadic E layer and the F3 layer characteristics before and during SSW events.

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