xuguang
cai
HAO, NCAR
Alan Burns (HAO NCAR)
Wenbin Wang (HAO NCAR)
Liying Qian (HAO NCAR)
Nicholas Pedatella (HAO NCAR)
Anthea Coster (MIT Haystack Observatory)
Shun-Rong Zhang (MIT Haystack Observatory)
Stanley Solomon (HAO NCAR)
Richard Eastes (LASP, CU)
Oral
We conducted observational and modeling studies of thermospheric composition and ionospheric total electron content (TEC) variations during two geomagnetically quiet periods (maximum Kp=1.7) at solar minimum. Daytime thermospheric O and N2 column density ratio (∑ O/N2) observed by Global-scale Observations of the Limb and Disk (GOLD) and TEC from a network of ground-based Global Navigation Satellites System receivers both exhibited large (~30% of reference values) and long-lived (5-11 hours) day-to-day variations in roughly the same mid-latitude geographic regions. Numerical simulations replicated the observed variability, though not perfectly. Analysis of the simulations suggested that the variations were mainly generated in the high-latitudes, and were subsequently advected equatorward and westward. When high-latitudes input was turned off in simulations, the variations were negligible. This suggested the potentially important role of high-latitude geomagnetic forcing in thermospheric composition and ionospheric density variations at mid-latitudes even during some ‘geomagnetically quiet’ periods at solar-minimum.
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