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SAMI3/WACCM-X Simulations of the Ionosphere during 2009

Abstract:

To study the day-to-day effects of the lower atmosphere on the ionosphere, we have performed simulations of SAMI3, NRL's physics-based model of the ionosphere, with a one-way coupling to the extended version of the Whole Atmosphere Community Climate Model (WACCM-X). WACCM-X has a top boundary located in the upper thermosphere (2.5×10^{-9} hPa, or ~ 500 km altitude); therefore we are able to drive SAMI3 using the full profile of the WACCM-X winds. To simulate specific events, WACCM-X can be constrained by data analysis products or observations. In this study, lower atmospheric weather patterns are introduced into WACCM-X using a linear combination of NASA's MERRA and the U.S. Navy's NOGAPS data assimilation products. The SAMI3/WACCM-X simulations are performed for several months in 2009. The January – February period is particularly interesting due to the large stratospheric warming event that occurred on 24 January 2009. We quantify the longitudinal and day-to-day ionospheric variability and compare our simulations with JPL ionospheric maps of total electron content.