

Modeling the Thermospheric Response to Solar and Geomagnetic Drivers during the Feb 2022 Starlink Event

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Abstract:

In early February of 2022, moderate solar and geomagnetic activity caused increased neutral densities at altitudes where SpaceX satellites were initially launched. The increased densities prevented the satellites from reaching their final orbit and as a result, 38 Starlink satellites were destroyed. The following study investigates this time period from a research modeling perspective. Here we use the Global Ionosphere/Thermosphere Model (GITM) to compare with recent simulations from NOAA's Space Weather Prediction Center's operational Whole Atmosphere Model (WAM-IPE). We use the second version of the Flare Irradiance Spectral Model (FISM2) as short wavelength radiative forcing using 58 wavelength bins in GITM. To estimate electron precipitation, we use the AE auroral model. Four simulations were completed. The first includes all forcings (electron and radiative), while the second and third isolate the radiative and precipitating electron forcing separately. The last simulation acts as a baseline simulation and does not include either of the forcings. We then compare the simulations with both observational data and the WAM-IPE model output to understand what the most important driver was for the Starlink incident and how well GITM performs for the time period of investigation.