Model	Model Developers	Reference	Model Type	Input	Output
JB2008	B. R. Bowman (Air Force Space Command)	http://sol.spaceenvironment.net/~JB2008/index.html	Empirical Thermosphere Model	- S10.7 index (the integrated 26-34 nm solar irradiance) - F10.7 index - M10.7 index derived from the Mg II core-to-wing ratio at 280 nm - Y10.7 index: weighted to represent the hot coronal 0.1-0.8 nm X-ray emission (X10.7) 81-day running mean of the daily value: F10.7_ave, M10.7_ave, S10.7_ave, Y10.7_ave - ap - Dst	- Exospheric temperature (K) - Neutral temperature (K) - Total mass density (kg/m^3)
DTM	S. Bruinsma (CNES)	http://www.atmop.eu/index.php/models	Semi-Empirical Thermosphere Model	- F30 index: solar radio flux at 30 cm (scaled to F10.7) - Kp	- Total mass density (g/cm^3) - partial density (g/cm^3): H, He, N2, O, O2 - Mean molecular Mass - Exospheric temperature (K) - Neutral Temperature (K)
NRLMSISE00	A. E. Hedin, J. M. Picone, D. P. Drob (NRL)	https://ccmc.gsfc.nasa.gov/modelweb/atmos/nrlmsise00.html https://ccmc.gsfc.nasa.gov/modelweb/models/nrlmsise00.php	Empirical Thermosphere Model	- F10.7 (daily, 81-day running mean of the daily F10.7 value, PF10.7) - ap	- Total mass density (g/cm^3) - partial density (g/cm^3): H, He, N2, O, O2 - Number density: He, H, N2,N, O, O2, Ar - Anomalous oxygen number density - Exospheric temperature (K) - Neutral Temperature (K)
CTIPe	Timothy Fuller-Rowell et al NOAA SEC	https://ccmc.gsfc.nasa.gov/models/modelinfo.php?model=CTIPe	Physics-based Coupled Ionosphere-Thermosphere Model	- Fixed or time-dependent Hemispheric Power in gigawatts - Hemispheric Power Index (activity level) during the simulated time interval interpolated on 12 minute temporal grid. - Ionospheric electric fields: At the present time the CTIPe model is coupled with the Weimer ionosphere electrodynamics model which calculates ionospheric electric fields for solar wind parameters (density, solar wind velocity magnitude, IMF magnitude and clock angle) - F10.7 cm	- Neutrals: The three components are wind vector, temperature, the number density of the three major species O, O2, N2, and mean molecular mass. - Ion and electron: H+, O+, electron number densities and temperatures over height range from 140 km to 2,000 km, plus N2+, O2+, N+ below about 500 km. Height and electron number density of ionospheric F2 peak.

Model	Developer	URL	Type	Inputs	Outputs
GITM	A.J. Ridley et al. Department of Atmosphere, Oceanic and Space Sciences, University of Michigan	https://ccmc.gsfc.nasa.gov/models/modelinfo.php?model=GITM	Physics-based Coupled Ionosphere-Thermosphere Model	• F10.7 • Hemispheric Power Index (HPI) • Interplanetary Magnetic Field • Solar wind velocity • Solar irradiance (for event runs)	• Temperatures: neutral, ion, electron (K) • Neutral winds: zonal, meridional, vertical (m/s) • Plasma velocities: zonal, meridional, vertical (m/s) • Neutral mass density (kg/m3) • Number densities: neutral (O, O2, N(2D), N(2P), N(4S), N2, and NO), ion (O+(4S), O+(2D), O+(2P), O2+, N+, N2+, and NO+), and electron (m-3)
TIE-GCM	R. G. Roble et al. High Altitude Observatory, National Center for Atmospheric Research	https://ccmc.gsfc.nasa.gov/models/modelinfo.php?model=TIE-GCM	Physics-based Coupled Ionosphere-Thermosphere Model	• Solar EUV inputs: F107 (current daily F10.7 solar index) and F107A (81-day center-averaged F10.7 solar index) • Particle precipitation: Hemispheric Power in GW, obtained either from 3-hour Kp index or from IMF Bz and solar wind speed • Ionospheric electric fields at high latitudes: Provided by Heelis model and Weimer model. • Inputs for Heelis model: Cross polar cap potential in kV, obtained from 3-hour Kp index Hemispheric Power in GW, obtained from 3-hour Kp index Optional (not implemented): y-component of the interplanetary magnetic field (By) in nT • Inputs for Weimer model: Interplanetary magnetic field, By and Bz, in nT Solar wind density and speed, ρ and v, in cm-3 and km s-1 • Inputs for lower boundary: Diurnal and semi-diurnal migrating tides, specified by the GSW	• Primary timed-dependent output fields, specified in latitude, longitude, and pressure level: Geopotential height: Height of pressure surfaces (cm) Temperatures: Neutral, ion, electron (K) Neutral winds: zonal, meridional, (cm s-1), vertical (s-1) Composition: O, O2, NO, N(4S), N(2D) (mass mixing ratios - dimensionless) Ion and electron densities: O+, O2+, Ne (cm-3), (NO+ is calculated from Ne - (O+ + O2+)) Electric potential: (V) • Other fields are available as secondary histories which can be set as needed.