The coronal/solar wind model, the Alfven Wave Solar atmosphere Model (AWSoM) a component within the Space Weather Modeling Framework (SWMF) follows a self-consistent physics-based global description of coronal heating and solar wind acceleration. AWSoM includes a description of low-frequency forward and counter-propagating Alfven waves that non-linearly interact resulting in a turbulent cascade and dissipative heating. In addition, there are separate temperatures for electrons and protons with collisional and collisionless heat conduction applied only to electrons and radiative losses based on the Chianti model. AWSoM extends from the base of the transition region where the strong density gradient necessitates self-consistent treatment of Alfven wave reflection and balanced turbulence. It includes a stochastic heating model as well as a description of proton parallel and perpendicular temperatures and kinetic instabilities based on temperature anisotropy and plasma beta.

To validate AWSoM, we model Carrington rotations representative of solar minimum conditions and compare the simulation results with a comprehensive suite of observations. In the low corona (r < 1.25 Rs), we compare with EUV images from both STEREO-A/EUVI and SDO/AIA and to three-dimensional tomographic reconstructions of the electron temperature and density based on these same data. We also compare the model to tomographic reconstructions of the electron density from SOHO/LASCO observations (2.55 < r < 6 Rs). In the heliosphere, we compare model predictions of solar wind speed with velocity reconstructions from Interplanetary Scintillation (IPS) observations. For comparison with observations near the Earth, we use OMNI data. Our results show that the AWSoM model performs well in quantitative agreement with the observations between the inner corona and 1 AU. In the lower corona, the model and the tomographic reconstructions agree within 20%-30% on average. The model also reproduces the fast solar wind speed in the polar regions. Near the Earth, our model shows good agreement with observations of solar wind velocity, electron temperature and density. The AWSoM model provides a comprehensive tool to study the solar corona and larger heliosphere with current and future solar missions as well as being well suited for space weather predictions.