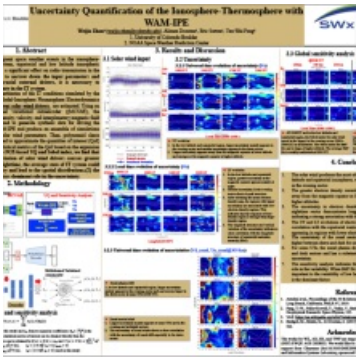
Weijia
Zhan
Space Weather Technology, Research and Education Center, Univeristy of Colorado Boulder
Alireza Doostan, University of Colorado Boulder
Eric Sutton, University of Colorado Boulder
Tzu-Wei Fang, NOAA Space Weather Prediction Center
Poster
One of the most frequent space weather events in the ionosphere-thermosphere (IT) system, equatorial and low latitude ionospheric irregularities can have a significant effect on radio transmission in the ionosphere. In order to narrow down the input parameters and identify the most crucial external drivers, it is necessary to quantify the uncertainty in the IT system.
In this study, the uncertainties of the IT conditions simulated by the Whole Atmosphere Model-Ionosphere Plasmasphere Electrodynamics (WAM-IPE) forecast system for verying solar wind drivers will be estimated. Using an advanced multichannel variational autoencoder ((MCVAE), the historical solar wind density, velocity, and interplanetary magnetic field (IMF) data are gathered to generate synthetic data for driving the model. We drive WAM-IPE and produce an ensemble of simulations using the synthetic solar wind parameters. Then, polynomial chaos expansion (PCE) is used to approximate the quantities of interest (QoI) and to estimate the statistical metrics of the QoI based on the expansion coefficients. Using the PCE-based UQ and Sobol index, we show the uncertainties and global sensitivity analysis results of the electron density, plasma flow, and neutral winds. Details regarding the universal time, local time, and vertical variances are provided.


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