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## **Space Weather Forecasting with an Ensemble Prediction System (MEPS) of Data Assimilation Models**

Abstract:

Space weather can have detrimental effects on a variety of civilian and military systems and operations, and many of the applications pertain to the ionosphere and upper atmosphere. Space weather can affect over-the-horizon (OTH) radars, HF communications, surveying and navigation systems, surveillance, spacecraft charging, power grids, pipelines, and the FAA's Wide-Area Augmentation System (WAAS). Because of its importance, numerous space weather forecasting approaches are being pursued, including those involving empirical, physics-based, and data assimilation models. Clearly, if there are sufficient data, the data assimilation modeling approach is expected to be the most reliable, but different data assimilation models can produce different results. Therefore, like the meteorology community, we created a Multimodel Ensemble Prediction System (MEPS) for the Ionosphere-Thermosphere-Electrodynamics (I-T-E) system that is based on data assimilation models. The MEPS ensemble is composed of seven physics-based data assimilation models for the ionosphere, ionosphere-plasmasphere, thermosphere, high-latitude ionosphere-electrodynamics, and mid-low latitude ionosphere-electrodynamics. Hence, multiple data assimilation models can be used to describe each region. For example, for the mid-low latitude ionosphere, ensemble modeling can be conducted using five different data assimilation models. The MEPS models can assimilate a range of ground and space observations, including GPS-TEC; ionosonde/digisonde plasma density profiles; in situ electron densities, plasma drifts, and magnetic perturbations; occultation data; ultraviolet emissions from the limb and disk; and radar line-of sight plasma velocities. The goal of the MEPS program is to improve space weather specification and forecasting with ensemble modeling. Selected ionospheric events that were reconstructed with more than one data assimilation model will be presented and discussed.