

### **Challenges in Modeling of Extreme Space Weather Events**

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Extreme space weather events are known to cause adverse impacts on critical modern day technological infrastructure such as high-voltage electric power transmission grids. First principles physics-based 3-D global MHD models play a major role in simulating the large-scale dynamics of magnetospheric systems and represent a very important component of attempts to understand the response of the magnetosphere-ionosphere system to varying solar wind conditions. Understanding of coupled magnetosphere-ionosphere dynamics during extreme solar wind driving is still a major challenge mainly because of a lack of data during time intervals when the magnetosphere is being strongly driven. In this presentation, we will highlight some of the on-going efforts to model extreme space weather events. Additionally, we will present results from current research efforts and discuss the major challenges encountered during these studies. Furthermore, we show how complete or good quality solar wind measurements from NASA's STEREO mission can complement current modeling efforts and provide vital information for the study on the Earth's response to extreme space weather.