

## Physics-based space weather modeling and forecasting activities at NASA GSFC Space Weather Research Center Physics-based space weather modeling and forecasting activities at NASA GSFC Space Weather Research Center

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NASA GSFC Space Weather Research Center (SWRC) leverages the capabilities of the Community Coordinated Modeling Center (CCMC) that hosts a great number of state-of-the-art physics-based space weather models developed by the international space physics community. In its role to support transition to operations activities, CCMC currently runs many of these models in a real-time mode. The real-time runs enable a wide spectrum of novel space weather products that SWRC uses to provide space weather information to the NASA customer. Examples include real-time execution of heliospheric MHD models that provide ensemble information about background solar wind conditions, predictive simulations of coronal mass ejection (CME) propagation in the interplanetary medium, magnetospheric MHD simulations and real-time modeling of the ionosphere-thermosphere conditions.

In this paper we provide an overview of the current physics-based space weather modeling and forecasting activities at CCMC and SWRC. We will discuss the usage of series of models to cover the entire space weather chain from the solar corona down to the upper mantle of the Earth. Tools such as cone model-based CME analysis procedure that have been developed at CCMC and SWRC to enable efficient usage of the physics-based simulation capacity will be reviewed. Further, CCMC has carried out and supported many verification and validation (V&V) activities that are a core element of model transition to space weather operations. Key elements of these V&V activities are also briefly discussed.

キーワード: space weather, modeling, physics-based simulations, forecasting

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