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Poster

Uncertainty Quantification (UQ) is critical in the Space Weather domain, where predictive models are built from first principles e.g. the Space Weather Modeling Framework (SWMF) to simulate phenomena such as CMEs (coronal mass ejections) and forecast their arrival time and geomagnetic impact accurately. Given the high cost of simulating Sun-to-Earth propagation of CMEs for a new event, we usually perform only a limited number of simulations based on varying flux rope parameters that describe the strength and shape of the CME. In this setting, surrogate models or emulators for approximating the true dynamics are valuable tools to provide improved extrapolation of the training data at arbitrary timesteps. These have the potential to accelerate forward UQ to propagate uncertainty from the free parameters to the QoIs and other downstream inference tasks.. Here, we compare the performance of different emulators, including parametrized Neural Ordinary Differential Equations (NODEs). These are constructed using data from synthetic white light images generated in the SWMF. The final surrogate model can be useful for generating the evolution of the leading edge based on unseen initial conditions and also supply predictive uncertainties on the test simulations.

Poster category:

Poster category
Solar and Interplanetary Research and Applications
Poster session day
Tuesday, April 16, 2024
Poster location
26
Meeting homepage
Space Weather Workshop 2024
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