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Poster
We present, for the first time, an integrated space-weather forecasting approach that combines two machine-learning components for solar eruptive events. The first focuses on predicting the time of arrival (ToA) of coronal mass ejections (CMEs) at Earth. It is trained in a multivariate framework using CME parameters, including speed, angular width, and mass, together with ambient solar-wind conditions and in situ measurements from spacecraft for events observed both remotely and in situ. Preliminary tests on previously unseen events are encouraging, with a Mean Absolute Error (MAE) below 9 hours. In addition, more than half of the test events are predicted within 5 hours of the observed arrival time, indicating that the method has clear potential for operational CME arrival forecasting.
The second component estimates the likelihood of an associated solar energetic particle (SEP) event. In this case, logistic regression is used within a supervised machine-learning framework to distinguish between two classes: non-SEP events (0) and SEP events (1). The present implementation uses flare magnitude and near-Sun CME speed as the initial predictors, and is applied to separate non-SEP from SEP events for two energy thresholds, E>100 MeV and E>300 MeV.
We aim to connect CME arrival-time forecasting with an early radiation-hazard assessment in a single system that provides both timing and probabilistic information for space-weather applications. Bringing these two elements together in one end-to-end workflow opens a path toward future operational forecasting in near-Earth and inner-heliospheric environments.
Poster session day
Wednesday, April 29, 2026
Poster location
45
Meeting homepage
[2026 Space Weather Workshop]
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