Paper ID: 89662
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57th IAA SYMPOSIUM ON SAFETY, QUALITY AND KNOWLEDGE MANAGEMENT IN SPACE ACTIVITIES (D5)
Interactive Presentations - 57th IAA SYMPOSIUM ON SAFETY, QUALITY AND KNOWLEDGE MANAGEMENT IN SPACE ACTIVITIES (IP)

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A MACHINE LEARNING-READY DATA PROCESSING TOOL FOR NEAR REAL-TIME FORECASTING

Abstract

Solar energetic particles (SEPs) constitute a crucial element of space weather (SWx), presenting radiation hazards to astronauts and space-based technology assets. Establishing a direct correlation between SEP characteristics and their solar origins remains challenging due to the intricate and intertwined processes governing SEP sources, acceleration, and transport. Long-term forecasting of SEPs remains elusive, motivating the use of data-driven machine learning (ML) for enhanced and reliable forecasting capabilities. However, the absence of a dedicated ML-ready suite of near real-time (NRT) data hampers effective forecasting.

To address this, we present efforts to develop an ML-ready data processing tool targeting NRT-only forecasting applications. Our approach involves integrating in-situ and remote data sets from diverse instruments, each with different latencies and data structures. We aim to construct a data acquisition and curation pipeline capable of handling NRT data sources, clean anomalies, and normalize timestamps. Additionally, the pipeline will facilitate model-ensemble training and inferencing for future predictions with associated confidence levels. This enables better comprehension of the physical processes involved and enhances the prediction of both nominal and worst-case SWx conditions.