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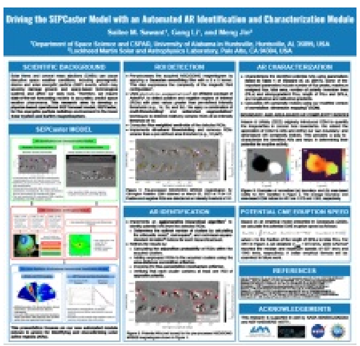
Poster
Solar flares and coronal mass ejections (CMEs) can cause disruptive space weather conditions, including geomagnetic storms and solar energetic particle (SEP) events, which may severely damage ground- and space-based technological systems and affect our daily lives. Therefore, we require state-of-the-art forecasting models to accurately predict space weather phenomena. This research aims to develop a physics-based operational SEP Forecast model, SEPCaster, for the energetic particle radiation environment in the inner solar system and Earth's magnetosphere.

SEPCaster is based on two advanced research models: the Alfv\'en Wave Solar Model (AWSoM) and the improved Particle Acceleration and Transport (iPATH) model. It operates in two distinct modes: an automated forecasting mode and a user-interactive mode. In the automated mode, SEPCaster runs with minimal human interaction, while in the interactive mode, users can modify the inputs and analyze specific events in greater detail.

This presentation focuses on a new automated module for identifying and characterizing active regions (ARs). We start by using real-time National Solar Observatory/Global Oscillation Network Group (NSO/GONG) magnetograms as our raw inputs and apply an image segmentation technique to detect regions of interest (ROIs) with positive and negative polarities. Next, we implement and refine a hierarchical clustering algorithm to identify potential ARs from these ROIs. We then calculate a set of parameters to characterize these ARs, including our newly defined area-based AR complexity index. Based on these parameters, we also compute potential CME eruption speeds, which are incorporated into SEPCaster.


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