



Contribution ID: 166

Type: **Contributed Oral**

A Machine Learning Framework for Building a Refined GOES Flare Catalog

Tuesday 2 December 2025 17:30 (15 minutes)

We present a new catalog for solar flares derived from Geostationary Operational Environmental Satellite (GOES) data using a deep learning-based detection method. Unlike the conventional rule-based methods, our approach identifies flare rises directly from the time series with a model that integrates multi-scale convolutional layers, a bidirectional long short-term memory (BiLSTM), and Transformer encoders. Trained on 7,700 manually labeled events and applied to GOES/XRS observations from 2018 to mid-2025, the method detects 201,463 flares, far exceeding the 14,612 listed in the GOES archive. The greatest relative increase appears for C-class events, many of which are often overlooked. Background subtraction of peak fluxes produces more symmetric waiting-time statistics, reducing bias from obscuration, while Bayesian-block analysis highlights strong temporal variability in flare rates. A complementary procedure links detected events to active regions using Solar Dynamics Observatory imaging. Together, these advances provide a more complete and less biased picture of flare occurrence, with potential applications for flare forecasting and solar-activity modeling.

Author: FARHANG, Nastaran (University of Sydney)

Co-authors: Prof. WHEATLAND, Michael (University of Sydney); Prof. MELATOS, Andrew (University of Melbourne)

Presenter: FARHANG, Nastaran (University of Sydney)

Session Classification: Solar Terrestrial and Space Physics

Track Classification: Topical Groups: Solar Terrestrial and Space Physics