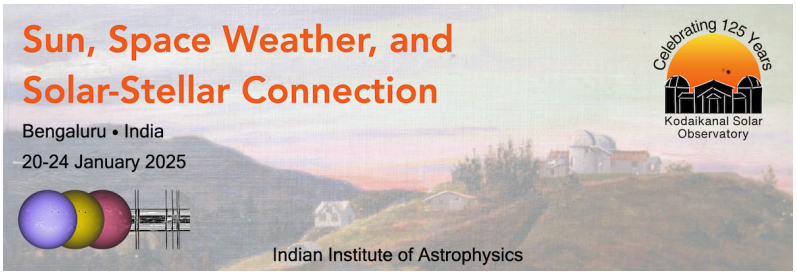

Contribution ID: **120** Type: **Contributed talk**

Time Evolution of Thermal and Non-thermal Energies in Solar Flares

Wednesday, January 22, 2025 2:45 PM (15 minutes)

We analyze two solar flares—an X-class flare from October 28th, 2021, and an M-class flare from November 29th, 2020—to investigate the dynamic changes in thermal energy during their evolution. Our study uses data from several sources, including the Atmospheric Imaging Assembly (AIA) on the Solar Dynamics Observatory (SDO), the X-ray Telescope (XRT) on Hinode, and the Spectrometer/Telescope for Imaging X-rays (STIX). By utilizing these datasets, we estimate the total thermal energy for both flares by calculating the Differential Emission Measure (DEM) to track changes in thermal energy over time. For the X-class flare, we further incorporate spectra from STIX on the Solar Orbiter to estimate the non-thermal energy component. Additionally, we examine how evolving volume estimates of the flare structure affect our thermal energy calculations, highlighting the value of high-resolution imaging from multiple wavelengths and perspectives. We propose a method to accurately determine the Line of Sight (LOS) throughout the Field of View (FOV) by using near-simultaneous observations from different vantage points, leading to a more precise volume estimate of the flare arcade. For the M-class event, we also analyze the thermal structure of the fan compared to the overall thermal evolution of the flare, finding that the thermal energy decay in the fan is slower than in the flare loops, which suggests a unique heating mechanism within the fan structure.

Contribution Type

Theme

Energetic Phenomena

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Session Classification: Shocks and particle Acceleration and Transport in IP Medium