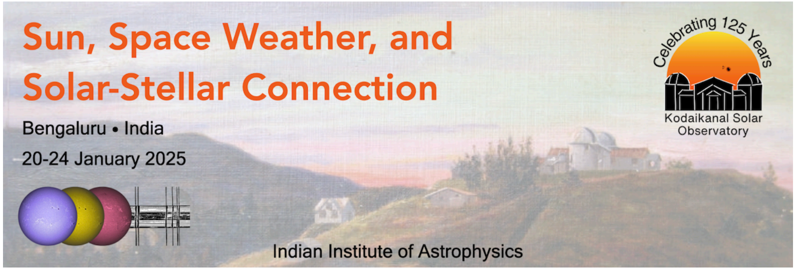


Contribution ID: **74**

Type: **Poster**

# Thermal Evolution of Earth-Directed CMEs Driving the Extreme Geomagnetic Storm on May 10, 2024

In May 2024, a series of solar eruptions occurred, triggered by a complex active region (β γδ ), leading to the extreme geomagnetic storm on May 10, 2024, the strongest storm in the last two decades. We investigate the kinematic and thermal evolution of coronal mass ejections (CMEs) responsible for this extreme event using multi-point coronagraphic data and near-Earth in-situ measurements, focusing on potential CME-CME interactions and their influence on observed in-situ data. We identified six CMEs directed towards Earth using SOHO/LASCO and STEREO-A/COR2 coronagraphs and applied the GCS model to estimate their 3D kinematics. To study the thermal evolution of the CMEs, we used the flux rope internal state (FRIS) model, which links their expansion to thermal properties. Further, we analyzed data from the Wind spacecraft to understand the heating and cooling within the ejected plasma near Earth. Our results show that the CMEs exhibited varying thermal behavior as they expanded, with many reaching an isothermal state at larger distances from the Sun. We also found that slower CME expansion tends to cause heat release in the plasma. Interestingly, electrons exhibit distinct thermal behaviors pre and post-ICME (heating) compared to those within the ICME (heat release). In contrast, ions within the CME show a two-phase temperature pattern. Overall, the interactions between CMEs strongly influence their kinematic and thermodynamic evolution and the resulting space weather effects.

## Contribution Type

## Theme

Energetic Phenomena

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