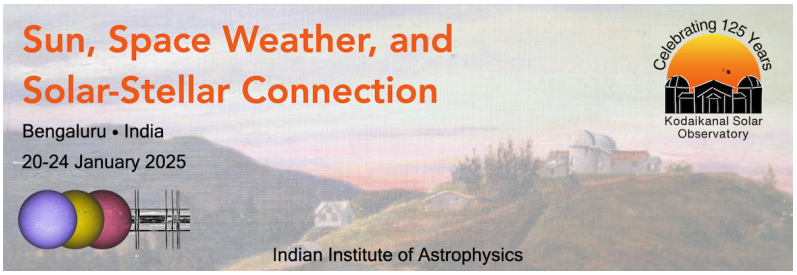

Contribution ID: **28** Type: **Contributed talk**

Global Coronal Magnetic Field Modelling to Study Solar Eruptive Events

Friday, January 24, 2025 9:10 AM (15 minutes)

Coronal mass ejections (CMEs) are the most energetic events originating from the Sun, causing significant and sudden disruption to the magnetic and particulate environment of the heliosphere. Thus, in the current era of space-based technologies, an early warning that a CME has left the Sun is crucial. Our magnetofrictional simulations that capture the global corona's continuous and dynamic evolution over many months demonstrate that the non-potential evolution of the corona leads to the accumulation of magnetic free energy and helicity, which is periodically shed in eruptive events. We find that these events fall into two distinct classes: One set of events is caused by eruption and ejection of low-lying coronal flux ropes, and they could explain the origin of filament-erupting CMEs. The other set of events is not driven by the destabilisation of low-lying structures but rather by the eruption of overlying sheared arcades. These are associated with streamer blowouts or stealth CMEs, which are sources of problematic geomagnetic storms. Further investigation into the second class of events predicts the occurrence of repeated eruptions without clear low-coronal signatures from such arcades, provided that the high, overlying magnetic field lines are sufficiently sheared by differential rotation. Thus, our study suggests that magnetofrictional models can, in principle, provide early indication - pre-onset of CMEs, irrespective of whether they originate from the eruption of a low-coronal flux rope.

Contribution Type

Theme

Connecting Solar Corona to Heliosphere

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Session Classification: Solar Active Regions and Eruptions