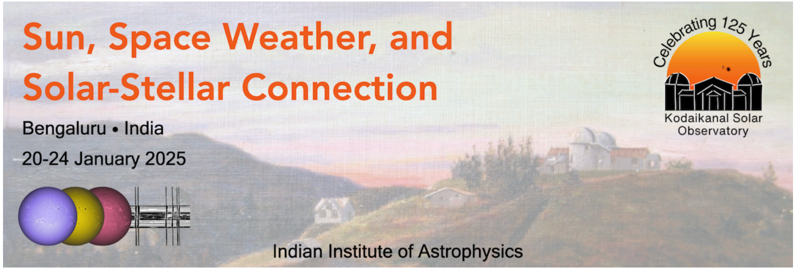

Contribution ID: **178** Type: **Invited talk**

Magnetic Interaction of Stellar Coronal Mass Ejections with Close-in Exoplanets

Thursday, January 23, 2025 4:40 PM (20 minutes)

Coronal Mass Ejections (CMEs) erupting from the host star are expected to have enormous effects on the atmospheric erosion processes of the orbiting planets. For planets with a magnetosphere, the embedded magnetic field in the CMEs is thought to be the most important parameter to affect planetary mass loss. In this work, we investigate the effect of different magnetic
field structures of stellar CMEs on the atmosphere of a hot Jupiter with a dipolar magnetosphere. We use a time-dependent 3D radiative magnetohydrodynamics (MHD) atmospheric escape model that self-consistently models the outflow from hot Jupiters magnetosphere and its interaction with stellar CMEs. For our study, we consider three configurations of magnetic field embedded in stellar CMEs –(a) northward ▯▯ component, (b) southward ▯▯ component, and (c) radial component. We find that both
the CMEs with northward ▯▯ component and southward ▯▯ component increase the mass-loss rate when CME enters the stellar side but the mass-loss rate becomes higher for the CME with northward ▯▯ component when it arrives at
the opposite side. The largest magnetopause is found for the CME with a southward ▯▯ component when the dipole and the CME magnetic fields have the same direction. We also find that during the passage of a CME, the planetary magnetosphere goes through three distinct changes - (1) compressed magnetosphere, (2) enlarged magnetosphere, and (3) relaxed magnetosphere for all three considered CME configurations. We compute synthetic Ly-▯ transits at different times during the passage of the
CMEs. The synthetic Ly-▯ transit absorption generally increases when the CME is in interaction with the planet for all three magnetic configurations. The maximum Ly-▯ absorption is found for the radial CME case when the magnetosphere is the most compressed.

Contribution Type

Theme

Solar - Stellar Connections

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