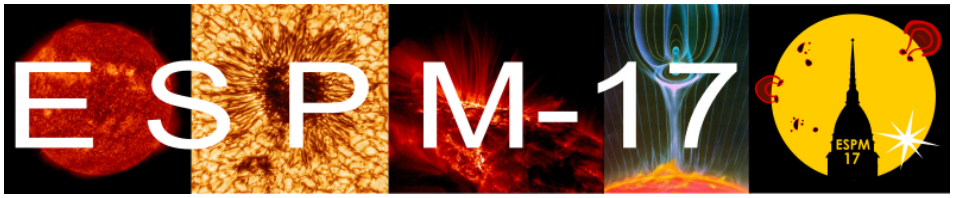

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Modelling of Coronal Mass Ejections Through the Novel FRi3D Model and the Effect of Twist Parameter

Coronal Mass Ejections (CMEs) are large-scale eruptive events originating from the magnetically complex regions of the Sun, and also the most energetic phenomenon in the heliosphere. Even though CMEs have been largely studied in the last several decades, and despite significant advances in our knowledge about them, a lot remains unknown about their internal structure, dynamics, and how they link to their interplanetary counterparts. Determining CMEs configuration and topology is also important for comprehending the amount of magnetic energy stored in the corona prior to CME eruption. Observations indicate that the energy is stored as a highly sheared and/or twisted magnetic field located above the polarity inversion line (van Ballegooijen et al., 2006). In the present work, we analyse Earth-directed CMEs occurring in 2022, where the availability of data from spacecraft in different viewpoints allows for a comprehensive analysis,insight into their evolution and link with the interplanetary counterpart. For the modelling of the CMEs we used the state-of-the-art 3D magnetohydrodynamic (MHD) heliospheric model EUHFORIA (EUropean Heliospheric FORecasting Information Asset). We coupled EUHFORIA with the novel flux-rope CME model FRi3D (Flux-Rope in 3D), which provides a rather realistic morphology of the CME structure. We study how the variation in the twist parameter impacts the predictability of kinematic and magnetic properties of CMEs when using the FRi3D model.

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