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Data-driven Modelings of the Initiation and Early Evolution of Coronal Mass Ejections

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Coronal mass ejections (CMEs) are the most intense explosions in the solar system, ejecting large amounts of magnetized plasma from the solar corona into the heliosphere. On the one hand, CMEs are associated with many astrophysical processes, such as magnetic reconnection, particle acceleration, and various types of MHD waves. On the other hand, CMEs are the primary drivers of disastrous space weather events. As a result, studies of CMEs not only deepen our understanding of fundamental astrophysical processes but also enhance the capacity for space weather prediction in practical applications.

In this talk, we will first introduce our recent progress in the development of observational data- driven models. Subsequently, we will explore the kinematics, magnetic topologies, and thermodynamic properties of CMEs using this advanced data-driven tool. These models reproduce some observed events and detail the role of 3D magnetic reconnection in the evolution of CME flux ropes, such as their formation, ascent, rotation, and other characteriscs. Our work suggests that data-driven models are a powerful tool for revealing the physical details behind real observations.

References

[1] J.H. Guo *et al*, ApJ, **961, 140** (2024)
[2] J.H. Guo *et al*, ApJS, **266, 3** (2023)
[3] J.H. Guo *et al*, ApJ, **956, 119** (2023)