

4 π models of CMEs and ICMEs

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Coronal mass ejections (CMEs) are among the most impressive manifestations of magnetically-driven solar activity. Although many aspects of their origin and interplanetary evolution are still not sufficiently well understood, it can be expected that their occurrence is not limited to the Sun and solar-like stars, but extends to a wide range of stellar objects harboring a magnetized convective envelope. In order to be able to understand and interpret corresponding observations of magnetically active stars, it is helpful to first study the CME phenomena exhibited by our own host star. For these, the pivotal role of interplanetary CMEs (ICMEs) in the context of solar-terrestrial relations ("space weather") has triggered the development of increasingly realistic numerical models, which draw huge benefits from the vast recent advances in both computational resources and the quality of space-borne observational data. After a brief introduction to the phenomenon of CMEs, I will review classes of existing (numerical) models for their development and propagation. Special emphasis rests on the models' different physical mechanisms, included effects, and selected findings obtained from their application. The importance of fully 3-D ('4 π ') spatial coverage will be highlighted.