Data-Driven MHD Simulations on Magnetic Flux Rope Eruptions

Yang Guo[1], M. D. Ding[1], P. F. Chen[1], Chun Xia[2], Rony Keppens[3], Ze Zhong[1], Jinhan Guo[1], Yiwei Ni[1]

[1] School of Astronomy and Space Science, Nanjing University
[2] School of Physics and Astronomy, Yunnan University
[3] Department of Mathematics, KU Leuven
e-mail (speaker): guoyang@nju.edu.cn

Solar eruptions such as flares and coronal mass ejections could cause disastrous space weather. To understand and predict these eruptive activities, we have to combine multi-wavelength observations and numerical simulations. Recently, data-driven magnetohydrodynamic (MHD) simulations have provided a series of new findings in studying the accumulation of electric current and magnetic energy in active regions, in explaining magnetic flux rope eruptions and coronal mass ejections. We briefly review the progress in this field and introduce one way to realize data-driven MHD simulation, including processing magnetic field observational data, inversion of velocity field and electric field, models as initial conditions and subsequent dynamic simulations. Finally, we will look into the future of the data-driven simulations and point out several methods to improve the simulation results.

References

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