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Buildup of Magnetic Flux Ropes toward Eruptions in the Solar Corona

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Solar corona is frequently disrupted by coronal mass ejections (CMEs), whose core structure is believed to be a magnetic flux rope (MFR) made of helical magnetic field. Although the presence of MFRs after solar eruptions has been verified by spacecraft measurements near Earth, the key processes and conditions that lead to the MFR formation and eruption on the Sun remains elusive. In this talk I will review our recent progresses on the structure of MFRs, particularly the distribution of magnetic twist and the characteristics of the MFR boundary, and on the nascent evolution of MFRs toward eruptions. We propose that a seed MFR is essential to CMEs' birth. This new picture has the capacity to accommodate a wide variety of plasma phenomena on the Sun and beyond, by bridging the gap between micro-scale dynamics and macro-scale activities.

References

Gou, Tingyu; Liu, Rui*; Kliem, Bernhard*; Wang, Yuming; Veronig, Astrid M. (2019) The Birth of A Coronal Mass Ejection, Science Advances, 5, eaau7004

Awasthi, Arun Kumar; Liu, Rui*; Wang, Haimin; Wang, Yuming; Shen, Chenglong (2018), Pre-eruptive Magnetic Reconnection within a Multi-flux-rope System in the Solar Corona, Astrophys. J., 857, article id. 124

Wang, Wensi; Liu, Rui*; Wang, Yuming; Hu, Qiang; Shen, Chenglong; Jiang, Chaowei; Zhu, Chunming (2017), Buildup of a highly twisted magnetic flux rope during a solar eruption, Nature Communications, 8, id. 1330

Liu, Rui*; Kliem, Bernhard; Titov, Viacheslav S.; Chen, Jun; Wang, Yuming; Wang, Haimin; Liu, Chang; Xu, Yan; Wiegelmann, Thomas (2016), Structure, Stability, and Evolution of Magnetic Flux Ropes from the Perspective of Magnetic Twist, Astrophys. J., 818, article id. 148