2nd Asia-Pacific Conference on Plasma Physics, 12-17,11.2018, Kanazawa, Japan

ON THE TWIST OF MAGNEITC FLUX ROPES IN THE CORONA AND SOLAR WIND

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Magnetic flux ropes (MFRs) are one of the fundamental structures in the universe filled with plasmas. They are believed to be the main carriers of mass, magnetic flux and magnetic free energy, and therefore closely related to various kinds of eruptions. Magnetic twist is a key parameter characterizing a MFR, providing clues to the important questions: when and how a MFR loses stability. In the corona and solar wind, MFRs could appear in, e.g., solar jets, coronal mass ejections and interplanetary magnetic clouds as revealed by a plenty of imaging data and in-situ measurements. Starting from observations and previous theoretical efforts, we try to better understand the twist of MFRs erupted from the Sun and seek the answers of the above questions. The main findings of our recent studies include (1) magnetic clouds, the post-eruption MFRs, are mostly highly-twisted, and the upper limit of the total twist, Φ, follows the relation $\Phi=2$ l/R, in which l is the length of the MFR and R is the radius[1]; (2) MFRs probably consist of a strong-twist core and a weak-twist outer shell[2-3]; and (3) coronal loops may carry twist, which can produce large-scale rotating solar jets through reconnecting with neighboring open field, and stronger-twisted loops tend to associate with larger jets[4].

References

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