Investigating the Initiation and dynamics of Flux-rope CMEs

Xin Cheng*[1]

[1]School of Astronomy and space science, Nanjing University – 22 Hankou RD, Nanjing, China, China

Abstract

Recent SDO observations reveal that coronal mass ejections (CMEs) often originate from the eruption of magnetic flux ropes. In the slow rise phase of CMEs, the flux rope lies along the polarity inversion line and first appears as a twisted channel in the AIA high temperature passbands, such as 131 A and 94 A. The hot channel will rise slowly with the velocity of 10-100 km/s typically, probably due to the increase of magnetic pressure of the flux rope or the decrease of magnetic tension over the flux rope. In the impulsive acceleration phase of CMEs, the hot channel quickly develops into the semi-circular flux rope-like structure with rapid increasing of upward movement velocity. In the meantime, the expanding of the hot channel compresses the surrounding magnetic field and plasma, which successively stack and form the CME leading front. From detailed kinematical analysis, we find that: (1) the impulsive acceleration of the hot channel begins prior to the onset of impulsive energy releasing of associated flare, (2) the speed of the hot channel is always faster than that of the LF in the field of view of AIA. These results suggest that the hot channel is the flux rope that solar community is looking for. It can exist prior to the solar eruption and its ideal instability probably plays a key role in the transition from the slow rise phase to the impulsive acceleration phase.

Keywords: CMEs, flares, magnetic flux rope

*Speaker