Interaction with Ambient Field during Coronal Mass Ejection Formation Process

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Coronal mass ejections (CMEs) are one the most spectacular explosive phenomena, in which large amount of mass and magnetic flux are ejected to the interplanetary space, as a result of a disruption of coronal magnetic field. It is very important for space weather science to understand the whole process of CMEs because of their close relation with geoeffective events. Although CMEs are results of a disruption of coronal magnetic field, which may be observed as flares, considerable fraction of the disruptions are not associated with CMEs. This fact implies that CME formation is governed by some factors such as interaction between an eruption and the global scale magnetic field.

In order to examine the condition whether the eruption of coronal field can be launched as a CME, we performed a three-dimensional MHD simulation of a twisted flux rope ejected from a small and strong magnetic field active region surrounded by a global coronal magnetic field. In the last year meeting, we already reported the initial results that a flux rope can be successfully ejected under moderately strong surrounding field and shows a rotation in the direction perpendicular to the ejection line.

We attempted to identify reconnection process which plays a significant role for CME formation or the CME rotation, by analyzing the time variation of the magnetic field topology. The results of the analysis imply that the CME rotation may be caused by the reconnection between the ambient field in front or side of the rising flux rope. We will present of the summary of the results and discuss the capability to apply the space weather prediction.