SELF-CONSISTENT MAGNETOHYDRODYNAMIC MODELING OF A CORONAL MASS EJECTION, CORONAL DIMMING, AND A GIANT CUSP-SHAPED ARCADE FORMATION

Daikou Shiota[1]; Hiroaki Isobe[2]; Peng Fei Chen[3]; Kazunari Shibata[2]

[1] Kwasan Observatory, Kyoto Univ.; [2] Kwasan Obs., Kyoto Univ.; [3] Kwasan, Kyoto Univ

Coronal mass ejections (CMEs) are one of the most spectacular phenomena in the solar corona and it is most important for the space weather research to understand the physics of them. Recent observations revealed that CMEs are associated with either solar flares or giant arcade formations, in which magnetic reconnection is thought to play an essential role. Considering these observations, Shibata (1996; 1999) suggest that CMEs, filament eruptions, flares/giant arcades can be understood in a unified view: mass ejection and magnetic energy release via magnetic reconnection.

We performed magnetohydrodynamic simulations of CMEs and associated giant arcade formations. The soft X-ray images synthesized from the numerical results are compared with the soft X-ray images taken with the Soft X-Ray Telescope aboard Yohkoh. The comparison between synthesized and observed soft X-ray images provides new interpretations of various features associated with CMEs and giant arcades. (1) It is likely that the Y-shaped ejecting structure, observed in the giant arcade on 1992 January 24, corresponds to slow and fast shocks associated with magnetic reconnection. (2) Soft X-ray twin dimming corresponds to the rarefaction induced by reconnection. (3) The inner boundary of the dimming region corresponds to the slow shocks. (4) The 'three-part structure' of a CME can be explained by our numerical results. (5) The numerical results also suggest that a backbone feature of a flare/giant arcade may correspond to the fast shock formed by the collision of the downward reconnection outflow.