MHD Simulation of Plasmoid-Induced-Reconnection in Solar Flares

Keisuke Nishida[1]; Masaki Shimizu[2]; Daikou Shiota[3]; Hiroyuki Takasaki[4]; Kazunari Shibata[5]

[1] Kwasan Observatory, Kyoto Univ; [2] none; [3] Kwasan Observatory, Kyoto Univ.; [4] Astronomy,Science,Kyoto University; [5] Kwasan Obs., Kyoto Univ.

http://www.kwasan.kyoto-u.ac.jp/~nishida/

Recent space observations have revealed various evidence of magnetic reconnection and common properties in flares (plasmoid ejection, cusp shaped loops, etc.), leading to unified view of various flares (Shibata 1996, 1999). However, the detailed physics of magnetic reconnection has not been established yet. Especially it is not revealed what determines the speed of reconnection, i.e. reconnection rate. Based on many observation, Shibata et al. (1995), Shibata (1999), Shibata and Tanuma (2001) proposed the plasmoid-induced-reconnection model, which suggests that reconnection rate, inflow speed, plasmoid ejection velocity are closely related each other.

In this study, we performed MHD simulations of solar flares with different resistivity model and different plasmoid velocity, and examined how the reconnection rate depends on the parameters. In the case in which reconnection occurs easily, reconnection rate becomes larger and consequently plasmoid velocity becomes larger. In contrast the case in which plasmoids are accelerated by an external force, i.e. in larger plasmoid velocity case, larger inflows are induced by mass conservation, and consequently reconnection rate also becomes lager. These results are consistent with observations (Shimizu et al. 2005, in preparation) and support plasmoid-induced-reconnection model strongly.