The process of the filament formation and eruption triggered by the emerging flux in the sun

Shun Notoya[1]; Takaaki Yokoyama[2]; Kanya Kusano[3]; Takehiro Miyagoshi[4]; Hiroaki Isobe[5]

[1] Earth Planetary Sci., Univ.Tokyo; [2] School of Science, Univ.Tokyo; [3] ESC/JAMSTEC; [4] Kwasan and Hida Observatories, Kyoto Univ; [5] Kwasan Obs., Kyoto Univ.

Emerging flux was thought to be the main trigger of solar flares and perhaps also CMEs. And some important observations showed that the apparent correlation between emerging flux and eruptions of quiescent filaments (Feynman & Martin, 1995; Wang & Sheeley,1999), which can be observed as CMEs. From these observational studies, Chen and Shibata (2000) performed two-dimensional simulations including the flux rope, which show the eruption process. Their results suggest that the reconnection is a key process for the eruption. But the principle limitation of the flux-rope model is that the ends of the flux rope are not anchored in the photosphere, and furthermore, the flux-rope is given at the initial condition, and its origin has not been discussed so much. So our purpose in this paper is to investigate that how a filament is produced and how an eruption process can be initiated by the emerging flux and what effects of three-dimensionality appear in the process of eruption. For that purpose, we performed three-dimensional numerical simulations of the emerging flux model by solving the resistive compressible MHD equations. From our results, a filamentary structure is produced from the coronal arcade field by the reconnection process, and when the reconnection process proceeds effectively, the produced structure is ejected upward by the magnetic force.