Homologous flare and magnetic reconnection

Hiroyuki Takasaki[1], Ayumi Asai[2], Junko Kiyohara[3], Kazunari Shibata[4]

[1] Astronomy,Science,Kyoto University, [2] Kwasan Obs., Kyoto Univ., [3] Department of Astronomy,Faculty of Science, Kyoto University, [4] Kazan Astron. Obs., Kyoto Univ.

Recently, the so-called CSHKP model (Carmichael 1964; Sturrock 1966; Hirayama 1974; Kopp-Pneuman 1976) is the most commonly quoted as the magnetic reconnection model for solar flares. This model suggests that the magnetic field lines in the current sheet that is generated in the corona successively reconnect, then plasmoid which contained in the magnetic island above the flare loops is ejected and then apparently growing flare loops and separating Ha ribbons at their footpoints are formed.

We present an examination of the multi-wavelength observation of three homologous flares which occurred on 2000 November 24. Homologous flares is defined as flares that occur successively in the same active region, and show a common pattern of structure and development (Ellison, McKenna, and Reid 1960; Ellison 1963). From the filtergram observations in Ha and in UV (1600 A), we confirmed that these three flares occurred at almost the same locations and they also have a lot of similarities to each other on the morphological point of view. It is very likely that the occurrence of homologous flare is due to the large-scale magnetic field configuration not changed drastically. Therefore, the observational study of homologous flares can help us to investigate the physical parameters including the magnetic field strength such as the energy release rate. In fact, it is difficult to estimate the exact value of the energy release rate because we don't know the size of the reconnection region and the velocity of reconnection inflow into reconnection region. Therefore, this kind of quantitative study has not been done sufficiently yet.

We estimate the physical parameters of each flare and caluculate the magnetic field strength near the reconnection point by using their physical parameters and relatively evaluated their energy release rates of homologous flares. Last of all, we propose a schematic reconnection scenario in these homologous. We conclude that all these three flare activities are driven or triggered by newly emerging fluxes.