AOGS 2006

The Coronal Field Strength and the Magnetic Reconnection Rate from the Goes X-Ray Flux and the Photospheric Magnetogram

TETSUYA YAMAMOTO[1], TAKASHI SAKURAI[2], KANYA KUSANO[3], TAKAAKI YOKOYAMA[4]

[1] *Department of Astronomy, Graduate School of Science, The University of Tokyo*

[2] *National Astronomical Observatory of Japan*

[3] *Earth Simulator Center*

[4] *Department of Earth and Planetary Physics, Graduate School of Science, The University of Tokyo*

The solar flare is a transient phenomenon, and has great influence on the solar-earth environment. In this study, considering the heating and cooling processes of a flare loop and several assumptions, we derived the coronal field strength (CFS) and the magnetic reconnection rate (MRR) of a flare from an X-ray light curve of the GOES satellite and a photospheric magnetogram. We analyzed 22 flares. Our analysis method is as follows. First we assumed that a flare loop consists of ten loops. Front view of the loops is arch-like, and side view of the loops is fan-like. With the magnetic flux conservation, the CFS is derived from the scale of the loop and the photospheric magnetogram. In order to estimate an X-ray light curve of the flare, we gave a temperature for each loop with a numerical simulation result (Shibata and Yokoyama 1999), and calculated radiative and conductive cooling fluxes in each loop. Here the loops are heated from the lowest loop to the highest loop with a time interval. From the height of the loops and this time interval, one velocity is estimated. We assumed that this velocity has a same magnitude with the reconnection inflow velocity. The MMR is estimated from this velocity. At last, for 22 flares we estimated CFSs and MRRs, which coincide with maximum X-ray fluxes and time intervals of increasing X-ray fluxes. Estimated CFSs and MRRs are 0.02-0.1 for averaged photospheric field strengths and 0.01-0.2, respectively. We report the way of derivation and the error of these values in detail. The photospheric magnetic properties associated with these values are discussed.