

Observations of Magnetic Reconnection Events in the Solar Chromosphere

Jongchul Chae¹¹ Department of Physics and Astronomy, Seoul National University

e-mail: jcchae@snu.ac.kr

The low atmosphere of the Sun refers to the photosphere and chromosphere that consists of weakly or partially-ionized plasmas. The magnetograph observations of the solar surface indicate that the low solar atmosphere contains magnetized plasma fragments of mixed polarity that are ceaselessly changing. The collision of two magnetized plasma structures of opposite polarity often produce the events of magnetic reconnection, which are observationally manifest as changes of magnetic connectivity, events of magnetic flux cancellation, transient brightenings, explosive events, and jet-like events. I will briefly review these observations and will discuss the current understanding of the magnetic reconnection in the low atmosphere of the Sun. Moreover, I will present some results on the high resolution spectrograph observations of the reconnection events in active regions using the Fast Imaging Solar Spectrograph (FISS) of the 1.6 meter Goode Solar Telescope at the Big Bear Solar Observatory.

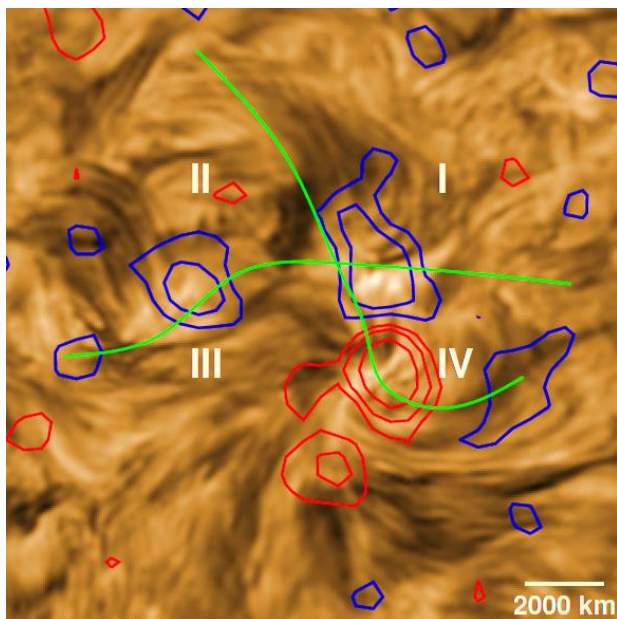


Fig. 1 Example of a magnetic reconnection event observed in the chromosphere of a quiet region of the Sun.

Figure 1 presents a magnetic reconnection event well observed in the chromosphere of a quiet region of the Sun¹. From the H α line observations, we found a plasma cloud ejection in domain II, and a set of shrinking bright

loops in domain IV, both of which are considered to result from the process of magnetic reconnection that took place on the separator. The superposed contours of magnetic flux density indicate that the reconnection in the chromosphere also results in the cancellation of magnetic flux observed in the photosphere. The measured rate of flux cancellation is very important in characterizing magnetic reconnection^{2,3}. The property of magnetic reconnection in the solar chromosphere can be fairly well described by the adiabatic current sheet model of Sweet-Parker type⁴.

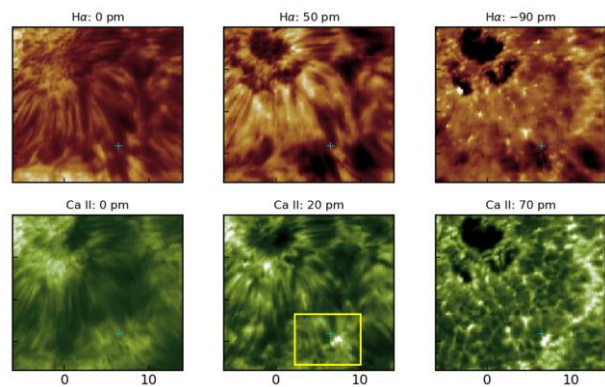


Fig. 2 Example of a magnetic reconnection event (marked by a box) in the chromosphere of an active region of the Sun. The full spectral profiles of the H α line and the Ca II 854.2 nm line were recorded in this region by the FISS.

Figure 2 presents a magnetic reconnection event in an active region with the FISS. The site of magnetic reconnection has a complicated pattern of plasma velocity, both vertically and horizontally. The result of the detailed analysis based on the multilayer spectral inversion⁵ will be presented in the meeting

References

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