Magnetic Flux Cancellation and Associated Plasma Heating in the Upper Solar Atmosphere

*Sung-Hong Park[1], KD Leka[1,2], Kanya Kusano[1]

1. Institute for Space-Earth Environmental Research of Nagoya University, 2. NorthWest Research Associates

Magnetic flux cancellation in the solar photosphere has been studied to understand a detailed, complicated process of magnetic reconnection, in particular with respect to various types of reconnection signatures in the upper solar atmosphere such as current sheet-like structures, jet-like features and nonthermal particle acceleration. Recently, a theoretical model of magnetic reconnection has been proposed, in which the reconnection process is driven by converging magnetic patches of opposite polarities on the photospheric surface and their flux cancellation. This model allows us to analytically estimate the amount of magnetic energy released as heat at a reconnecting current sheet. Here we present a small-scale flux cancellation event observed by Hinode, IRIS and SDO. During flux cancellation, two opposite-polarity magnetic patches are identified and traced by an automated feature tracking technique. Determining their flux, converging speed and overlying field strength as a function of time, we first estimate the temporal variation of the total rate of energy release as heat through reconnection. This estimated heating rate is then compared with the multi-wavelength IRIS and SDO/AIA observations to quantitatively examine how valid the proposed reconnection model is in the context of the release of magnetic energy.

Keywords: Magnetic Reconnection, Magnetic Flux Cancellation, Plasma Heating