# What Determines the Duration of Magnetic Reconnection in Solar Flares?

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After the Yohkoh mission, there have been many evidences of magnetic reconnection during the Long Duration Events (LDEs) and impulsive flares. The Long Duration Events and impulsive flares are characterized by the duration of the X-ray brightening in the solar corona. The LDEs last typically longer than one hour whereas the impulsive flares last for less than an hour. Yohkoh has shown cusp-like structures in the LDEs but loop-top hard X-ray (HXR) sources and the plasmoid ejections in case of impulsive flares. Although these discoveries provide a clear evidence of magnetic reconnection in such dynamic events, there is no model which can explain the duration of reconnection events.

The dynamical processes associated with solar flares are widely studied through MHD simulations. These MHD simulations are based on the models that ultimately provides longer reconnection time because the magnetic flux in such models is supplied continuously into the reconnection region and there is no mechanism which could stop the reconnection process. Since such models provide reconnection that lasts longer, it is suitable for LDEs. So, it remain unclear what determines the duration of magnetic reconnection during the LDEs and impulsive flares.

In order to understand the mechanism that controls the duration of magnetic reconnection, we performed 2.5 dimensional MHD simulations. We adopted six different initial magnetic configurations to examine the relation between the duration of solar flares and the amount of magnetic flux supplied into the reconnection region. It is found that the amount of the magnetic flux advected into the inflow region determines the timescale of the solar flares. As the size of the inflow region increases, the duration of magnetic reconnection also increases. This is because the timescale of the flare is $\frac{L}{2M_A v_A}$, where $L$ is the size of the inflow region, $M_A$ is the reconnection rate, $v_A$ is the Alfvén velocity. Further, our simulation cleary demonstrate the importance of the size of the inflow region in determining the duration as well as energy release during the reconnection events.

Keywords: flare; magnetic reconnection.