

Abstract Submitted
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What Condition is Necessary for Solar Eruptions? SATOSHI INOUE, Center for Solar-Terrestrial Research, New Jersey Institute of Technology — We conducted a magnetohydrodynamic (MHD) simulation of solar active region 12673. This active region produced huge X-flares on September 6 2017, but our recent study found that the magnetic flux rope (MFR), which is a bundle of the twisted magnetic field lines and caused the X-flares, stably existed as of 2 days before the X-flares takes place (Yamasaki et al. 2021). The purpose of this study is to reveal what condition is necessary for the eruption of the MFR, as of September 4, in the region where the X-flares occurred. We used a non-linear force-free field (NLFFF) as the initial condition of the simulation that is reconstructed from the observed photospheric magnetic field. As a result, although the NLFFF, which includes highly twisted field lines, was stable to small disturbances, the eruption could be achieved if the highly twisted MFR which is composed of strongly twisted lines with more than one-turn is formed through the reconnection. We estimated a ratio of the magnetic flux of the newly created MFR and the magnetic field lines surrounding it before the eruption. We found that when the flux ratio is over ~ 0.1 , the MFR could be driven upward before it becomes torus instability which is considered as a strong candidate for the onset mechanism of the MFR eruptions.

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