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On the Role of Magnetic Twist in Flare/CME Production

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We monitored the coronal response to the photospheric magnetic input in an active region, utilizing nonlinear force-free field extrapolation. A magnetic flux rope formed along the major polarity inversion line of the active region. The magnetic twist number of this flux rope increased before, and decreased after, each major flare (C-and-above classes) taking place in this active region. Meanwhile, the magnetic free energy exhibited a stepwise decrease across each of these flares. Analysis utilizing the differential emission measure method indicates the presence of hot plasmas in excess of 10 MK surrounding the flux rope even before flares and further heating of plasmas surrounding the flux rope during flares. We suggest that the kink instability played a crucial role in triggering these eruptions, and that the reconnection between the flux rope field and the overlying field was the major mechanism to heat plasmas in confined flares.