

M19a Data-driven Simulation of a Deflected Eruption in Solar Active Region 11283

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Solar flares are commonly known to be caused by the release of magnetic energy accumulated in the solar atmosphere. To understand the mechanism of solar flares, numerical modeling of coronal magnetic fields based on magnetohydrodynamics (MHD) theory has been developed. These numerical approaches enable exploration of the mechanisms involved in flare initiation. More recently, data-driven MHD modeling, which continuously introduces time-series of observational data in the bottom boundary has been developed. In this study, we conduct a long-term data-driven simulation of the M5.3 flare observed on Sep., 6, 01:59 UT, 2011 in NOAA Active Region 11283 (AR 11283) to explore the mechanism of the flare production in this AR. We use a model developed by Kaneko et al. (2021), which uses the electric field inversion from the photospheric magnetic field. We use 36 snapshots of the photospheric magnetic field (SHARP) obtained from SDO/HMI, and the simulation covers the period from Sep., 4, 19:48 UT, 2011 to Sep., 6, 06:48 UT, 2011. In our modeling, we have successfully reproduced both the formation of magnetic flux ropes (MFRs) and the eruption of the reproduced MFRs, which exhibits an inclination with respect to the photosphere. To explain the mechanism of the inclined eruption, we apply a new methodology for calculating the decay index, which takes into account all eruptive directions of a torus plasma. This methodology allows us to evaluate the possibility for the torus instability growth and to determine the potential eruptive direction of the torus plasma.