M16b Data-driven MHD Simulation of Solar Active Region NOAA 11283

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Solar flares are caused by the release of magnetic energy accumulated in the solar atmosphere. It occurs in the solar active regions (ARs) where the strong magnetic field are present. In terms of the flare events, all of the energy stored in AR is usually not released with a single flare. It is still difficult to predict the exact value of released energy. Moreover, the physical mechanism to determine the ratio between the released energy and the stored energy is unclear because the coronal magnetic field cannot be observed directly. MHD simulation is a powerful method to investigate and understand the evolution of the coronal magnetic field. In this study, we conducted an MHD simulation on AR11283 where multiple M and X flares have occurred. The objectives of this study are to reproduce a flare event and to know about the energy release rate of the flare and the physical mechanism to determine the rate. We applied a newly developed data-driven simulation method in which the time series observational photospheric magnetic field data (SDO/HMI vector magnetic field data of AR11283) are introduced as the bottom boundary condition. We carefully investigated the effects of the numerical filtering and the resistive diffusion to simulate the observed evolution of this active region from the energy build-up phase to the post-flare phase.