Simulation Study of Solar Flare Trigger Mechanism

J. Muhamad [1)], K. Kusano[1)], S. Inoue[2)], and D. Shiota[1)]

[1)] Institute for Space-Earth Environmental Laboratory, Nagoya University, Furo-cho, Chikusa-ku, Nagoya 464-8601 Japan
johanm@isee.nagoya-u.ac.jp
[2)] Max Planck Institute for Solar System Research, Göttingen, Germany

Abstract

Solar flare releases huge amount of energies from corona to the interplanetary space due to magnetic reconnection process. The releasing energy is initially stored in the corona as the magnetic energy contained within solar coronal magnetic structure. Due to some perturbations in the photosphere, solar coronal structure can be destabilized, which lead to the eruption. In this study, we performed MHD simulation with zero plasma beta to figure out what mechanism possible to trigger the flare. The coronal magnetic field was reconstructed by using MHD relaxation method to extrapolate coronal structure above active region NOAA 10930 in the state of Nonlinear Force-Free. We showed that this coronal model was stable against any instabilities before the perturbation was introduced. Various small bi-pole structures were then imposed onto the initial coronal structure to understand which configuration effective to trigger the flare. We confirmed that two kind of small bi-pole structures so called Opposite-Polarity (OP) and Reversed-Shear (RS) structures that imposed to the highly sheared magnetic fields were able to trigger the flare.