Simulation of Sigmoid Structure and Filament Eruption of AR11283 using a Three-dimensional Data-driven Magnetohydrodynamic Model

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Abstract

We present an analyses of the magnetic structures of AR11283 during the period September 6, 2011 using the vector magnetogram obtained from Helioseismic and magnetic image (HMI) on-board the Solar Dynamics Observatory (SDO) together with a 3D data-driven CESE-MHD model (Jiang, et al 2012; Wu et al. 2006). The focus of our analyses is the evolution of the 3D coronal magnetic field and eruption in response to the change of photospheric magnetic field. The non-potentiality of magnetic characteristics such as (i) the lengh of the magnetic shear along the main neutral line (Lss), (ii) unsigned magnetic flux (F), (iii) the magnetic energy flux across the photosphere to the corona, (iv) the current system and (v) the free magnetic energy of the active region are presented. The simulated magnetic field configuration has revealed the Sigmoid which has been compared with images recorded by the Atmosphere Image Assembly (AIA)/SDO. It shows remarkable resemblance. This sigmoid feature apparently becomes unstable when it erupts. The simulated magnetic non-potential characteristics are used to investigate the conditions for the initiation of filament eruption.

Keywords: Prominence, Eruption, Observations, 3D MHD Simulations

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