[구SS-15] Nonlinear Force-Free Field Reconstruction Based on MHD Relaxation Method

Jihye Kang[1] , Satoshi Inoue[1], Tetsuya Magara[1,2], Jun-Mo An[1], Hwanhee Lee[1]
[1]School of Space Research, Kyung Hee University, [2]Department of Astronomy and Space Science, Kyung Hee University

In this study, we extrapolate a nonlinear force-free field (NLFFF) from an observed photospheric magnetic field to understand the three-dimensional (3D) coronal magnetic field producing a huge solar flare. The purpose of this study is to develop a NLFFF extrapolation code based on the so-called MHD relaxation method and check how accurately our model reconstructs a coronal field. Furthermore, we apply it to the photospheric magnetic field obtained by Helioseismic and Magnetic Imager (HMI) on board Solar Dynamics Observatory (SDO) to reconstruct a 3D magnetic structure.

We first investigate factors in controlling the accuracy of our NLFFF code by using a semi-analytical solution obtained by Low & Lou (1990). To extend a work done by Inoue et al. (2014), we apply various boundary conditions at the side and top boundaries in order to make our solution close to a realistic solution. As a consequence, our solution has a good accuracy when three components of a reference field are all fixed at the boundaries. Furthermore, it is also found that our solution is well matched to the Low & Lou solution in the central area of a simulation domain when the three components of a potential field are fixed at side and top boundaries (this approach is close to a realistic solution). Finally, we present the 3D coronal magnetic field producing an X 1.5-class flare in the active region 11166 through the extrapolation from SDO/HMI.

[구SS-16] Observational test of CME cone types using SOHO/LASCO and STEREO/SECCHI during 2010.12-2011.06

Hyeonock Na, Soojeong Jang, Jae-Ok Lee, Harim Lee, Yong-Jae Moon,
School of Space Research, Kyung Hee University, Korea

We have made a comparison of three cone models (an asymmetric cone model, an ice-cream cone model, and an elliptical cone model) in terms of space weather application. We found that CME angular widths obtained by three cone models are quite different one another even though their radial velocities are comparable with one another. In this study, we investigate which cone model is proper for halo CME morphology and whether cone model parameters are similar to observations. For this, we look for CMEs which are identified as halo CMEs by one spacecraft and as limb CMEs by the other ones. For this we use SOHO/LASCO and STEREO/SECCHI data during the period from 2010 December to 2011 June when two spacecraft were separated by 90±10 degrees. From geometrical parameters of these CMEs such as their front curvature, we classify them into two groups: shallow cone (5 events) and near full-cone (28 events). Noting that the previous cone models are based on flat cone or shallow cone shapes, our results imply that a cone model based on full cone shape should be developed. For further analysis, we are estimating the angular widths of these CMEs near the limb to compare them with those from the cone models. This result shows that the angular widths of the ice-cream cone model are well correlated (CC = 0.81) with those of observations.