[구SE-03] The Relation Between Magnetic Field Configuration And The Flux Expansion Factor

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In this study we use three-dimensional magnetohydrodynamic simulations of flux emergence from solar subsurface layer to corona. In order to study the twist parameter of magnetic field we compare the simulations for strongly twisted and weakly twisted cases. Based on the results, we derive a flux expansion factor of selected flux tubes which is a ratio of expanded cross section to the one measured at the footpoint of the flux tube. To understand the effect of flux expansion factor, we make a comparison between magnetic field configuration and the expansion factor. By using a fitting function of hyperbolic tangent we derive noticeable correlations among the strength of the vertical magnetic field, current density and expansion factor. We discuss what these results tell about the relationship between the twist of emerging field and the mechanism for the solar wind.

[구SE-04] Three-Dimensional Modeling of the Solar Active Region

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In this paper, we introduce the 3D modeling of the coronal magnetic field in the solar active region by extrapolating from the 2D observational data numerically. First, we introduce a nonlinear force-free field (NLFFF) extrapolation code based on the MHD-like relaxation method implementing the cleaning a numerical error for Div B proposed by Dedner et al. 2002 and the multi-grid method. We are able to reconstruct the ideal force-free field, which was introduced by Low & Lou (1990), in high accuracy and achieve the faster speed in the high-resolution calculation (512^3 grids). Next we applied our NLFFF extrapolation to the solar active region NOAA 10930. First of all, we compare the 3D NLFFF with the flare ribbons of Ca II images observed by the Solar Optical Telescope (SOT) aboard on the Hinode. As a result, it was found that the location of the two foot-points of the magnetic field lines well correspond to the flare ribbon. The result indicates that the NLFFF well capture the 3D structure of magnetic field in the flaring region. We further report the stability of the magnetic field by estimating the twist value of the field line and finally suggest the flare onset mechanism.