[포SE-42] The effect of field-line twist on the dynamic and electric current structures of emerging magnetic field on the Sun

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In this study we use three-dimensional magnetohydrodynamic simulations to investigate how the dynamic state of emerging magnetic field is related to the twist of field lines. Emerging magnetic field forms a magnetic structure on the Sun where various kinds of activity such as solar flares, jets, and coronal mass ejections are observed. To understand the physical mechanism for producing such activity, we have to know the dynamic nature of this structure. Since flares are the manifestation of rapidly dissipating electric current in the corona, we also investigate the distribution of current density inside the structure and examine how it depends on the field-line twist. To demonstrate the dynamic structure of emerging magnetic field, we focus on the factors characterizing the geometric property and stratification of emerging magnetic field, such as the curvature of field line and the scale height of field strength. These two factors show that emerging field forms a two-part structure in which the central part is close to a force-free state while the outer marginal part is in a fairly dynamic state where magnetic pressure force is dominant. We discuss how the field-line twist affects the two-part structure and also explain a possible relation between electric current structure and sigmoid observed in a preflare phase.

[포SE-43] Development of an Automatic Program to Analyze Sunspot Groups on SOHO/MDI Continuum Images using OpenCV

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Sunspots usually appear in a group which can be classified by certain morphological criteria. In this study we examine the moments which are statistical parameters computed by summing over every pixels of contours, in order to quantify the morphological characteristics of a sunspot group. The moments can be additional characteristics to the sunspot group classification such as McIntosh classification. We are developing a program for image processing, detection of contours and computation of the moments using continuum images from SOHO/MDI. We apply the program to count the sunspot numbers from 303 continuum images in 2003. The sunspot numbers obtained by the program are compared with those by SIDC. The comparison shows that they have a good correlation (r=89%). We are extending this application to automatic sunspot classification (e.g., McIntosh classification) and flare forecasting.