

## Three-Dimensional Structure Analysis of Coronal Magnetic Field in AR NOAA 10930 Based on Magnetogram Data from Hinode/SOT

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The solar active phenomena, such as solar flares and coronal mass ejections(CMEs), are widely believed to be a sudden release of magnetic energy stored in the solar corona. Therefore, the understanding of three-dimensional structure of coronal magnetic field is very important to reveal the trigger mechanism of them as well as to realize the prediction of onset of solar weather events, although the onset process is still enigma.

Coronal magnetic field can be well approximated by nonlinear force-free (NLFF) field, because plasma beta value of the solar corona is much smaller than unity. However, since the force-free equation is nonlinear, we must extrapolate coronal magnetic field numerically from magnetogram data. *Hinode*/SOT is the ideal tool for this purpose, because of the highest resolution and the capability of continuous observation.

In this study, we have developed the new NLFF field solver, in which the conventional magnetofrictional method is extended by adapting a multi-grid technique and the optimized searching procedure of initial trial function. We have applied the extended magnetofrictional method onto series of magnetograms for active region NOAA10930, which were observed by *Hinode*/SOT before and after the onset of X-class flare on Dec. 13, 2006. As a result of reconstruction of magnetic field before flare, we found that the multiple shear structures of magnetic field lines were formed on the magnetic neutral line. It is well consistent with the reversed shear field model, which was proposed as the trigger mechanism of flares by Kusano et al. 2004. We will, furthermore, discuss the storage and release process of magnetic energy associated with flaring process based on the 3D analysis of magnetic field.