[SO13] Can a Closed Magnetic Field System Have More Energy than the Open Field System in a Semi-infinite Space?

최광선
경희대학교 우주과학과

It is still a poorly understood issue whether a closed magnetic field system can have more energy than the corresponding open field in a semi-infinite space. Although there are some examples of configuration transition from a closed system to an open system with increasing energy of the system, such transitions can hardly explain the magnetic field opening in solar eruptions because there is no free energy budget for expelling material in addition to the opening of the field. However, the Aly-Sturrock theorem denies existence of a closed force-free field having more energy than the open field. In this paper, it is examined why Aly and Sturrock's proof of their theorem is incomplete. Some magnetic field configurations are explicitly precluded in their proof, not because their method of proof discriminates them, but because those configurations apparently lead to contradiction to their conclusion. We demonstrate that some field configurations, which, though, are not precluded in their proof, can have more energy than the open fields. Their plausible importance in solar eruption is proposed by presenting the relevant observations.

[SO14] Comparison between Fast Fourier Transform Method and Green's Function Method for Reconstructing Coronal Magnetic Field as a Linear Force-free Field

Eun-Kyung Lim[1], Jongchul Chae[1]
[1]*Department of Physics and Astronomy, Seoul National University*

Coronal magnetic field is extrapolated using photospheric magnetic fields as a boundary condition. Adopting linear force-free field assumption, we can reconstruct the coronal magnetic fields. There are some methods in solving the equation such as the Fast Fourier transform(FFT) method suggested by Alissandrikis(1981) and the Green's function method indicated by Chiu and Hilton(1977). Due to the time efficiency of the FFT method, FFT method has commonly used by the researchers so far. On the other hand, FFT method still has a shortcoming in a sense of assuming the periodic boundary condition which is not in a real solar photosphere. In order to make use of Green's function method effectively which does not assume the periodic boundary condition itself, we have found the way to reduce the calculation time of the Green's function method by using the Convolution theorem. The time required for the Green's function method is only a few times as long as that required for the FFT method. In present work, we aim to test both FFT and Green's function method using both a simple linear force-free field model and real magnetograms. This work will help us to understand the advantages and disadvantages of both methods and to make an appropriate decision on choosing a better method.