Geophysical Research Abstracts
Vol. 18, EGU2016-11251-1, 2016
EGU General Assembly 2016


# A New Method for Reconstruction of Coronal Force-Free Magnetic Fields

Sibaek Yi, Gwangson Choe, Daye Lim, and Kap-Sung Kim
Kyung Hee University, Yongin, Korea (sibaekyi@khu.ac.kr, gchoe@khu.ac.kr)

We present a new method for coronal magnetic field reconstruction based on vector magnetogram data. This method belongs to a variational method in that the magnetic energy of the system is decreased as the iteration proceeds. We employ a vector potential rather than the magnetic field vector in order to be free from the numerical divergence B problem. Whereas most methods employing three components of the magnetic field vector over-specify the boundary conditions, we only impose the normal components of magnetic field and current density as the bottom boundary conditions. Previous methods using a vector potential need to adjust the bottom boundary conditions continually, but we fix the bottom boundary conditions once and for all. To minimize the effect of the obscure lateral and top boundary conditions, we have adopted a nested grid system, which can accommodate as large as a computational domain without consuming as much computational resources. At the top boundary, we have implemented the source surface condition. We have tested our method with the analytic solution by Low & Lou (1990) as a reference. When the solution is given only at the bottom boundary, our method excels in most figures of merits devised by Schrijver et al. (2006). We have also applied our method to the active region AR 11974, in which two M class flares and a halo CME took place. Our reconstructed field shows three sigmoid structures in the lower corona and two interwound flux tubes in the upper corona. The former seem to cause the observed flares and the latter seem to be responsible for the global eruption, i.e. the CME.