[S08-2] Determination of Magnetic Helicity of Solar Active Regions Using the Linear Force-free Field Model.

임은경, 채종철
서울대학교 지구환경과학부

Magnetic helicity is a useful quantity in characterizing the magnetic system of solar active regions. We aim to measure the helicity of the coronal magnetic field of an active region based on the linear force-free field assumption. With a value of the force-free α, the coronal field is constructed from the extrapolation of SOHO/MDI magnetograms, and the constructed field lines are compared with the coronal loops in the EUV images taken by SOHO/EIT and TRACE. The force-free α that best fits the loops is used to calculate the helicity of the active region. We have applied this method to AR 10696 during its first rotation. We have compared our results with the accumulated amount of the helicity transferred to the corona via the photosphere which is determined independently (Jeong and Chae 2005). We find that the two different methods yielded the helicity values that are comparable to each other with the difference being about 30%. Moreover the temporal variation of the helicity is similar. Our results suggest that the two different methods are fairly consistent to each other, and hence the determined helicity values may not much deviate from the real one. The next step of our study is to deal with troubles arising when a large α value is used, and when active regions are much away from the disk center.

[S08-3] Magnetic Twist of EUV Coronal Loops Observed by TRACE

RyunYoung Kwon, Jongchul Chae
Astronomy Program, School of Earth and Environmental Science
Seoul National University

EUV images taken by TRACE clearly display a number of thin coronal loops that represent one million degree plasma tracing magnetic field lines in the corona. We estimate the magnetic twist that can explain the constriction of coronal loops. We assume that the segment of a coronal loop is a part of a straight, non-force-free twisted flux tube. Its axial field component is assumed to be uniform over the radial distance from the axis of the loop, and the twist peaks on the axis, so that it is ensured that pressure always peaks on the axis. This flux tube model is characterized by three independent parameters that are axial field strength, peak pressure excess and loop width. The peak pressure excess and the loop width are determined from the analysis of the loop on TRACE 171Å image, and the axial field strength is computed from the linear-force free extrapolation of photospheric magnetic field observed by SOHO/MDI. We have applied this method to several coronal loops observed near the disk center. As a result we have found that these loops have twist values from 1.3π to 1.6π, which correspond to a winding number of about 0.7.