[구SE-05] RELATION BETWEEN VIRIAL ENERGY AND MAGNETIC ENERGY PROVIDED BY AN EMERGING FLUX TUBE ON THE SUN.

Jihye Kang[1], Tetsuya Magara[1,2], Jun Mo An[1], Hwanhee Lee[1]
[1]School of Space Research, Kyung Hee University
[2].Department of Astronomy and Space Science, Kyung Hee University

The MHD virial theorem applied for observed photospheric field may be the one of way to estimate magnetic energy of generally invisible coronal magnetic structure. However, the photospheric field is not in a force-free state, so the application of virial theory needs some care. Here we use a series of MHD simulations of emerging field to investigate how we can apply the virial theorem to the emerging field. In early emerging phase, virial energy has a minus value although positive area at the photosphere is continuously generated toward a late emerging phase. We discuss why this tendency occurs. Then we derive the critical height where the actual emerging magnetic energy is almost comparable to the virial energy. If the difference between virial energy and magnetic energy becomes 10 percentage of the magnetic energy, we define this is the critical height, and assume the emerging field is close to force-free. We also discuss how the critical height changes with the initial twist of an emerging flux tube.

[구SE-06] On the Association Between Sub-photospheric Flows and Photospheric Magnetic Fields of Solar Active Regions

Ram Ajor Maurya and Jongchul Chae
Astronomy Program, Seoul National University, Seoul 151-747, Korea

We present the study of association between sub-photospheric flow and photospheric magnetic fields of active regions respectively derived from the local helioseismology and observed magnetic fields. It is believed that the energetic transients, e.g., flares and CMES, are caused by changes in magnetic and velocity field topologies in solar atmosphere. These changes are essentially brought about by the magnetic fields that are rooted beneath the photosphere where they interact and get affected by sub-photospheric flows. Therefore, we expect the topology of sub-surface flows to be correlated with the observable topology of magnetic fields at the photosphere and higher layers. In order to examine the correlation, if any, we computed the near photospheric flows and photospheric magnetic fields using the Doppler velocity and magnetic fields observations, respectively, provided by the SDO/HMI. The high resolution Doppler observations from the HMI enabled us to compute the very high p-modes parameters which sample the sub-photosphere shallow near the photosphere. Furthermore, we compute the sub-photospheric flow topology parameters, e.g., vorticity, kinetic helicity, and photospheric magnetic field topology parameters, e.g., magnetic helicity, from the magnetic fields observations to compare their associations. We present the result of the analysis in the paper.