

A09b **Investigation of virial theorem in active region on the Sun : comparison between simulation and observation**

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Virial theorem is a way to estimate the magnetic energy of invisible coronal magnetic structure. However, we should be careful about the use of the virial theorem because the photospheric magnetic field is not generally force-free. Here we use a series of MHD simulations of an emerging flux tube in which we change the twist of magnetic field, to investigate how much virial theorem can be applied to a magnetic structure formed via flux emergence on the Sun. We then calculate the virial energy for NOAA active region 11158 on 2011 February 16 and NOAA active region 11302 on 2011 September 26 using vector magnetograms obtained from Helioseismic and Magnetic Imager (HMI) onboard Solar Dynamic Observatory (SDO). We discuss the atmospheric level at which force-free is established, which has turned out to depend on the twist of magnetic field.