



A statistics study of the comparison of two methods to calculate relative magnetic helicity

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As we all known, magnetic helicity is conserved in situation of ideal magnetohydrodynamics. It is important to compare the change of magnetic helicity during the emergence of magnetic flux for a deep comprehension of this conservation law. A statistical research is carried out and we select 74 active regions in the period of 23rd solar cycle (1996-2006). We attempt to use two approaches to calculate the change of magnetic helicity of certain active region, called Local Correlation Tracking (LCT) and non-linear force free field extrapolation (NLFFF). We adopt the magnetograms from Michelson Doppler Imager (MDI) on board the Solar and Heliospheric Observatory (SOHO) and from 35cm-Solar Magnetic Fields Telescope (SMFT) at Huairou Solar Observation Station (HSOS) for applying two approaches, respectively. It is easily demonstrated the correlation coefficient between the bottom boundary magnetic flux from different magnetograms is high enough (0.77). We also compare helicity calculated by two methods, showing the correlation coefficient is 0.57, so that we can use these magnetograms to compare the consistency of two methods. Then two different examples are compared for further analysis.