Magnetic Helicity and Solar Activity Cycle

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Using a data set of photospheric vector magnetograms obtained at the Huairou Solar Observing Station of Beijing Astronomical Observatory during the period of 1988-97, we computed the local current helicity $(B_z \cdot (\mathrm{curl}\boldsymbol{B})_z)$ for 422 active regions. We found that active regions generally contain mixed signs of current helicity, but in most cases a particular sign of helicity is dominant over a whole region area. The sign of helicity is mainly negative in the northern hemisphere and positive in the southern hemisphere. Active regions whose sign of helicity does not follow this rule tend to occur at some heliographic longitudes, and such longitude zones persist over long period.