



Huairou Solar Observing Station

Solar cycle variation of helicity characteristics

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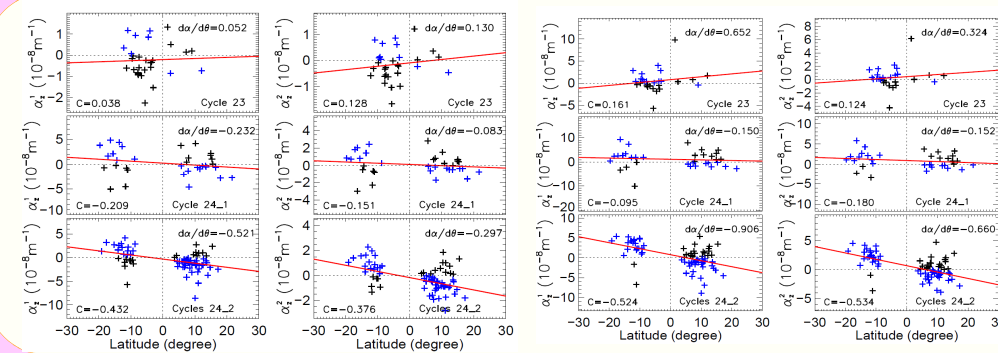
Abstract. In this poster we present our study on solar cycle variation of helicity characteristics using a sample of all active regions observed by SP/Hinode up to June 2012. We first confirmed our previous finding that the usual hemispheric helicity sign rule is not followed in the descending phase of solar cycle 23 and is followed in the ascending phase of solar cycle 24, with a further finding that the later phase of solar cycle 24 shows an even stronger evidence to follow the usual hemispheric helicity sign rule. We also checked our previous finding that the strong and weak magnetic fields possess opposite helicity signs and found that this rule is not followed in the later phase of solar cycle 24. This means that this helicity character also possesses a solar cycle variation, in addition to the solar cycle variation of the usual hemispheric helicity sign rule, and there is a roughly 2-year time delay between these two.

Parameters

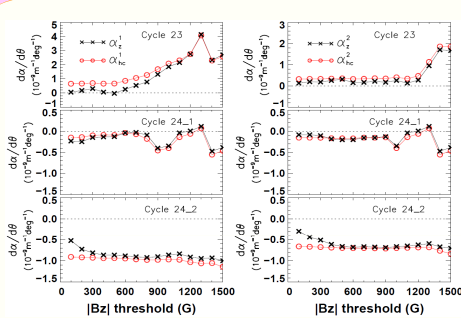
1. Average local twist $\alpha_z = \frac{(\nabla \times \mathbf{B})_z}{B_z}$ $B_z = f \cdot B \cos(\gamma)$ $B_t = \sqrt{f} \cdot B \sin(\gamma)$

2. Normalized average current helicity $\alpha_{nc} = \frac{\sum(\nabla \times \mathbf{B})_z B_z}{\sum B_z^2}$ $B_z = B \cos(\gamma)$ $B_t = B \sin(\gamma)$

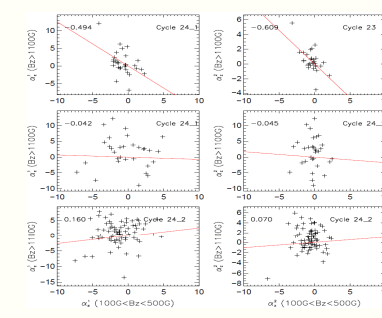
Statistical Results



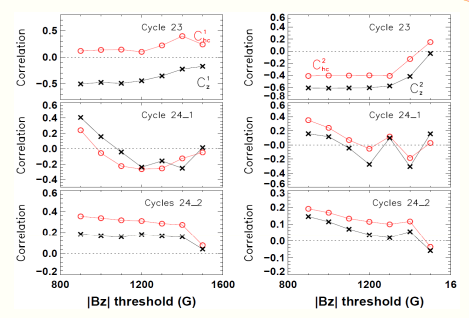
Cycle 23: 2006.11~2008.06 30 ARs
 Cycle 24_1: 2008.10~2010.09 34 ARs
 Cycle 24_2: 2010.10~2012.06 75 ARs
Cycle 23: Do not follow the usual hemispheric helicity sign rule. Also found in Tiwari et al. (2009)
Cycle 24_1 and 24_2: Follow the usual hemispheric helicity sign rule.
24_2 better than 24_1



$d\alpha/d\theta$ with different $|B_z|$ thresholds

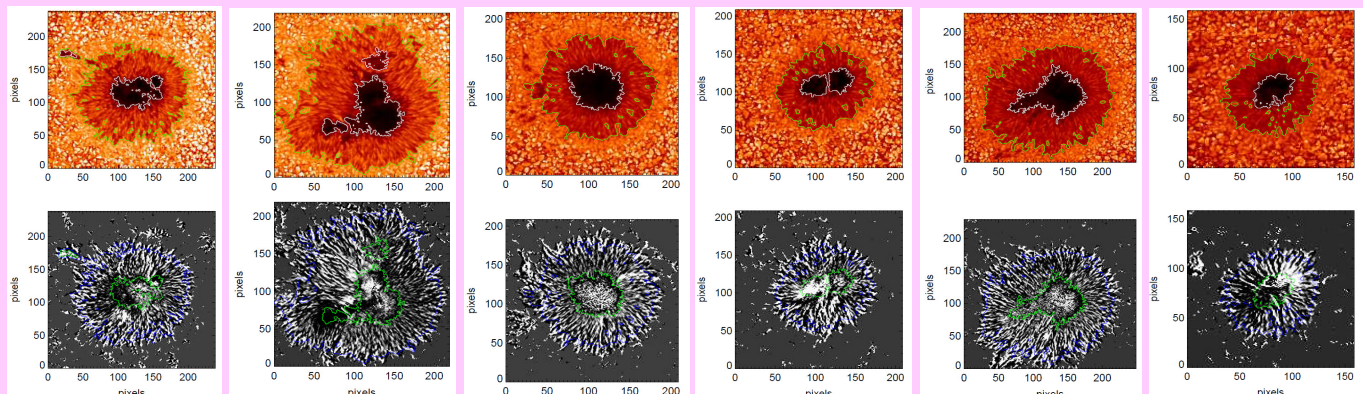


Correlation between weak fields and strong fields(1100 G)



Correlation between weak fields and strong fields

Observation and Samples



2007.01.05

2007.05.01

2010.08.03

2010.08.10

2011.10.28

2011.11.23