[S08-4] Evolutionary Characteristics of Magnetic Helicity Injection in Active Regions

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Magnetic helicity is now regarded as an important physical quantity in understanding the magnetic activities of solar active regions such as flares and coronal mass ejections. A common wisdom is that magnetic helicity is transported from the interior to the corona, and then to the interplanetary space. In the present study, we are interested in examining the temporal behavior of helicity injection through the photospheric boundary that divides the interior and the corona. Specifically we aim to see whether magnetic helicity is supplied to the corona in a more or less steady way or not. We determined the rate of helicity injection in each active region applying Chae's method to the full-disk, 96 minute-cadence magnetograms taken by SOHO/MDI. Using these data, each active region could be followed without interruption for about 5 days while they were away from the limb. Some active regions were followed at next rotations, too. As a result, we found that magnetic helicity was supplied intensively during the period of flux emergence, especially during the growth of active regions. The amount of helicity injected during the growth period ranged from 1.75 x 1042 Mx2 to 43.5 x 1042 Mx2 depending on the active region flux. These values are much larger than the estimated contributions of differential rotation at the photospheric level. Our result suggests that most of the magnetic helicity in active regions may be supplied for several days during the early phase of the active regions.

[S08-5] The Magnetic Structure of Filament Barbs

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There is a controversy on how features protruding laterally from filaments, called barbs, are magnetically structured. On 2004 August 3, we observed a filament that had well-developed barbs. The observations were performed using the 10 inch refractor of the Big Bear Solar Observatory. A fast camera was employed to capture images at five different wavelengths of the Hα line, and successively record them based on frame selection. The terminating points of the barbs were clearly discernable in the Hα images without any ambiguity. The comparison of the Hα images with the magnetograms taken by SOHO/MDI revealed that the termination occurred above the minor polarity inversion line dividing the magnetic elements of the major polarity and those of the minor polarity. There is also evidence that the flux cancellation proceeded on the polarity inversion line. Our results together with similar other recent observations support that filament barbs are cool matter suspended in local dips of magnetic fieldlines, formed by magnetic reconnection in the chromosphere.