The investigation of 3-component magnetic and velocity stuructures of solar magnetic cancellation by Hinode satellite

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A convergence and disappearance of positive and negative patches in the line-of-sight magnetic field is called a magnetic cancellation. There are two theoretical pictures of a magnetic cancellation, U-loop emergence and Omega-loop submergence. It is important to distinguish these two models because they are completely different in the flux transport between the photosphere and the solar atmosphere. The discrimination between these models by observations has been worked by several researches.

Harvey et al. (1999) investigate the timing difference of cancellations in the photosphere and chromosphere to determine the emergence or submergence. The result is that the submergence is dominant but this is an indirect evidence of the submergence. Chae et al.(2004) investigate three components of magnetic field and velocity field of active region cancellations by polarization measurements. They observed the horizontal field and downflow(1km/s) between the cancellations. This is the first direct evidence but the time evolution of downflow is not observed.

We investigate the magnetic field and velocity field of quiet region cancellations by using Hinode satellite. We observe horizontal field connecting the canceling magnetic patches and characteristic downflow(40min, 1km/s) around cancellation sites. This is the first direct evidence of quiet region cancellations. We also determine the time evolution of downflow by deriving Doppler velocity from filtergram data. The timing of cancellations and downflow is same. The magnetic flux before the cancellation and the submerged flux calculated from Doppler velocity are consistent. These results support the Omega-loop submergence. We are going to discuss the comparison with X-ray images taken by Hinode/XRT in the presentation.