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The flux distribution of the solar photosphere using Hinode sattelite

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The magnetic field on the solar photosphere appears as a collection of patches. These magnetic patches show a dynamic behavior such as emergegence, motion, and disappearance. The size distribution of the magnetic flux in these patches is the basic information for studying such behavior and has some information of the physical mechanism in the background. There are several studies on the distribution function but it is still under debate: Parnell et al.(2009) report the power-law distribution of the magnetic flux while Hagenaar et al.(2001) report exponential distribution.

To investigate this issue independently, we use the NaI magnetogram taken by the Solar Optical Telescope/ Filtergram imager (SOT/FG) onboard Hinode. We used the clumping method for the automatic detection of the patches. In this method, the patches are found by enclosing the pixels which have greater values than the given thresold. Two quiet regions are invesigated. More than 800 and 1000 patches are detected, respectively. We found that the flux distributions of both regions are like exponential functions. These functions are nearly persistent for more than four hours. We discuss the relationship between the power-low distribution and the exponential distibution and the probability that the power-law distribution can be made by the summation of the exponential function.We will also report the difference of the flux distribution between active and quiet regions.

Keywords: The Sun, Photosphere, Magnetic field, Quiet Sun