Calibration and Analysis of Vector Magnetograms by Solar Flare Telescope of BOAO

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In this work we introduce basic procedures for calibration and analysis of vector magnetograms made by the Solar Flare Telescope(SOFT) of BOAO. To identify the spectral line of Fe 6302.5 for vector magnetograph (VMG), we scanned monochromatic images integrated over filter passband, changing the central wavelength of a Lyot filter. Then we obtained a filter-convolved spectral line profile, which is found to be in good agreement with spectral atlas data provided by Kitt Peak Solar Observatory. This line profile is used to derive calibration coefficients of longitudinal and transverse fields by the line slope method.

We have developed an improved iterative calibration method by using theoretical Stokes polarization signals calculated with various inclination angles of magnetic fields. Then we applied it to a dipole model to characterize field configurations of a typical single round sunspot and compared our method with a conventional method(Ichimoto 1997). It is interesting to note that the conventional method remarkably underestimate the transverse field components near the inner penumbra.

Finally, we have compared our vector fields of AR8422 with those made with a similar vector magnetograph at Mitaka solar observatory. The comparisons show that longitudinal fields are very similar to each other but transverse fields are somewhat different. A field of view (400″ ×300″) of our observed vector magnetogram has been confirmed by finding the maximum correlation(r=0.962) between our rescaled longitudinal magnetrogram and corresponding Mitaka's magnetogram. We also present our vector magnetograms, H-alpha, and white light observations of AR8419 during its flaring(M3.1/2B) activity.