Diagnosis of Faraday Rotation with Video Vector Magnetograph at Huairou

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Over the wavelength interval of 150 mÅ redward of line center of the FeI λ5324.19 Å to 150 mÅ to the blue, in steps of 10 mÅ, observations of a simple sunspot were obtained with the Video Vector Magnetograph at Huairou Solar Observing Station (HSOS) of National Astronomical Observatories. In this paper, we present results of the inversion of stokes polarization profiles of this sunspot to recover the vector magnetic field parameters of the spectral line forming region using the FeI λ5324.19 Å using a nonlinear least-squares fitting. At the same time, curves of the observed variation of azimuth with wavelength were compared with model calculations for the azimuth at each wavelength as derived the inverse Zeeman effect modified by Faraday rotation. Hagyard, et al. (2000, Solar Phys. 191, 309) find it is difficult to separate two effects of Faraday rotation and $\pi - \sigma$ rotation. However, $\pi - \sigma$ rotation relates to the Landé factor of a spectral line. For the spectral line FeI 5324.19 Å, its Landé factor g = 1.5. In the solar magnetic field atmosphere, its Zeeman split is less than that of line FeI 5250.22 Å which has larger Landé factor g = 3. The correlations in Figure 1 show that the azimuth rotation increases as the field strength increases and inclination angle decreases. The results show that rotation of the azimuth is less significant in observation taken near the center of the FeI λ5324.19 Å than that of FeI λ5252.22 Å line.
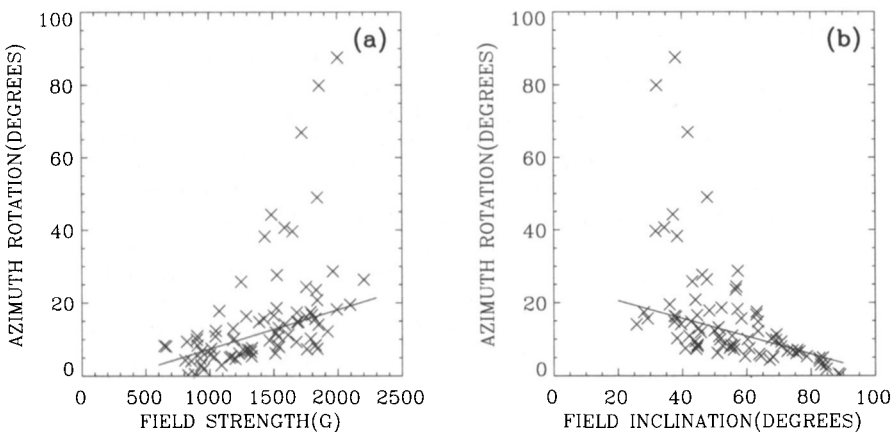

Figure 1.   Correlation plots of field strength and field inclination