

Are visible lines useful for spectropolarimetry?

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Abstract. The ability of new instruments for providing significantly accurate inferences of vector magnetic fields and line-of-sight velocities of the solar plasma depends a great deal on the sensitivity to these physical quantities of the spectral lines chosen to be measured. Recently, doubts have been raised about visible Stokes profiles to provide a clear distinction between weak fields and strong ones filling a small fraction of the observed area. The goal of this contribution is to give qualitative and quantitative arguments that help in settling the debate since several instruments are already operating (e.g. SP/Hinode) and others are planned that employ visible lines. The sensitivity of the Stokes profiles is calculated through the response functions (e.g. Ruiz Cobo & Del Toro Iniesta, 1994). Both theoretical and empirical evidences are gathered in favor of the reliability of visible Stokes profiles. The response functions are used as well for estimating the uncertainties in the physical quantities due to noise in the observations. A useful formula has been derived that takes into account the measurement technique (number of polarization measurements, polarimetric efficiencies, number of wavelength samples), the model assumptions (number of free parameters, the filling factor), and the radiative transfer (response functions). We conclude that a scenario with a weak magnetic field can reasonably be distinguished with visible lines from another with a strong field but a similar Stokes V amplitude, provided that a Milne-Eddington atmosphere is good enough to describe the solar atmosphere and that a typical noise of $10^{-3}I_c$ is reached in the observations.