The quiet Sun magnetism: What can we learn from the Hanle effect?

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The physics of the outer layers of the Sun is mostly driven by magnetic phenomena. This is the reason why high resolution investigations of the magnetic fields in the hot and dilute outer atmosphere of the Sun, from the photosphere to the chromosphere and corona, are the major objectives of future large solar telescopes, such as the Advanced Technology Solar Telescope (ATST), or the European Solar Telescope (EST).

The so-called "quiet Sun" is filled in with magnetic fields distributed in strengths and over a wide range of spatial scales. The magnetic energy content of this distribution of fields is a crucial issue, related to the long standing questions of the coronal and chromospheric heatings. Zeeman diagnostics of the magnetic fields depend crucially on the spatial resolution of the observations, whereas diagnostics based on the Hanle effect do provide valuable information on the average field strength even if the magnetic structures are not resolved. However, they rely on the precise radiative transfer modeling of polarized lines formed under non-LTE conditions. The use of the differential Hanle effect on lines with different magnetic sensitivities is a method of choice to obtain model-independent diagnostics.
Another promissing way explored nowdays is to make use of the complementary diagnostics provided by both the Zeeman and Hanle effects when they can be observed in the same lines.