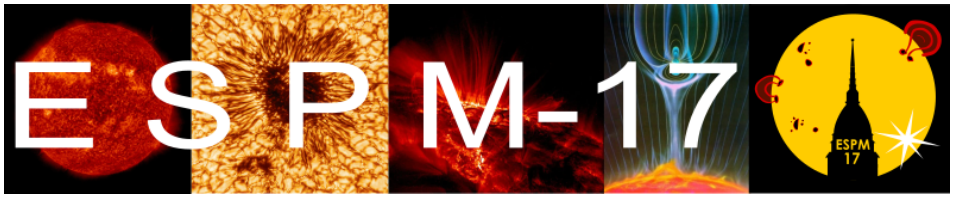

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Unravelling the stratification of the chromospheric magnetic field using the Hα line

The Hα line is widely used to study solar chromosphere, but polarimetric studies to infer magnetic fields are scarce. This is partly due to no polarimetric studies of Hα line utilizing 3-D radiative transfer, and earlier 1-D radiative transfer studies suggested a significant contribution of the photospheric fields. By analyzing spectropolarimetric data of a small pore simultaneously recorded in the Hα and CaII8542 lines, Mathur et al. (2023) found that line core of the Hα line probes chromospheric magnetic field. In this study, we analyze spectropolarimetric observations of a complex active region recorded simultaneously in the Hα and CaII8662 lines. The sunspot exhibits multiple structures, 4 umbras and a lightbridge, and a region where CaII8662 line core is in emission, a signature of localized heating. Consistent with the Mathur+2023, we found that the magnetic field inferred from the Hα line core is consistently smaller than that inferred from inversions of the CaII8662 line at logτ500=−4.5, however, in contrast with Mathur+2023, uncorrelated. The field strength and morphology inferred in the heating region from the inversions at logτ500=−4.5 is comparable to that of at logτ500=−1. In the heating region, the WFA over Hα line core and full spectral range are similar in strengths and morphology and uncorrelated with fields at logτ500=−1. Thus, we suggest that line core of the Hα line always probes the chromospheric magnetic field at higher heights than that probed by Ca2IR triplet, making Hα line spectropolarimetry a valuable diagnostic for studying chromosphere, especially in regions with localized heating.

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