Contributed Talk

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Brightness of solar magnetic elements as a function of magnetic flux at high spatial resolution

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We investigate the relationship between the photospheric magnetic field of small-scale magnetic elements in the internetwork region of the quiet Sun at disk center, and the brightness in the UV spectral ranges at 214 nm, 300 nm, 313 nm, 388 nm, and 397 nm, and in the visible at 525.02 nm (line core of the Fe I spectral line) and 525.40 (continuum), by analysing spectropolarimetric and imaging time series acquired simultaneously by the Imaging Magnetograph eXperiment (IMaX), and the Sunrise Filter Imager (SuFI), on-board the balloon-borne observatory Sunrise during its first science flight in June 2009, with high spatial and temporal resolution.

We find a tight dependence between the line of sight component of the magnetic field B_{LOS}, and the emission from the lower chromosphere (sampled by Ca II H-line at 397 nm), revealing the role of these elements in chromospheric heating. We also find a dependence between the contrast in the UV and B_{LOS}, that is best described by a logarithmic function. This, along with the high contrast reached at these wavelengths, reveals the contribution of small-scale elements in the QS to the irradiance changes for wavelengths below 388 nm, which was never studied before at such high resolution. We also show by plotting the continuum contrast at 525.40 nm against B_{LOS}, that strong magnetic field elements in the internetwork were resolved by IMaX, resulting in constant contrasts for large magnetic fields in our I-B scatterplot, unlike the turnover obtained in previous observational studies. This turnover is due to the intermixing of the bright magnetic features with the dark intergranular lanes surrounding them.