Nature of small-scale Ca II H brightenings associated with low magnetic flux in quiet-Sun region

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- Chromospheric emission observed using the Ca II H and K resonance lines is generally well positively correlated with photospheric magnetic fields.
- A fraction of strong chromospheric emission is found to originate over regions of low magnetic flux densities in the photosphere. (Green box region in Fig 1), which has not been well understood.

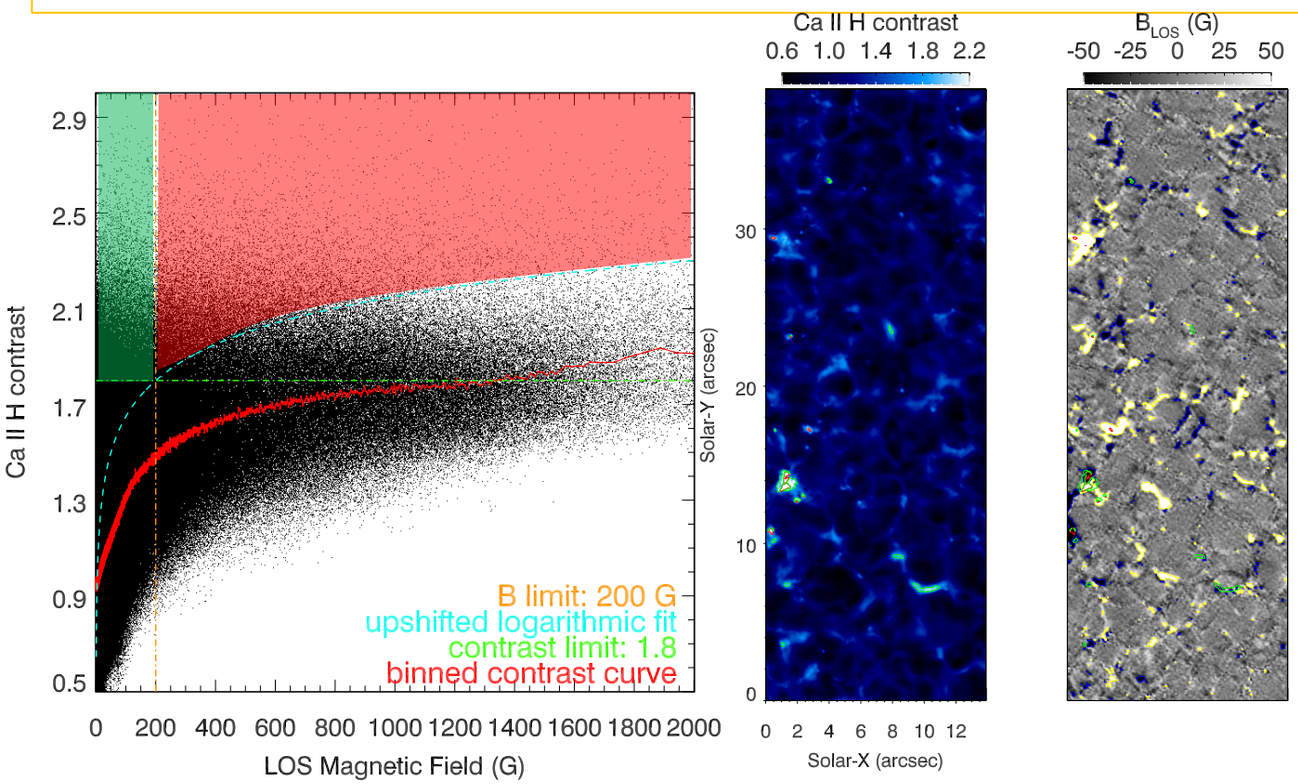

Fig 1: Pixel-by-pixel scatterplot of Ca II H contrast and B_{LOS}, and an example of Ca II H and magnetograph map.

- Data Source: IMaX (0.05”/pixel) and SuFI (0.02”/pixel) onboard the first flight of the balloon-borne observatory **SUNRISE** in June 2009.

202 brightenings associated with low B_{LOS} (marked by Green Contours in figures) are identified, where:

- 70 cases are “canopy-like” brightenings, located at **peripheries of strong field regions** (e.g. Fig 2).

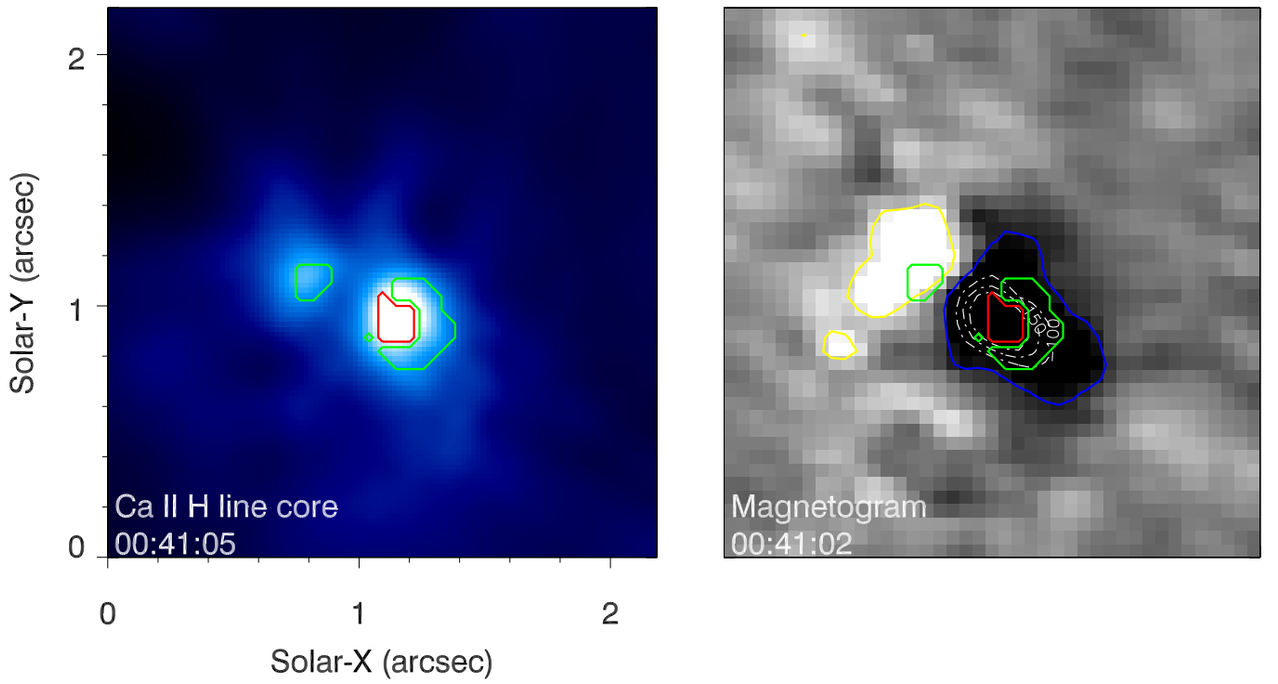

Fig 2: An example of “canopy-like” brightening

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- 132 cases are “non-canopy” brightenings, which are located in **weak B_{LOS} region**.
- 4 different categories based on different magnetic features (Fig 3), where Class 2 in majority.

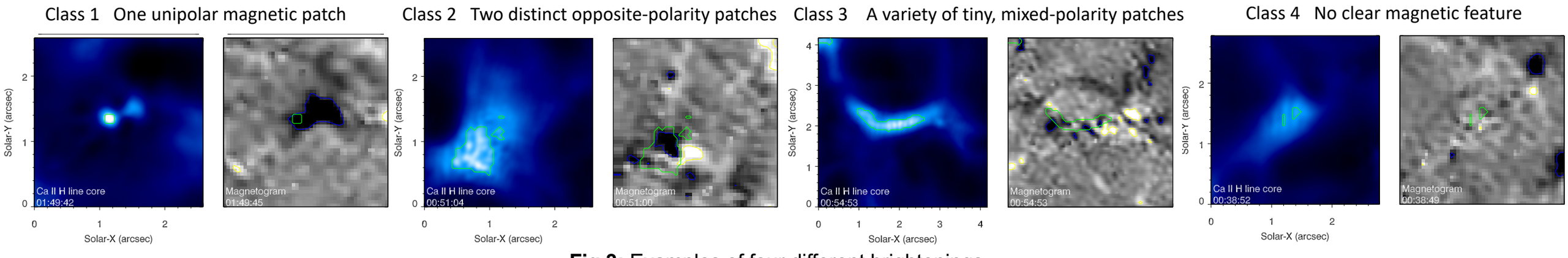

Fig 3: Examples of four different brightenings

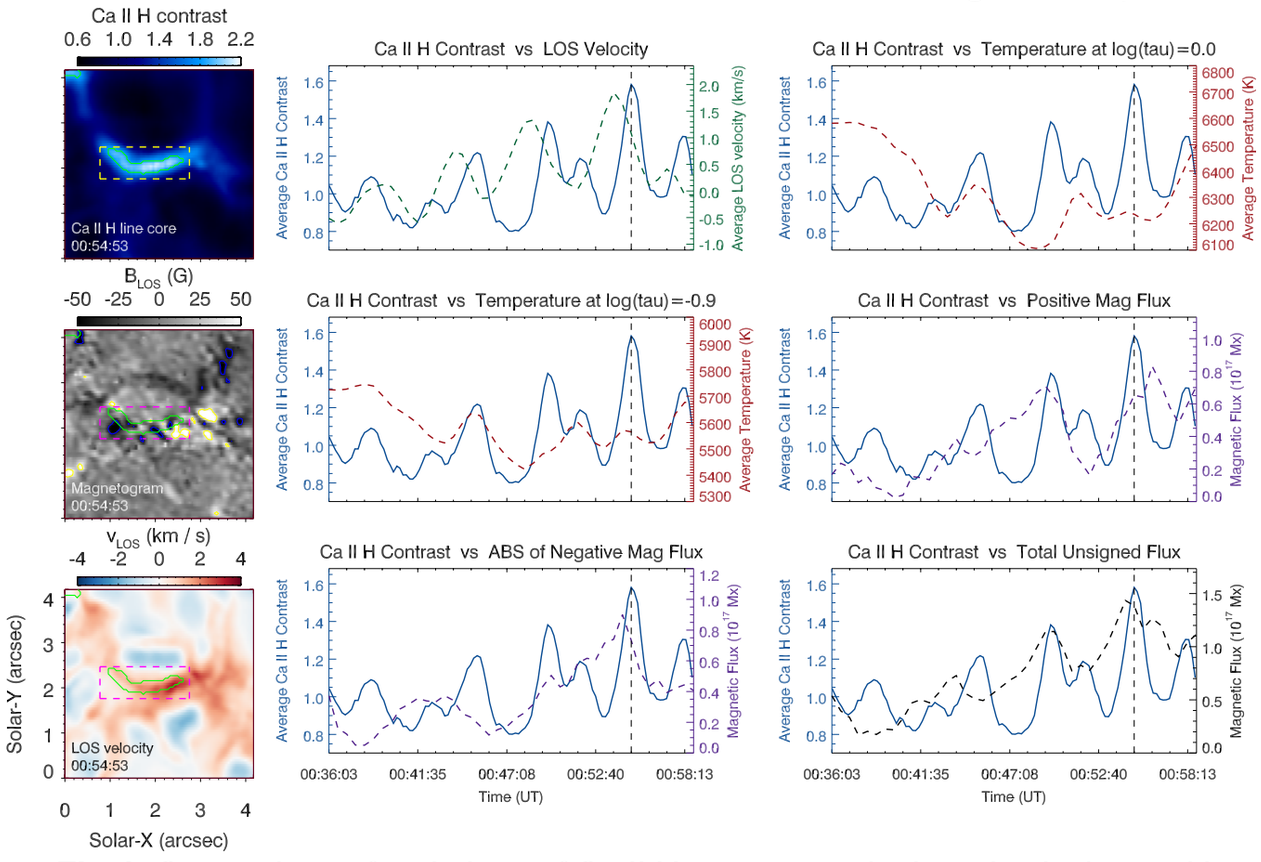

Fig 4: Comparison of variations of Ca II H contrast and other physical quantities.

- Most such brightenings are short-lived (101/132)
- Periodic Ca II H and v_{LOS} variations can be widely found (e.g. Fig 4).
- Flux emergence & Cancelation & Shock heating can contribute to brightenings at the same time.