Magnetic elements as bright points in the Hα wings

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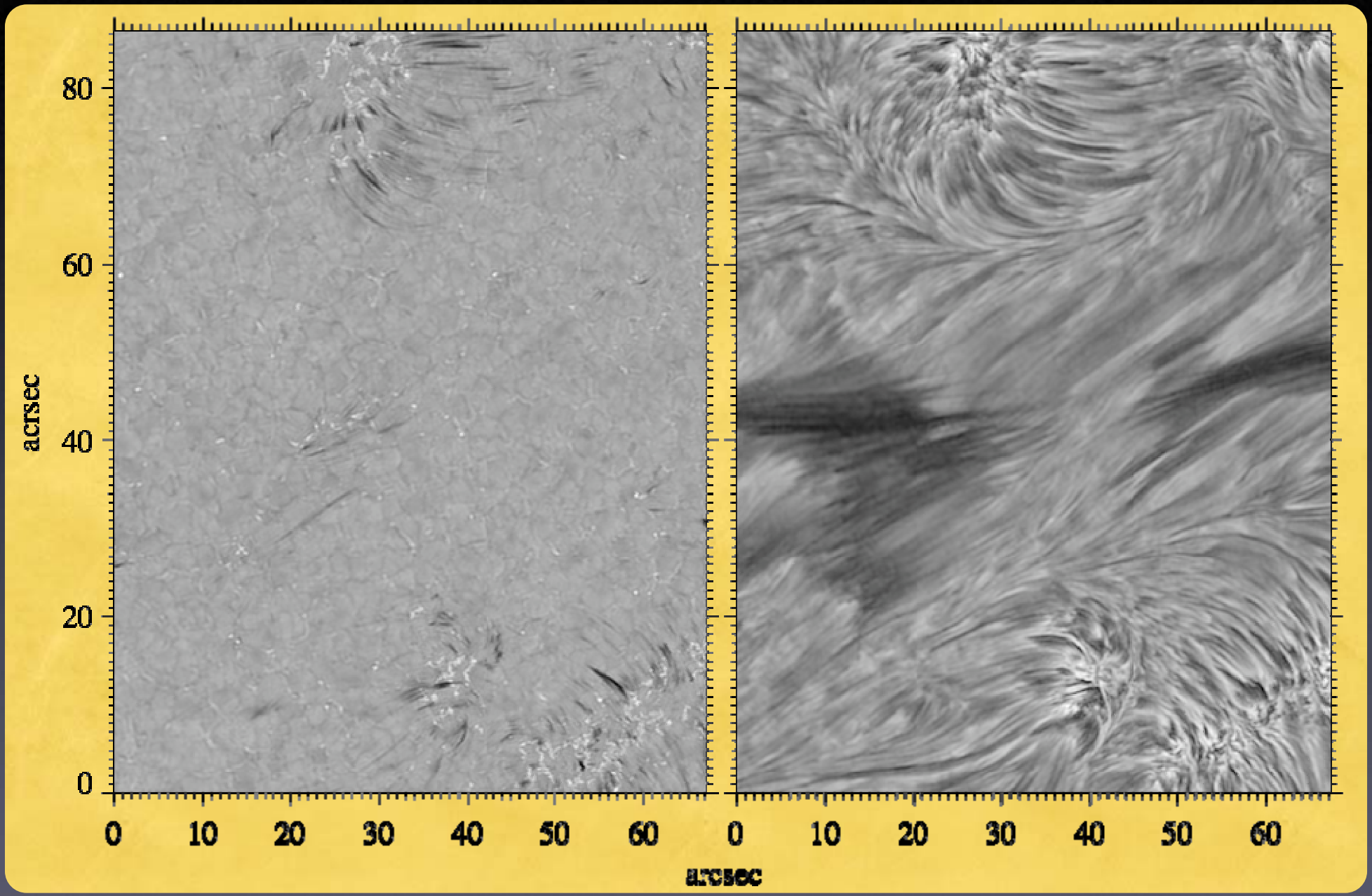
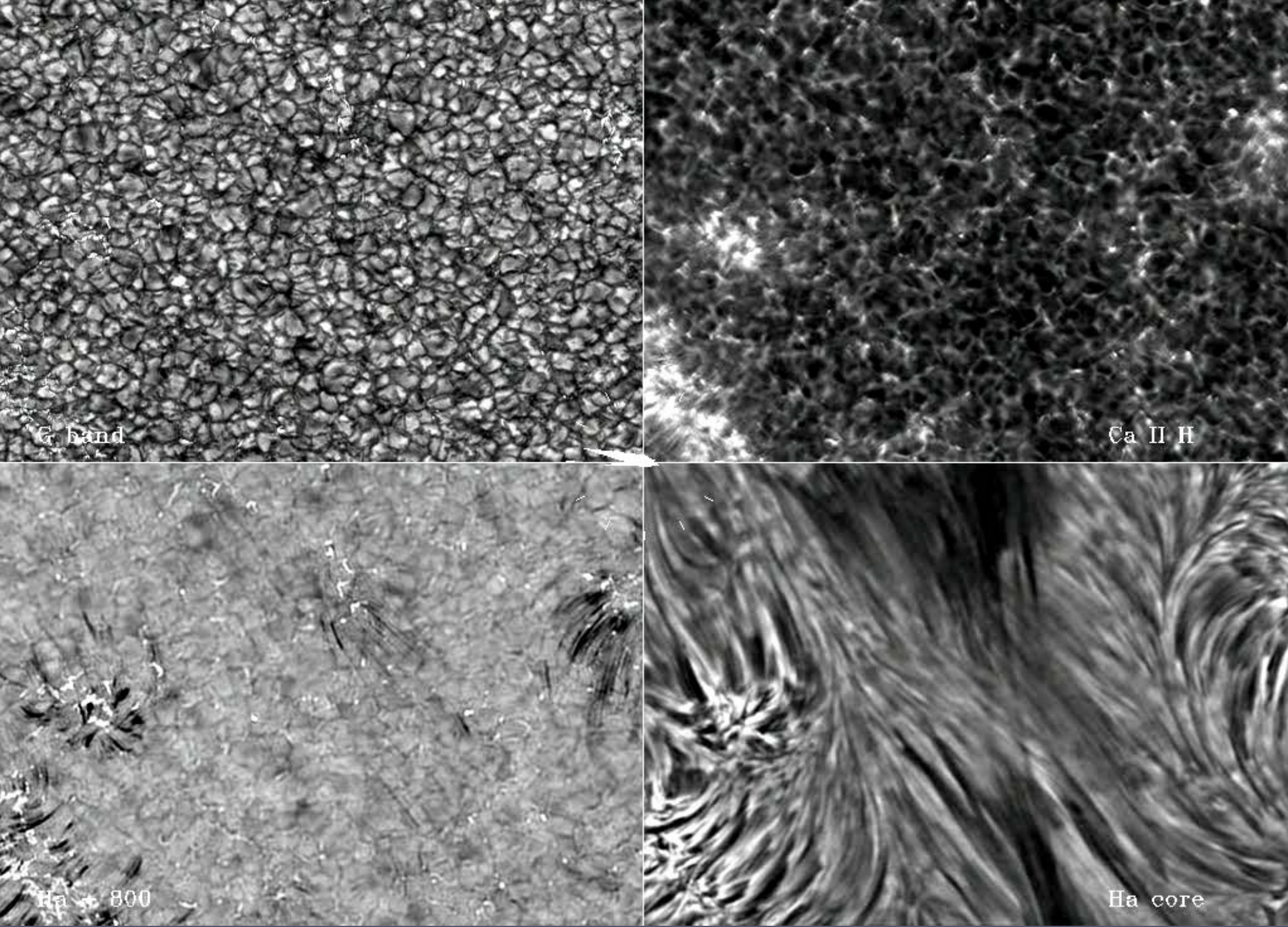
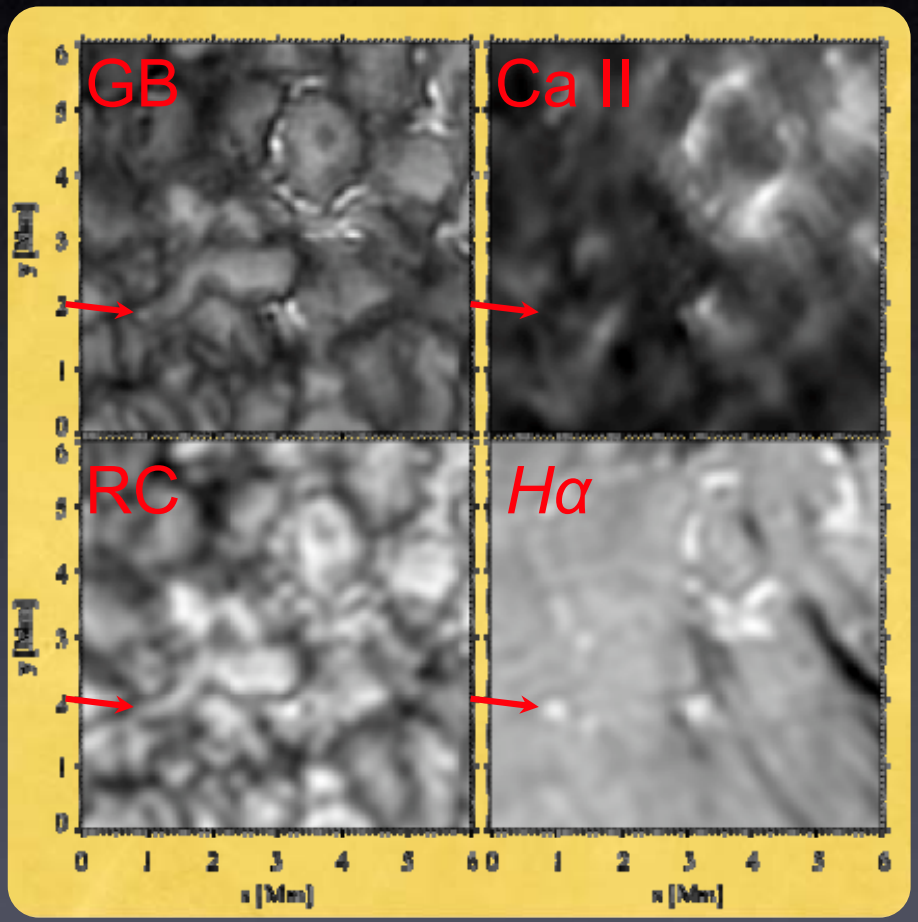
DOT Hα channel




G band
Ca II H
Hα + 800
Hα core

Observations

- Magnetic elements show up as bright points in the G band, CN band, the wings of Ca II H&K, and the wings of Hα.
- Hα wing: BPs are very bright, thanks to low granulation contrast, though less sharp than in G band.



Questions:

- Are the bright points in the Hα wings formed in LTE?
- Why does one not observe reversed granulation as in the wings of Ca II H&K?
- Why is the granulation contrast so low in the Hα wings?

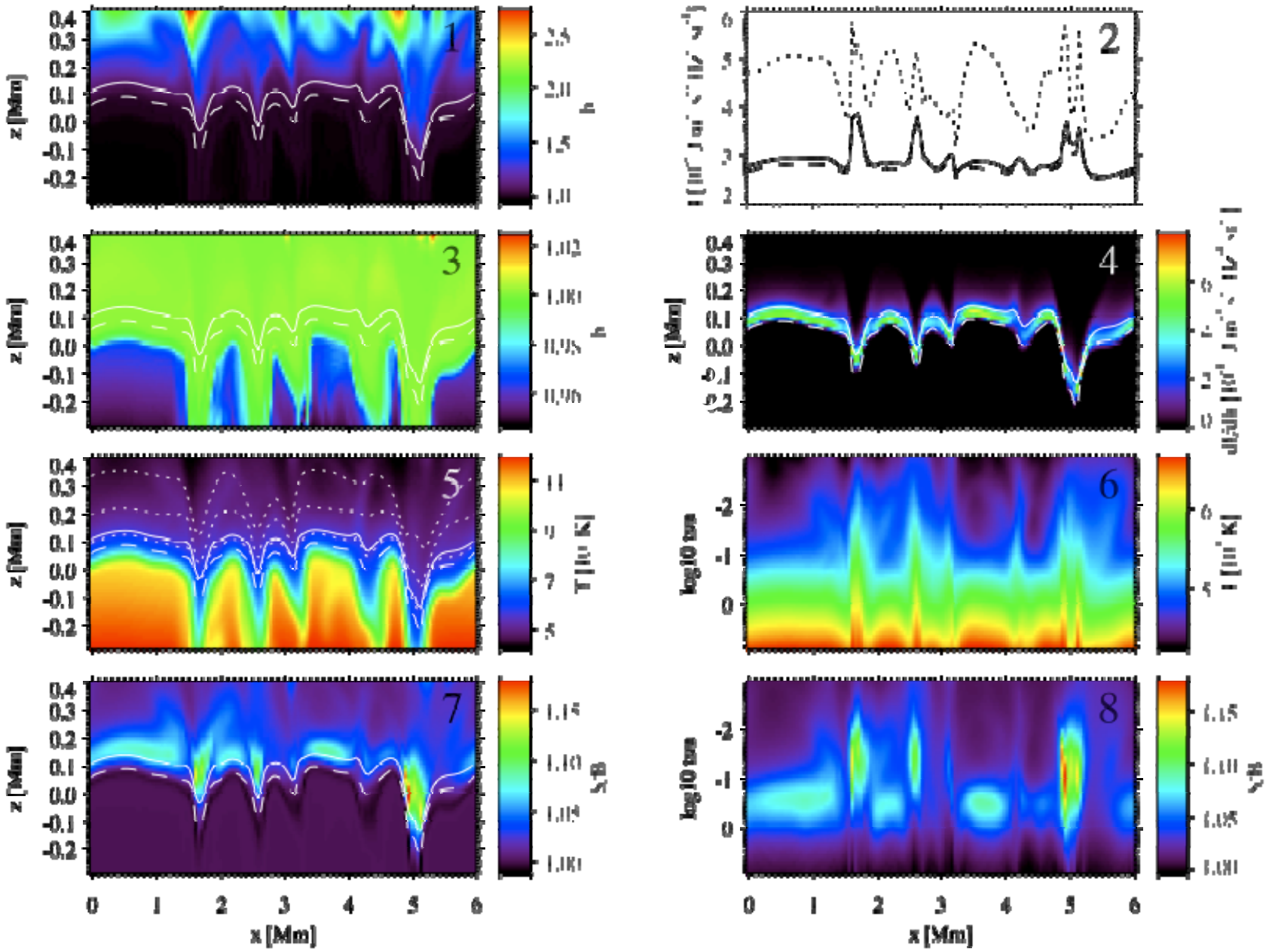
Simulations: LTE suffices

b3

b2

T

S/B



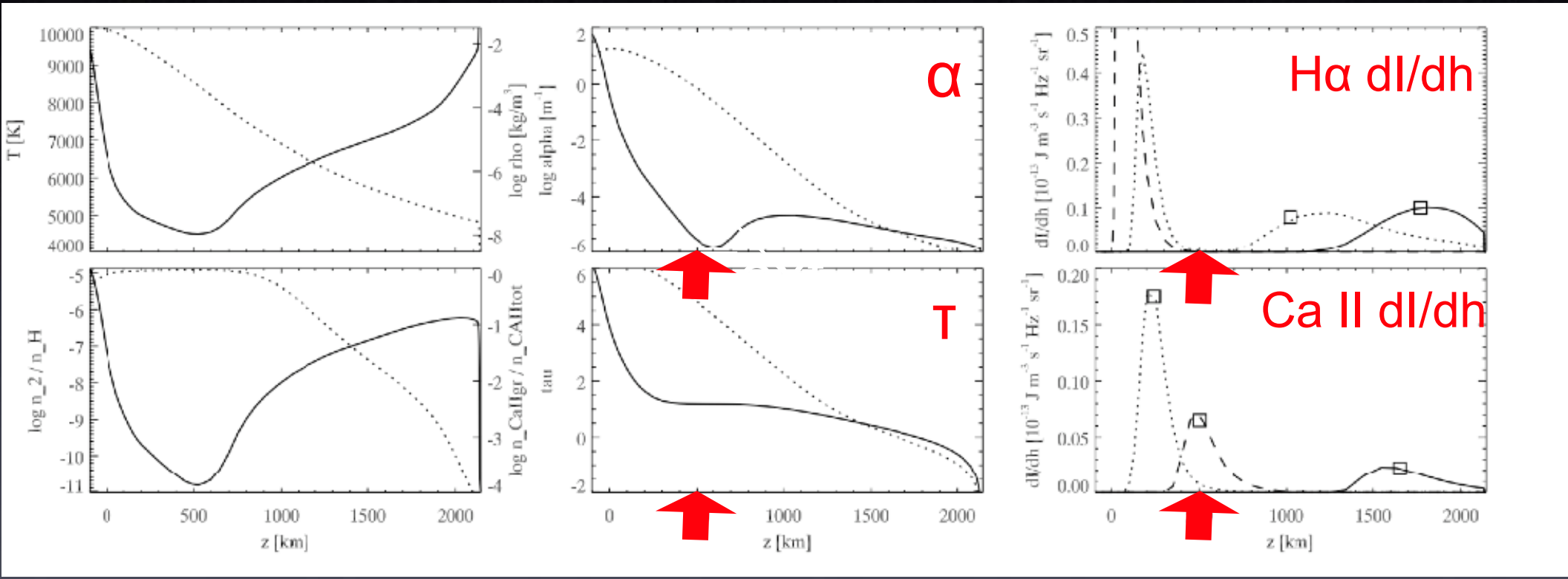
I

dI/dz

T(τ)

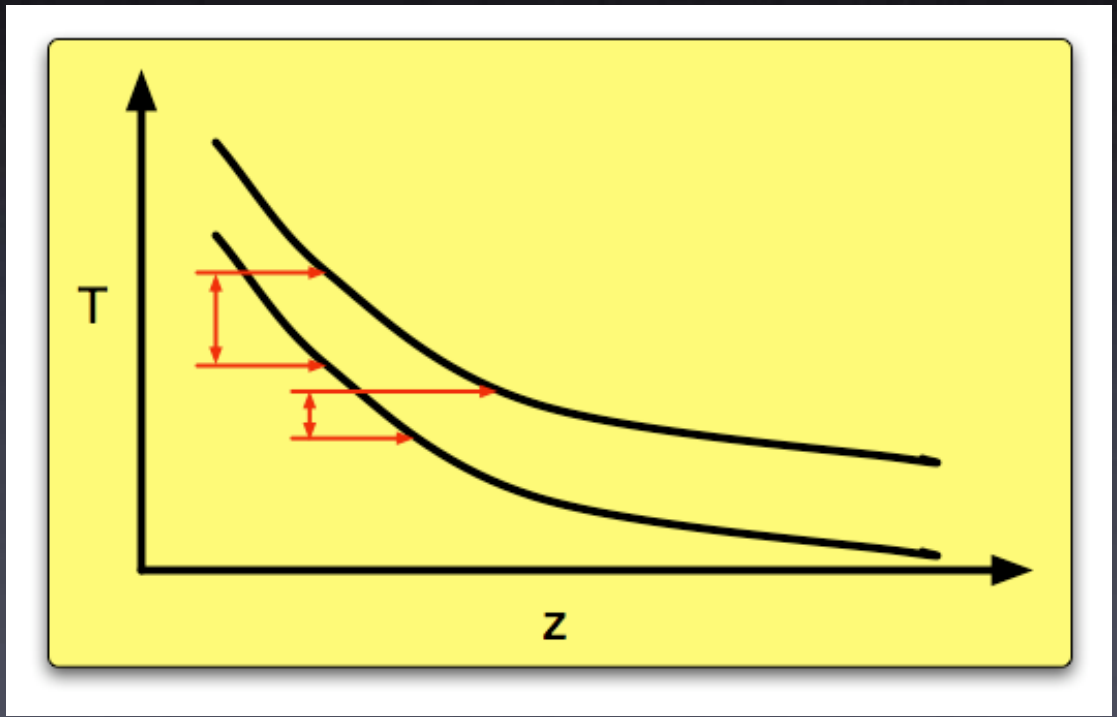
S/B(τ)

No reversed granulation: not enough opacity in lower chromosphere



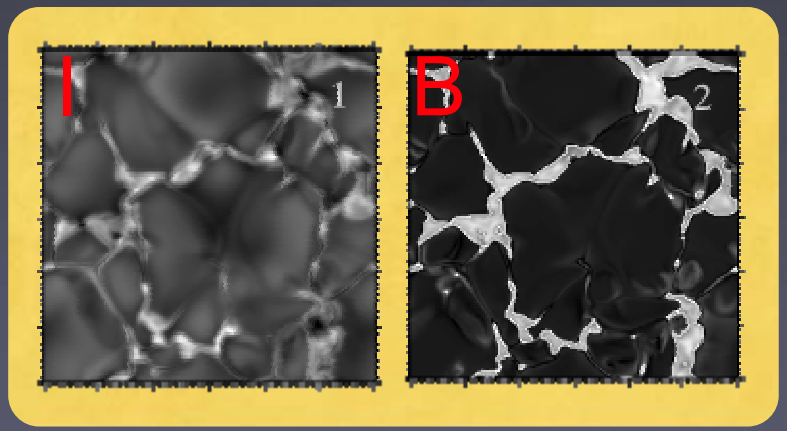
Low granulation contrast

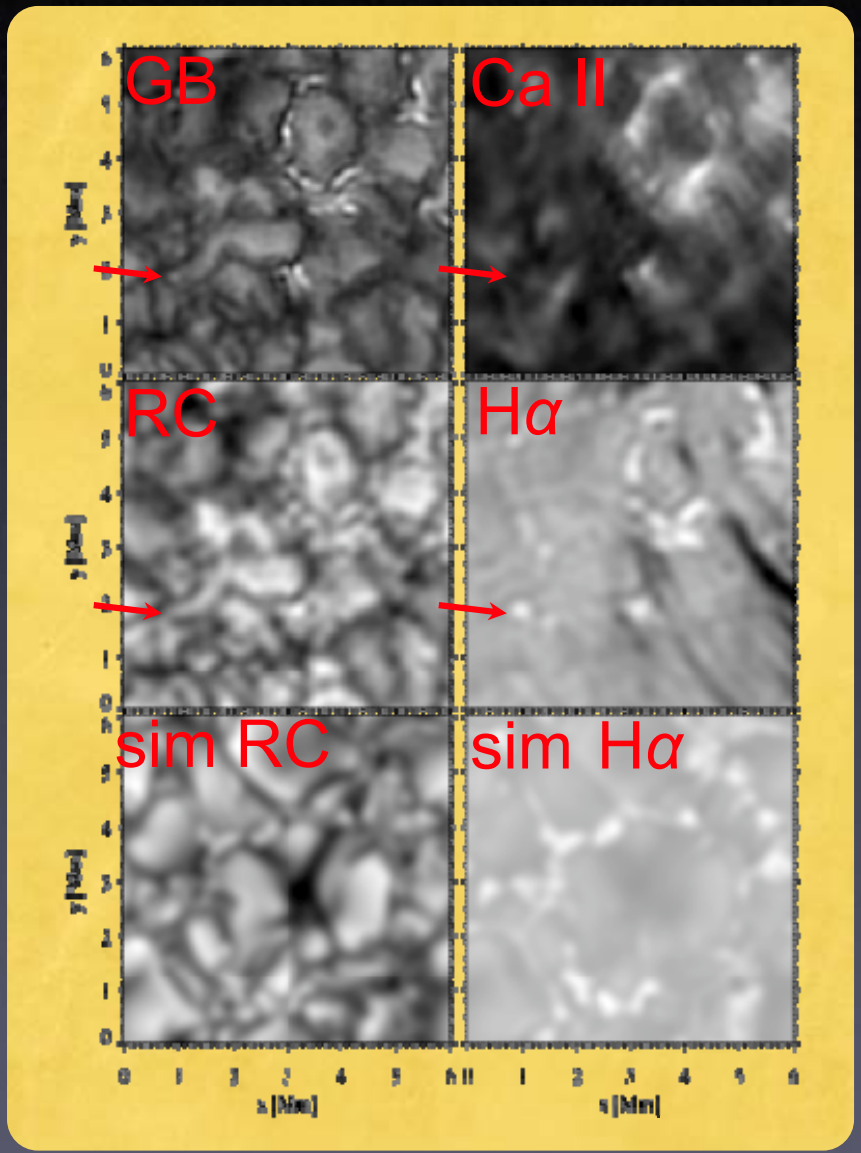
- Source function and the opacity of Hα sensitive to temperature variations.
- Emergent intensity insensitive to temperature variations



Comparison of observations and simulations

- Simulation (bottom panels): similar appearance.
- Simulated bright points track magnetic field.
- Bright point contrast is bigger in observations



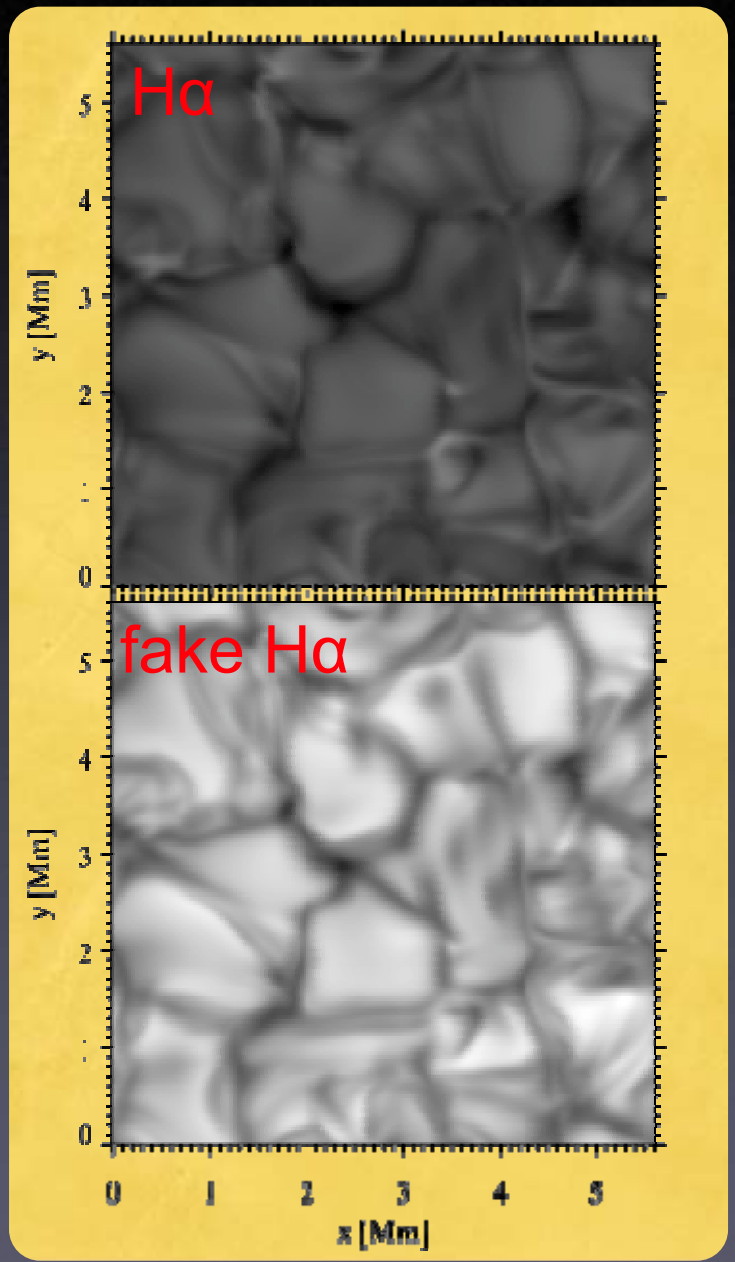


Summary & conclusions

- I compared observations and simulations of bright points in the blue wing of the Hα line.
- The line wing forms in LTE in the photosphere.
- Bright points coincide with intergranular magnetic fields.
- The Hα line wing is a suitable proxy magnetometer thanks to low granulation contrast

Hα vs ‘fake’ Hα

- Compare Hα (lower level at 10.2 eV) with fake Hα (lower level at 1 eV).
- Hα: RMS=0.0116
- fake Hα: RMS=0.0307



Scatterplots