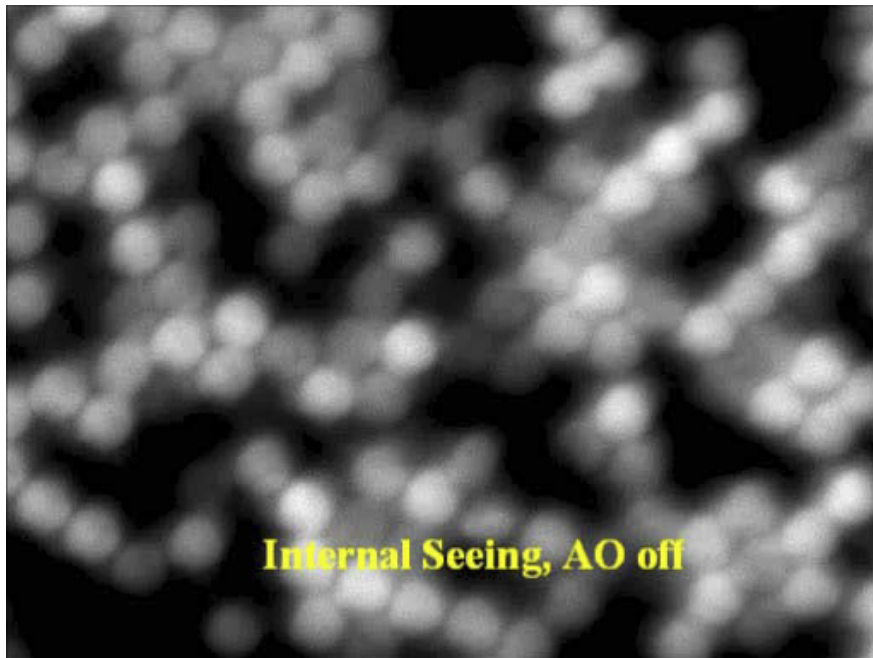


1<sup>st</sup> SOLARNET meeting  
Oslo, 5-8 August 2013

# First Experiences with GREGOR

D. Soltau

Experience No 1: Internal seeing



*„Always keep some stroke in reserve.  
You might need it some day.“*

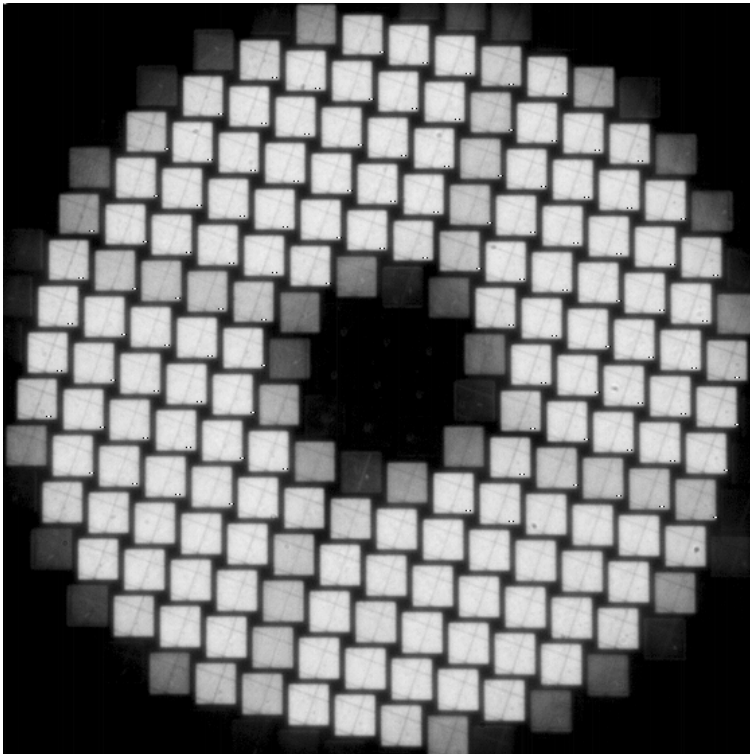
anonymous solar physicist, early 21st  
century

1<sup>st</sup> SOLARNET meeting  
Oslo, 5-8 August 2013

# First Experiences with GREGOR

D. Soltau

Experience No 2:



*„Contrast in WFS is not all, but all is nothing  
without sufficient contrast in the WFS.“*

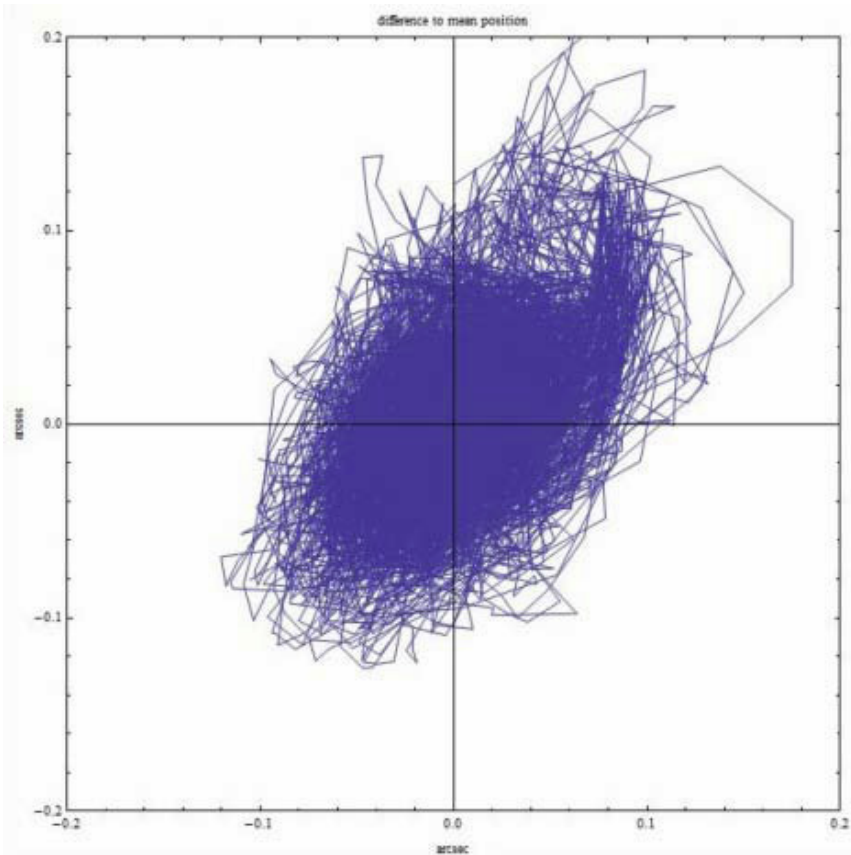
*anonymous solar physicist,  
early 21st century*

1<sup>st</sup> SOLARNET meeting  
Oslo, 5-8 August 2013

# First Experiences with GREGOR

D. Soltau

Experience No 3: Microvibrations

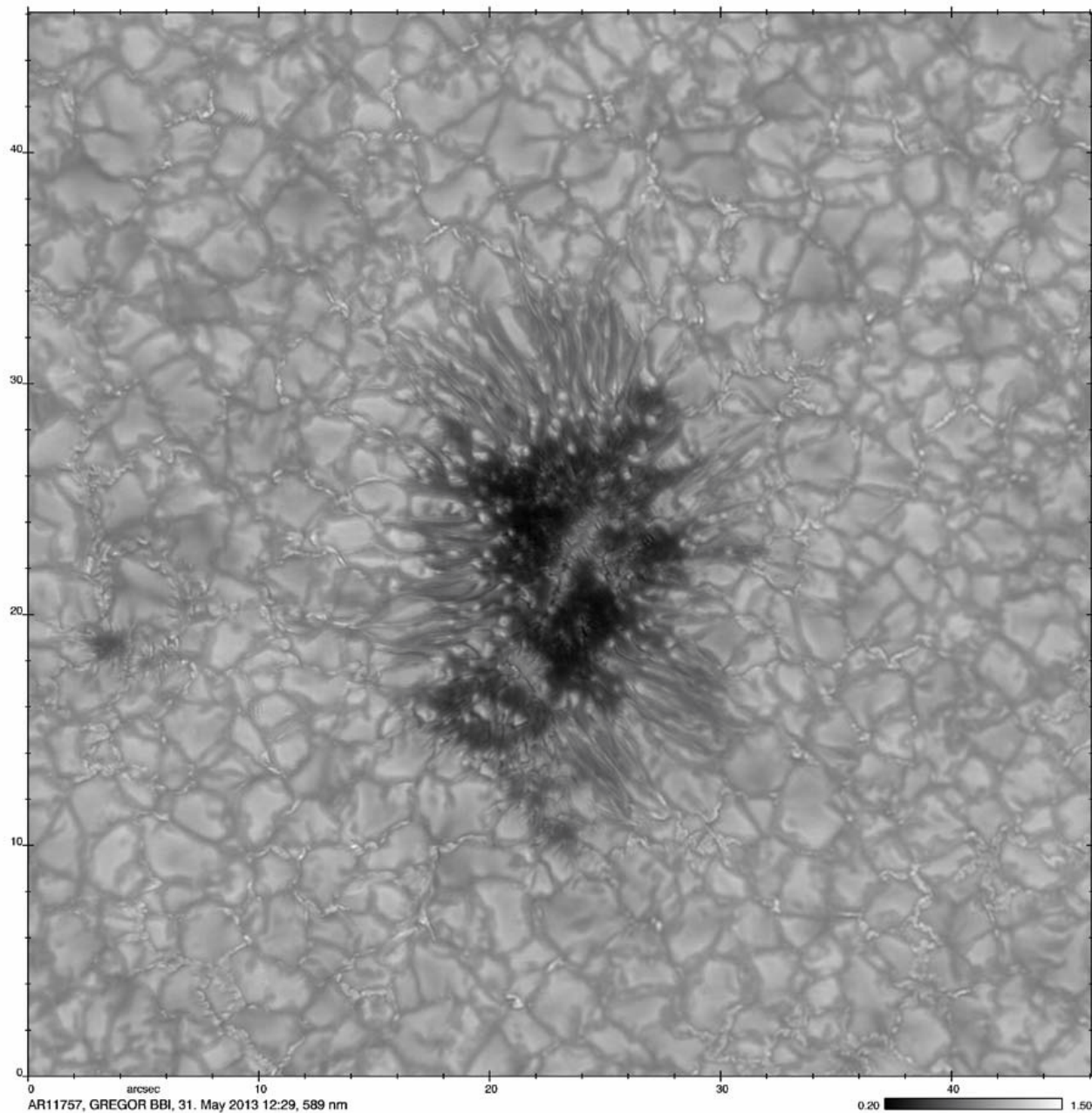


*„Moving parts move.“*

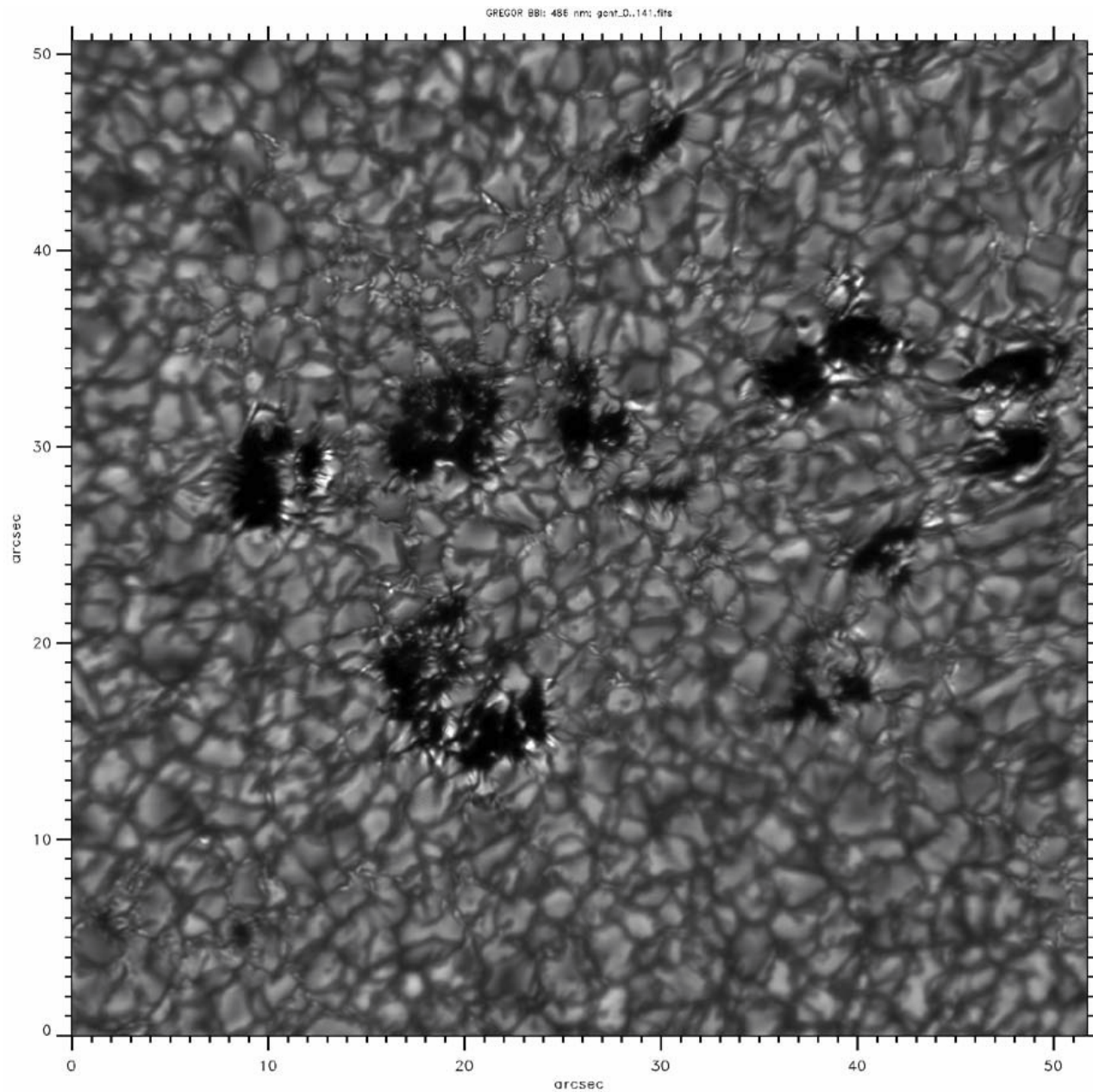
anonymous solar physicist,  
early 21st century

cooling on  
0.05 arcsec (rms)

# GREGOR Broad Band Imager



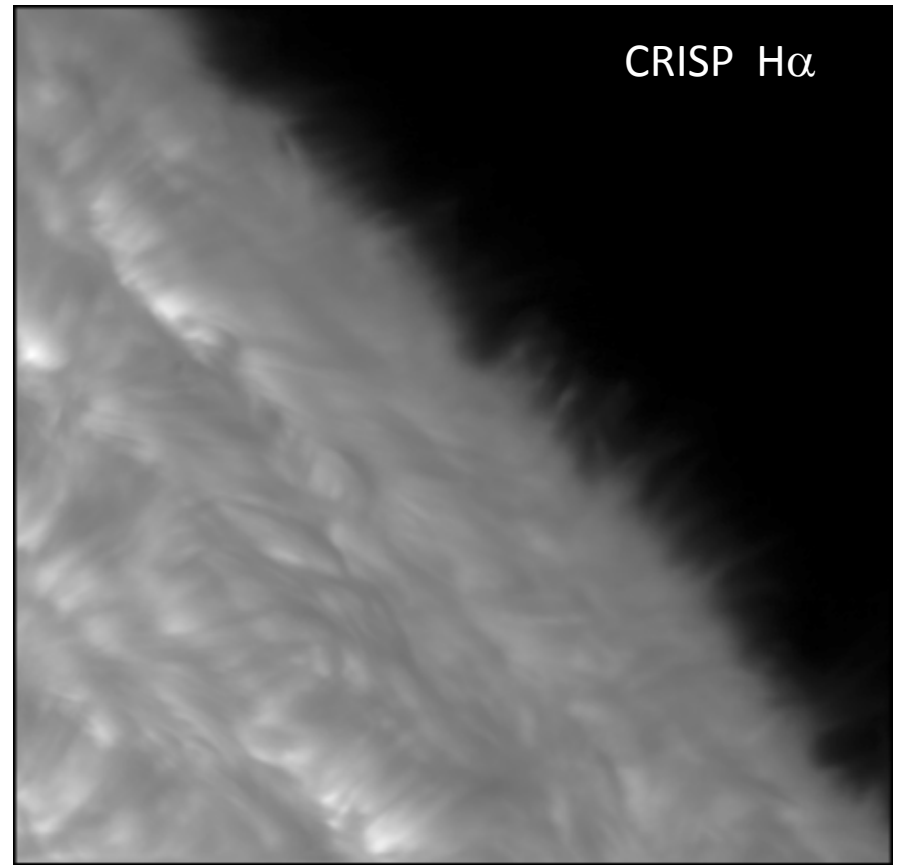
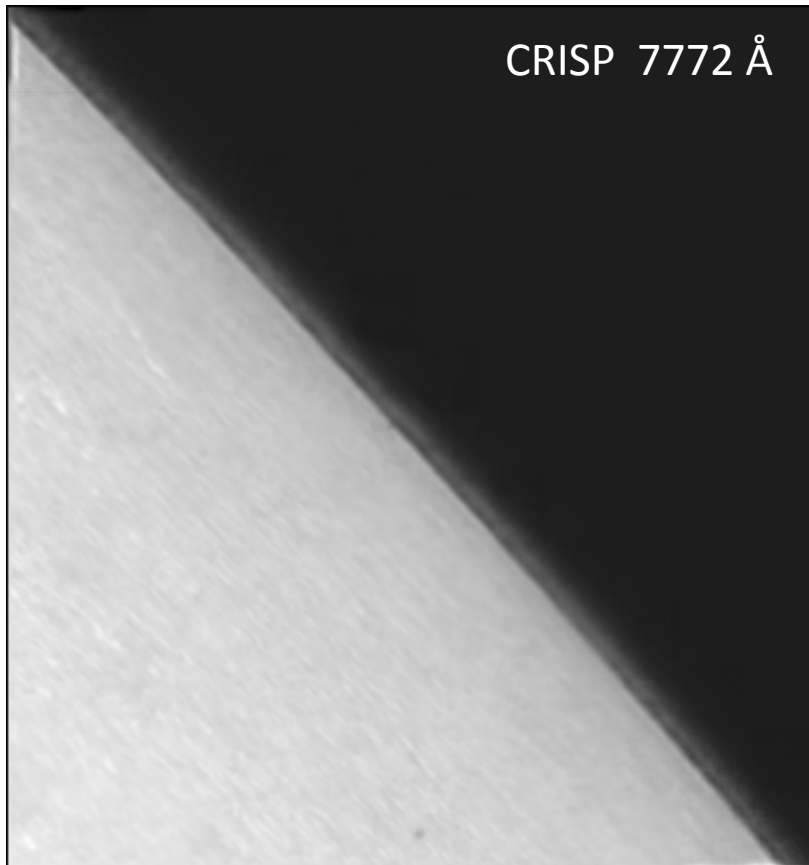
# GREGOR Broad Band Imager



1<sup>st</sup> SOLARNET meeting  
Oslo, 5-8 August 2013

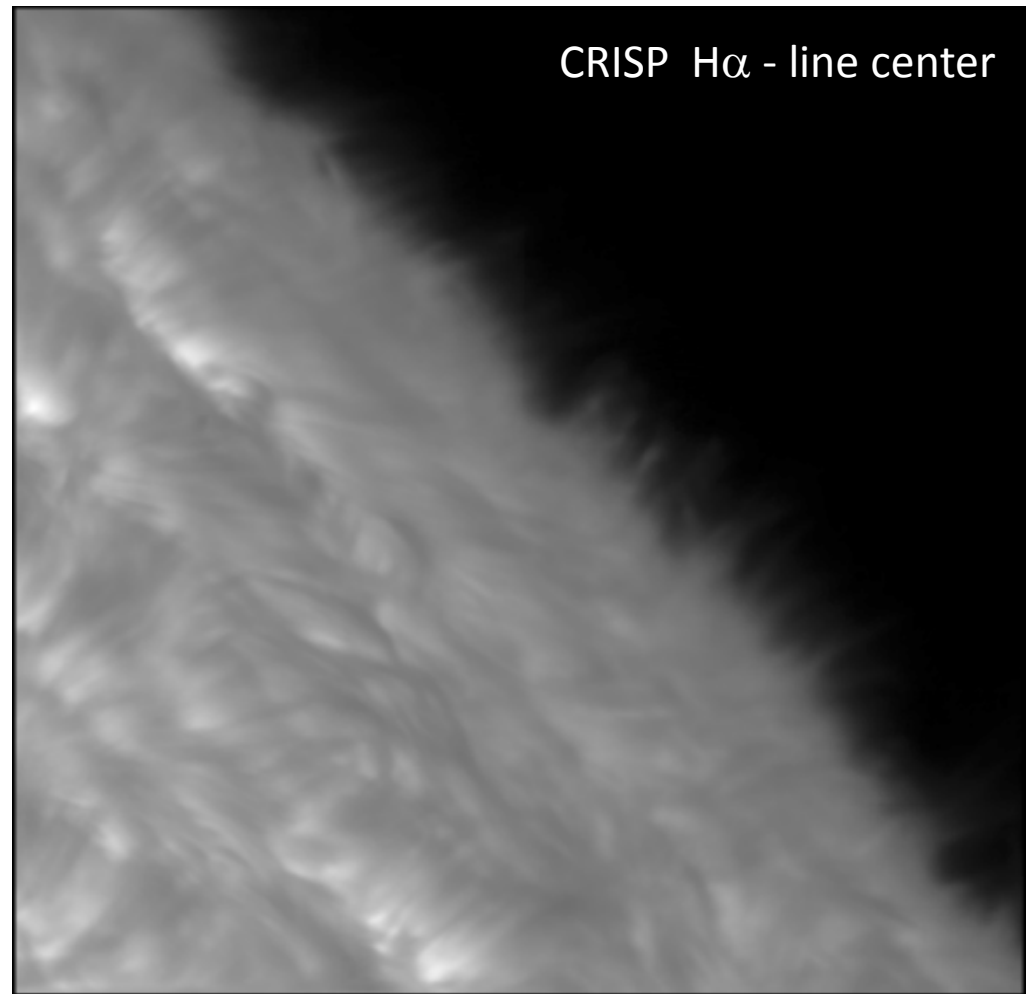
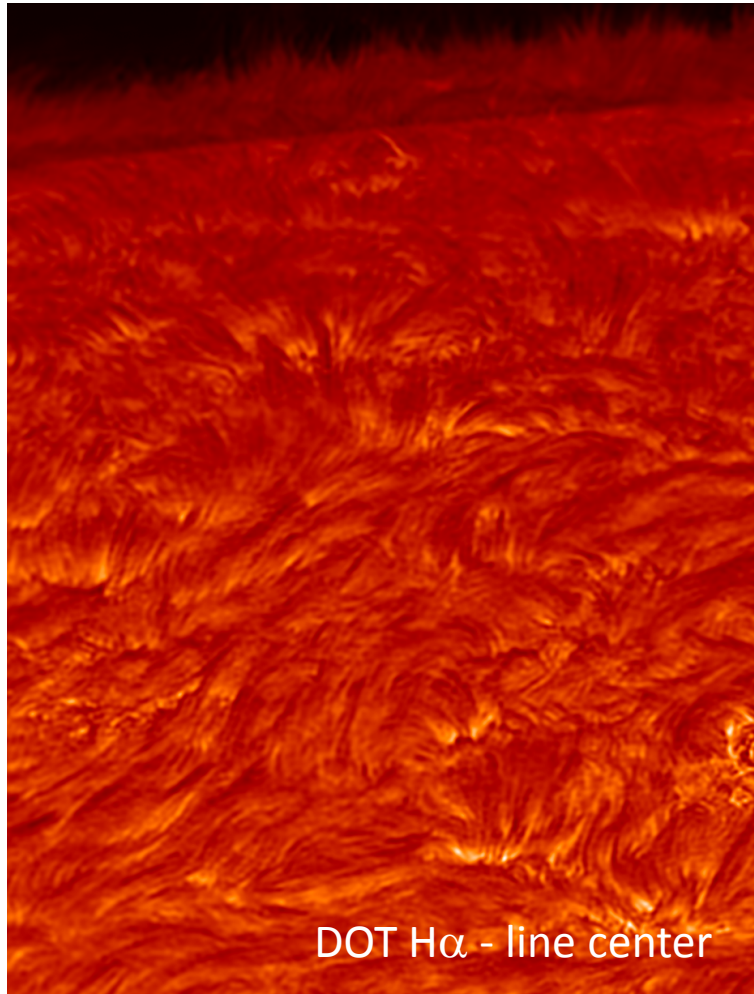
## OI imaging in 7772 Å

Hiva Pazira, Jaime de la Cruz Rodriguez, Dan Kiselman, Peter Sütterlin



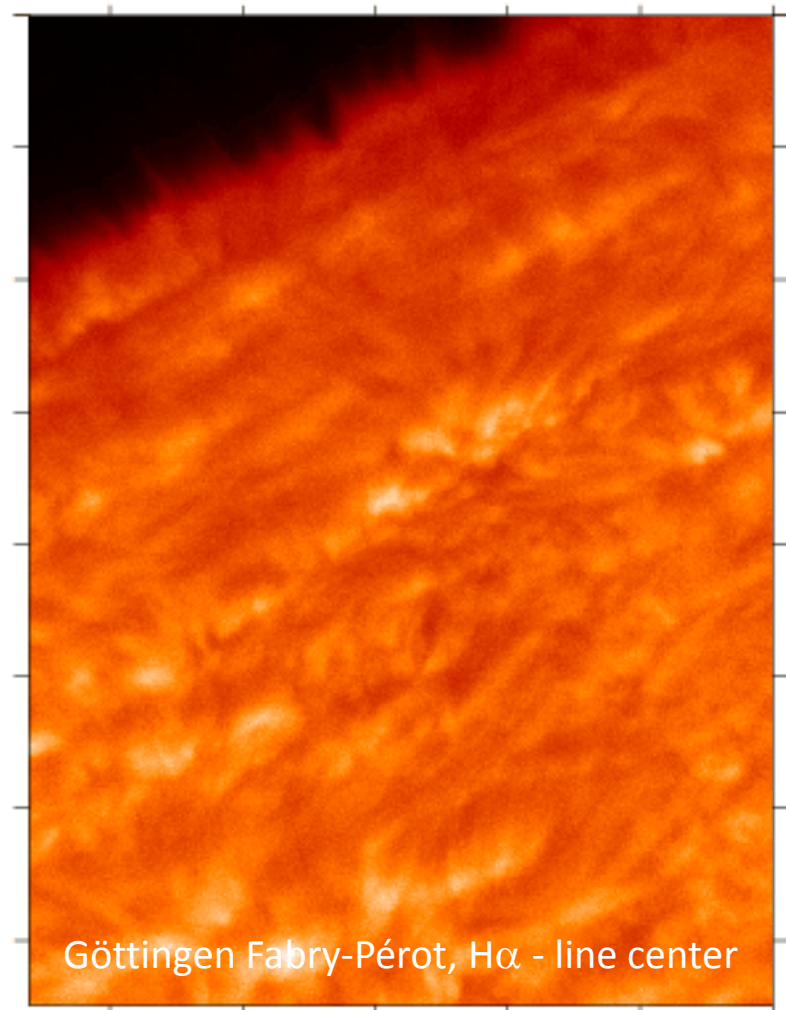
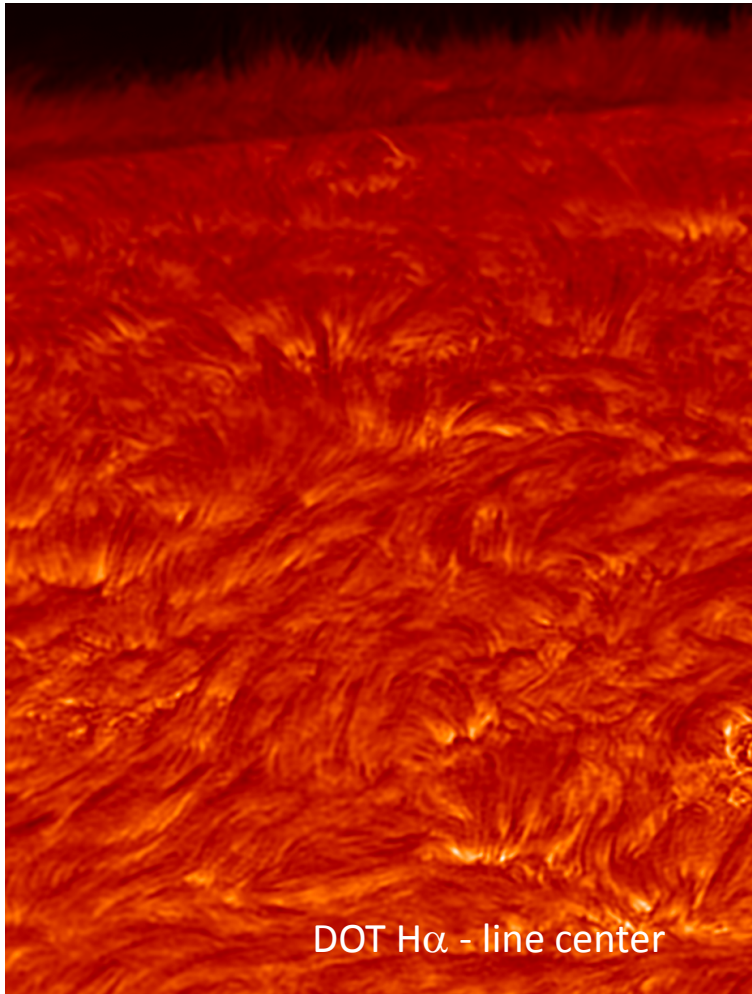


Is the sharp limb in the DOT image parasitic continuum light?



Is the sharp limb in the DOT image parasitic continuum light?

[Puschmann et al. 2006: A&A, 451, 1151](#)

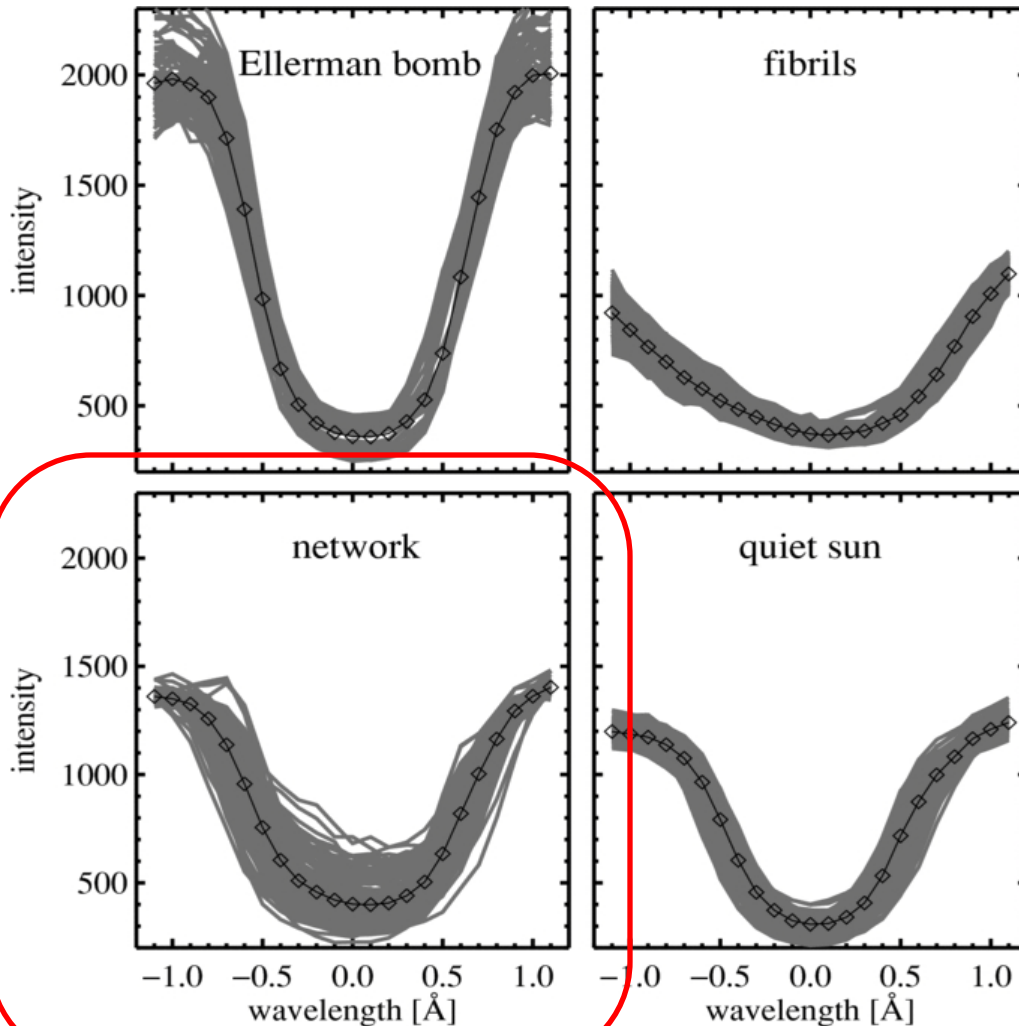




# ELLERMAN BOMBS AT HIGH RESOLUTION

## I. MORPHOLOGICAL EVIDENCE FOR PHOTOSPHERIC RECONNECTION

[Watanabe et al. 2013: ApJ, 2011, 71](#)



Characteristic H $\alpha$  profiles collected from the CRISP scan.

Each panel contains a number of per-pixel profiles for a specific pixel category.

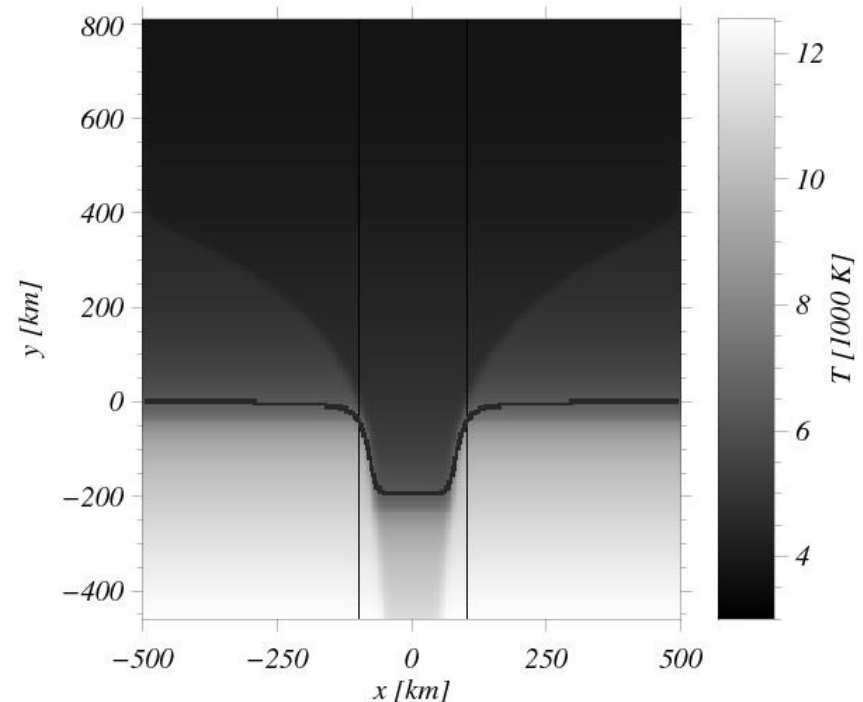
The solid curve is their mean, with the CRISP sampling wavelengths marked.

# Three-dimensional non-LTE radiative transfer effects in Fe I lines

## I. Flux sheet and flux tube geometries

Holzreuter & Solanki 2012: A&A, 547, 46

- levels of approximations of radiative transfer:
  - 3D NLTE
  - 1D NLTE
  - LTE
- effects of the approximations in flux tubes and flux sheets observed in:
  - Fe I 524.7 nm
  - Fe I 525.0 nm
  - Fe I 630.1 nm
  - Fe I 630.2 nm

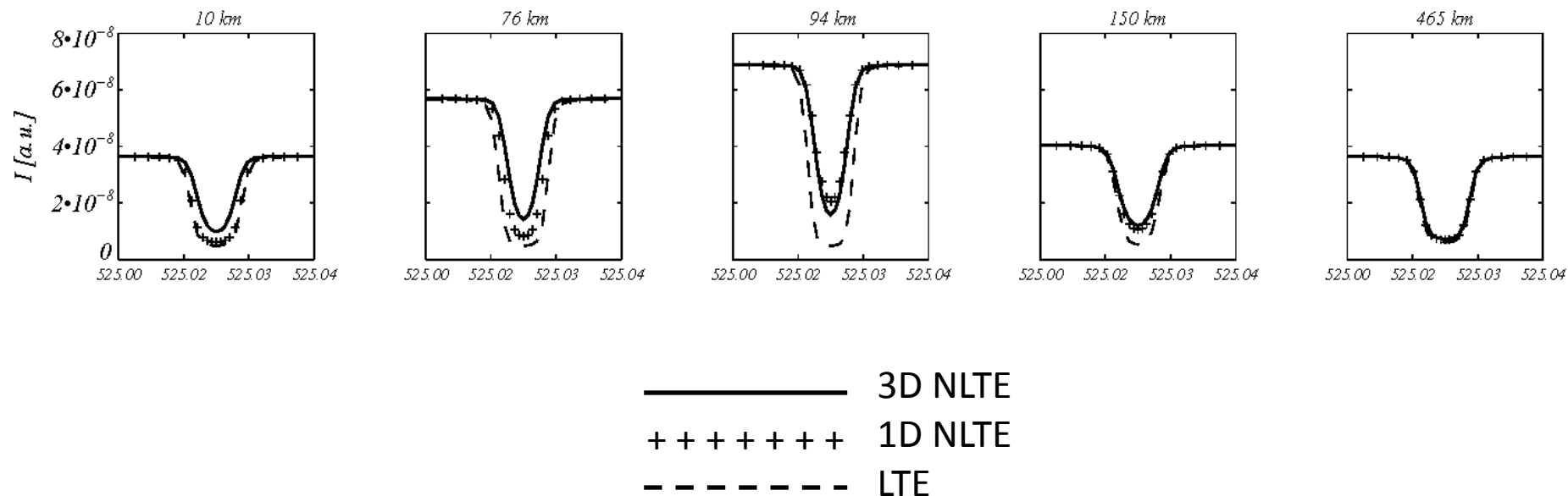


Flux sheet model employed

# Three-dimensional non-LTE radiative transfer effects in Fe I lines

## I. Flux sheet and flux tube geometries

Holzreuter & Sloanki 2012: A&A, 547, 46



- Results:**
- LTE is a poor approximation in the flux sheet model
  - errors in the determination of **magnetic field strength** on the order of 10% to 20%
  - errors in the determined **temperature** can reach 300-400 K

# Three-dimensional non-LTE radiative transfer effects in Fe I lines

## II. Line formation in 3D radiation hydrodynamic simulations

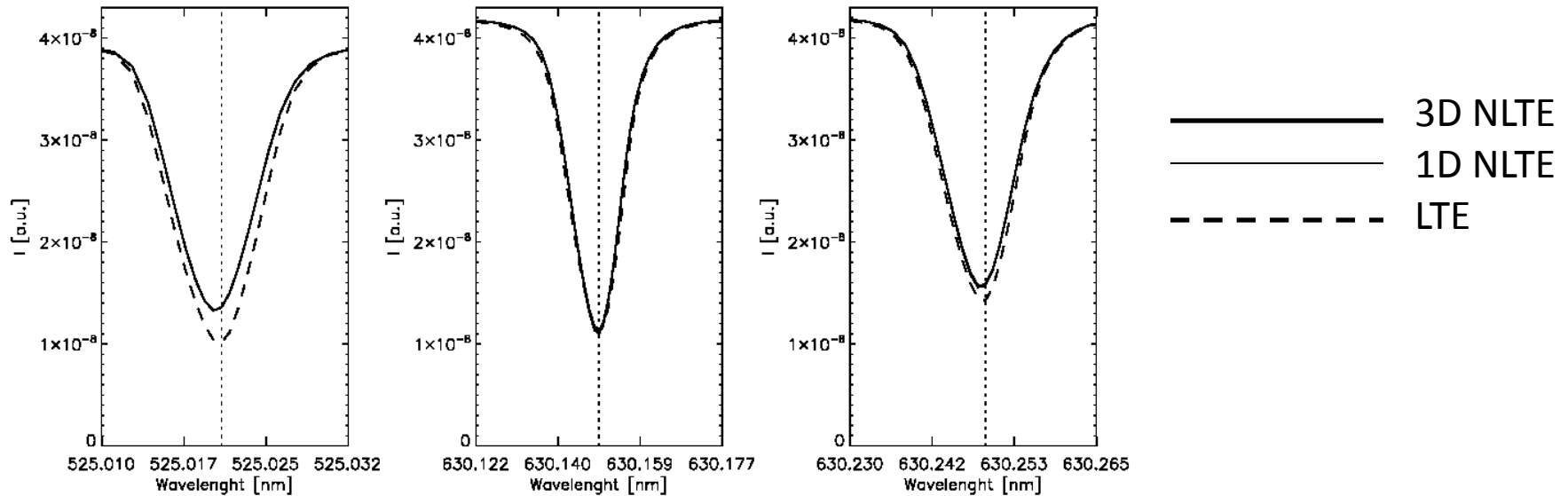
[Holzreuter & Solanki 2013: A&A, 558, 20](#)

- different levels of approximations of radiative transfer:
  - 3D NLTE
  - 1D NLTE
  - LTE
- model atmosphere: a snapshot from MURAM 3D radiation-hydrodynamic simulation
- effects of the approximations for the lines:
  - Fe I 524.7 nm
  - Fe I 525.0 nm
  - Fe I 630.1 nm
  - Fe I 630.2 nm

# Three-dimensional non-LTE radiative transfer effects in Fe I lines

## II. Line formation in 3D radiation hydrodynamic simulations

[Holzreuter & Solanki 2013: A&A, 558, 20](#)



### Results:

- are of particular importance for **the inversions** of high resolution observations
- **line depths** and **equivalent widths** may differ by up to 20% from the corresponding LTE value if 3D radiative transfer is applied
- determination of **temperature** by 1D NLTE inversions may produce errors of up to 200 K if one neglects 3D radiative transfer