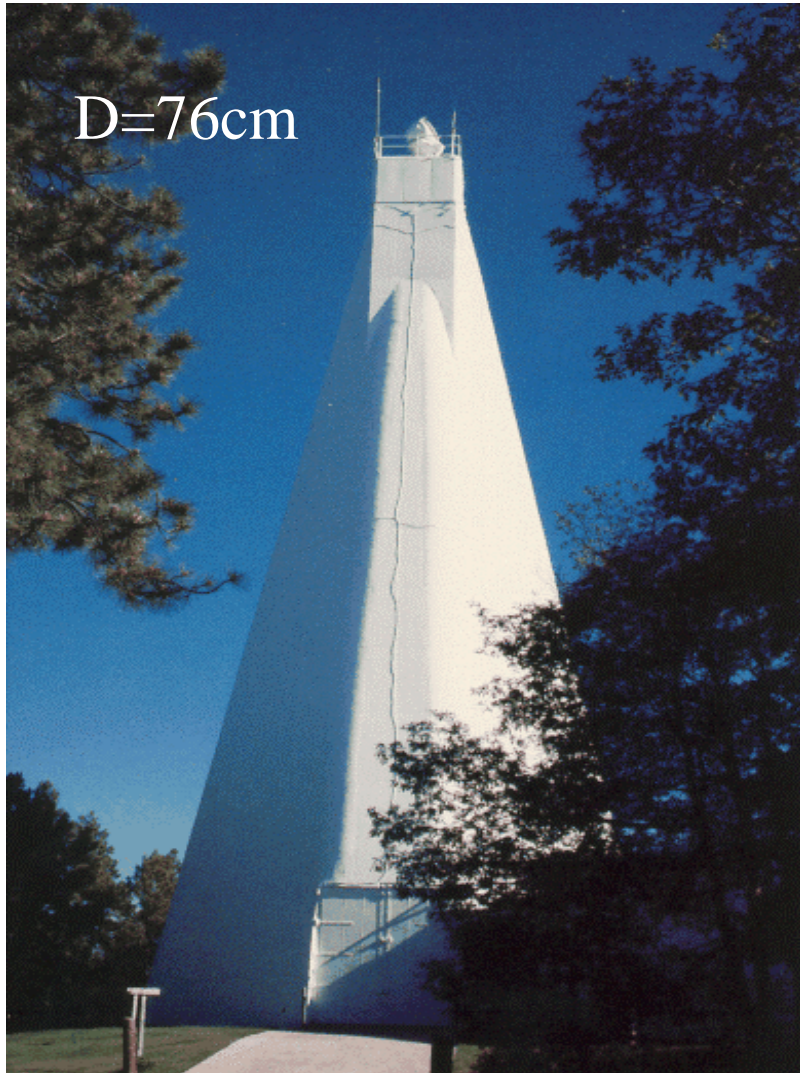


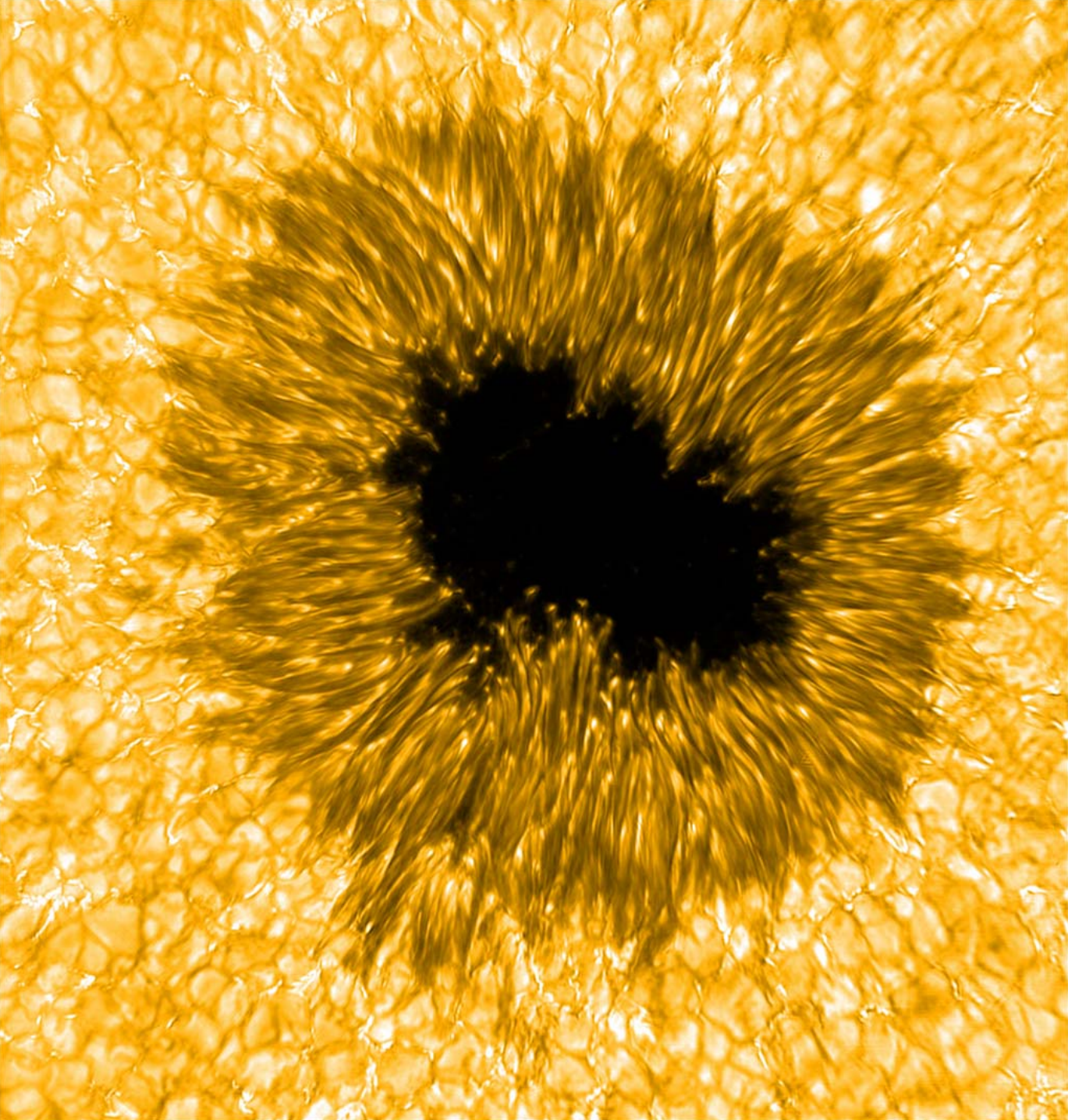
Ground-based support from NSO/SP

T. Rimmele

Dunn Solar Telescope (DST)

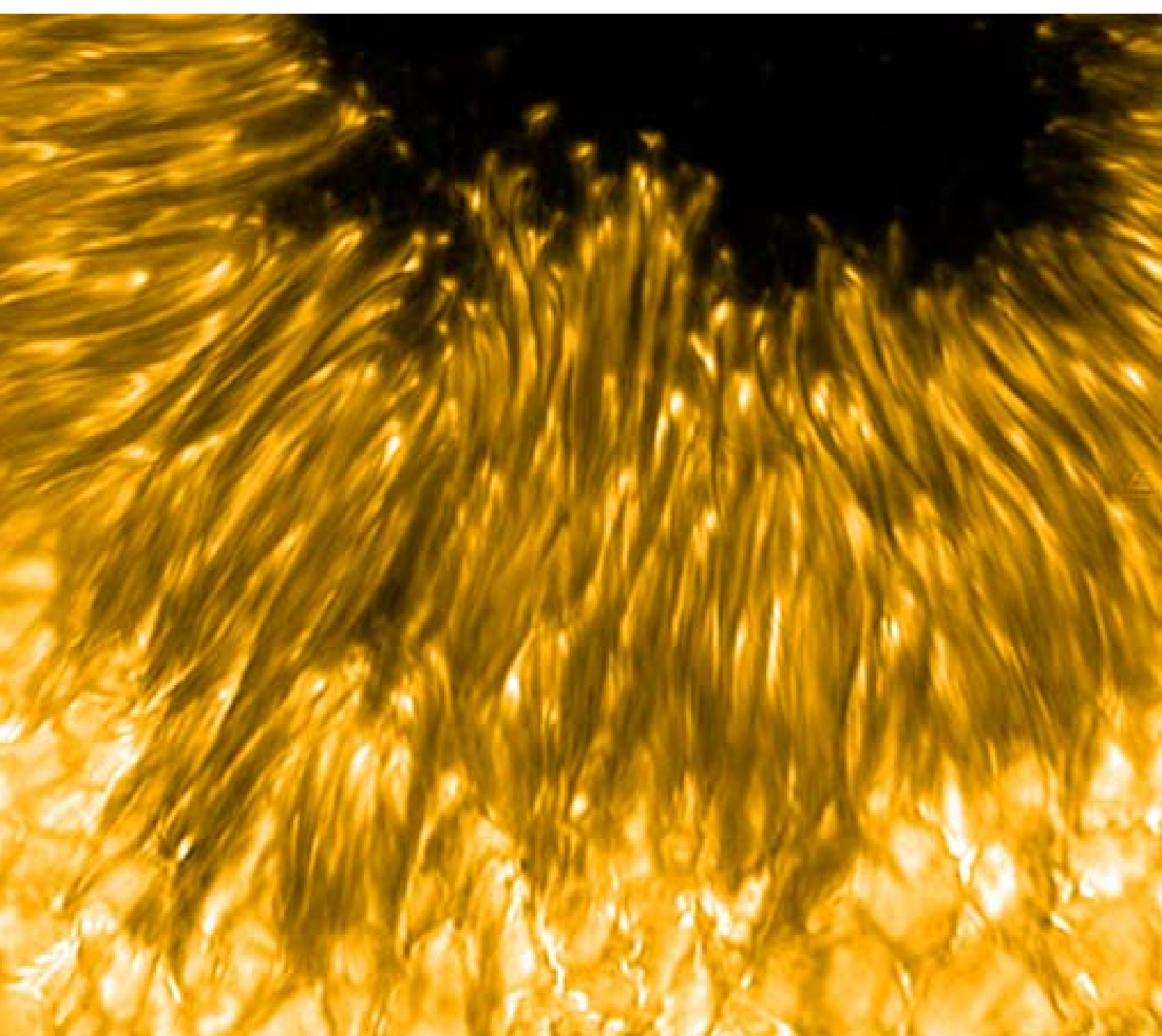


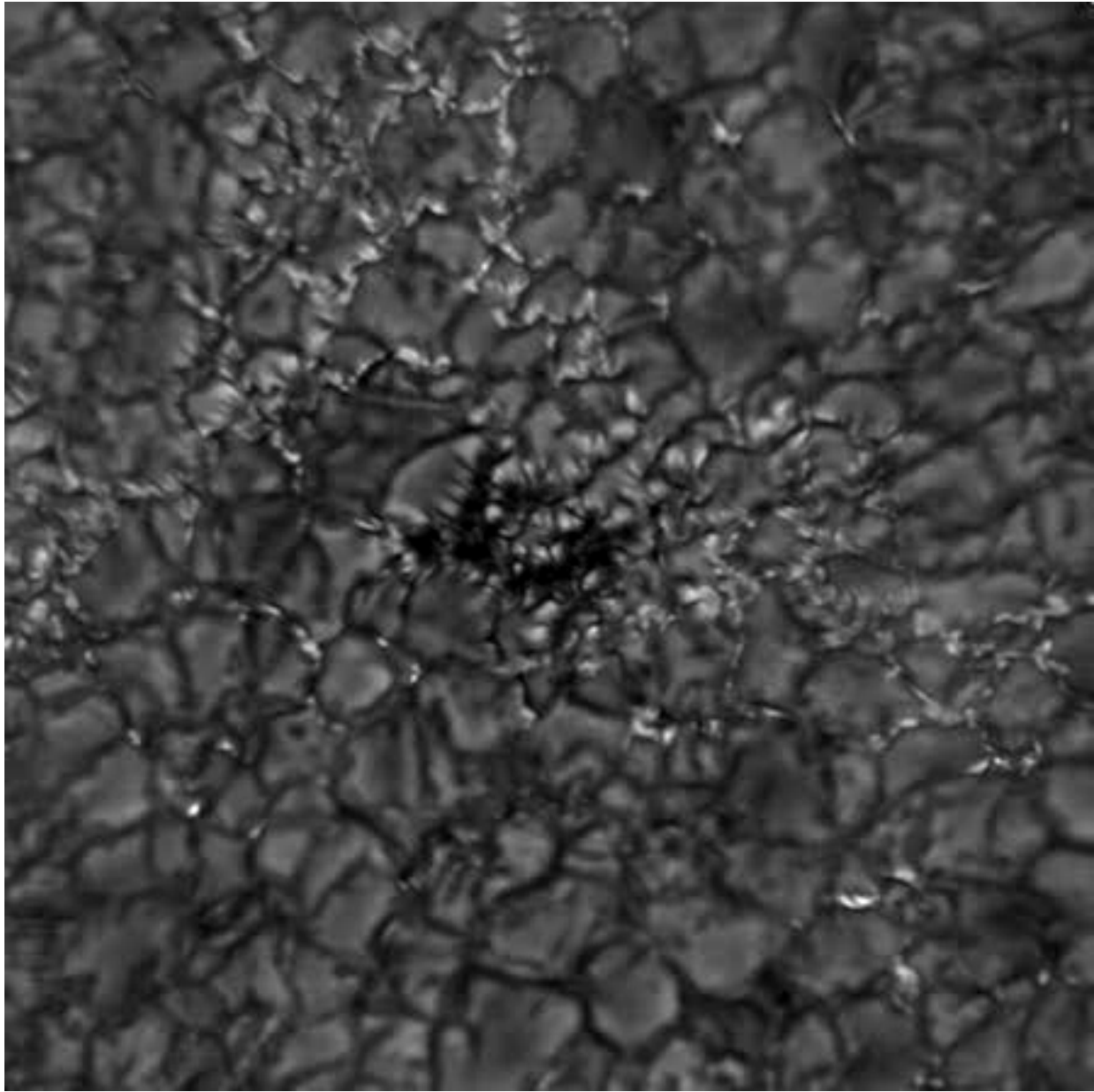
- two high order adaptive optics systems (97 actuators)
- Visible and NIR spectro-polarimeters
- Narrow-band tunable filters with polarimetry
- Spectrograph
- High resolution imaging

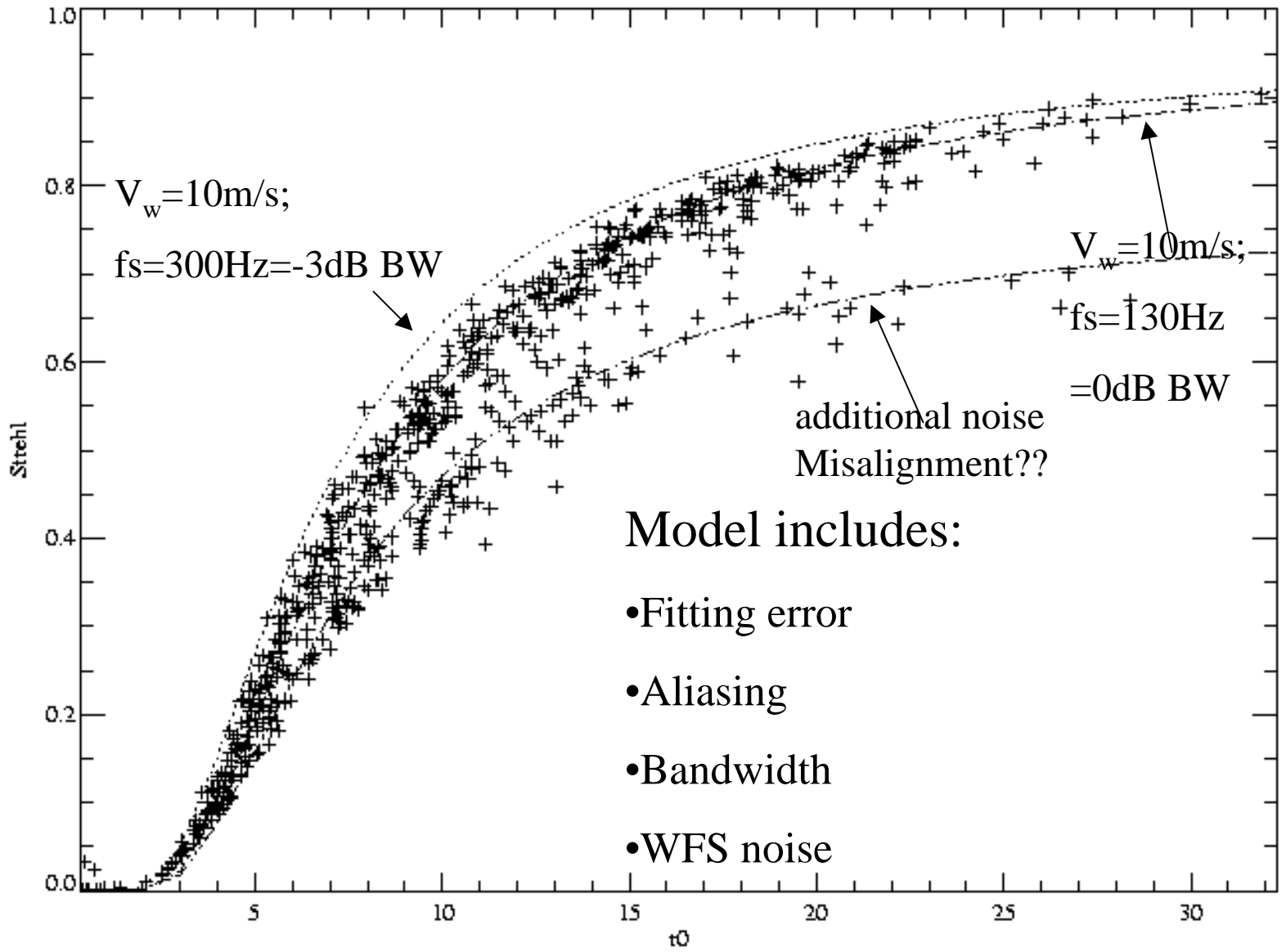


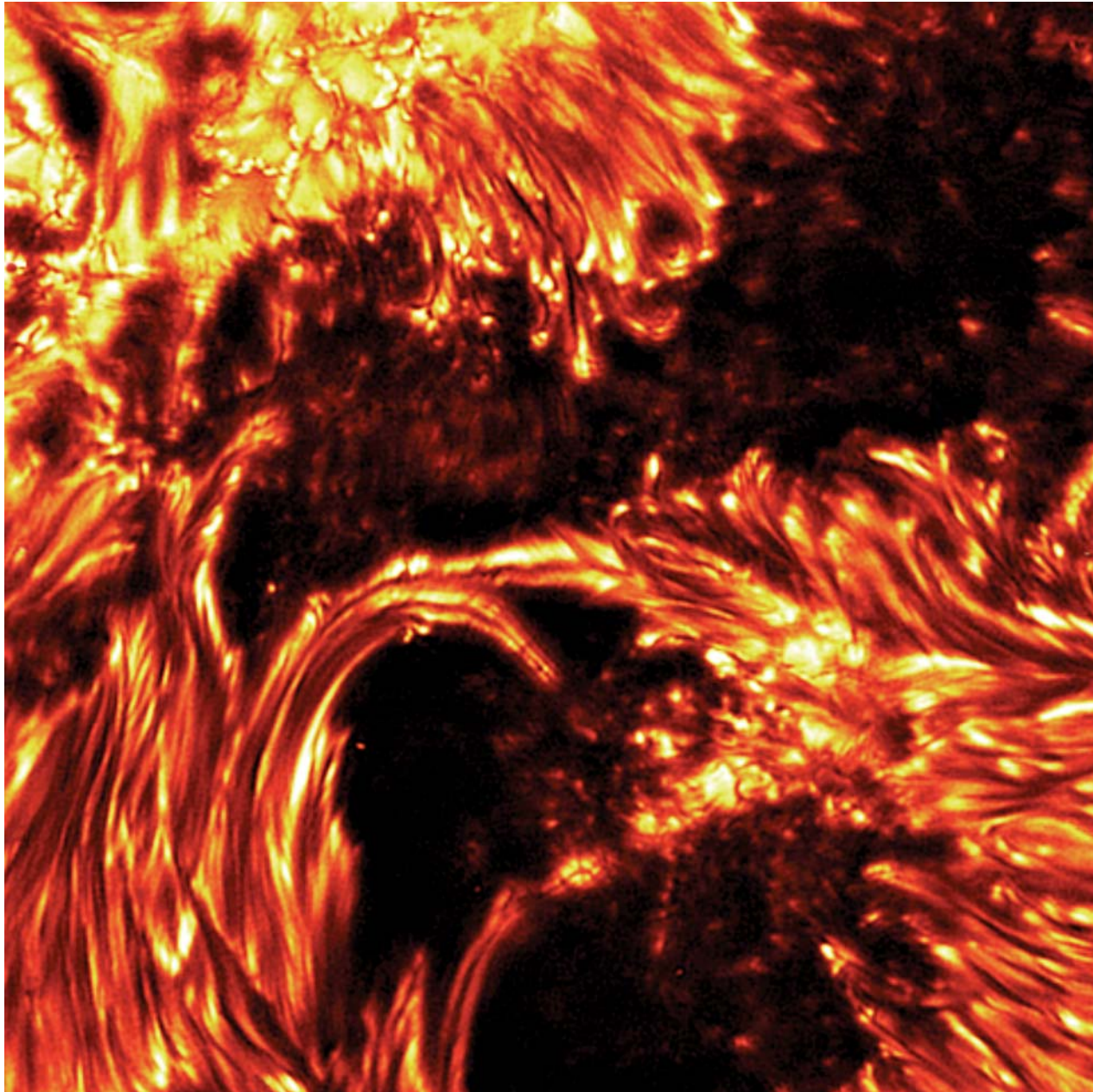
Speckle
reconstruction

G-band





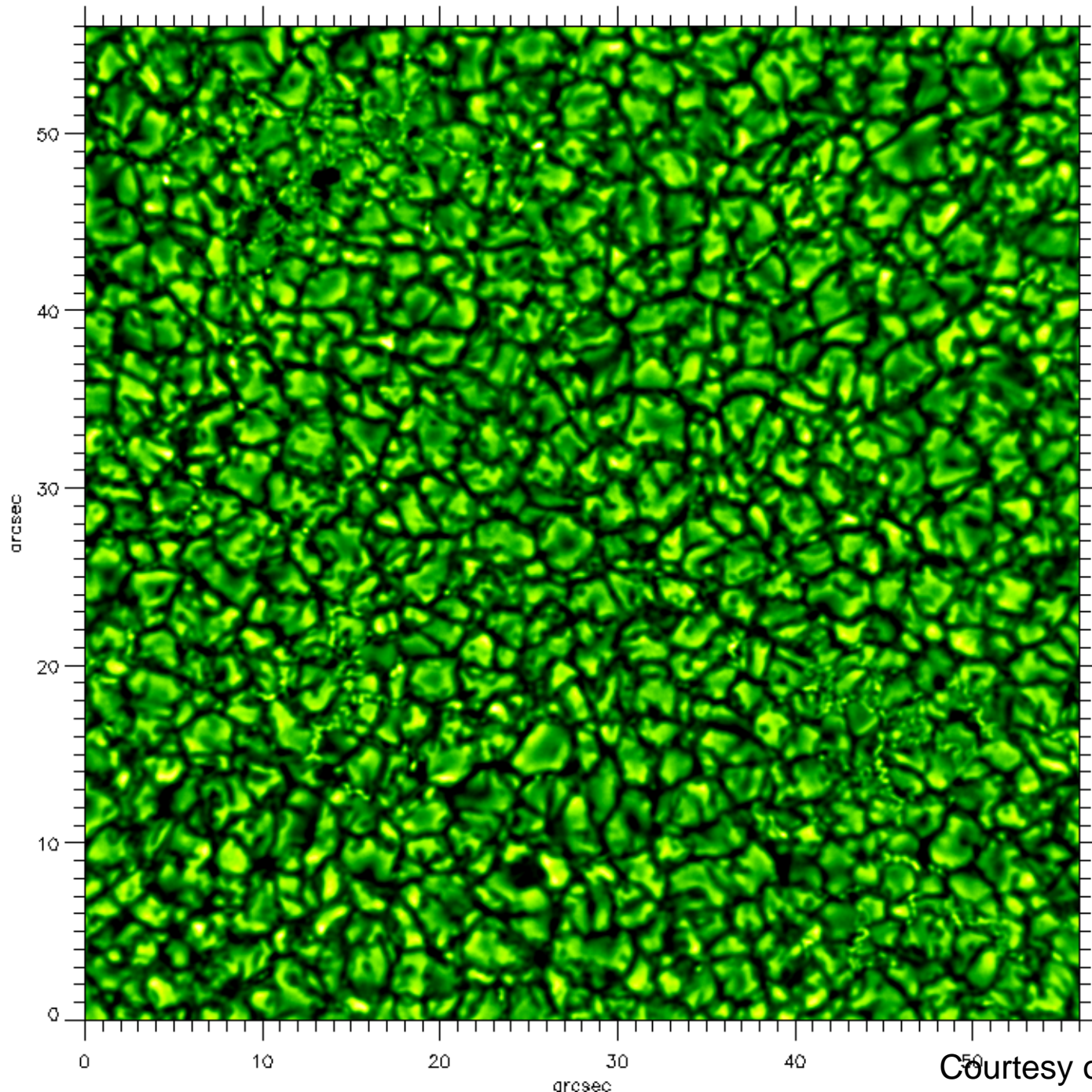




Individual
snapshot

G-band

430 nm



3 sec
exposure
Tip/tilt on

AO loop
on

Courtesy of T. Rimmele

DST Instruments

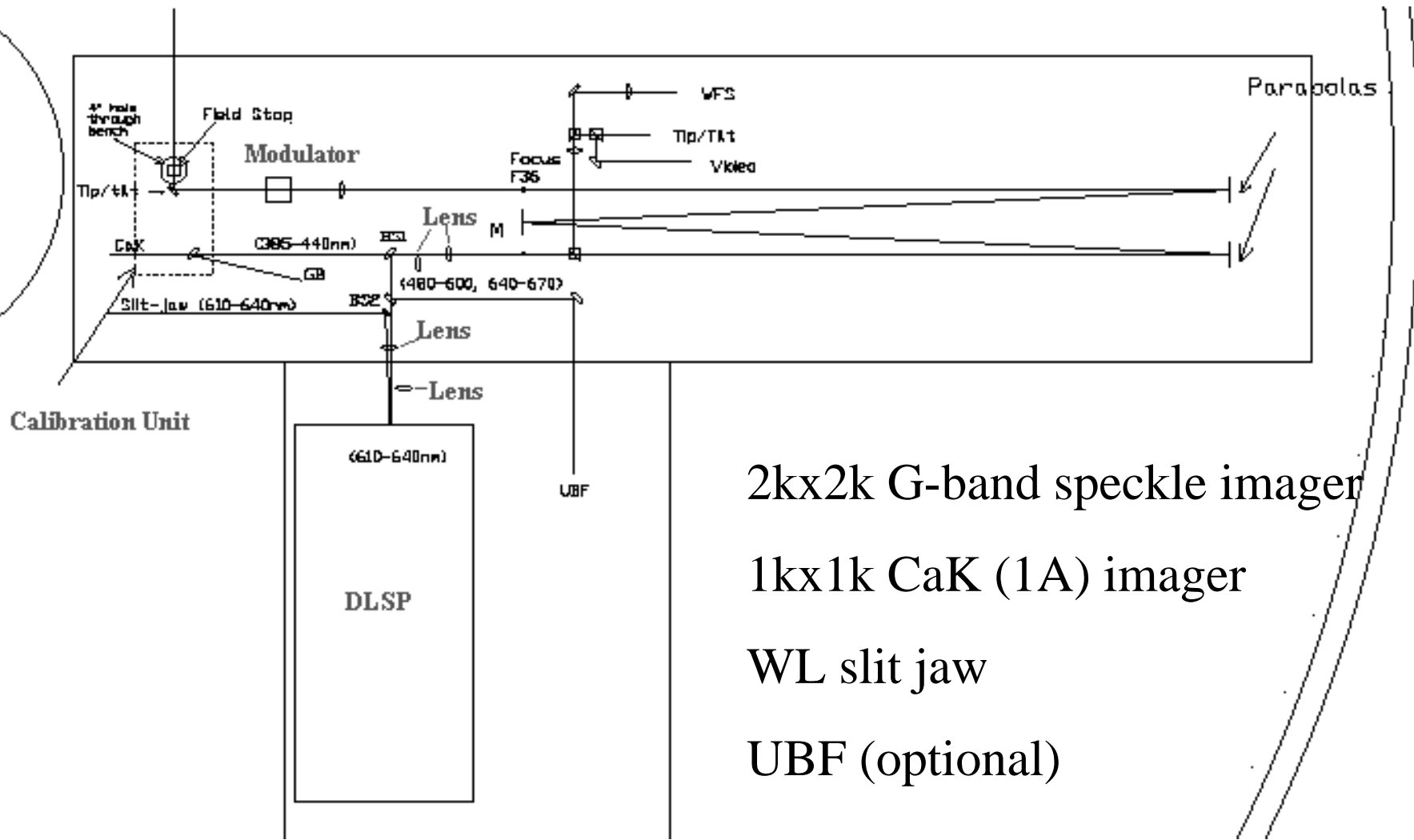
Fixed instrument (10min startup):

- Diffraction Limited Spectro-Polarimeter (DLSP)
- IR Spectro-Polarimeter (2007)

Instruments requiring setup time:

- SPINOR
- IBIS
- UBF
- Horizontal Spectrograph

DLSP Optical Setup at Port-2



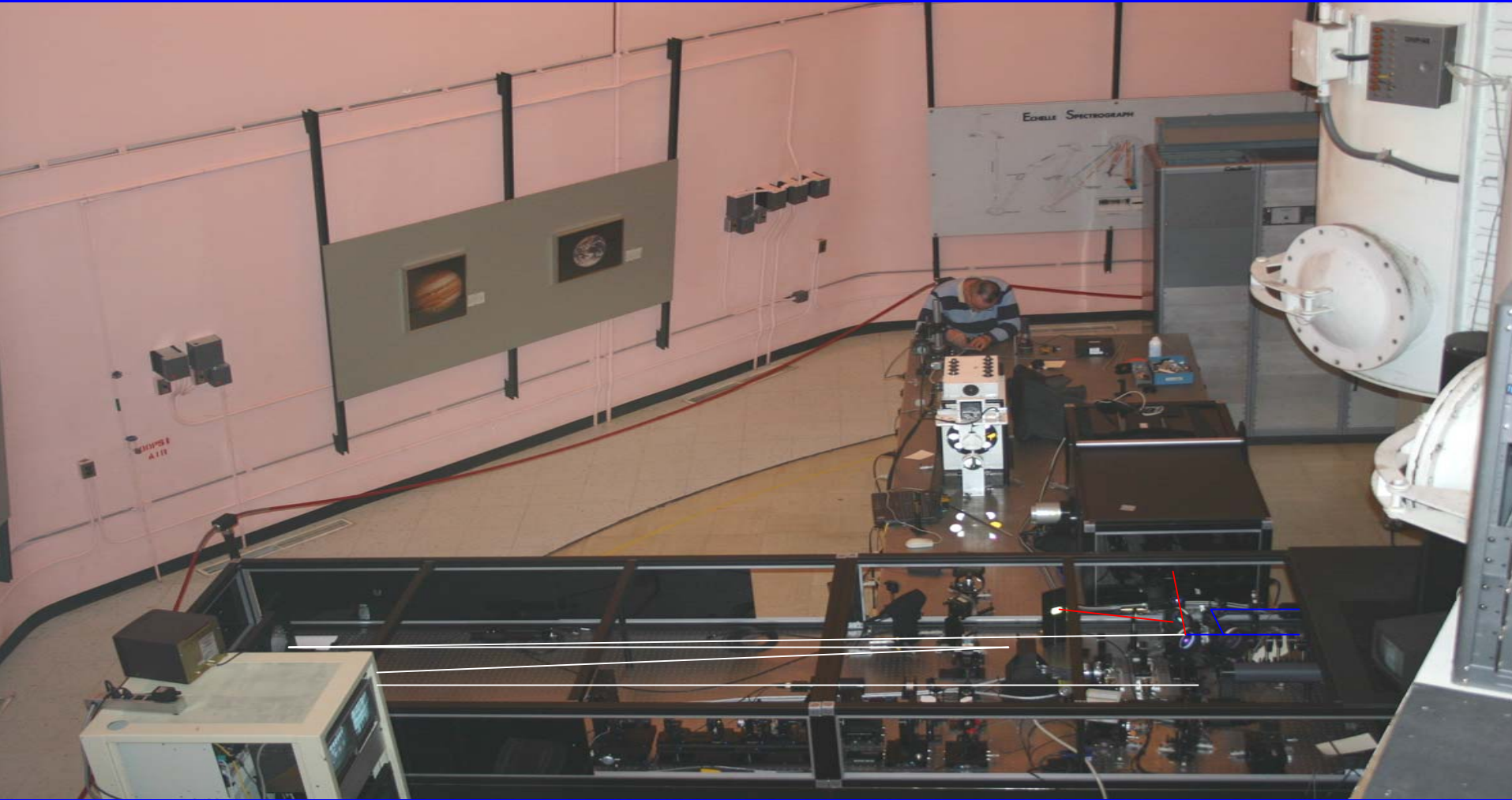
2kx2k G-band speckle imager

1kx1k CaK (1A) imager

WL slit jaw

UBF (optional)

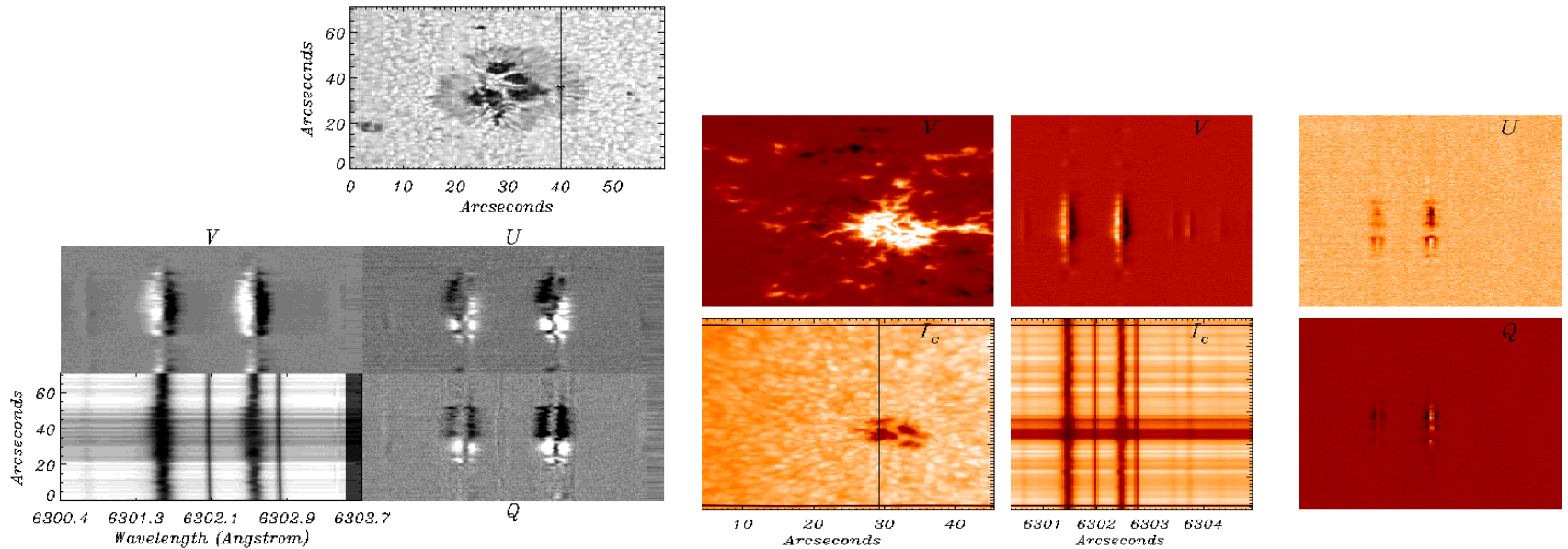
DLSP Setup at Port-2



DLSP

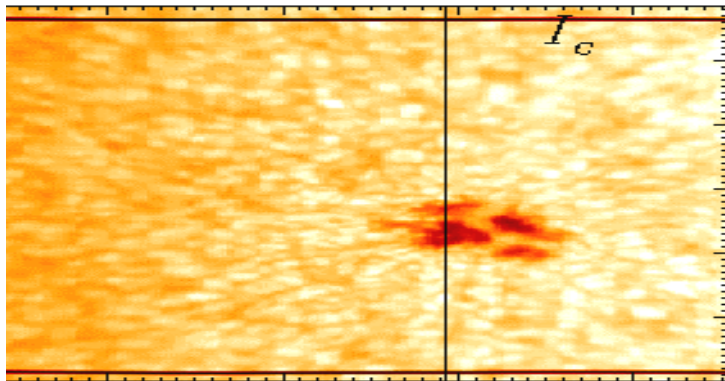
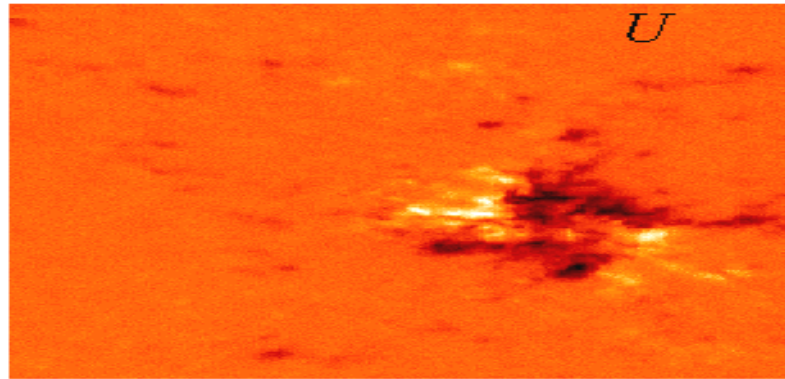
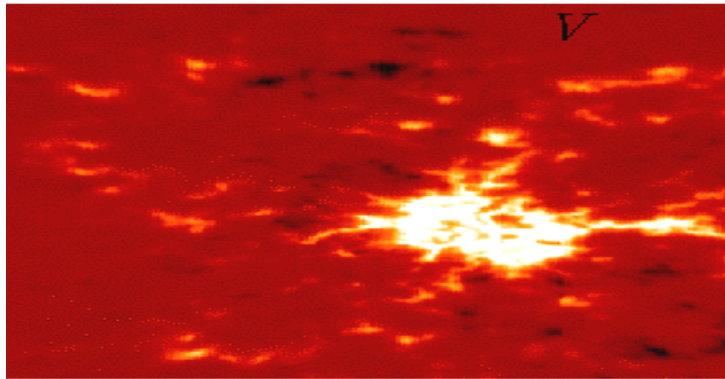
- Two resolution modes
 - 0".09/pix, FOV 60"
 - 0".2/pix FOV 180"
 - realtime data processing pipeline (calibration, inversion)
- Complementary use:
 - Zoom in at higher resolution (if seeing cooperates)
 - Cover different parts of large active regions
 - Higher cadence
 -

DLSP Data Reduction

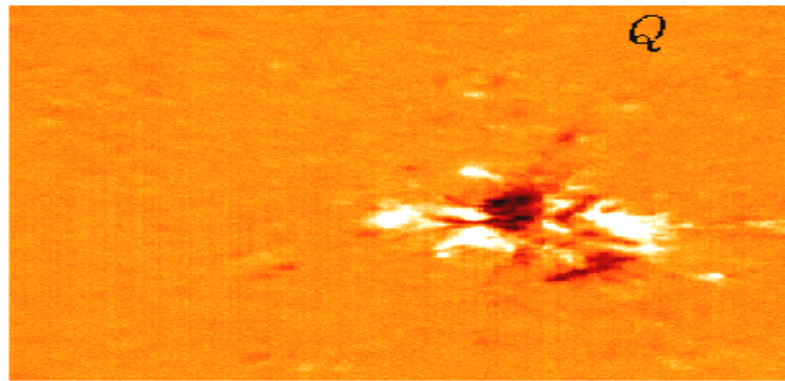


- Data product very similar to Solar-B SOT-FPP-SP
- Both are spectrograph based
- Both measures the full vector field
- Both observe at the 630nm line pair

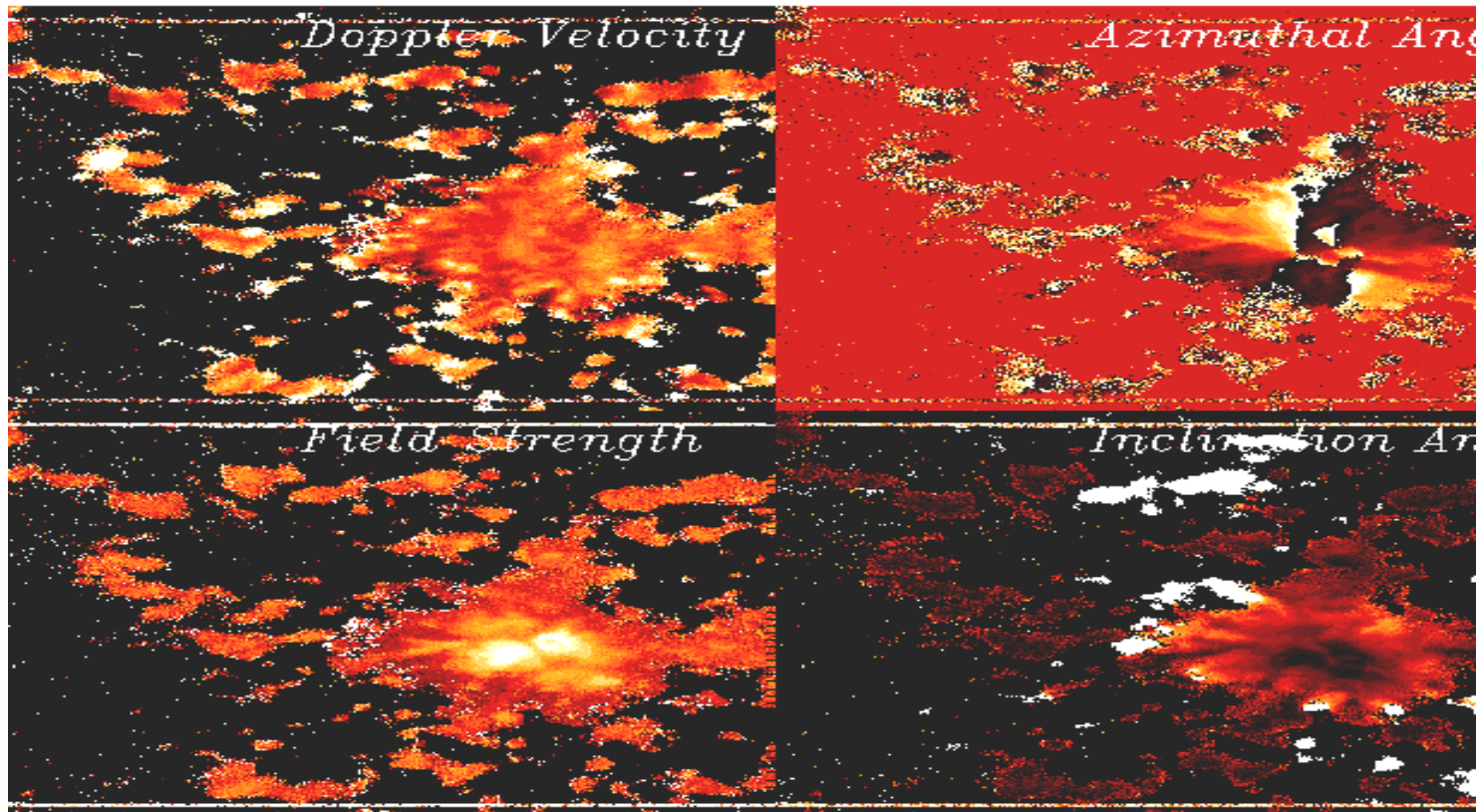
Sample Calibrated Map



10 20 30 40
Arcseconds



A Sample ME inversion



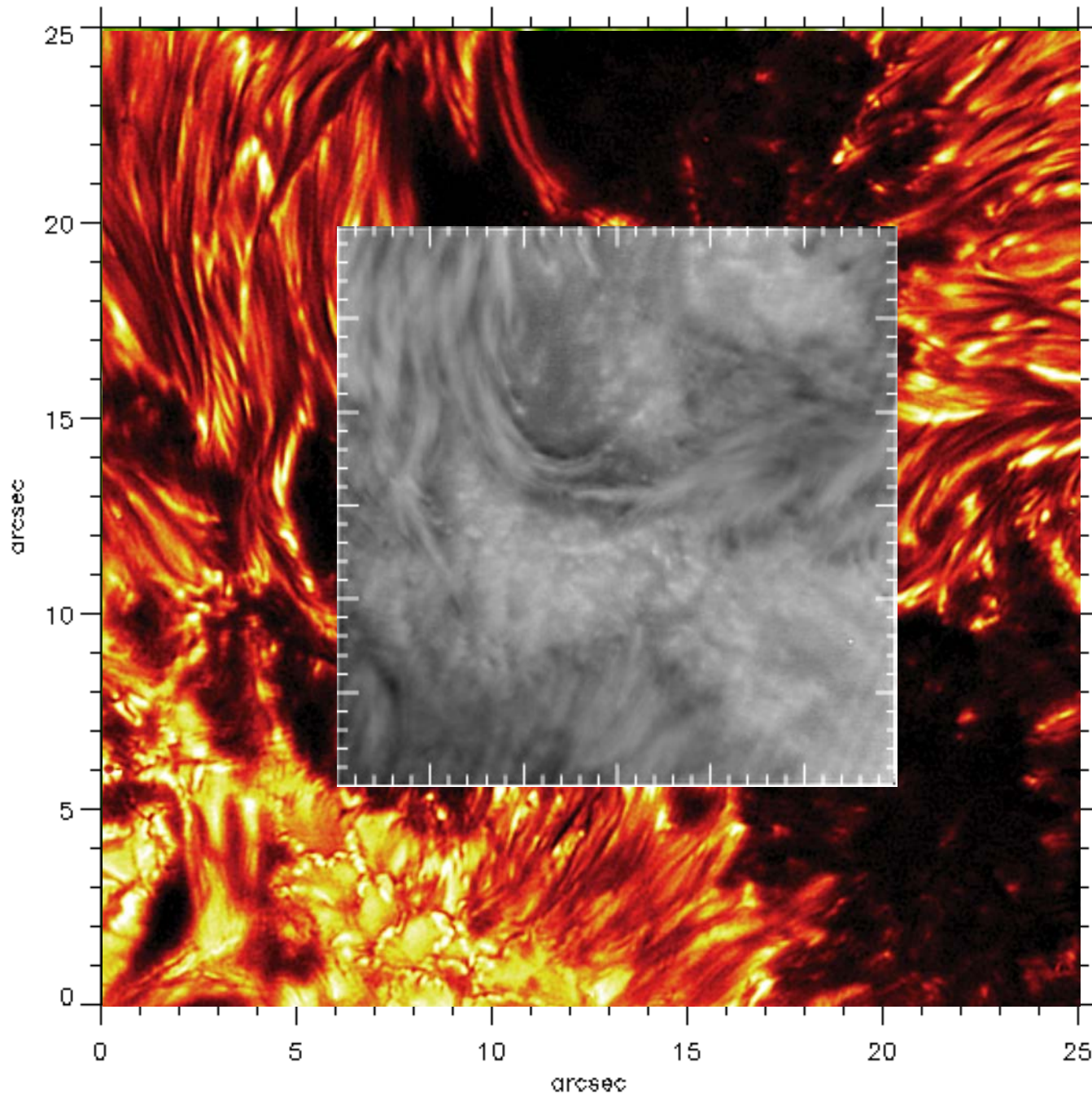
10 20 30 40
Arcseconds

Universal Birefringent Filter

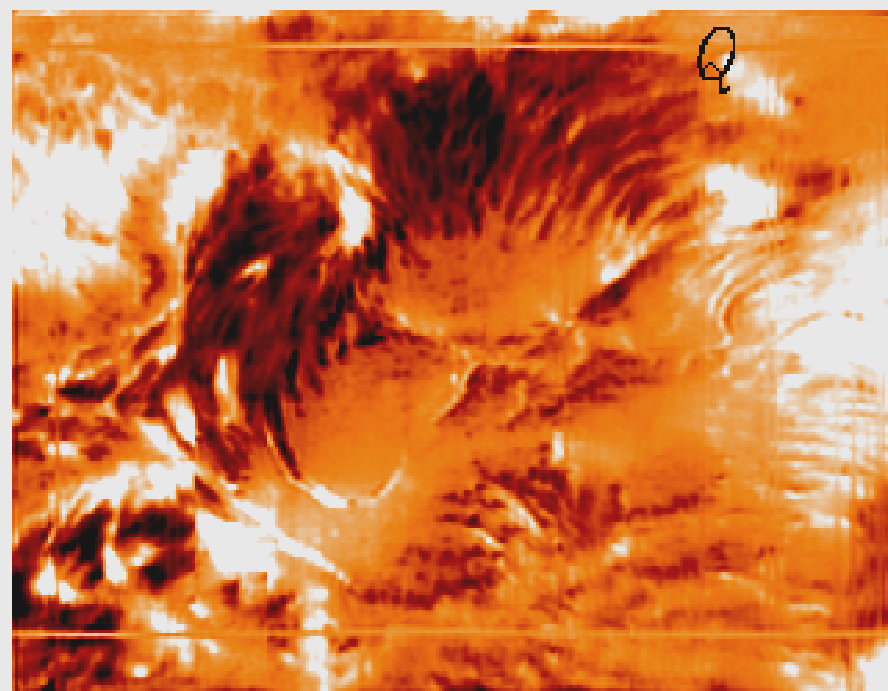
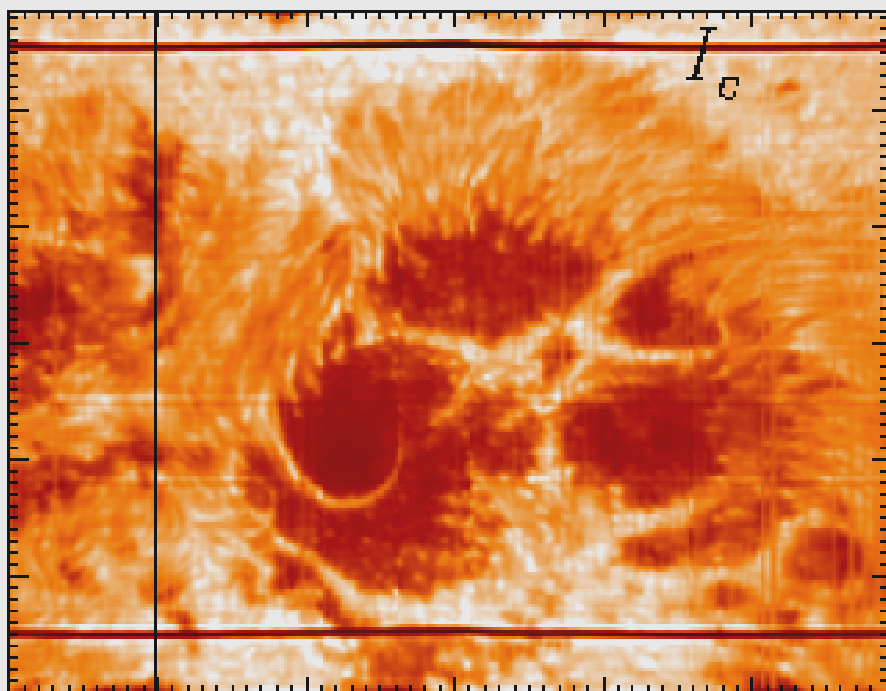
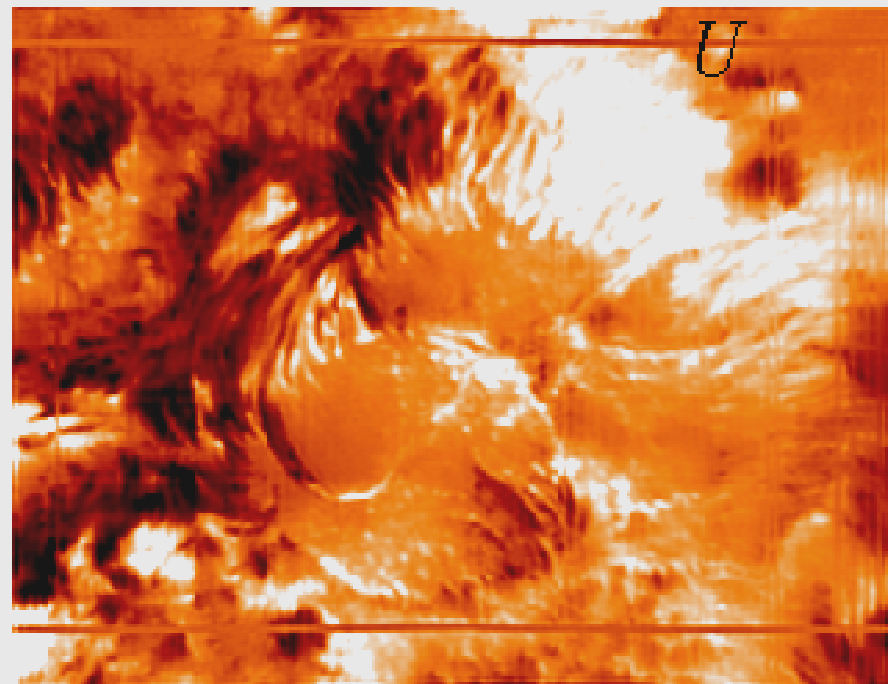
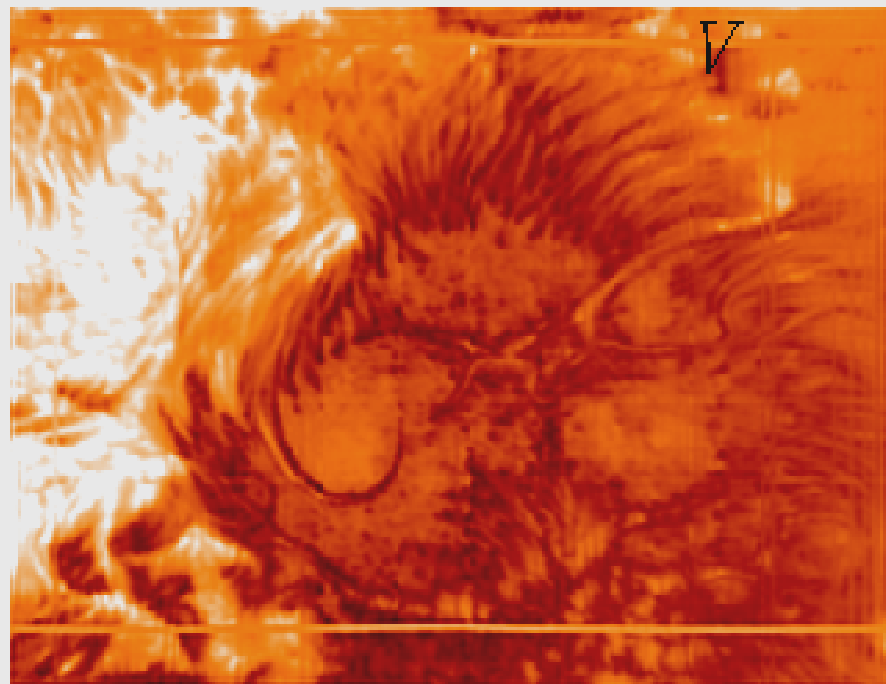
UBF

- Lyot filter 160 –250 mÅ passband
- Tunable 450 –750 nm
- Filtergrams
- Dopplergrams
- Magnetograms

FeI 543.4nm integral line absorption



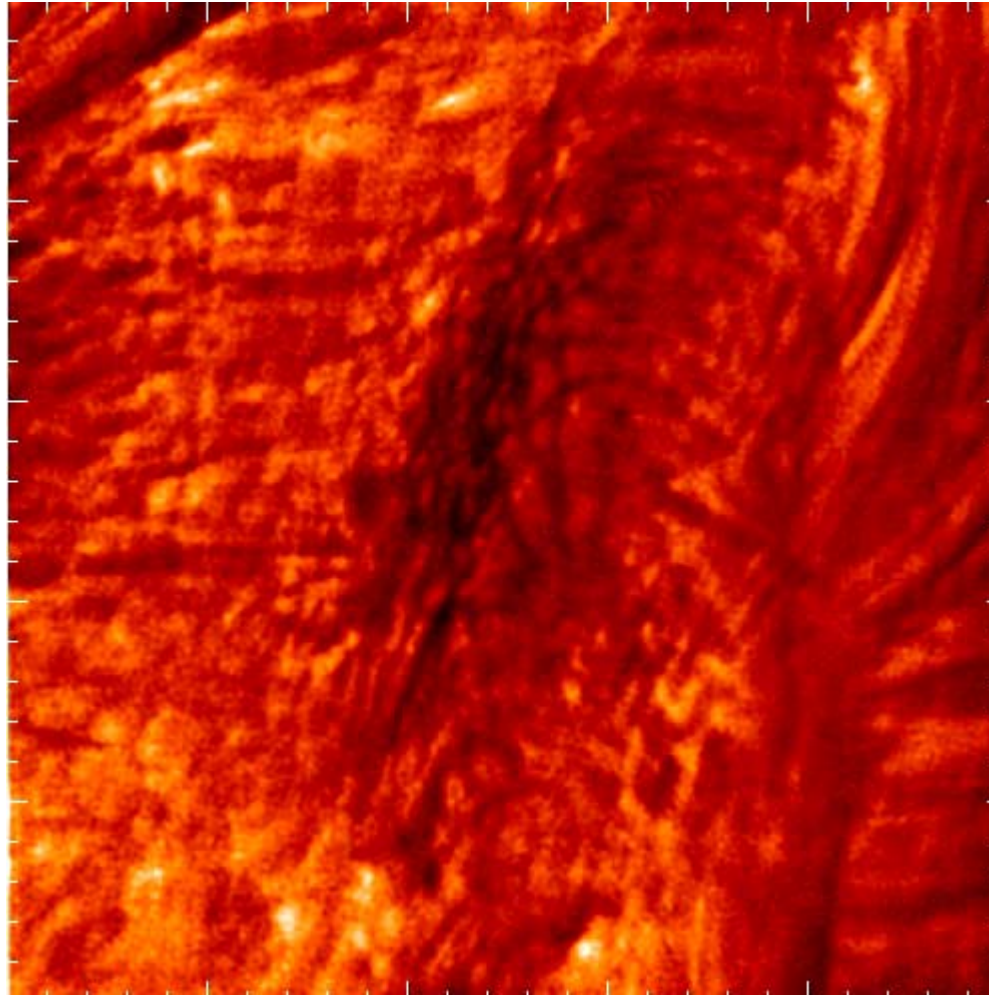
14 sec
exposure



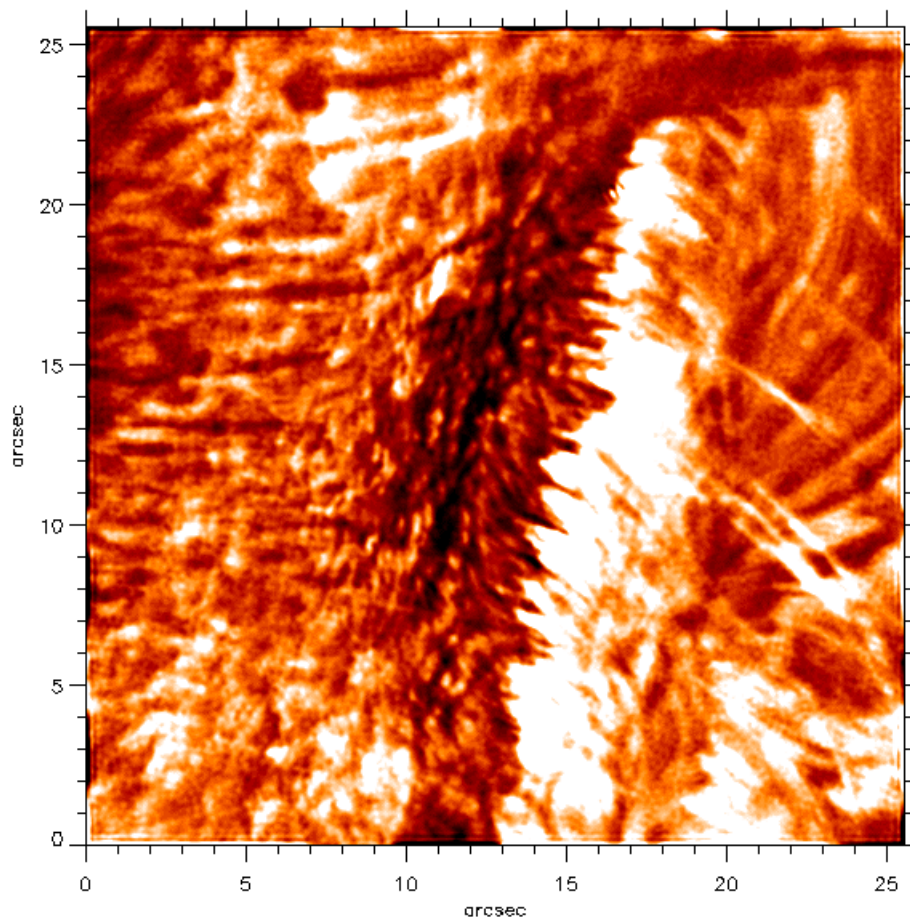
Afternoon seeing conditions.

AR 0486
observed
close to east
limb

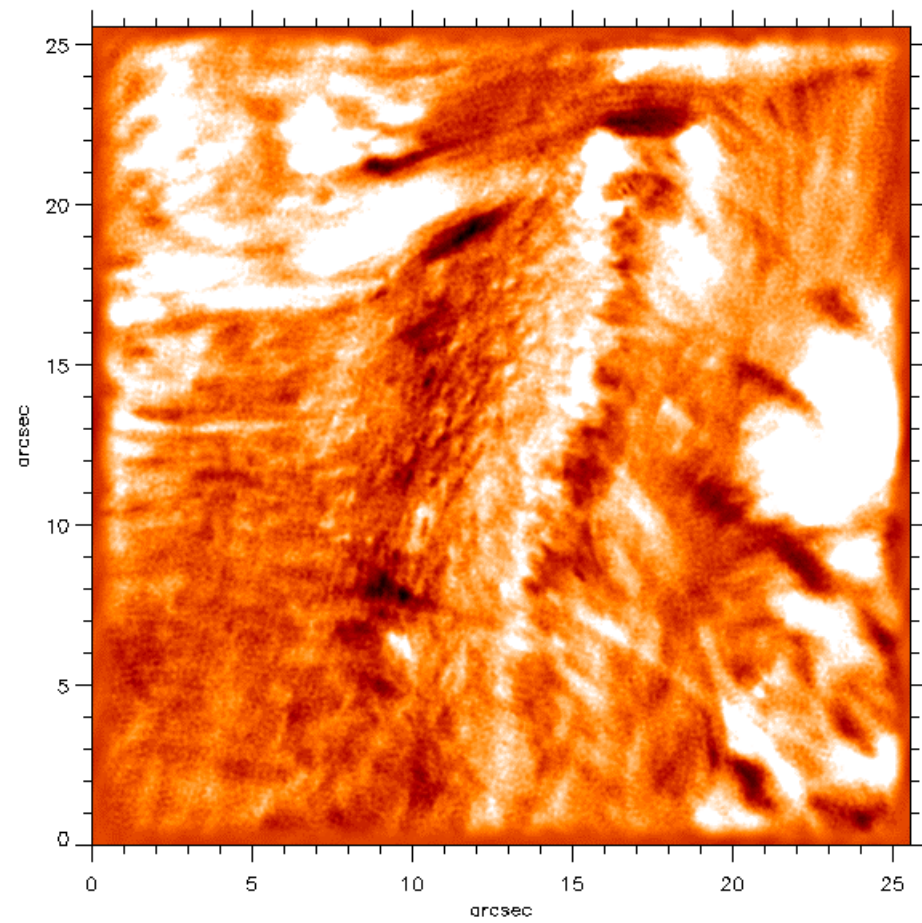
10/24/03
UT 18:14 –
UT 19:31



H-alpha core



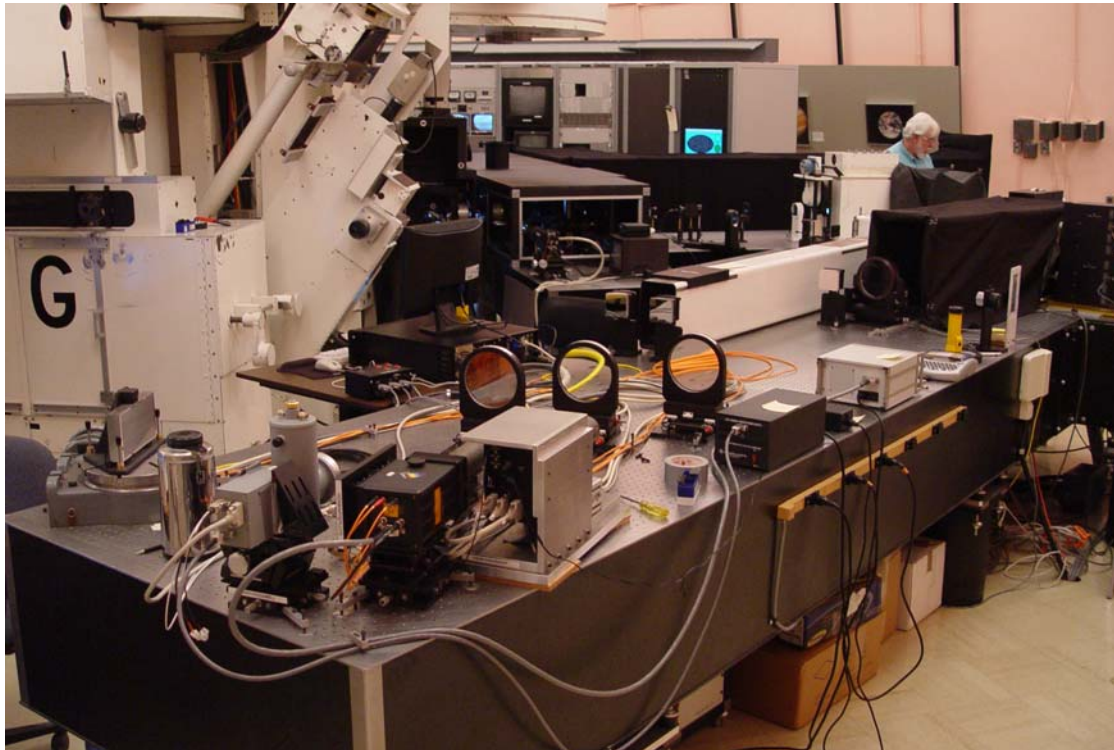
H-alpha velocity



SPINOR

Spectro-Polarimeter for INfrared and Optical Regions

- Versatile achromatic spectro-polarimeter 430nm –1600nm
- Simultaneous visible and near-infrared operation
- High spatial resolution ($\sim 0.25''/\text{pix}$) using new high-order AO



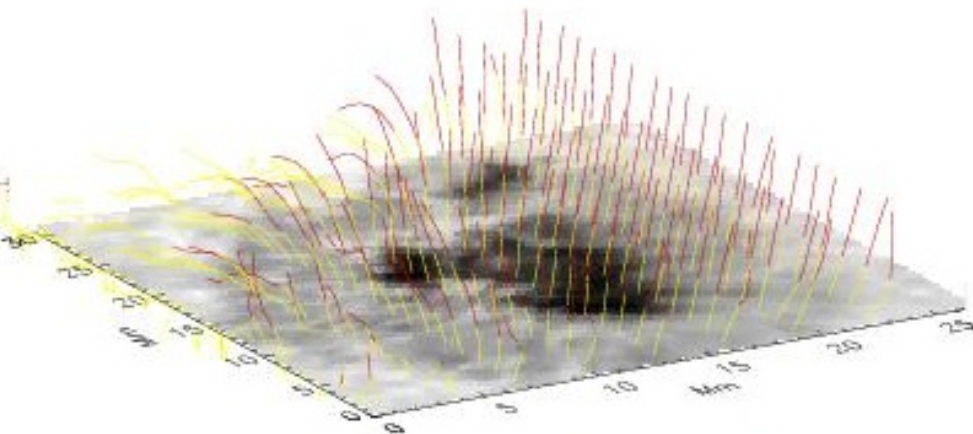
- 3D structure of magnetic field:
 - FeI 6302, CaII 8542, HeI 10830
- Chromospheric field:
 - CaII 8542, HeI 10830
- Quiet Sun fields:
 - 1.56 micron lines

Chromospheric polarimetry with SPINOR

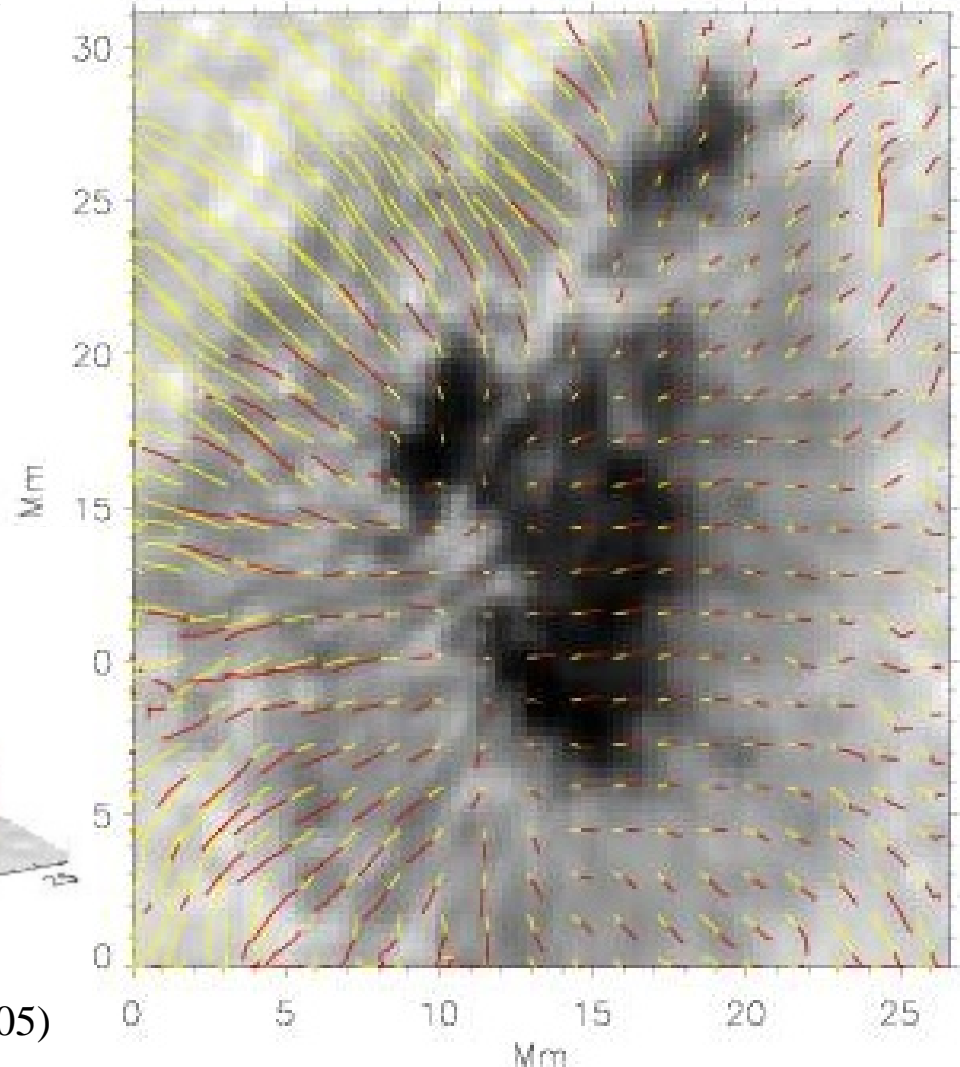
- 3D tomography of a sunspot (phot+chrom) using 2 FeI and 2 CaII lines and

yellow: 0 - 800 km

red: 800 - 1600 km

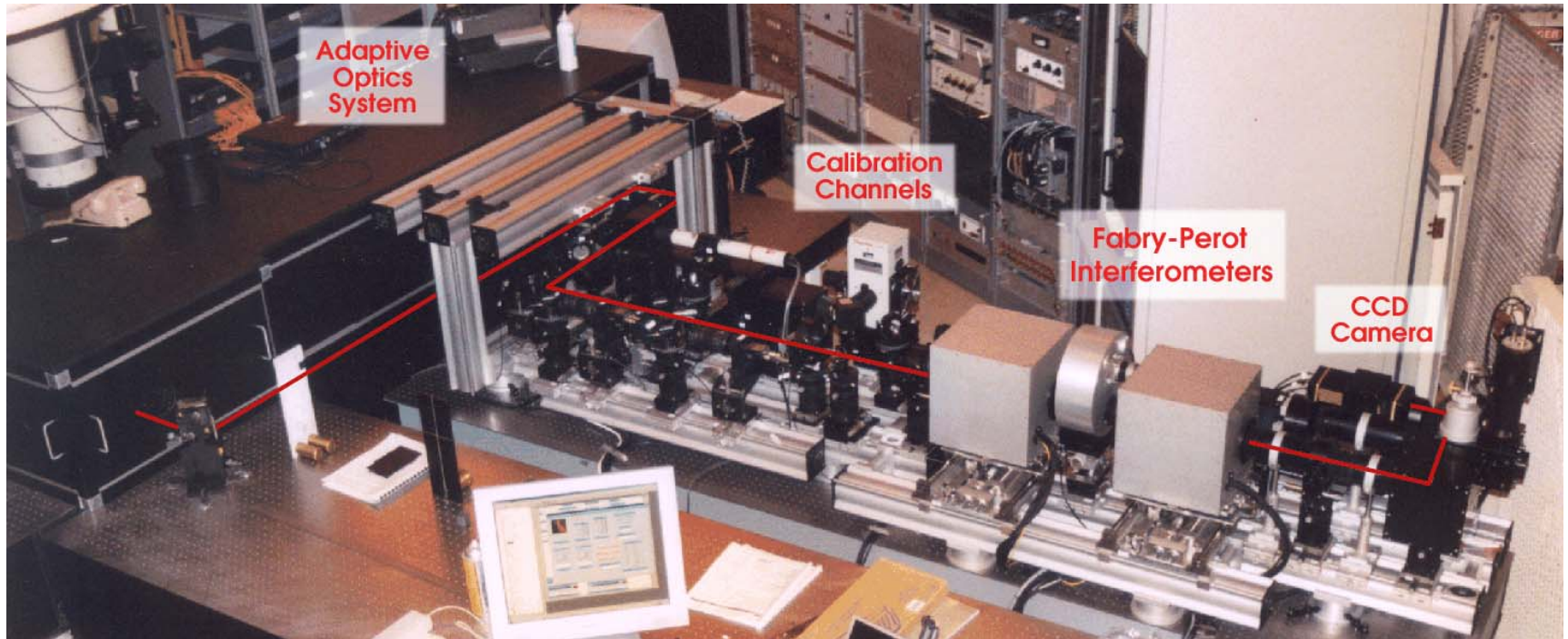


Socas-Navarro (2005)



IBIS - Interometric Bldimensional Spectrometer

Installed at the Dunn Solar Telescope, Sac Peak since June, 2003



Design Considerations:

High Spectral Purity

– *classical, on-axis Fabry-Perot mounting
identical instrumental profile over entire field*

Wavelength Stability

– *thermally controlled; 10 m/sec per 10 hours*

High Throughput

– *$1-2 \times 10^2$ photons/msec/pixel – $t_{exp} \sim 20-100$ msec*

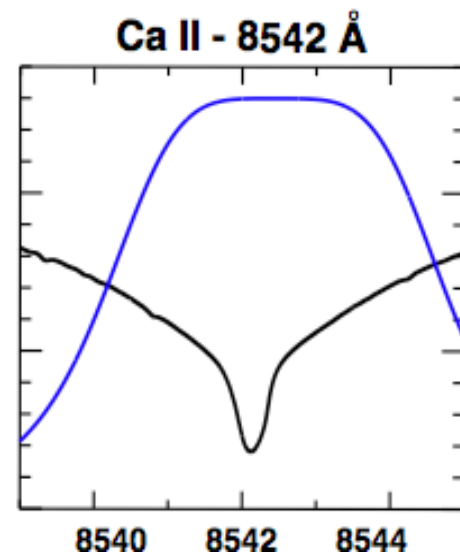
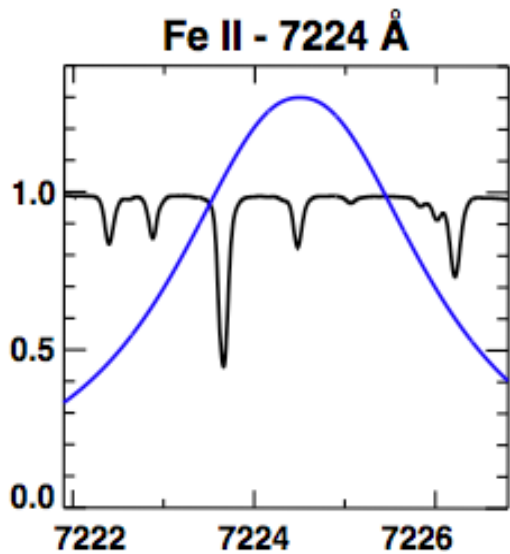
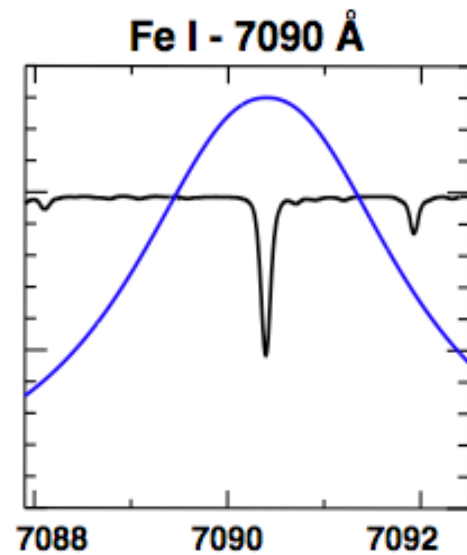
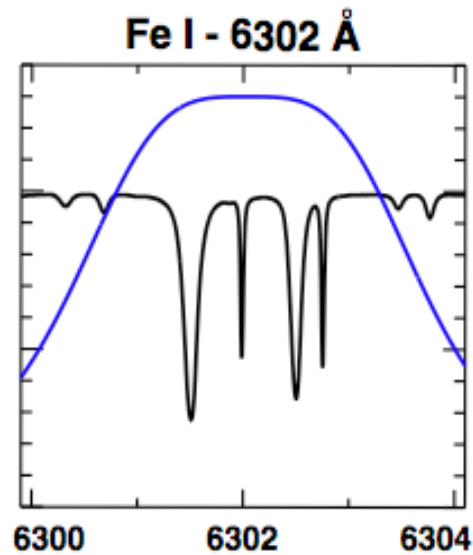
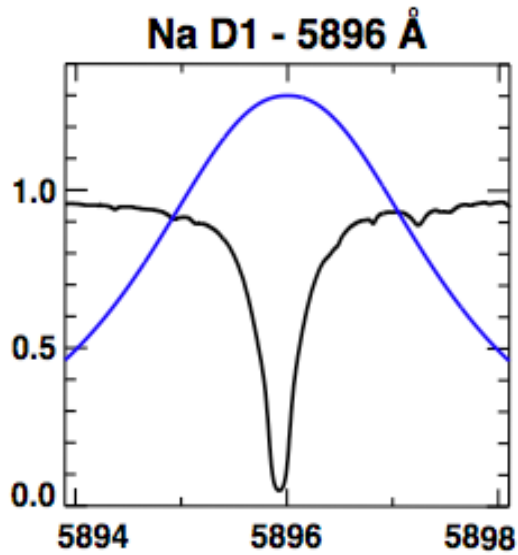
Rapid Tuning

– *sample entire line with ≥ 20 points in ≤ 10 seconds*

IBIS Instrumental Characteristics

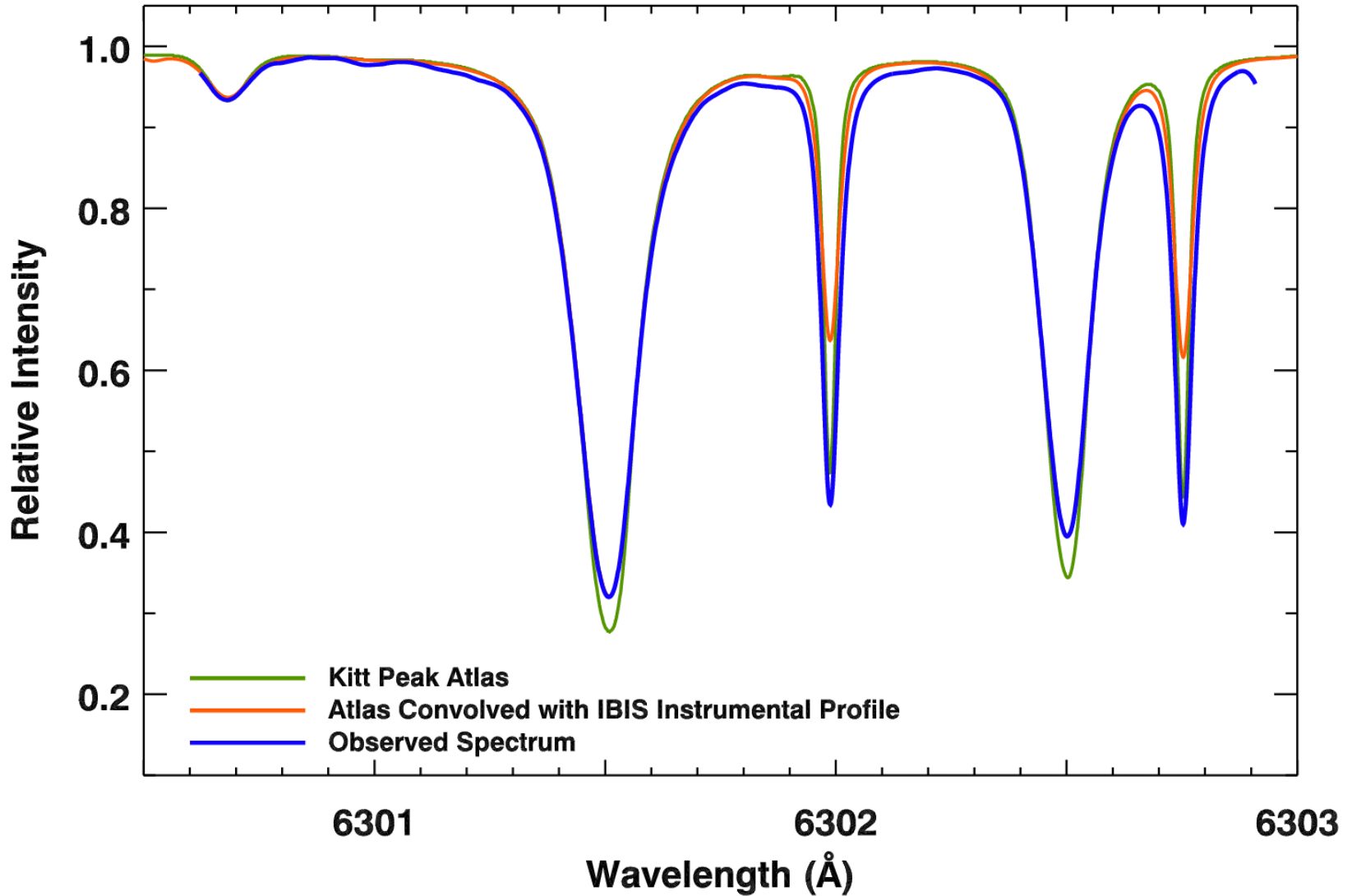
- Transparency = 15%
- Spectral Range = 5500 - 8700 Å
- FOV = 80" (diameter)
- Spatial scale = (0.083")² / pixel
- Frame rate = 2–5 frames/sec
- Exposure Time = 20-100 msec
- Spectral Resolution = 196,000-274,000
- Wavelength Setting Time = < 20 msec
- Minimum Wavelength Step = 4.5–6 mÅ

Current IBIS Wavelength Ranges



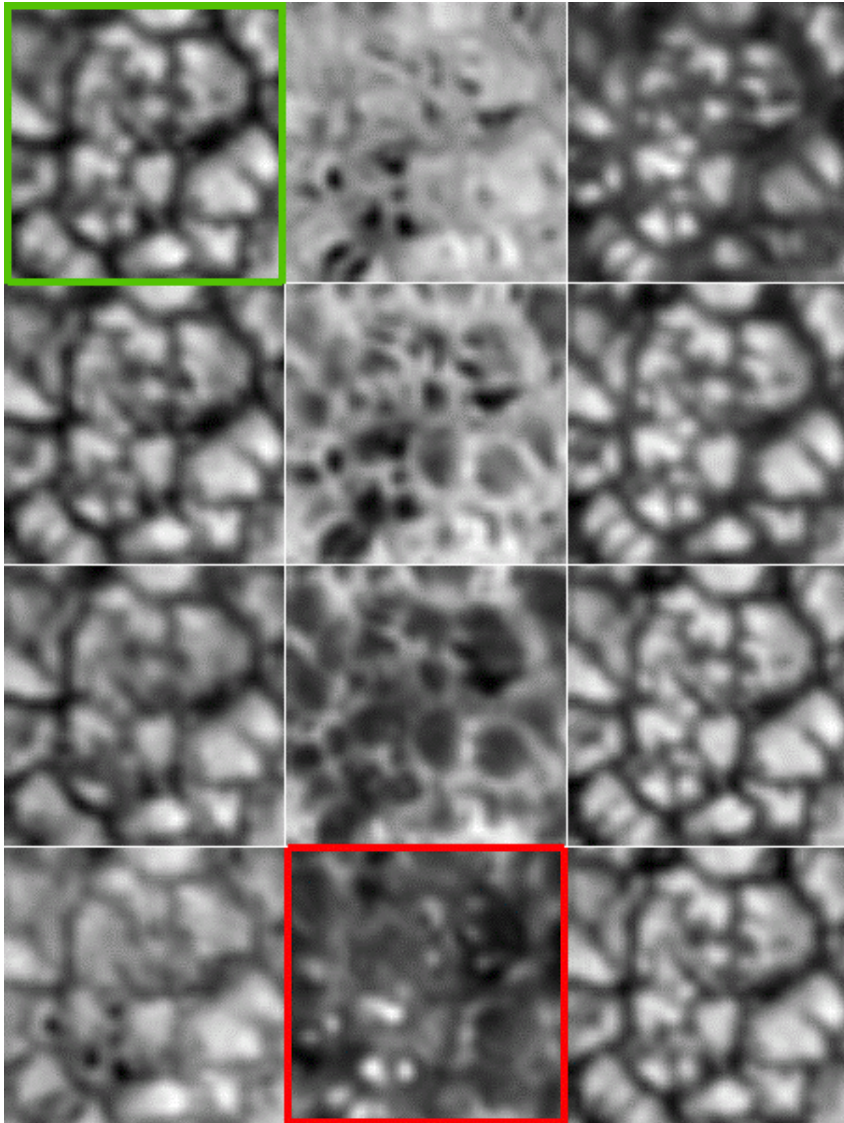
<u>Filter</u>	<u>FWHM</u>
5896 Å	25 mÅ
6302 Å	24 mÅ
7090 Å	26 mÅ
7224 Å	27 mÅ
8542 Å	46 mÅ

IBIS Observed Spectral Profile



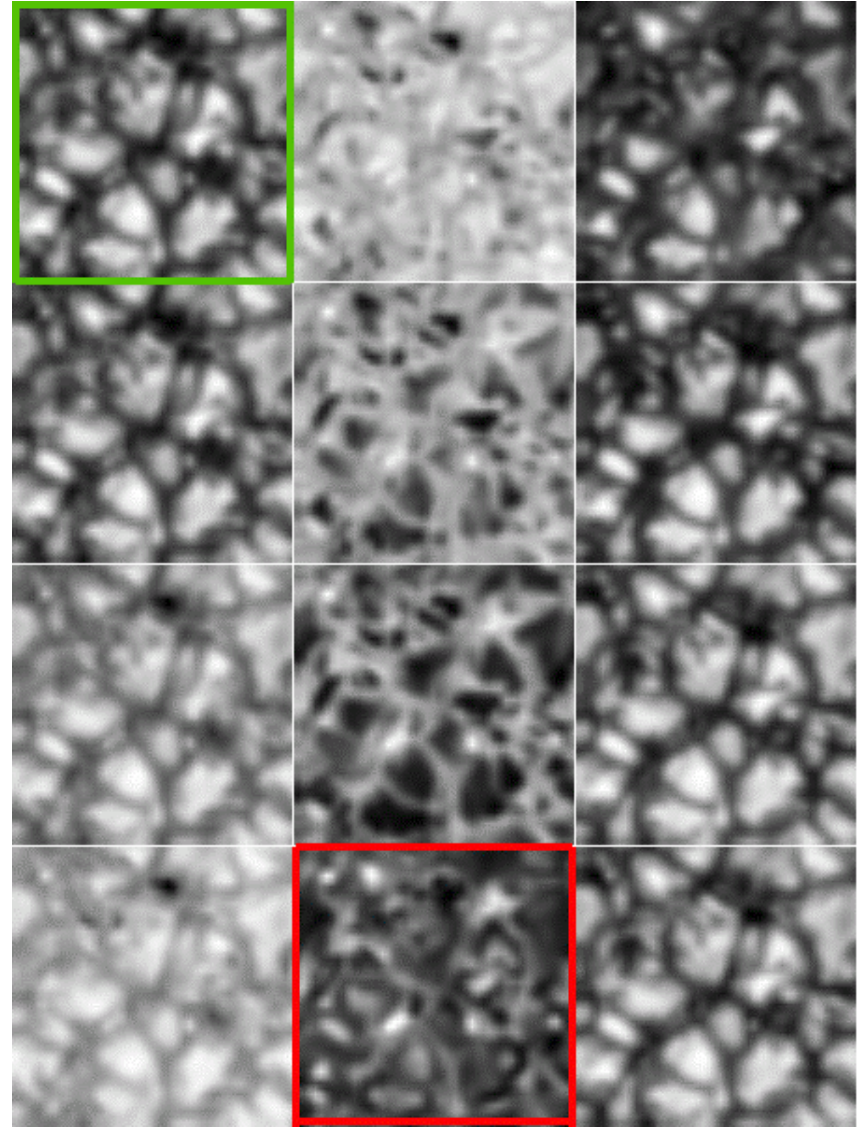
Monochromatic Imaging of Fe I 7090 Å, $\Delta\lambda$ 30 mÅ

IBIS Observations

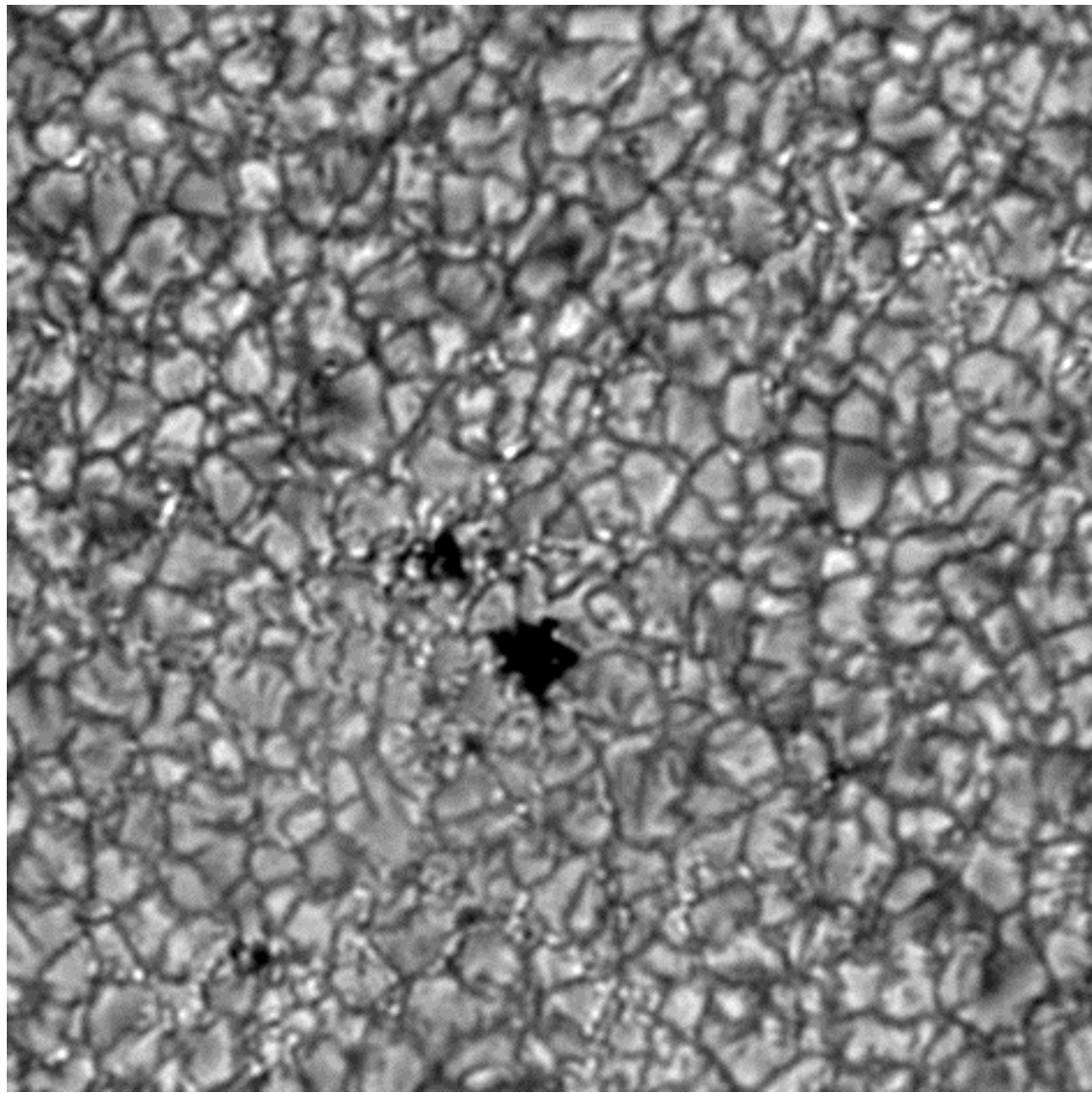


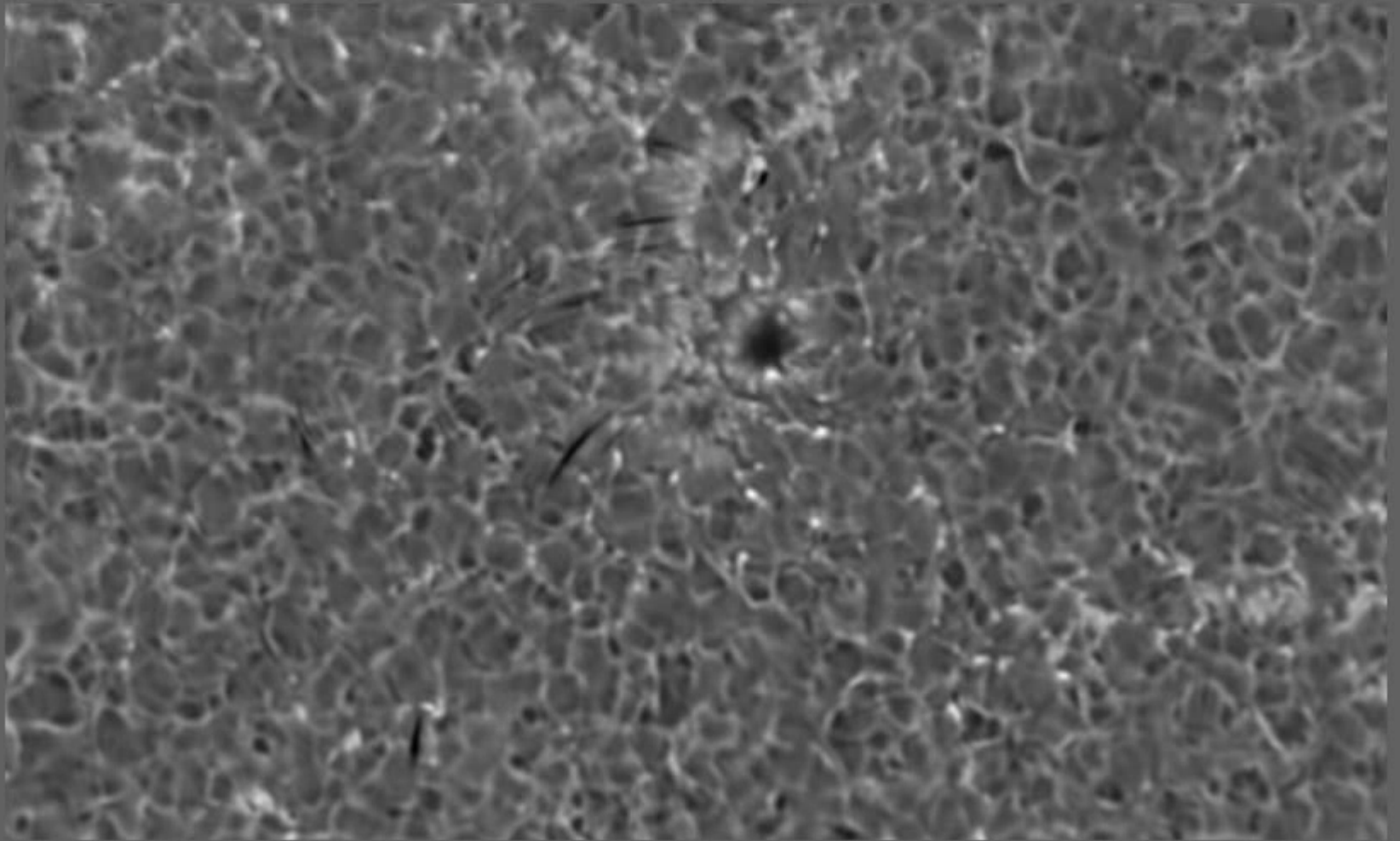
line core

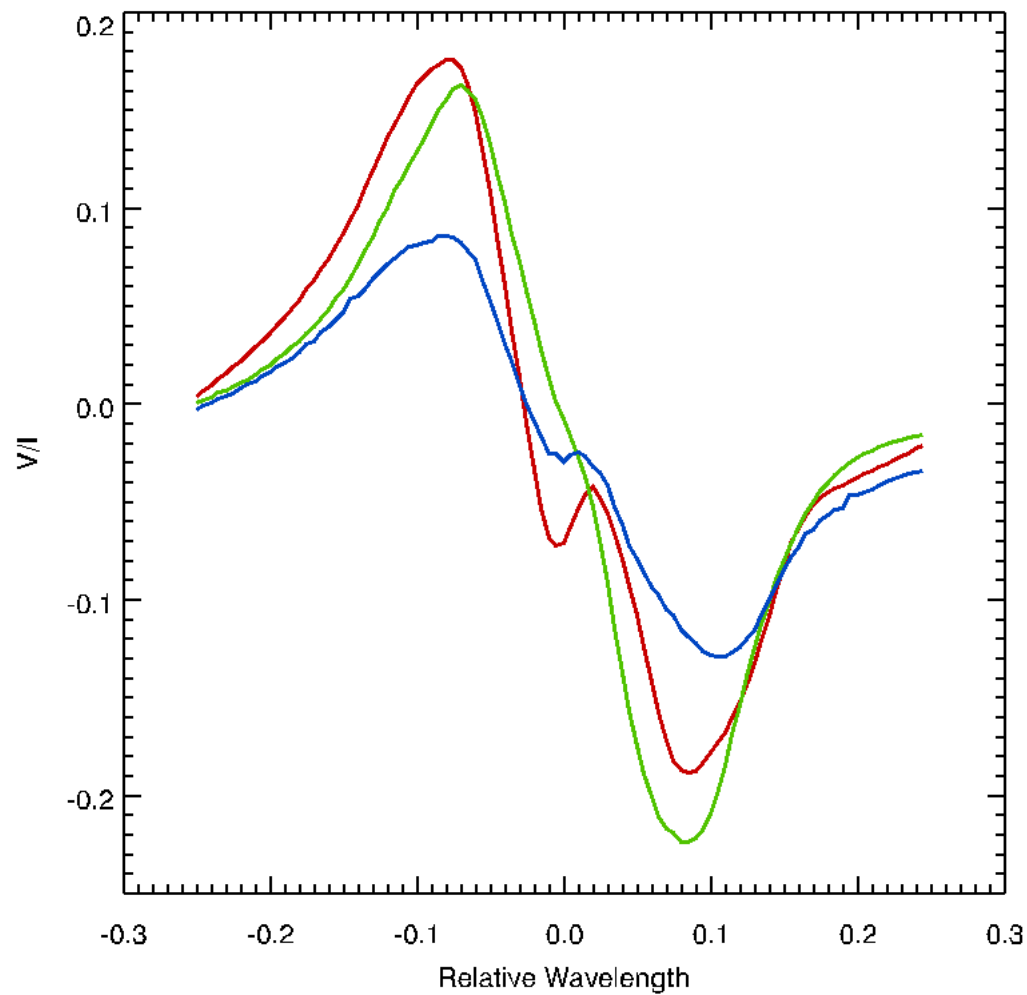
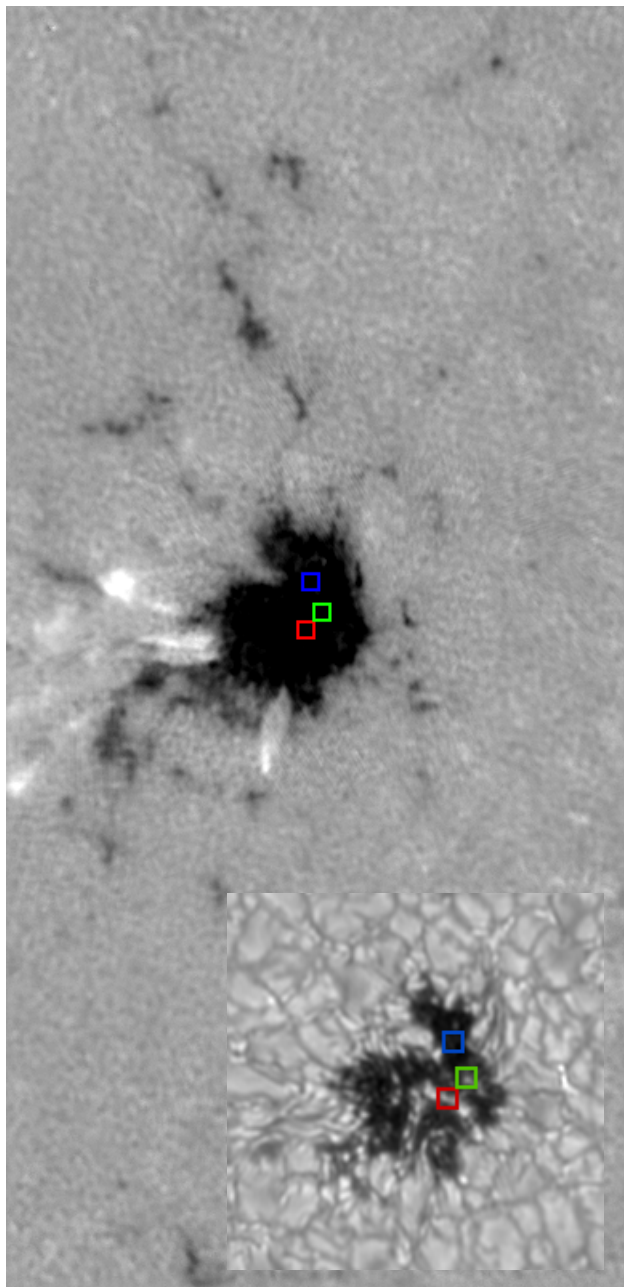
Simulations

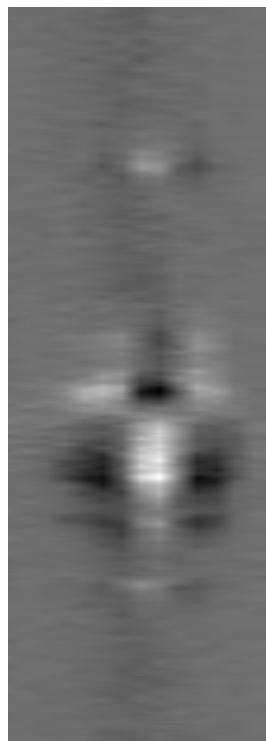
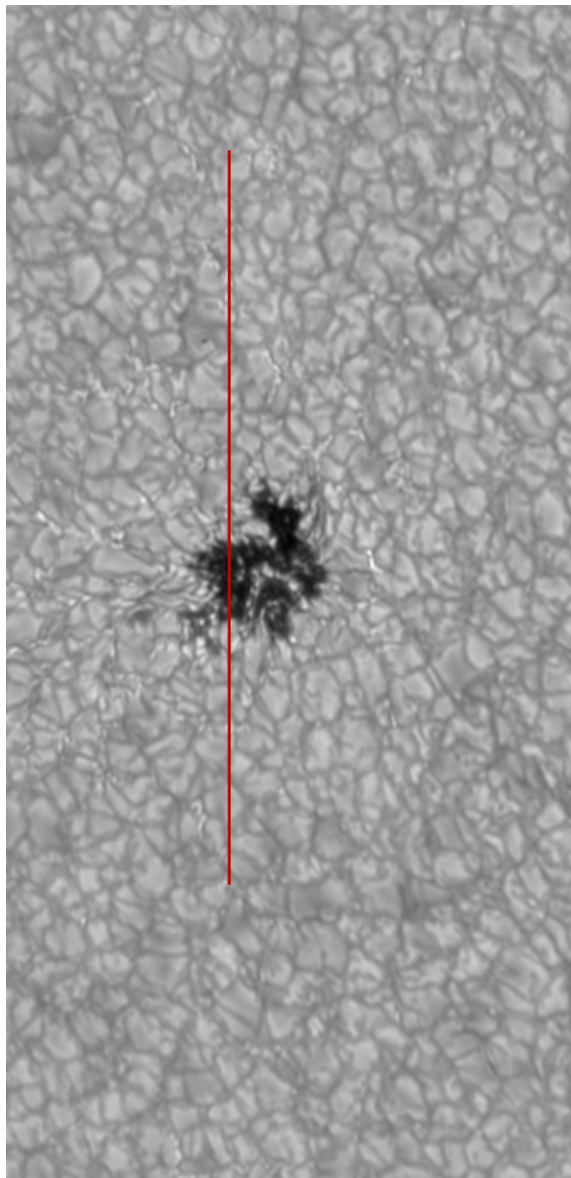


Vögler, *et al.*, 2003





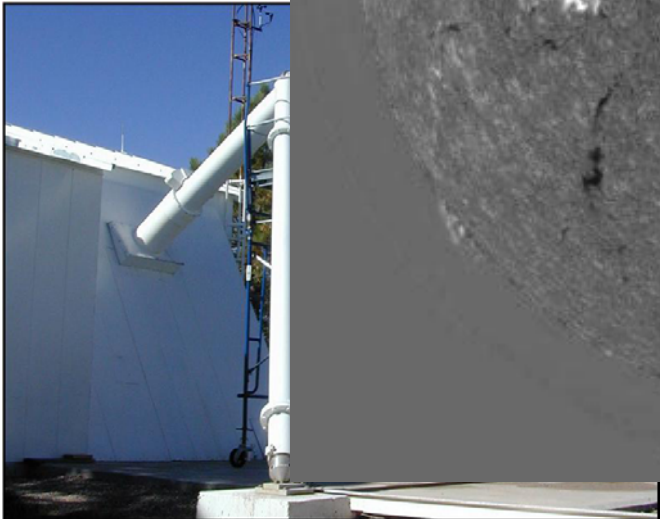
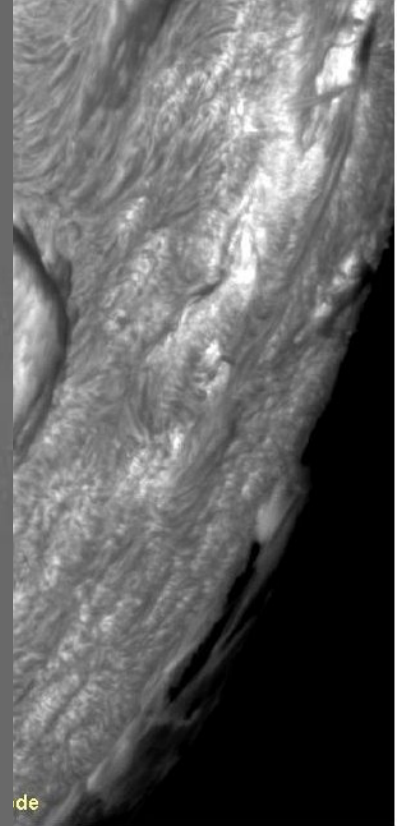
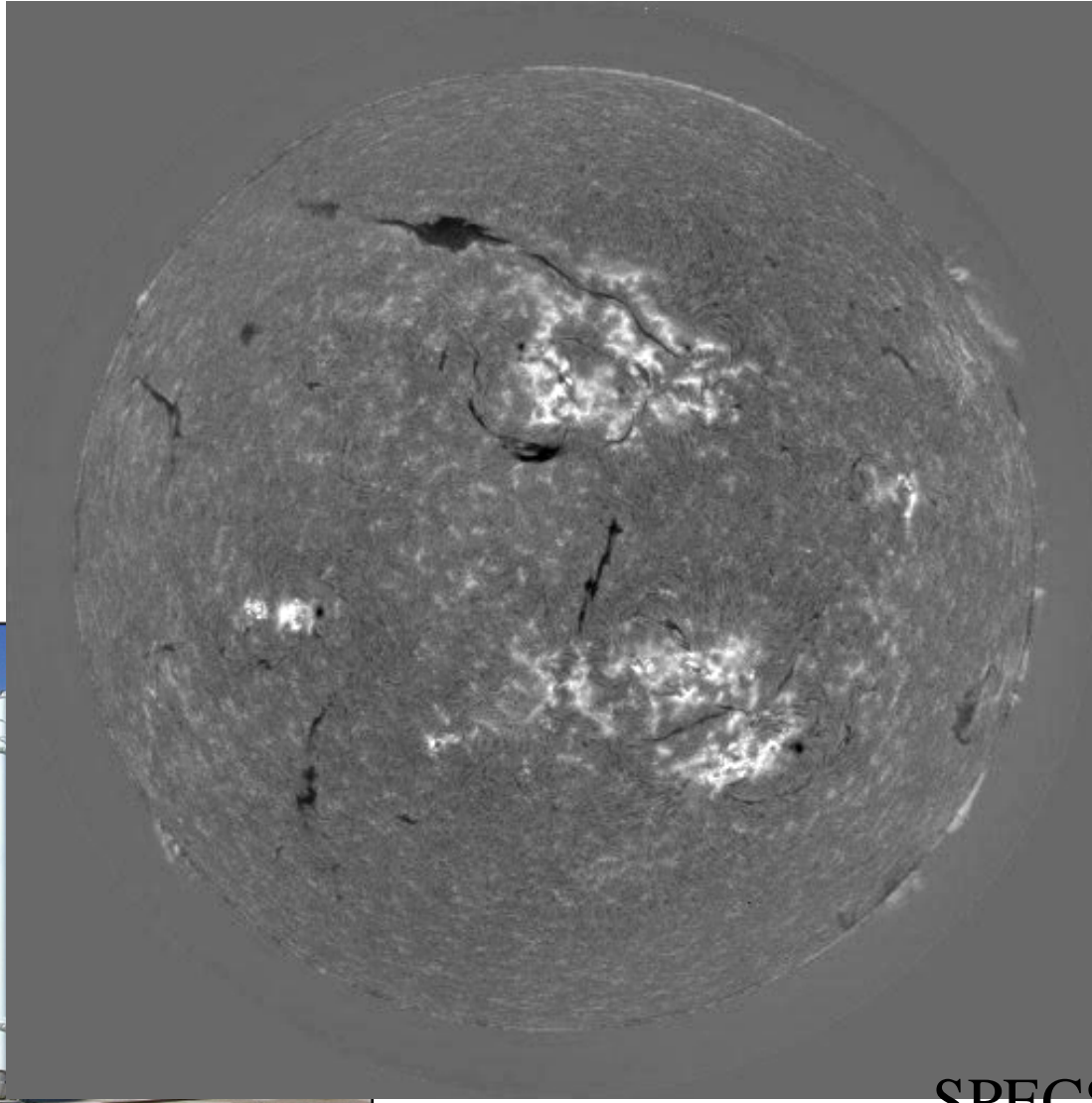




Stokes Q Profiles

IBIS Vector Polarimetry

O-SPAN Optical Solar Patrol Network



SPECS

Summary

- Many opportunities for ground based support from Sac Peak
- Design observing programs that are complementary to Solar-B:
- What is the best strategy? JOP? Bumping?