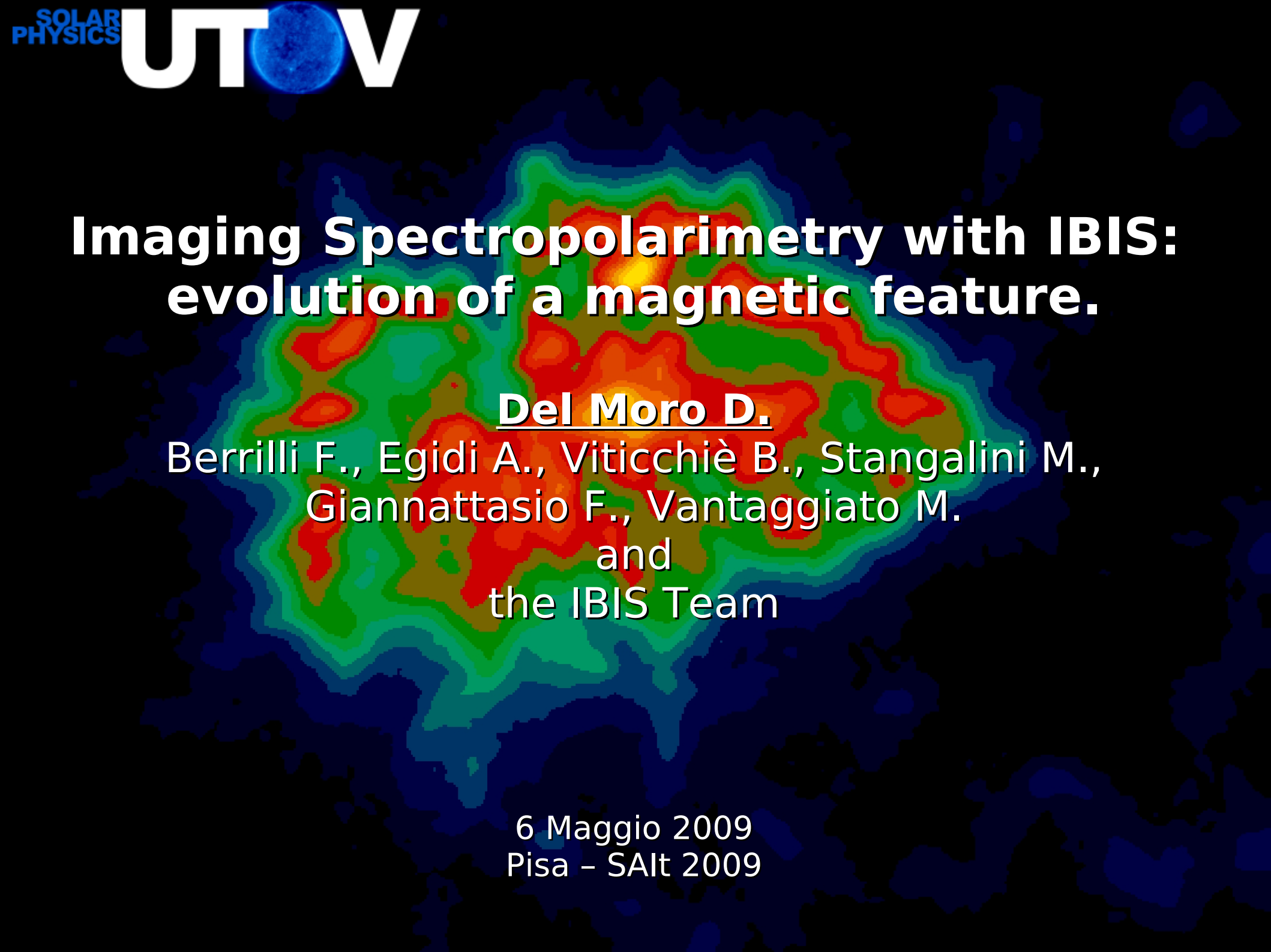

Imaging Spectropolarimetry with IBIS: evolution of a magnetic feature.

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Giannattasio F., Vantaggiato M.
and
the IBIS Team

6 Maggio 2009
Pisa – SAIt 2009

Outline

- Spectropolarimetry of Magnetic Features

- IBIS
  - a) Vector polarimetry upgrade
  - b) Dual-beam polarimetry

- Observations
  - a) AR 11005
  - b) Dataset
  - c) Data calibration & restoring

- Data Analysis
  - a) Total linear and Total circular polarization
  - c) 3 and 5 minutes waves maps
  - d) Correlation between 3min and Linear Polarization

- Conclusions

2D Spectropolarimetry of Magnetic Features

Many related unresolved problems:

- Monolithic vs “Spaghetti” model
  - Study of umbral dots and Light Bridges

- Energy Storage
  - a) Moat Flow
  - b) Moving Magnetic Features

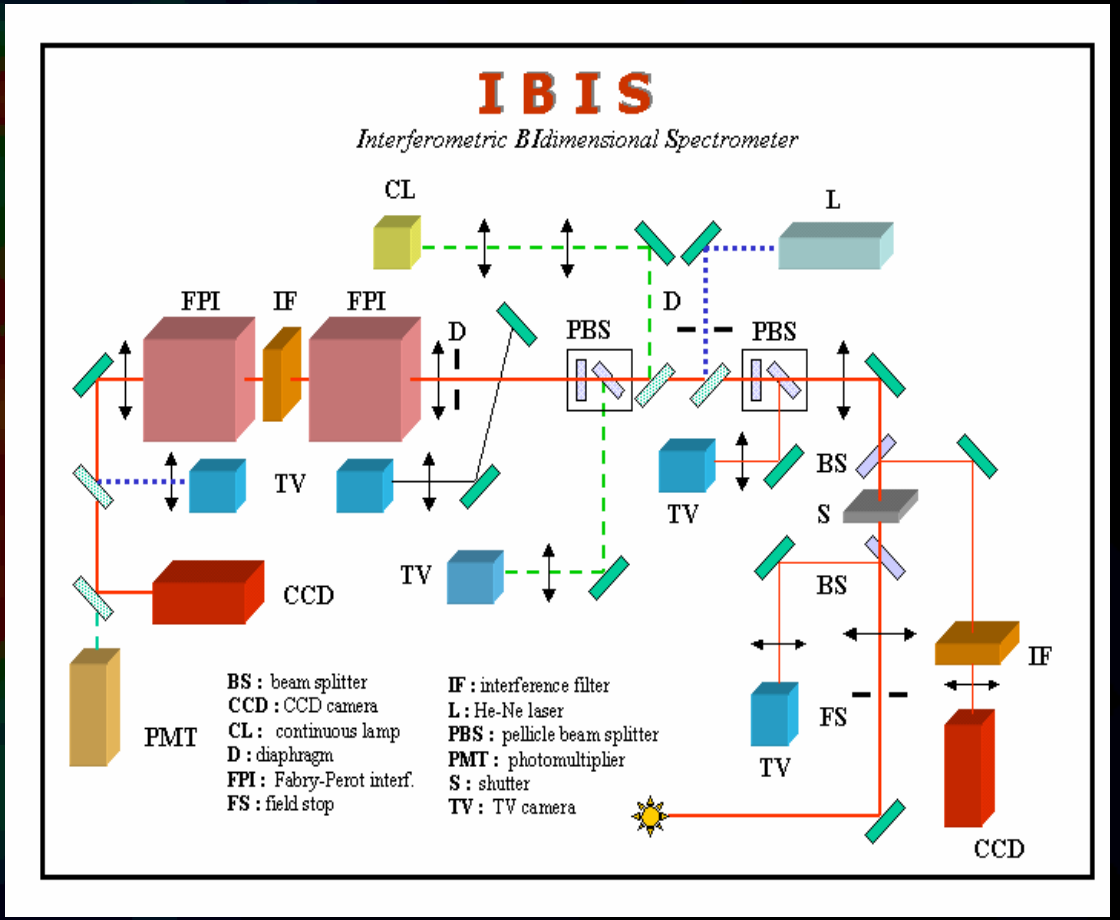
- Wave propagation in Magnetized Plasma
  - a) Magnetic Portals
  - b) Magneto-Acoustic Waves

IBIS
Interferometric Bidimensional Spectrometer

In spectropolarimetric mode, the incoming light to IBIS is modulated by a pair of liquid crystal variable retarders placed in a collimated beam upfront the field stop of the instrument.

The light is analyzed by a beam splitter in front of the detector, imaging two orthogonal states onto the same chip thus allowing for dual-beam spectropolarimetry.

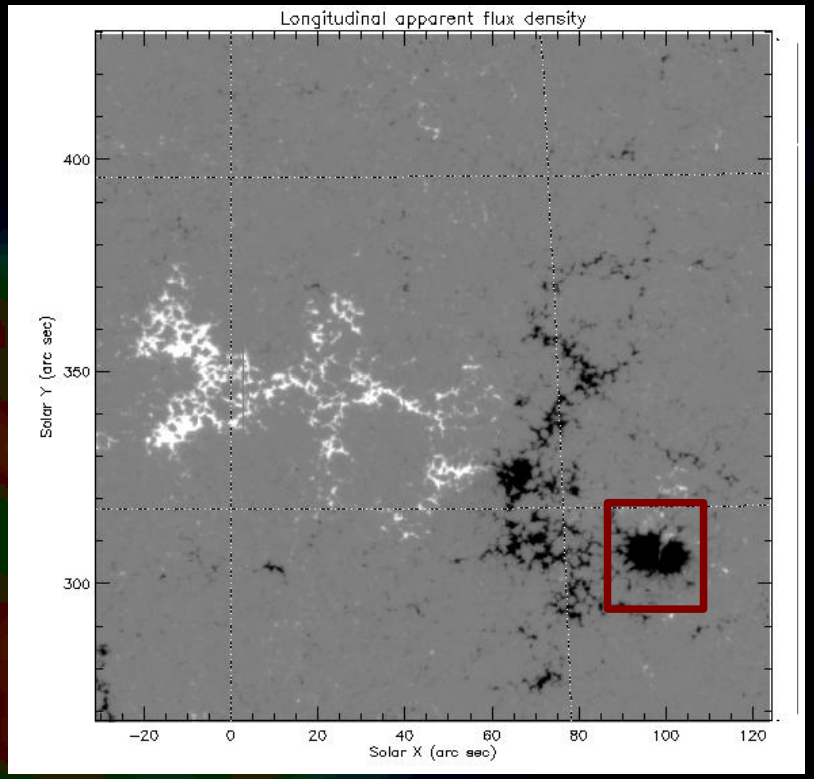
The modulation is in such a way that at each wavelength position six modulation states I + S (and its orthogonal states I – S) are detected with the following temporal scheme:
S = [+Q, +V, -Q, –V, -U, +U].

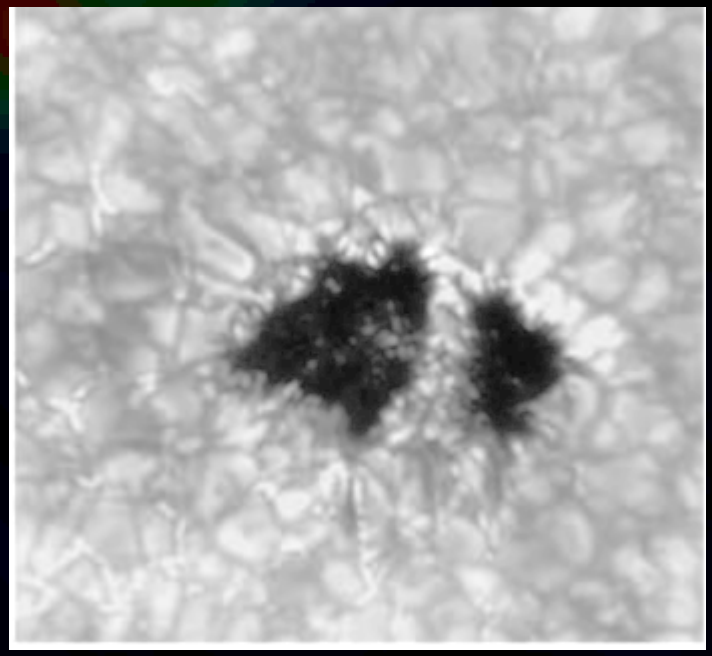


Observations

on October 15, 2008
from 16:34 UT to 17:43 UT

NOOA 11005 [25.2N, 10.0W]



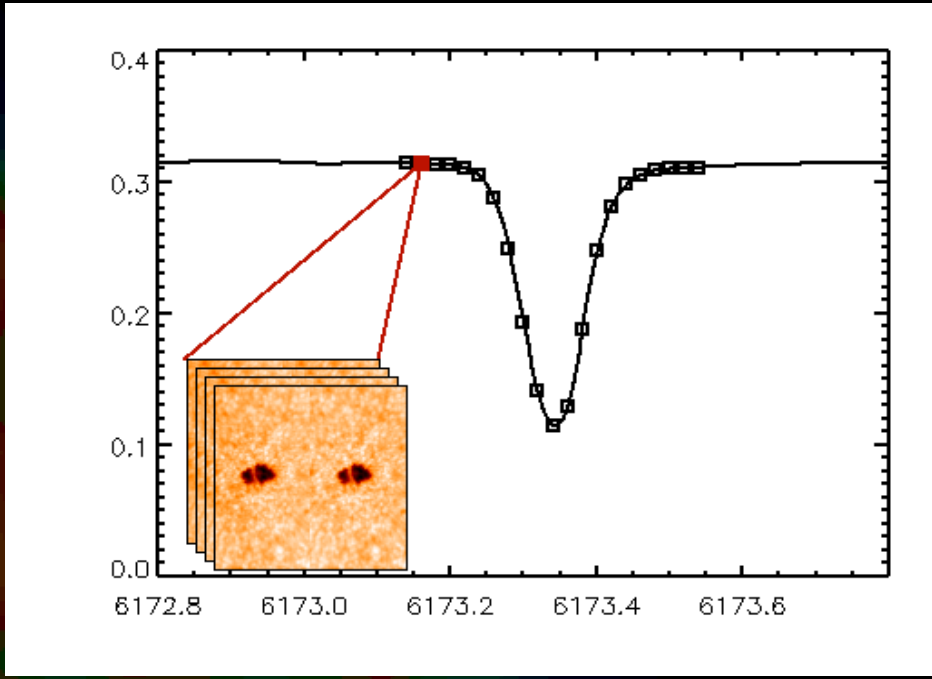


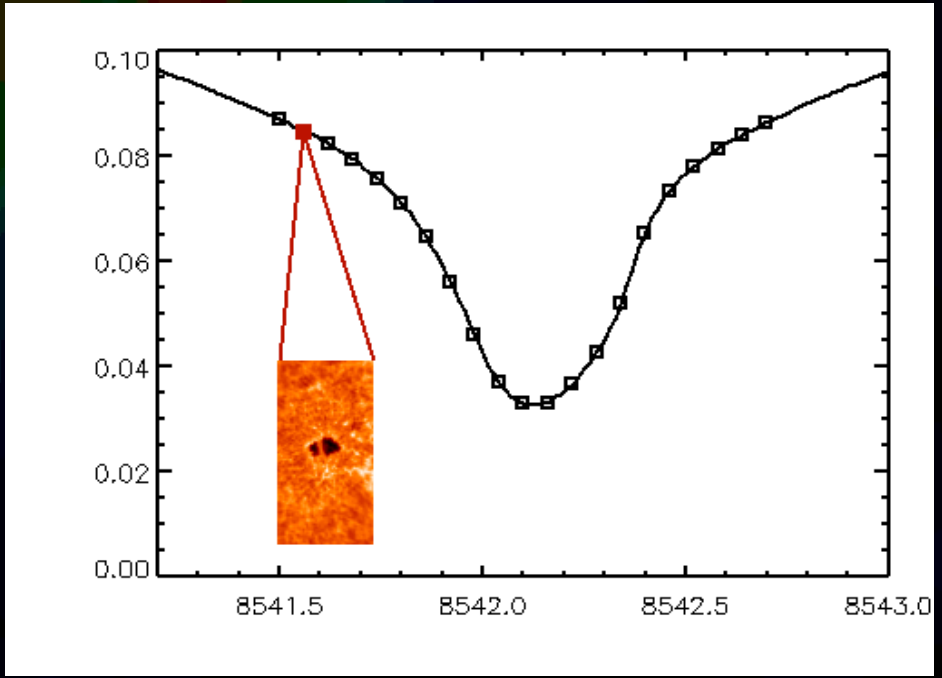
Dataset

Every 52 s:
147 Broad-band images
147 G-band images

21 point Full-Stokes scan of
Fe I 617.3 nm

21 point I-only scan of
Ca II 854.2 nm



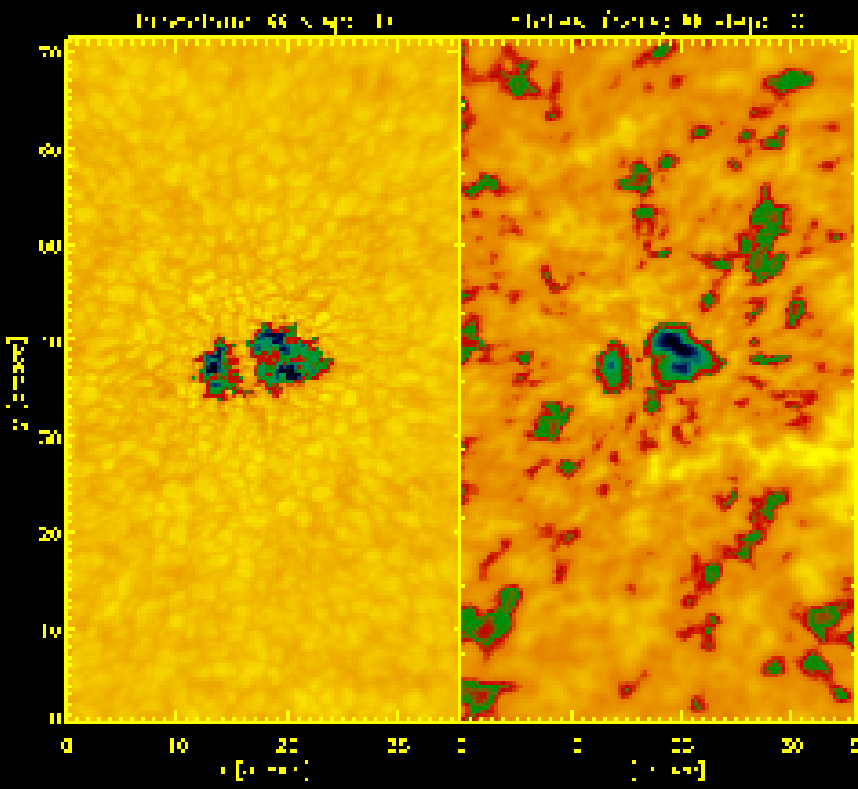


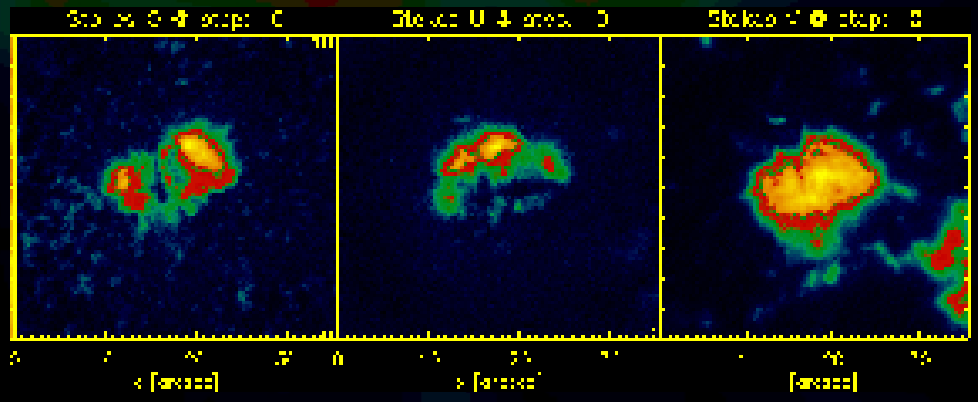
Data reduction and restoring

MFBD for Broad-band images
MFBD for G-band images

Spectropolarimetric calibration
+ de-stretching
for Full-Stokes scans of Fe I 617.3 nm

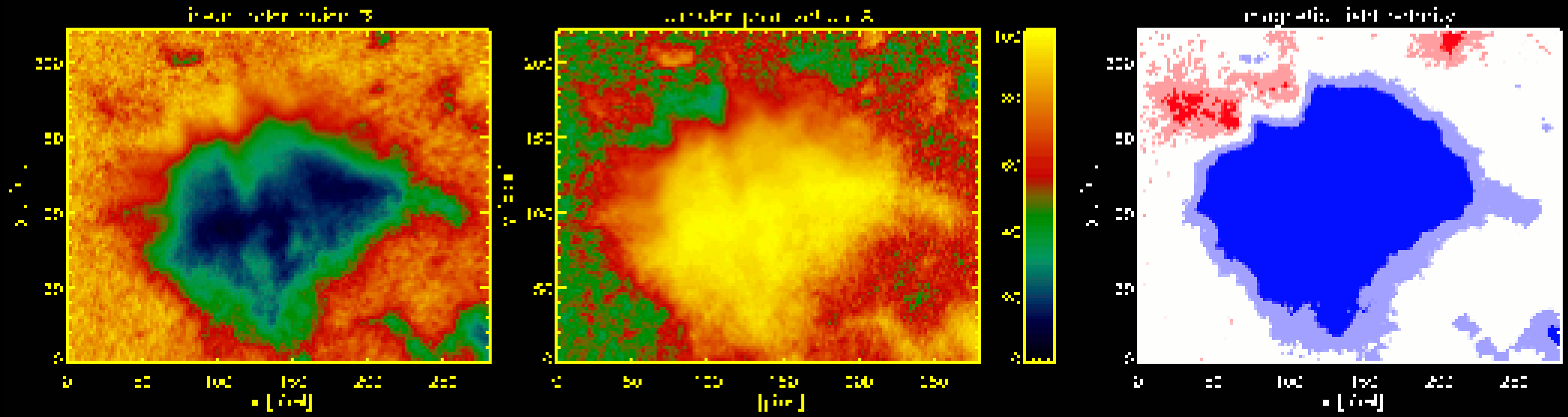
Spectral calibration
 + de-stretching
for I-only scans of Ca II 854.2 nm





Data Analysis

Magnetic Field Vector retrieval

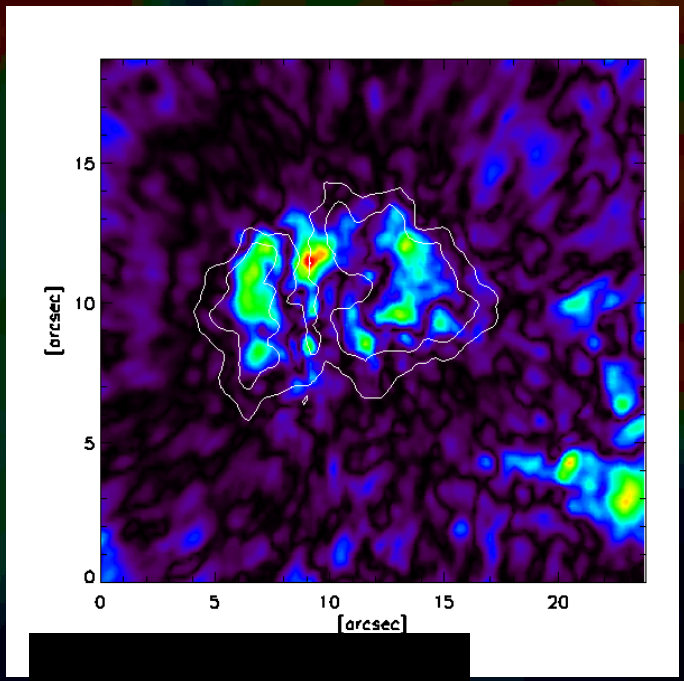


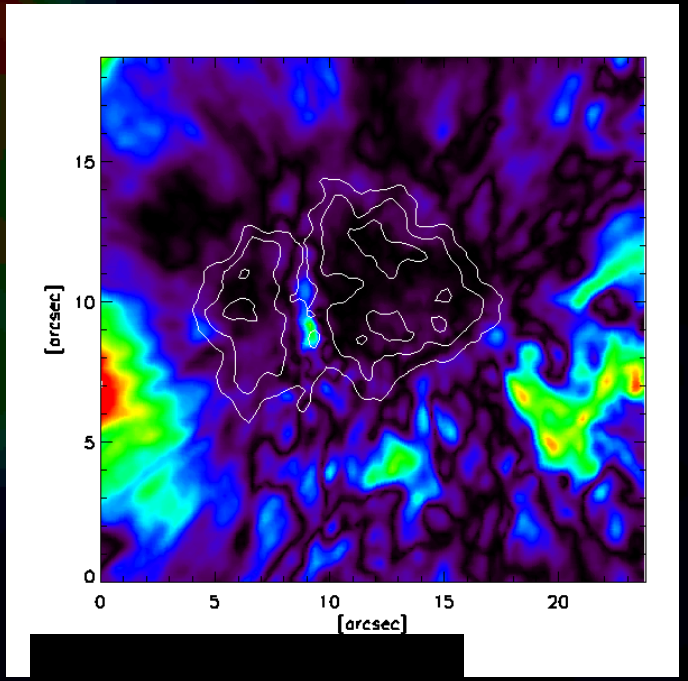
Total Linear polarization Circular polarization Magnetic field polarity

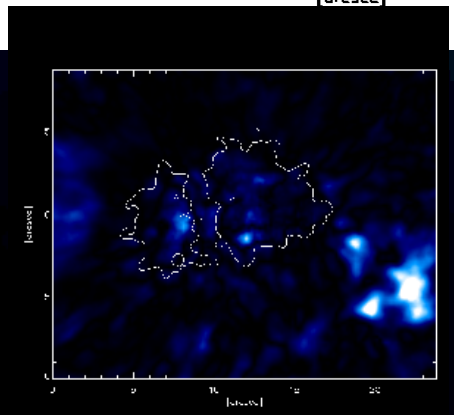
Data Analysis

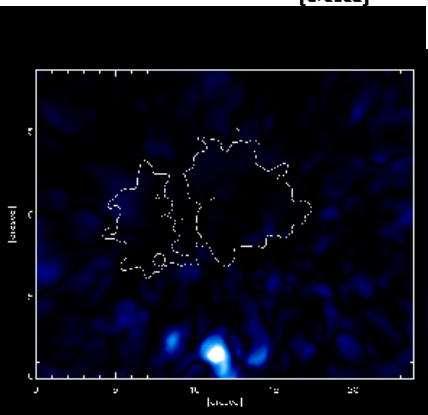
3 and 5 minute waves maps

From correlation of
Fe I Dopplergrams
vs
Ca II Dopplergrams



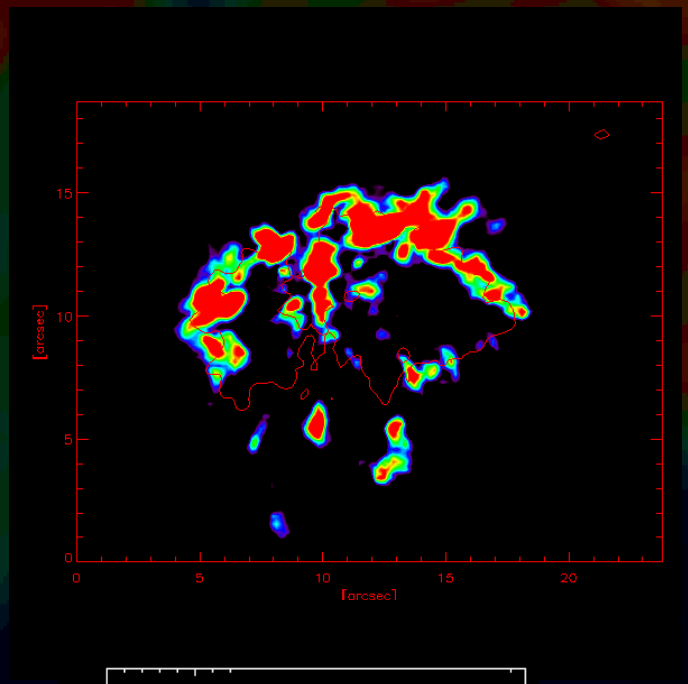


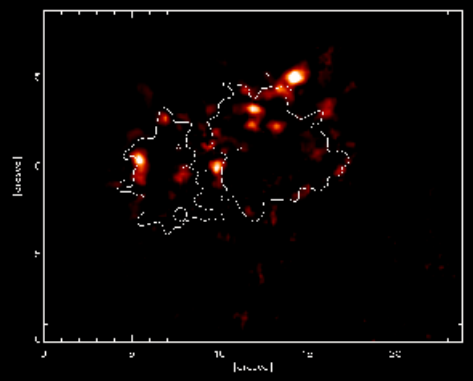




Data Analysis

Correlation between 3 minutes and linear polarization





Candidate sites for fast magneto-acoustic wave propagation

Conclusions

- The spectropolarimetry of Magnetic Features with high time cadence offers new analysis tools to the astrophysics

- Some of the results have been already submitted

- A new promising dataset is ready for analysis

References

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