A ZIMPOL polarimeter system installed at GREGOR in Tenerife, first results.

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Outline

- Scientific goal
- Instrumentation
- Observations
- Perspectives
Scientific goal

- Explore with better spatial resolution the Second Solar Spectrum

- Investigating other scientific fields requiring high spatial and polarimetric resolution (Hanle effect, forward scattering Hanle effect, Zeeman, Hanle–Zeeman, other)
Instrumentation

- **Polarimeter**: ZIMPOL allows high polarimetric resolution ($<10^{-5}$)

- **Currently** ZIMPOL is regularly used for spectro-polarimetric observations at IRSOL, telescope aperture 45 cm

- **Experience with ZIMPOL installed on larger telescopes**: already performed campaigns (J.O. Stenflo group + IRSOL staff) at Kitt Peak, Sac Peak, SST La Palma, THEMIS

- **Current project**: observing with ZIMPOL at GREGOR in Tenerife (1.5 m aperture, collaboration KIS, MPS, IAP)
Example of an observation at IRSOL

Forward scattering polarization Hanle effect (Trujillo Bueno, 2001) in the Ca i 4227 Å line measured at IRSOL (Anusha et al. 2011)

Long exposure time
(~20 minutes)
near an active region

(50 arcsec)
Instrumentation: ZIMPOL principle

Modulation - demodulation principle:

\[ \vec{S}, \vec{S}_{Tel}, I(t), \vec{I}_4 \]
Spectro-polarimetry with GREGOR

The calibration unit is located before the first folding mirror, thus in a place with faint, almost zero (?) instrumental polarization.

Entrance of the spectrograph

M3, M4, plate, M5, M6, M7, plate, (derotator), M11, AO mirrors, pentaprisim
The system works!

Sr I and Fe I at 4607 Å

Measured at x=843” y=173” in an active region

Exposure time 60 sec
Example: \( \text{Sr} \, \text{I} \, 4607 \, \AA \)

Observed near the limb at \( x=976\,'' \, y=179'' \)

Stokes profiles averaged over 2''

exposure time: 60 sec
Topics investigated in October 2014

- Producing 2D forward scattering Hanle effect maps in order to investigate the chromospheric magnetic field (E. Carlin, and al.)

- Investigating V/I signatures measured close to the limb in chromospheric lines (L. Belluzzi, and al.)
Foreseen improvements

- ZIMPOL parallelization: exposure and digitalization

- At GREGOR:
  - Derotator (foreseen 2015)
  - Adaptive Optics working in a stable way near the limb
  - Instrumental scattered light to be reduced (new mirrors coating)
Thank you for your attention

Thank you Bruce and collaborators for organizing this IAU Symposium
Scattering polarization peak of a MgH line with an amplitude of $1.6 \times 10^{-5}$.