



# THEMIS solar telescope: A new era begins!

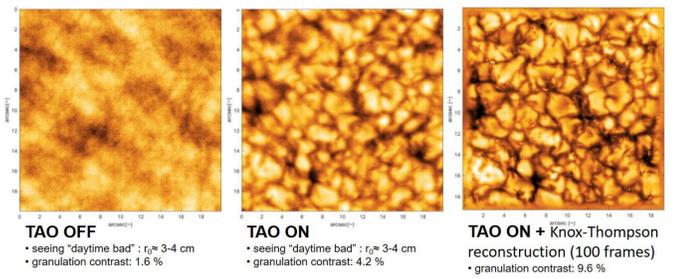
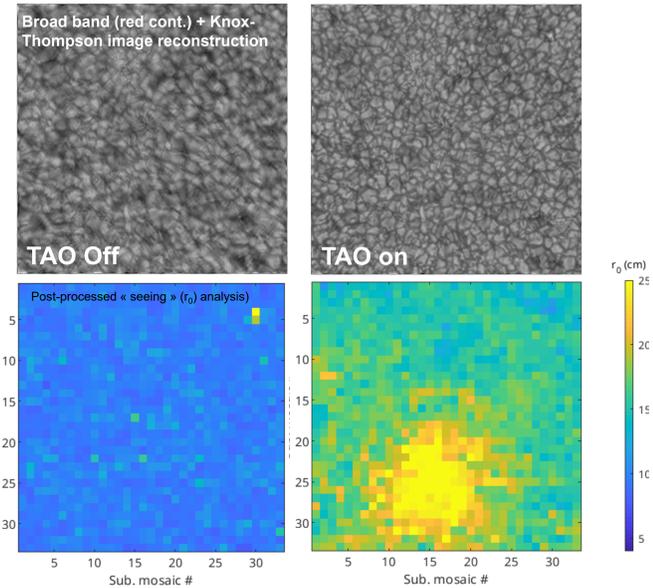
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**THEMIS** (Rayrole et al. 85), the French 1-m class solar telescope, has benefited from profound renovations and modification of its light path over the last 10 years (Gelly et al. 16). Thanks to a state-of-the-art solar adaptive optics, THEMIS observations can now reach the diffraction limit at 0.15", enabling to resolve details on the scale of 100 km on the Sun. THEMIS spectro-polarimetric mode has also been renewed, providing unprecedented observations by THEMIS

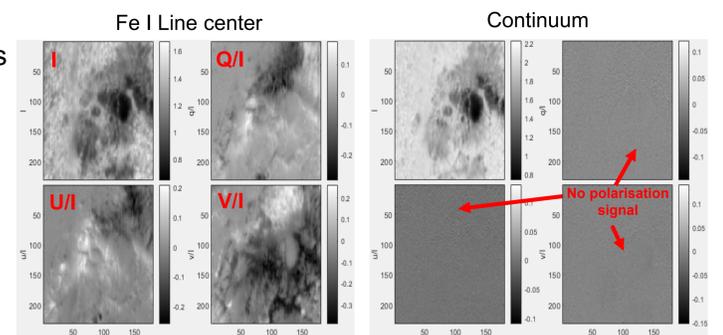
## THEMIS Adaptive Optics:

- "Classical" single-deformable mirror (DM) AO
- **TAO uses innovative wavefront sensing and mirror commanding concepts** (Tallon et al. 22, Thiebaut et al. 22)
- Specifications
  - 76 sub-aperture Shack-Hartmann WFS
  - Optical-path-compatible 16mm DM
  - 97 actuators on DM
- TAO started from scratch in 2016
  - first light in December 2020
  - Closed AO loop on the Sun
  - Real time correction (RTC) running in CPU at 1250 Hz
- **With TAO, THEMIS is reaching its theoretical diffraction limit, of ~0.17" at  $\lambda \sim 650$  nm!**
  - resolution on the Sun: ~125 km

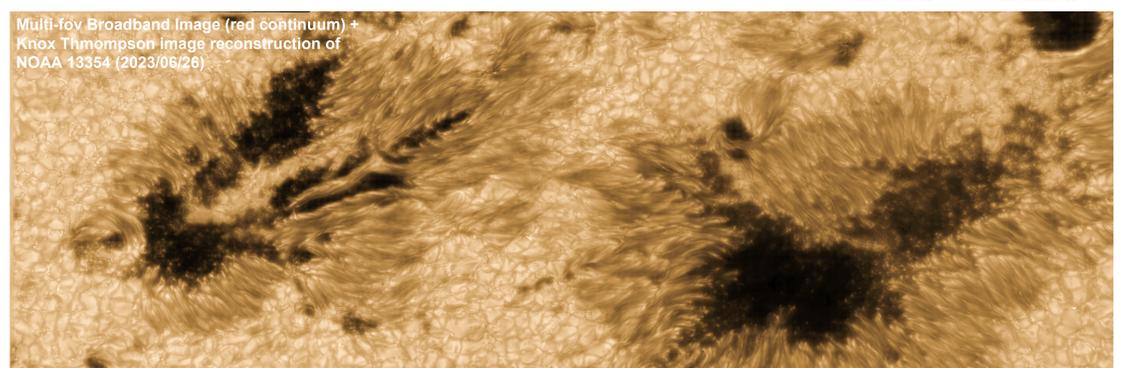
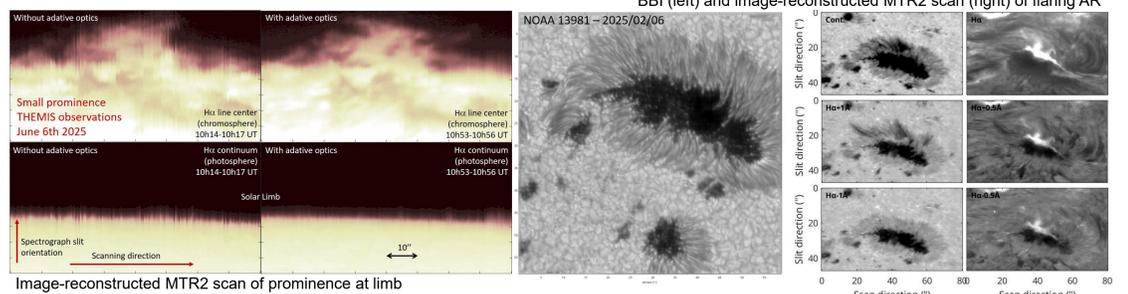


## Updated polarimetry

- New AO-compatible optical path
  - new transfert optics and new derotator
- **Superimposed dual-beam with beam exchange**
  - F1 : Polarization analyzer + double Savart plates
  - Wollaston prisms ahead of spectral cameras
- **THEMIS remains strongly a polarization-calibration-free telescope**
- Routine production of Stokes map (x, y,  $\lambda$ , S).
  - **B maps with spatial resolution < 0.5"**



## Recent highlights



Superimposed dual-beam polarimetric analyzer @ F1

New Transfer Optics & Derotator

Deformable Mirror

Field scanning mirror

to MTR2 spectrograph



<https://www.themis.iac.es>



THEMIS\_SOLAR

In the spring of 2026, a new synergic instrument is going to be installed and commissioned at THEMIS, the upgraded Italian spectro-imager "Interferometric Bldimensional Spectrometer (IBIS 2.0, Ermolli et al. 24)



TERRE & UNIVERS



FSLAC International Research Lab.



ATST Action Thématique Soleil-Terre

ASHRA Action Spécifique Haute Résolution Angulaire