First Results of Coordinated Observations from Hinode, IRIS and New Solar Telescope

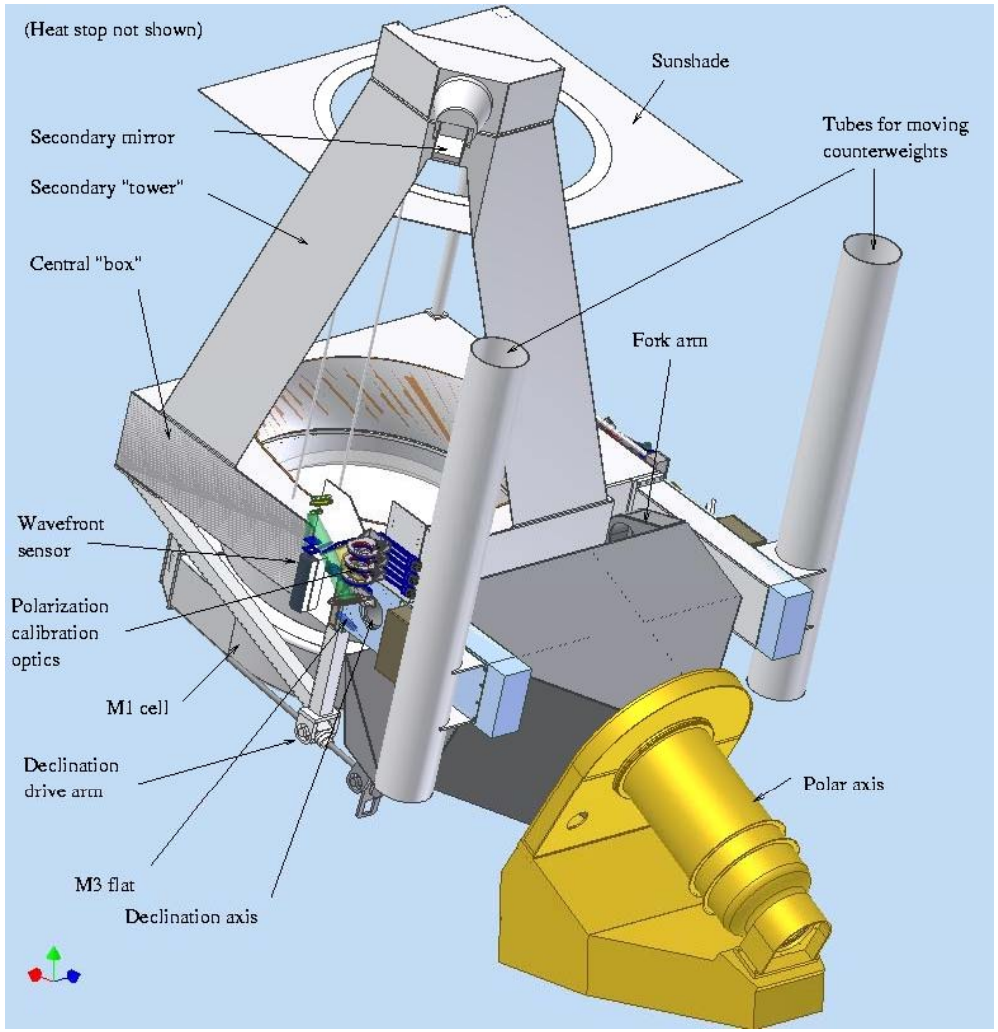
Alexander Kosovichev and BBSO Team

NJIT New Jersey's Science & Technology University

Big Bear Solar Observatory

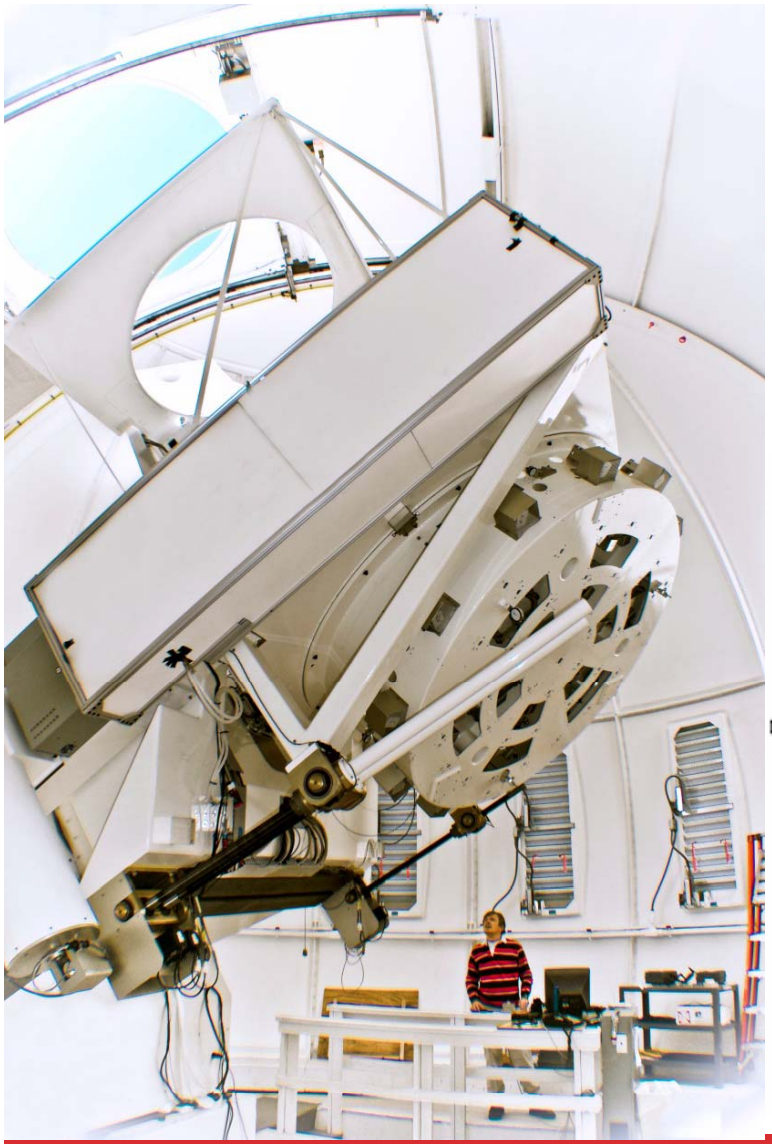
THE EDGE IN KNOWLEDGE

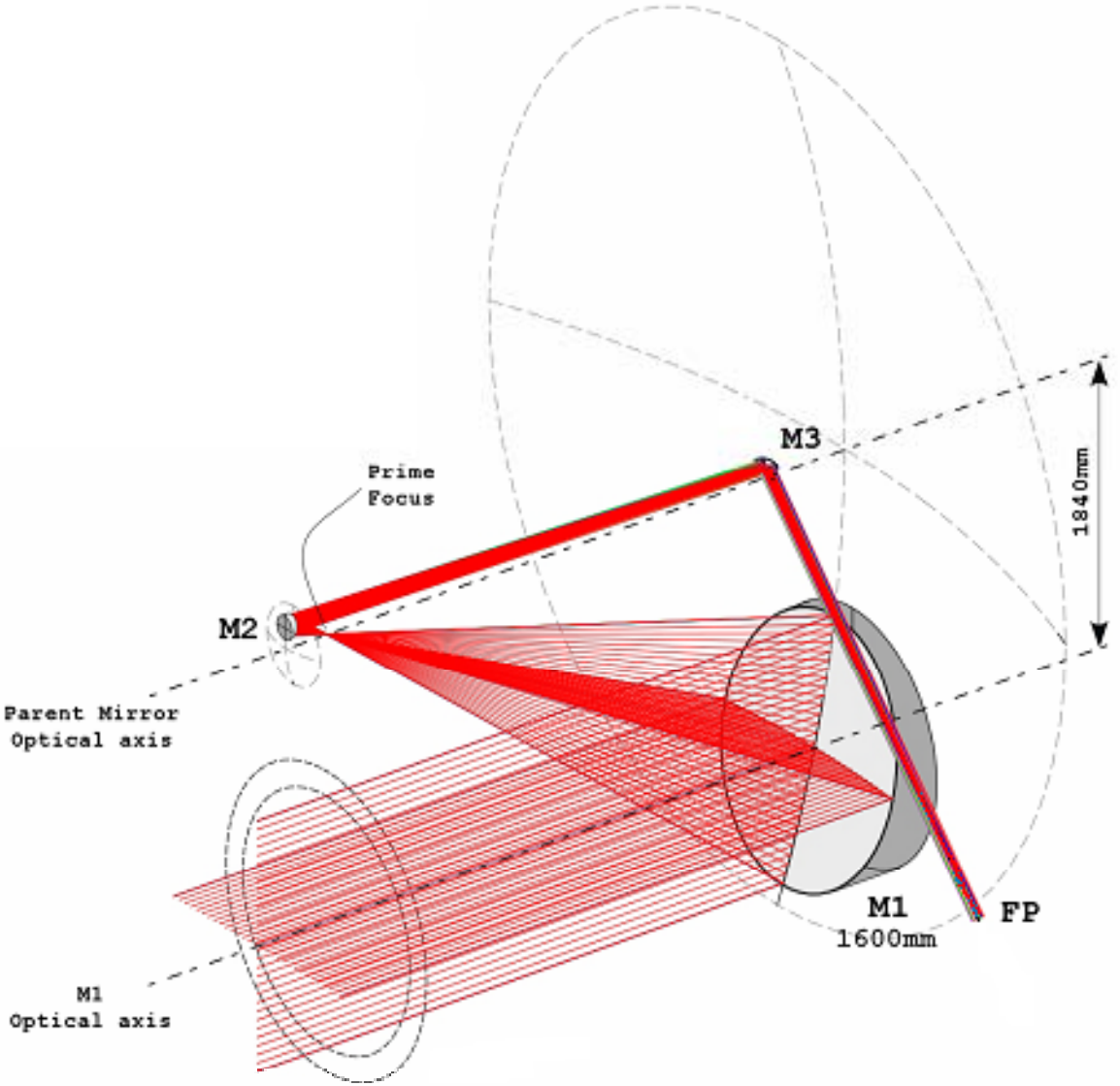
NST Main Features



- All reflecting, off-axis Gregorian optical configuration
- PM: 1.6 m clear aperture with f/2.4
- Figured PM to 16 nm rms
- Effective focal length: 83.2 m (f/52 at Gregorian focus)
- FOV: 2' in prime focus
- Wavelength range from 380 nm to 1.7 μm in Coudé lab with AO
- PM active thermally controlled
- Integrated active optics (ao) and adaptive optics (AO)
- Quasi-static telescope alignment
- Diffraction limited: 0.06″@ 500 nm and 0.2″@ 1.56 μm with AO
- WFS, polarization and calibration optics immediately before M3
- Facility-class instruments

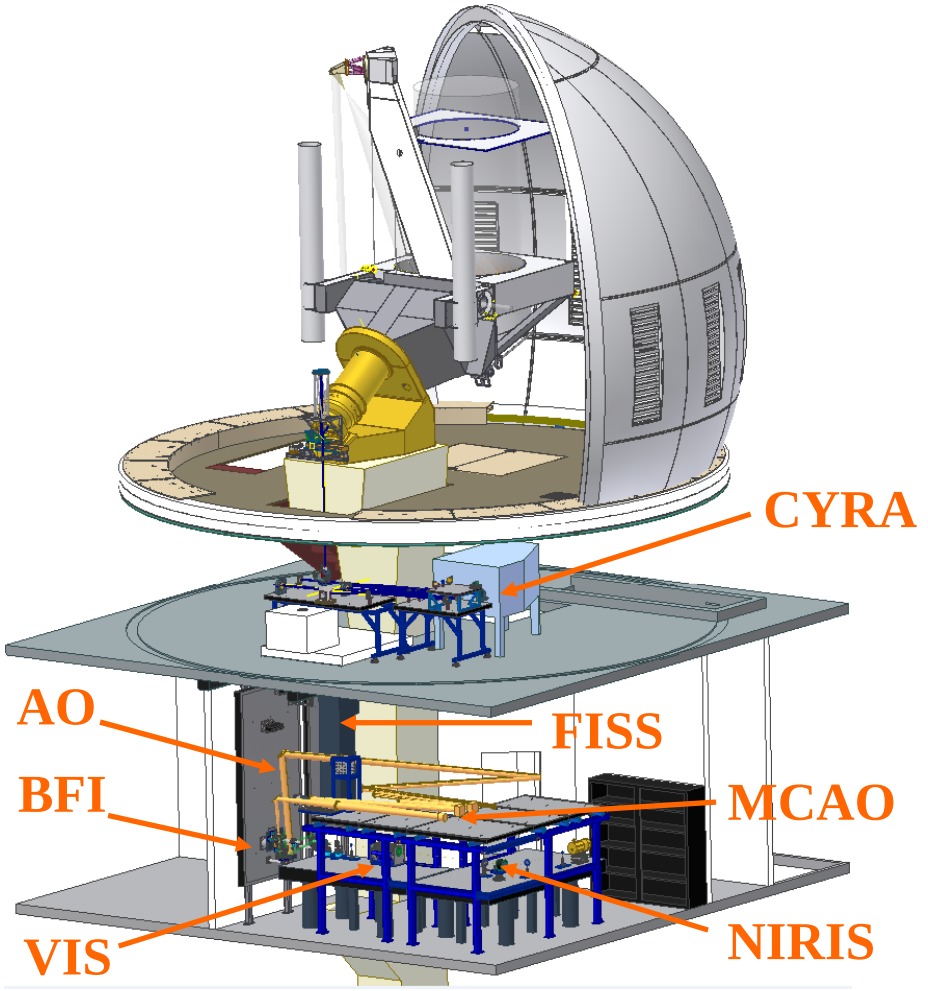
Off-Axis Telescope





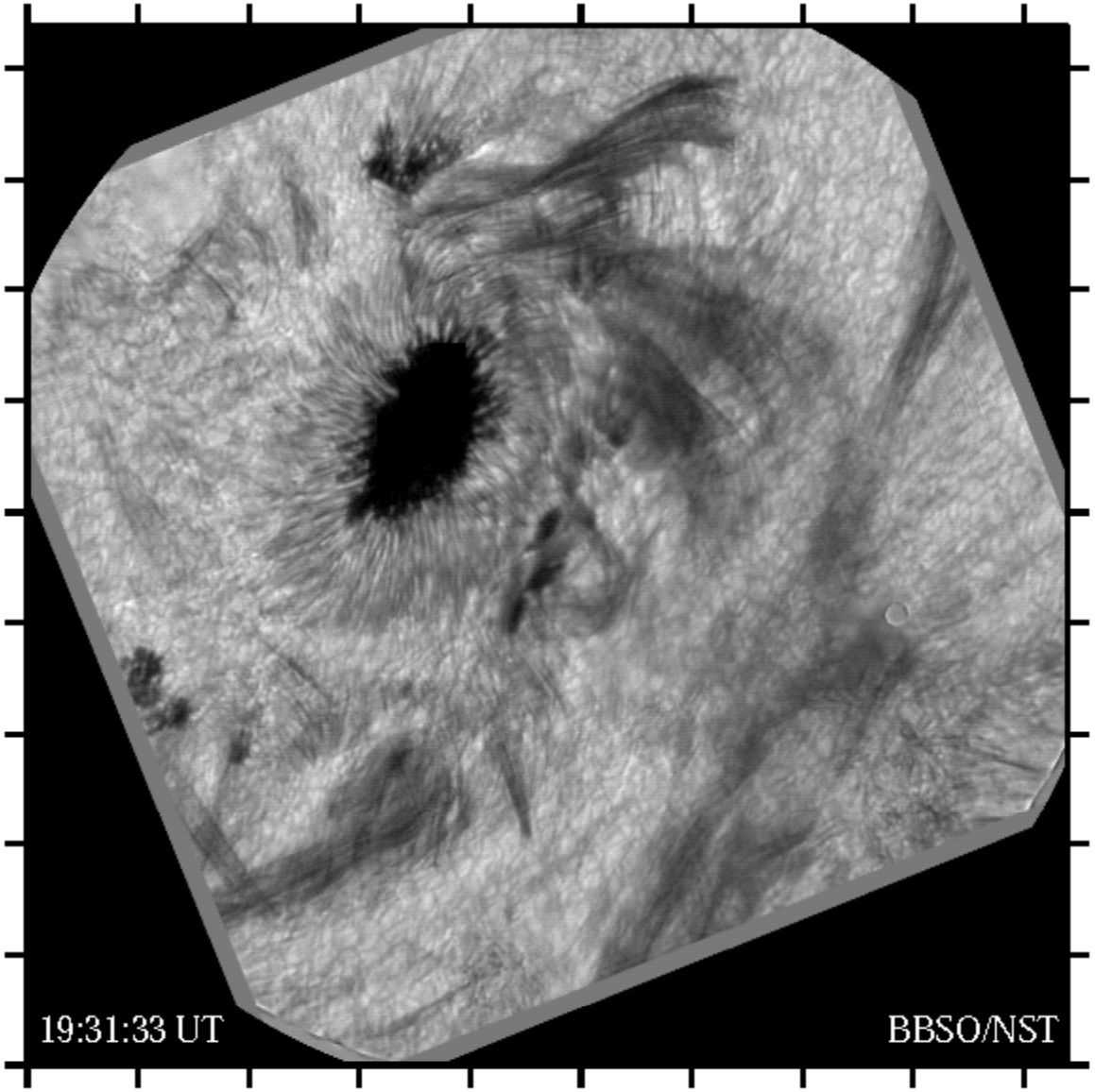
NST Scientific Instruments

- Adaptive Optics System (AO: AO-76, AO-308, MCAO)
- Visible Imaging Spectrometer (VIS)
- Near InfraRed Imaging Spectro-polarimeters (IRIM, NIRIS)
- Cryogenic Infrared Spectrograph (CYRA)
- Broad-band Filter Imager (BFI)
- Fast Imaging Solar Spectrograph (FISS)

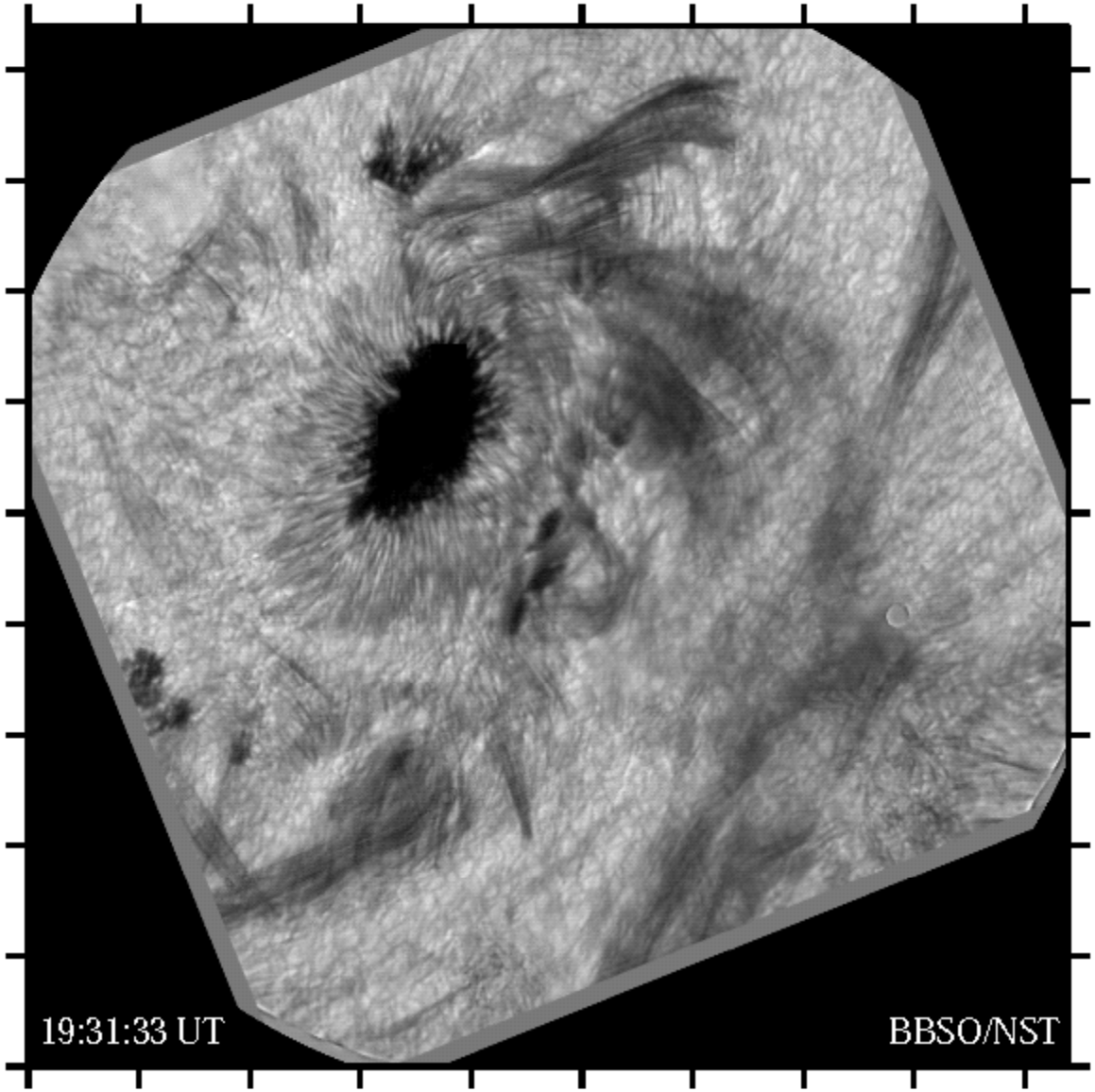


Example: M1.2 flare in He I 10830

7/5/2012



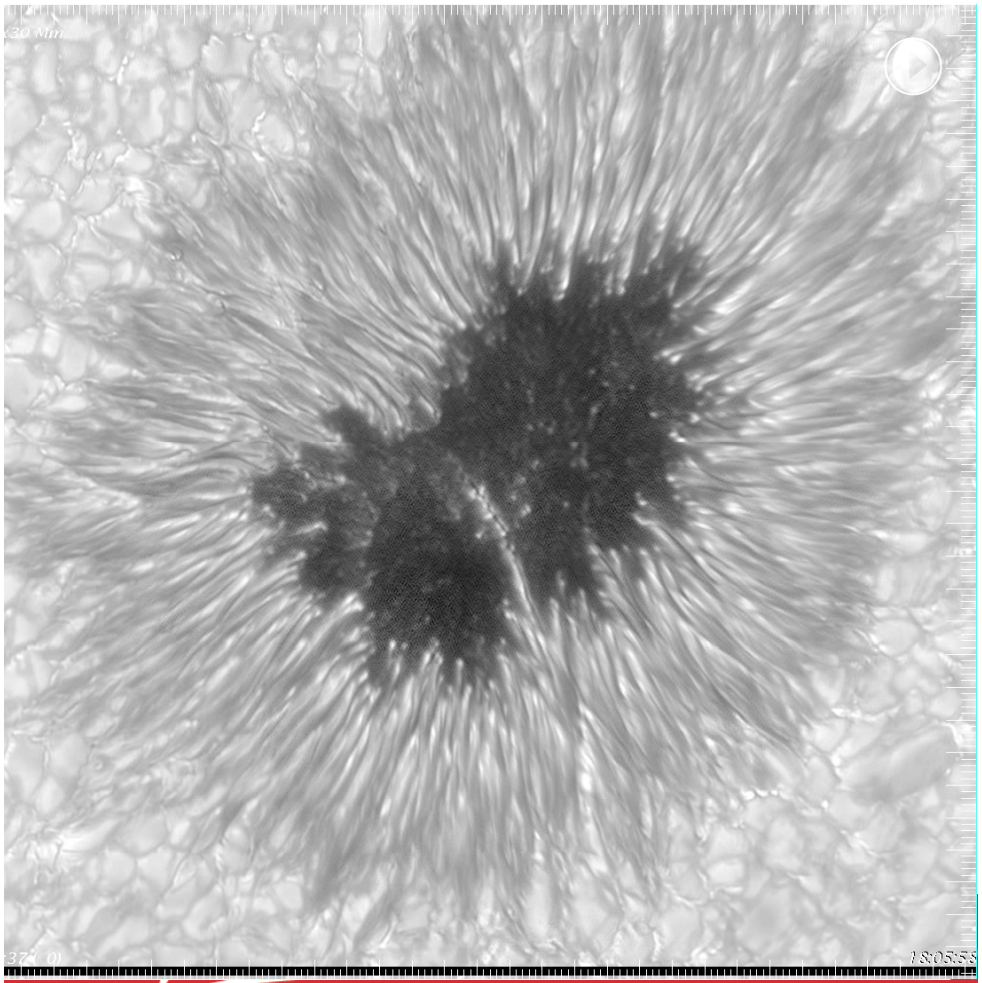
7/5/12
1083nm
--Flaring

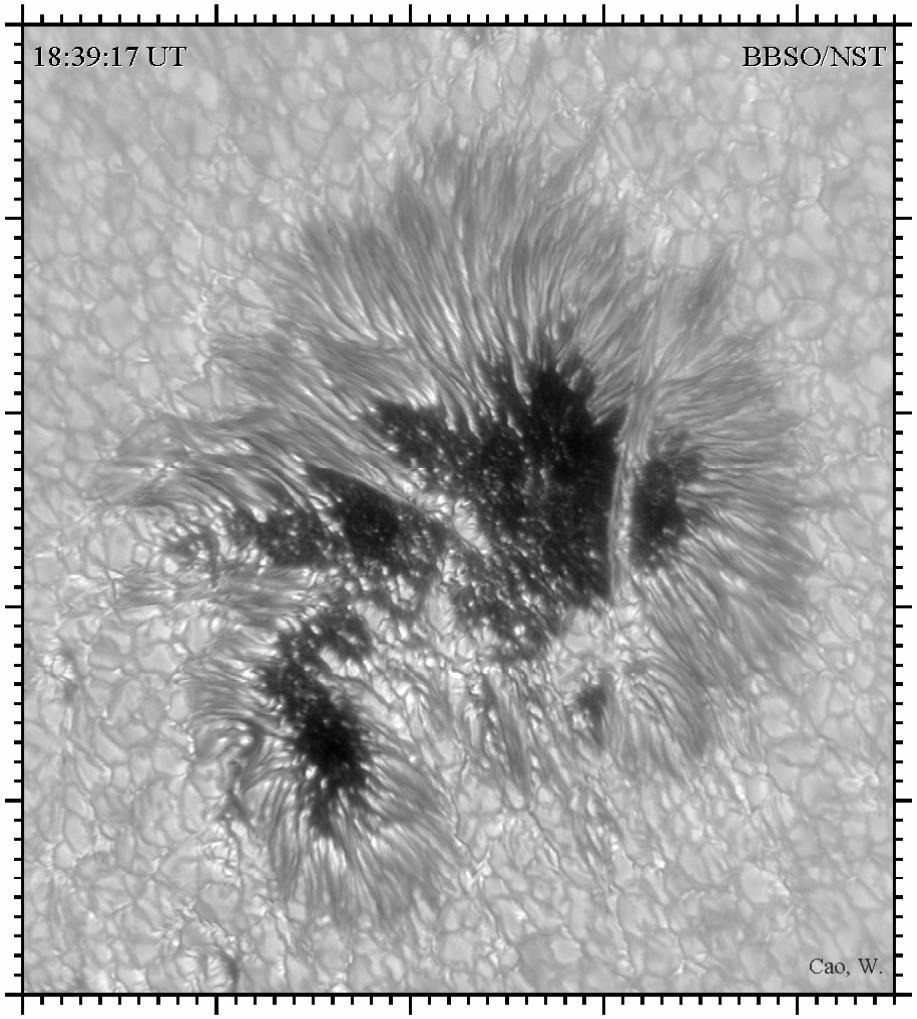


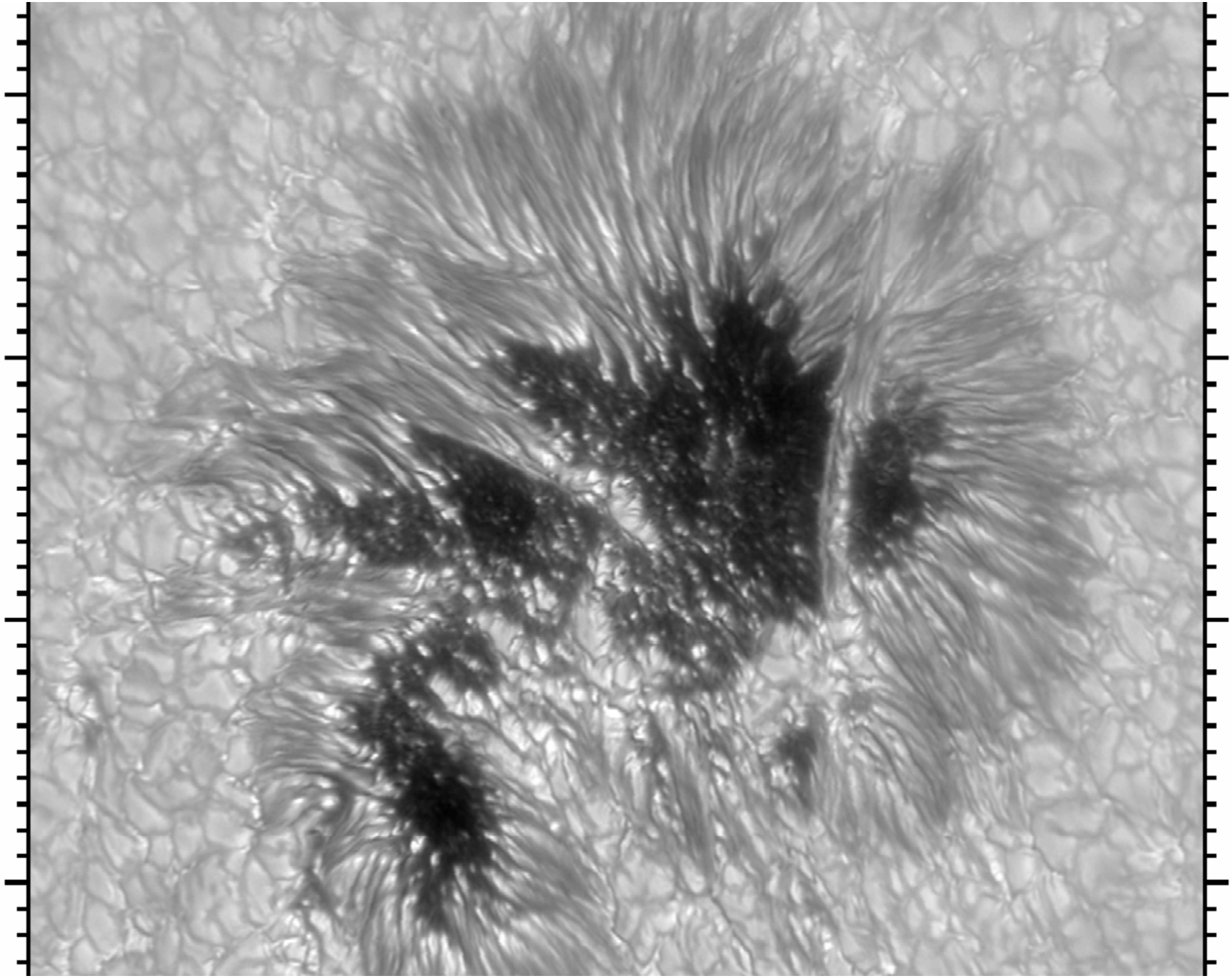
Initial Joint NST-IRIS-Hinode Program

- **Broad-band Filter Imager** (BFI) **:**
  - TiO (7057A) 15-sec cadence (“bursts” of 150 images)
- **Visible Imaging Spectrometer (VIS):**
  - H-alpha scans (5 positions, - 0.8, -0.4, 0, 0.4, 0.8 A)
  - 15-sec cadence

Photospheric observations (TiO filter)
AO-76 (2012) vs. AO-308 (2013)

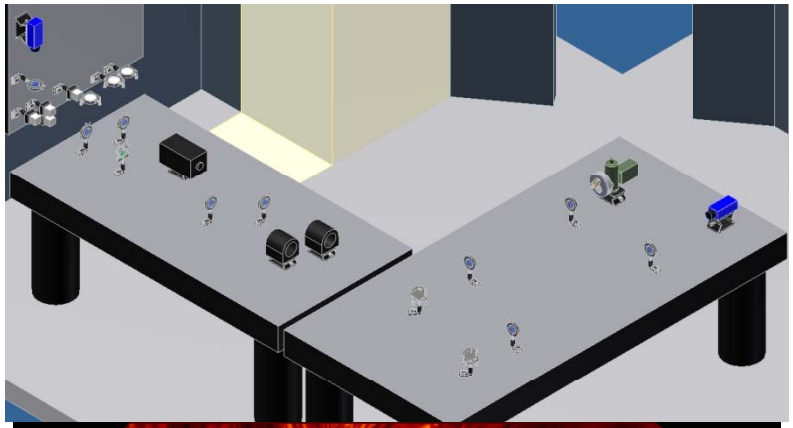


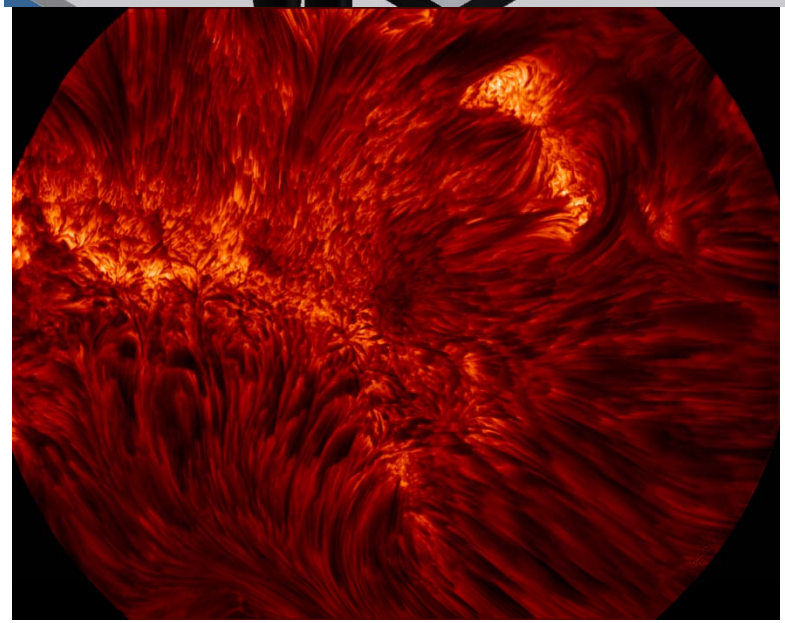




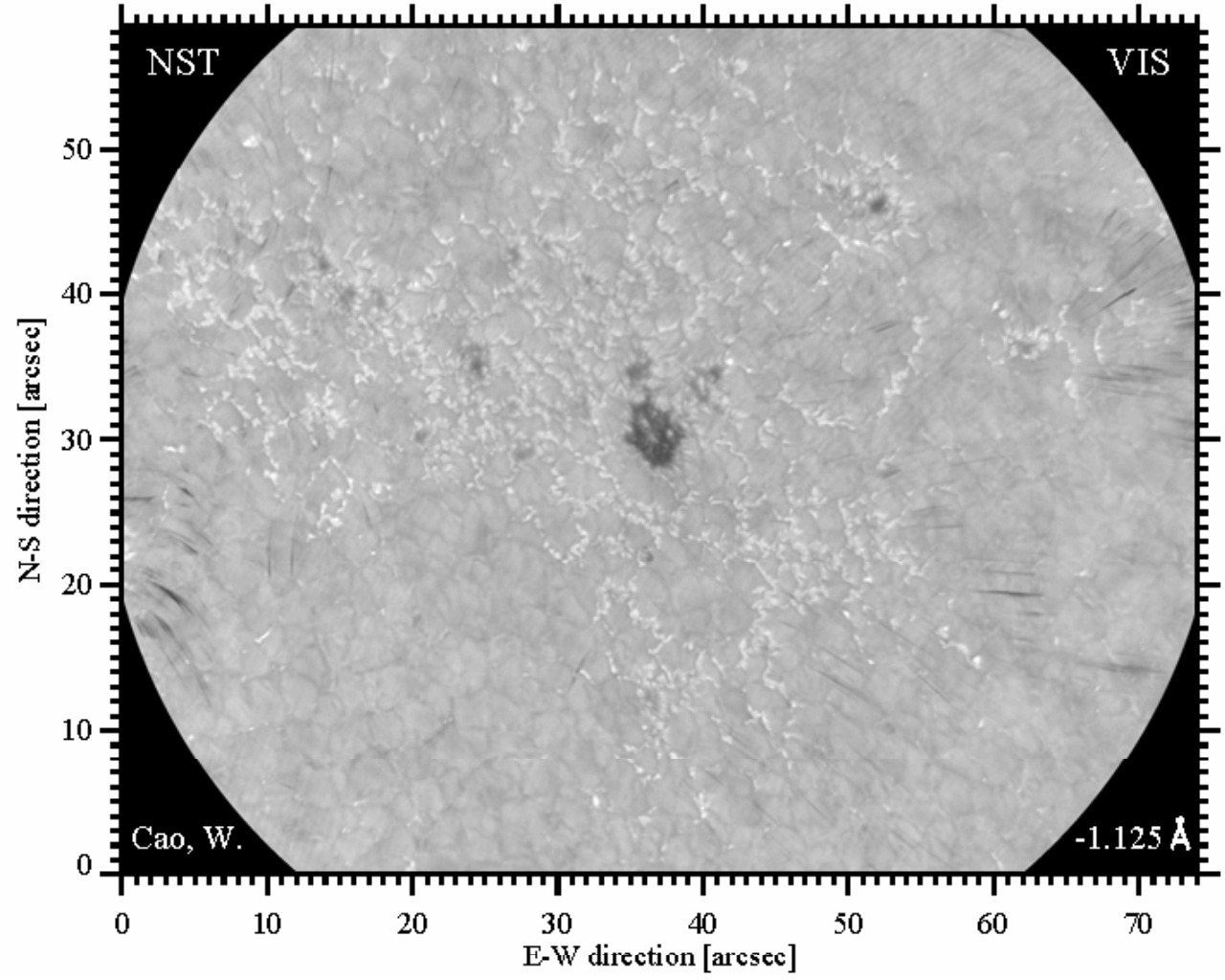
Visible Imaging Spectrometer

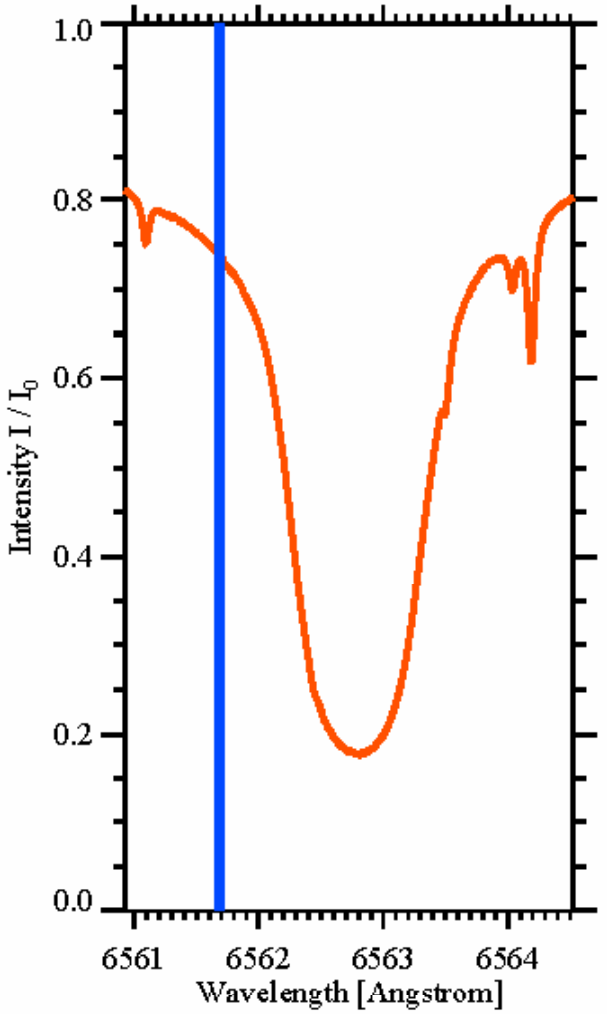
- Single Fabry-Pérot etalon (D = 70 mm) plus narrow band interference filter
- Wavelength coverage: 550 – 700 nm
- Band pass: 5.8 pm
- Telecentric optical configuration
- Field of view: 70” by 64”
- Available spectral lines:
  - Hα (656.3 ± 0.15 nm)
  - Fe I (630.2 ± 0.15 nm)
  - NaD_2 (588.9 ± 0.15 nm)
    - more lines coming as needed ...
- High speed computer with SSD HDs
- Spectroscopy cadence: a 11 points scan with multi-frames selection: < 15 s





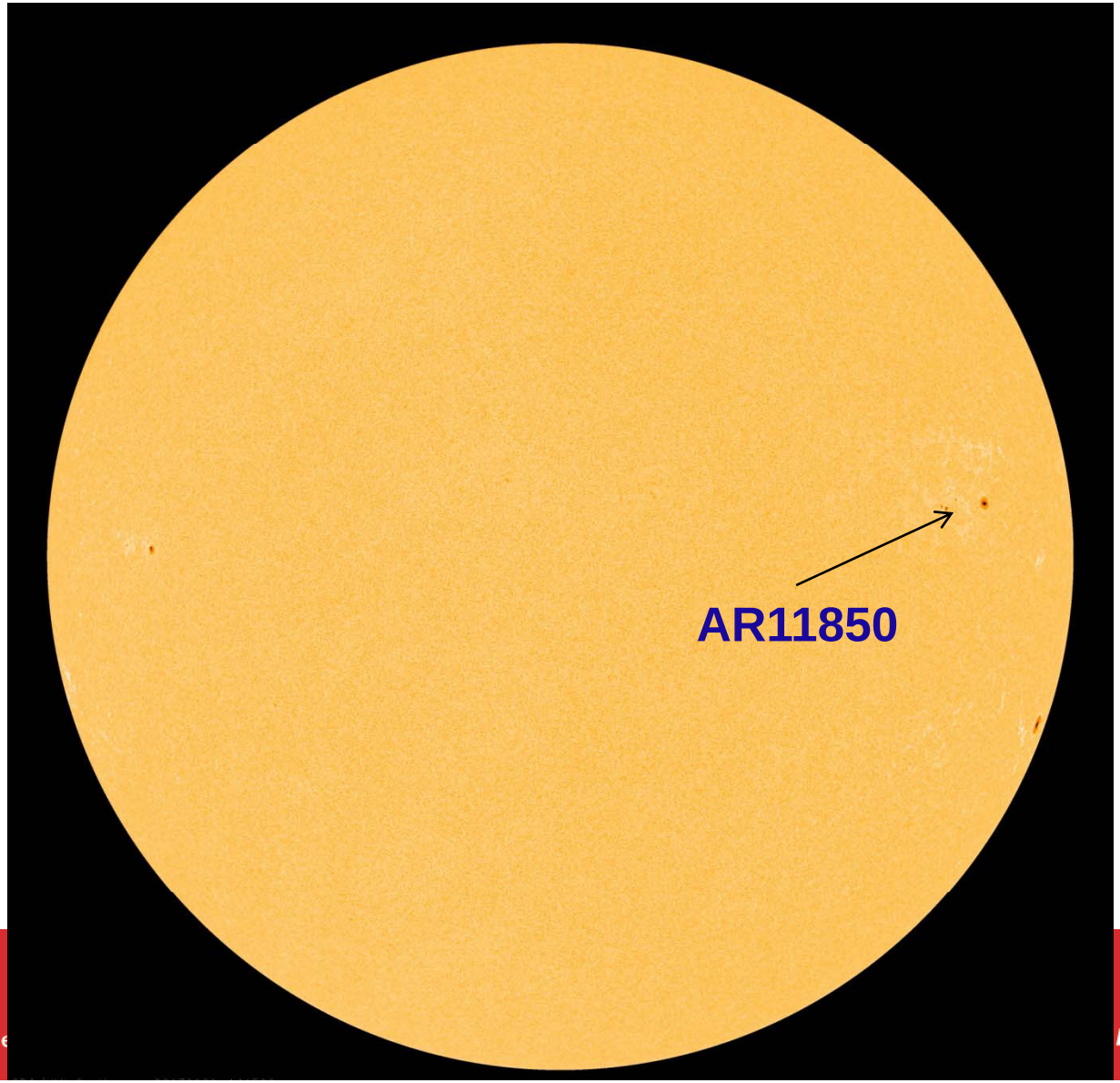
VIS: H-alpha Observations



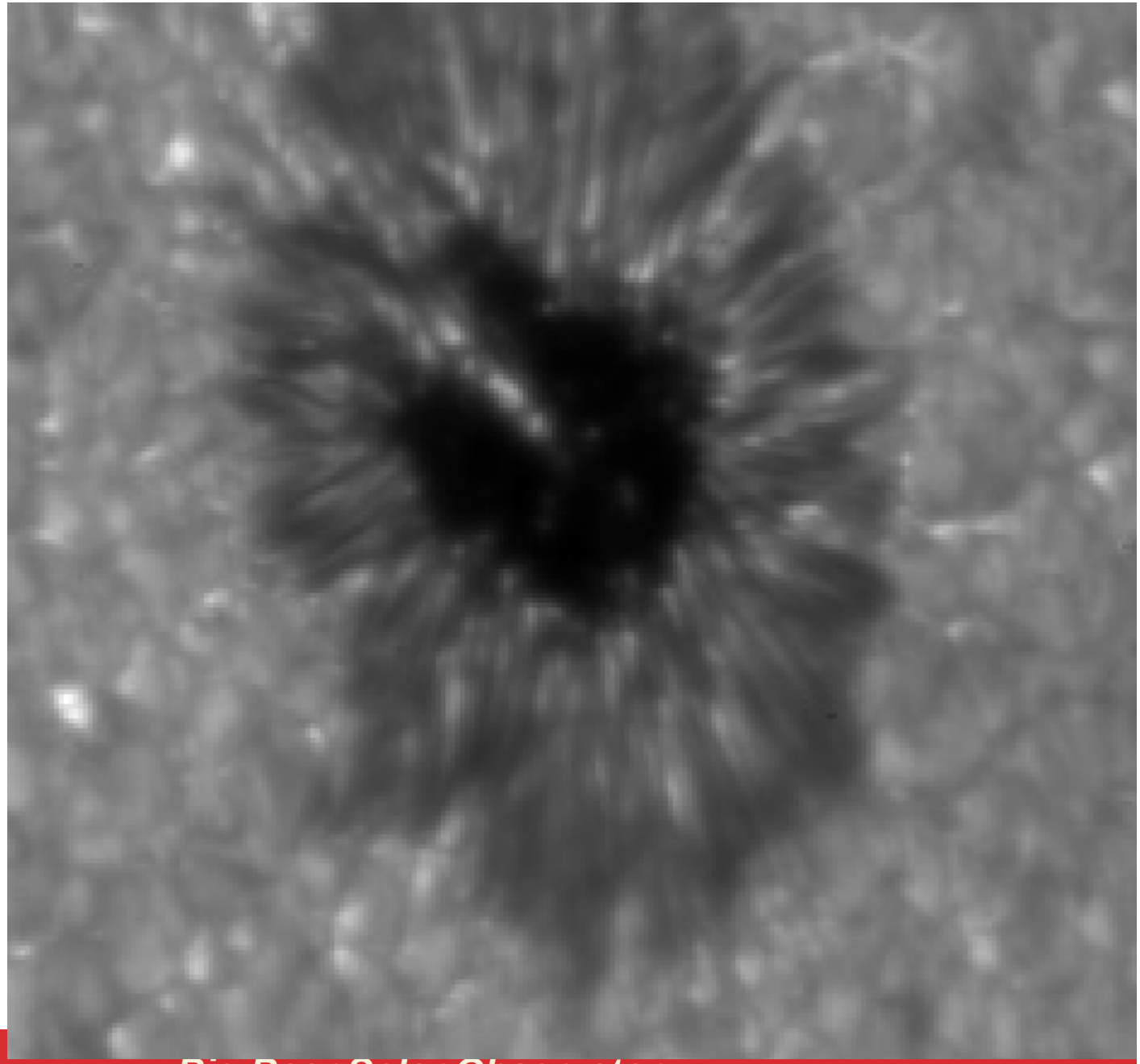


Joint observations: AR 11850

(September 29 and 30, 2013)



AR 11850: Hinode G-band



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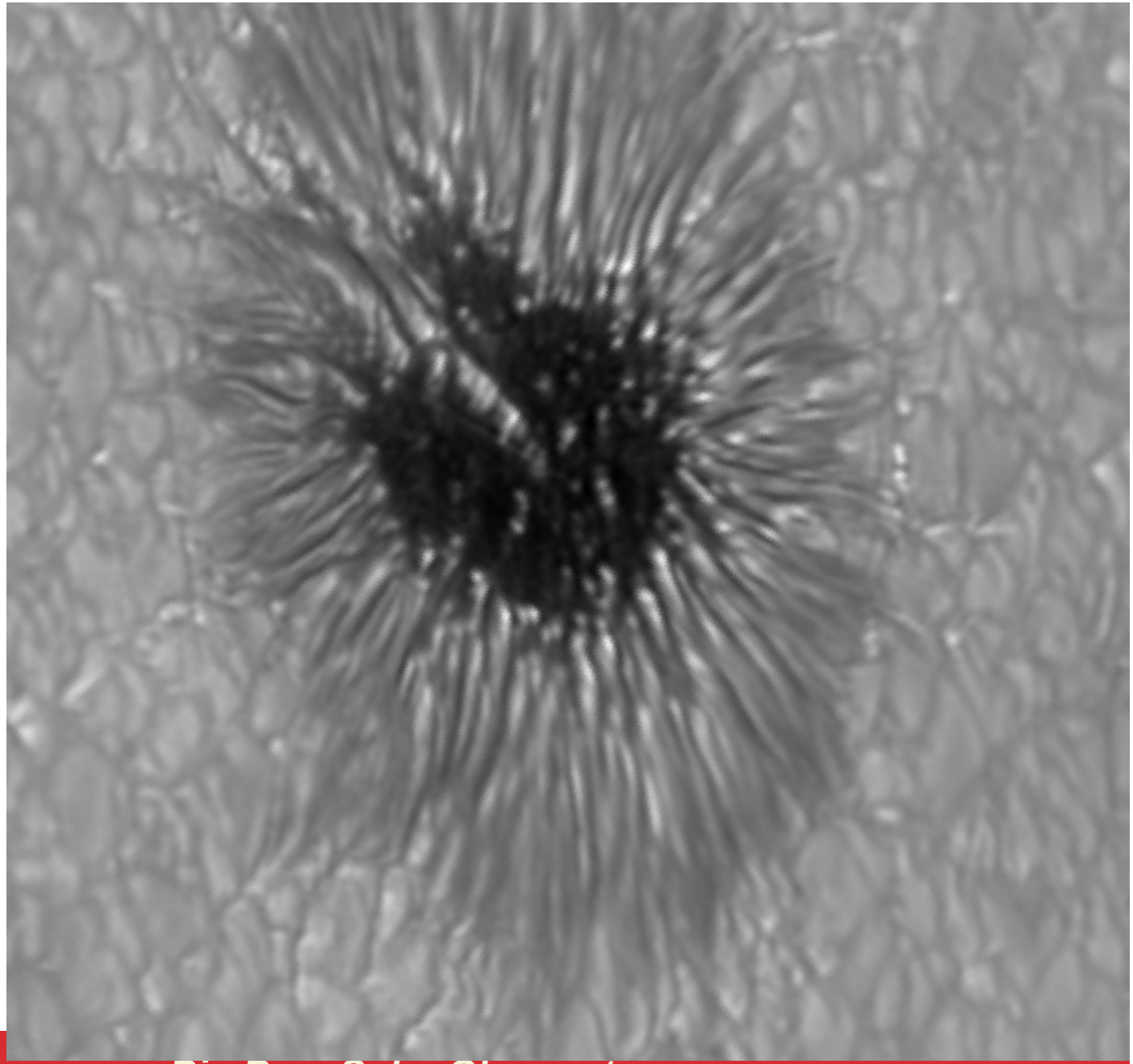
AR 11850: NST TiO 7057 A



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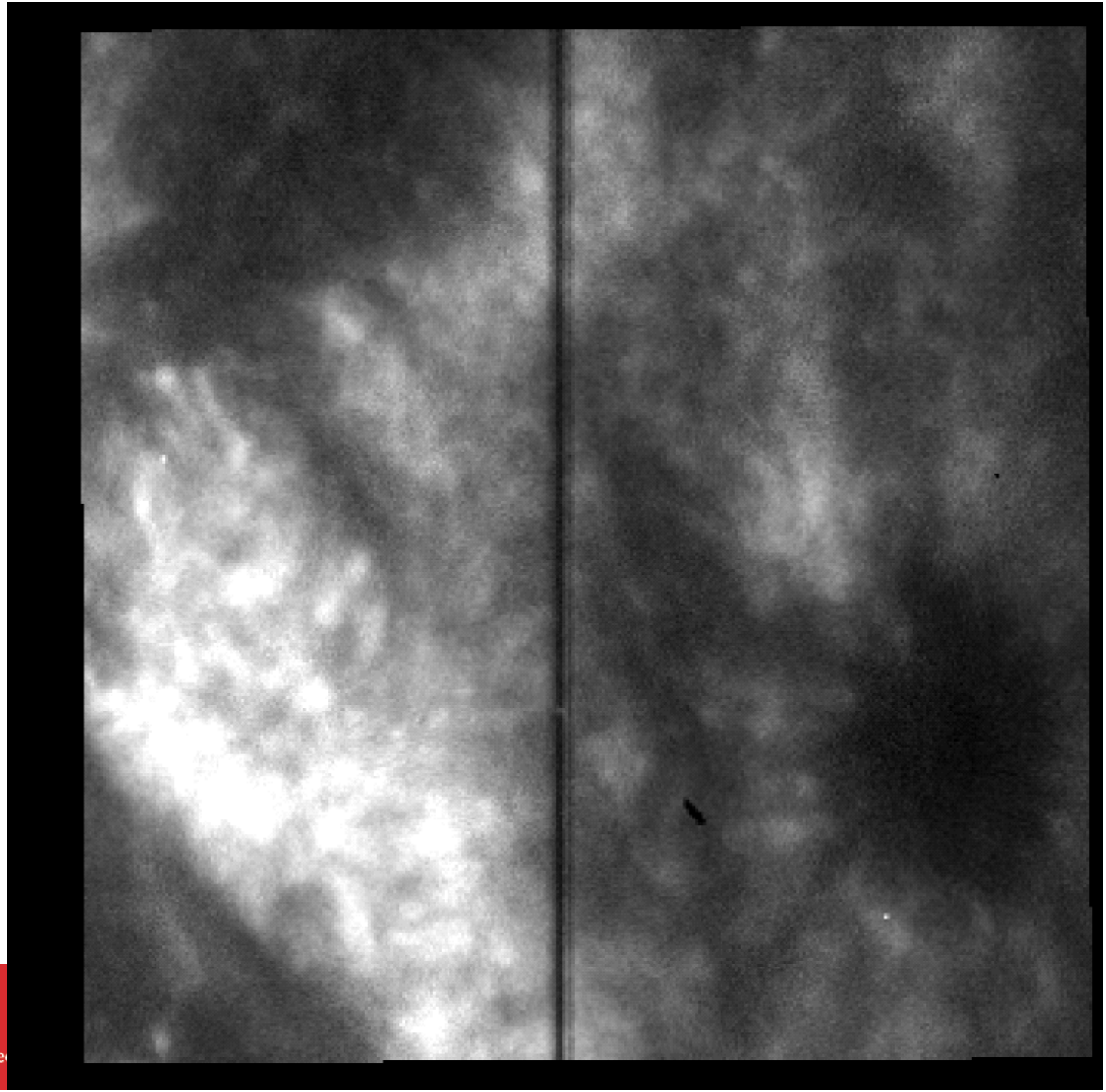
AR 11850: IRIS Mg II k 2796A



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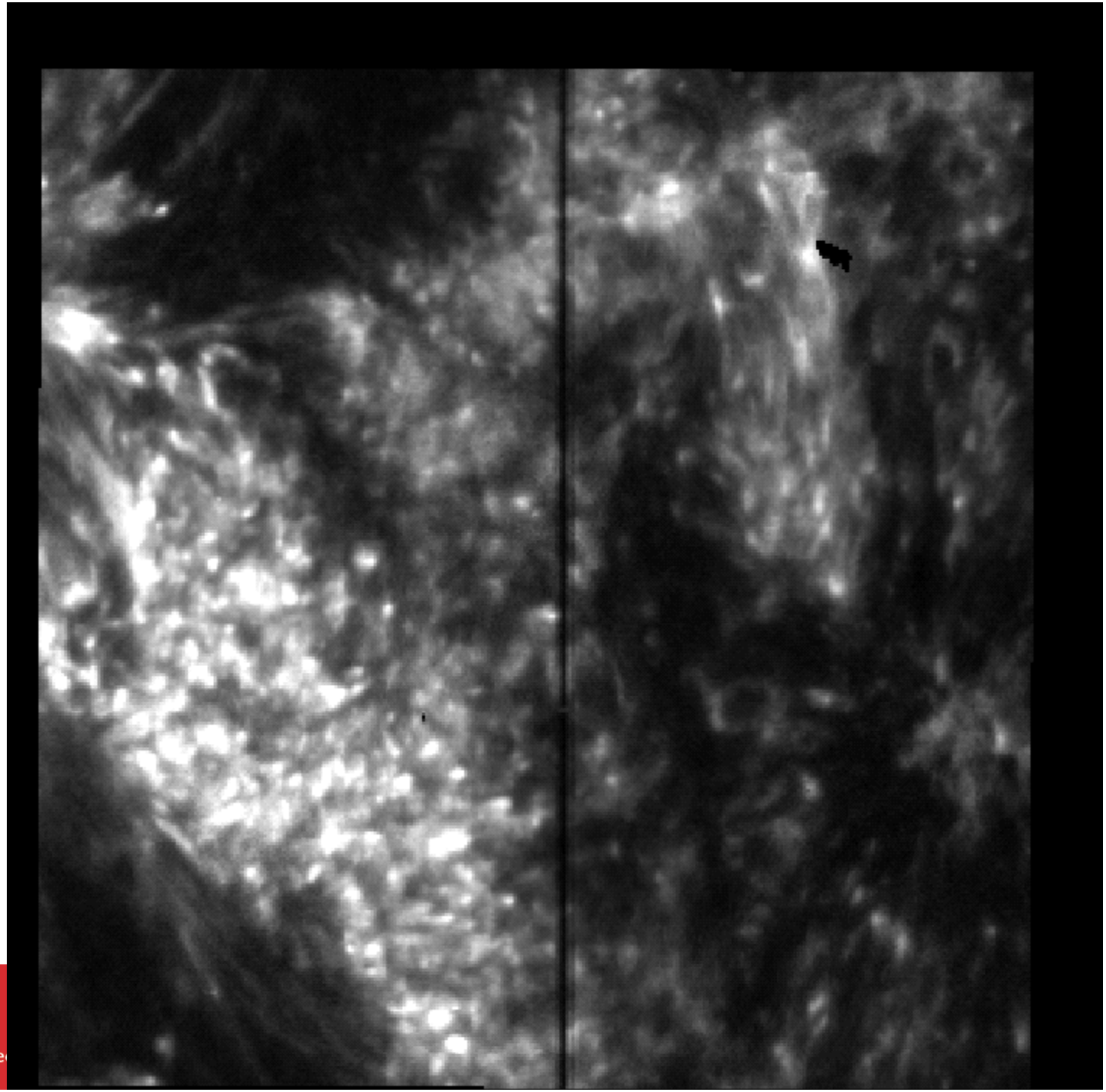
AR 11850: IRIS Si IV 1400A



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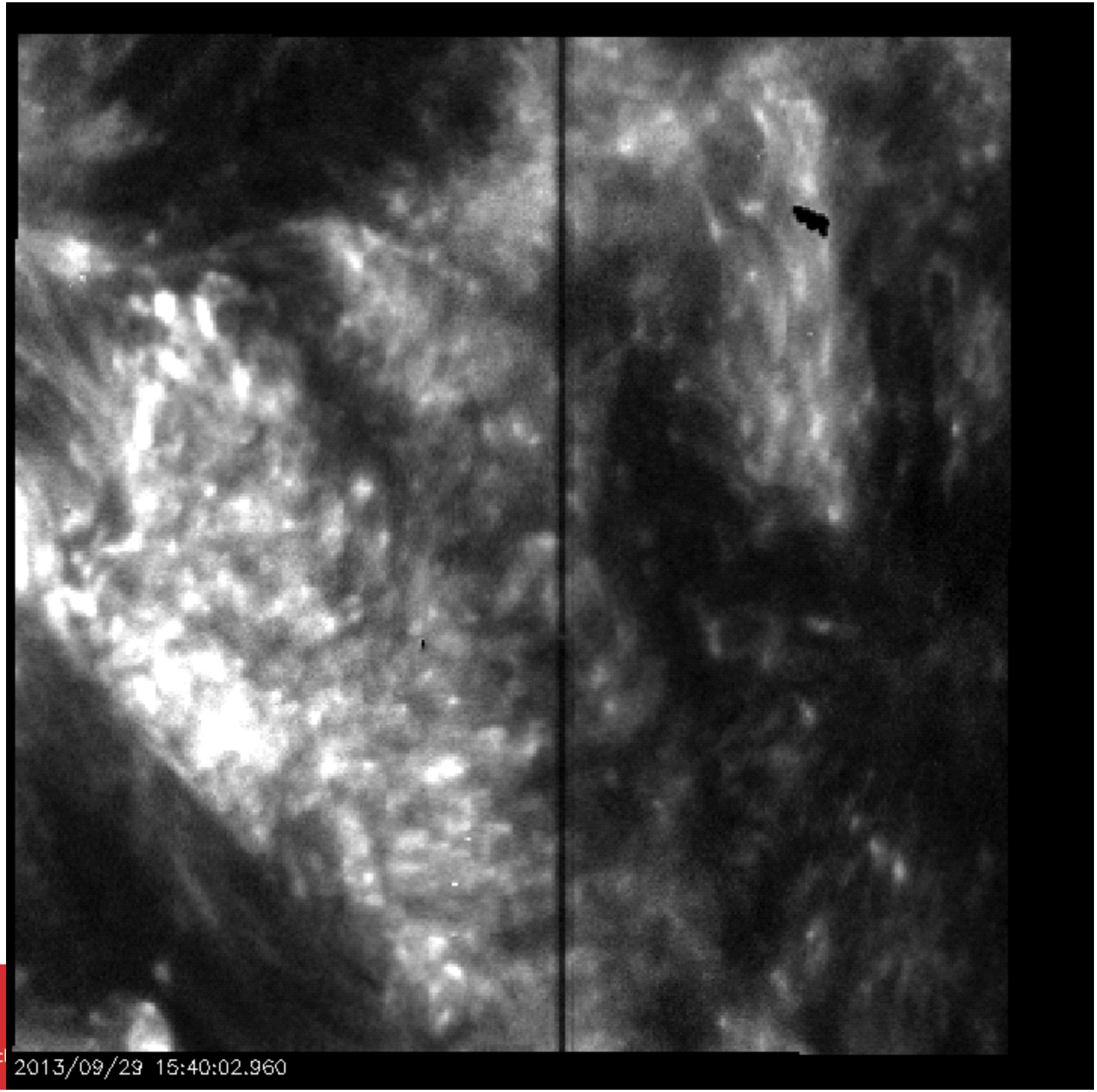
AR 11850: IRIS C II 1330A



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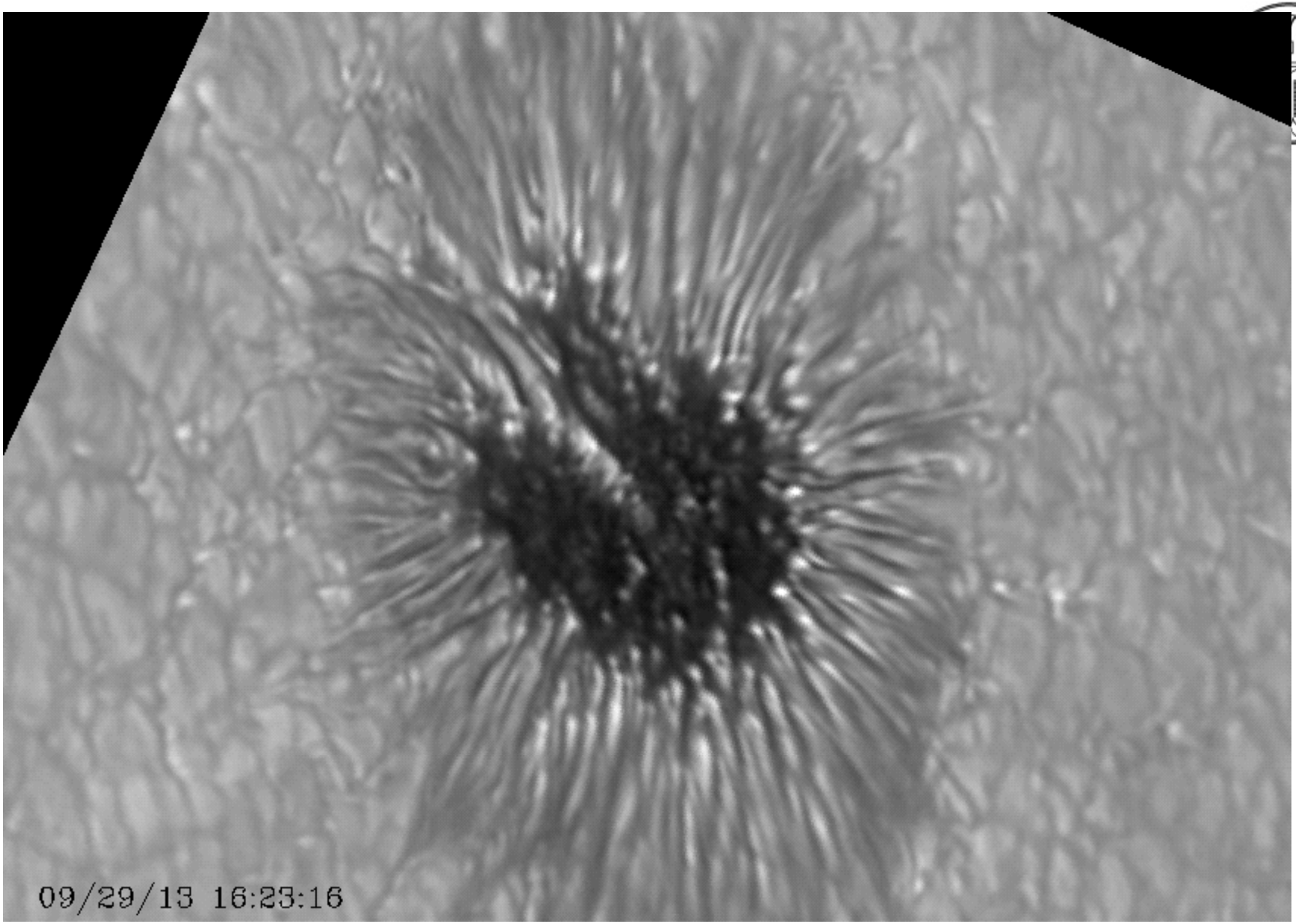
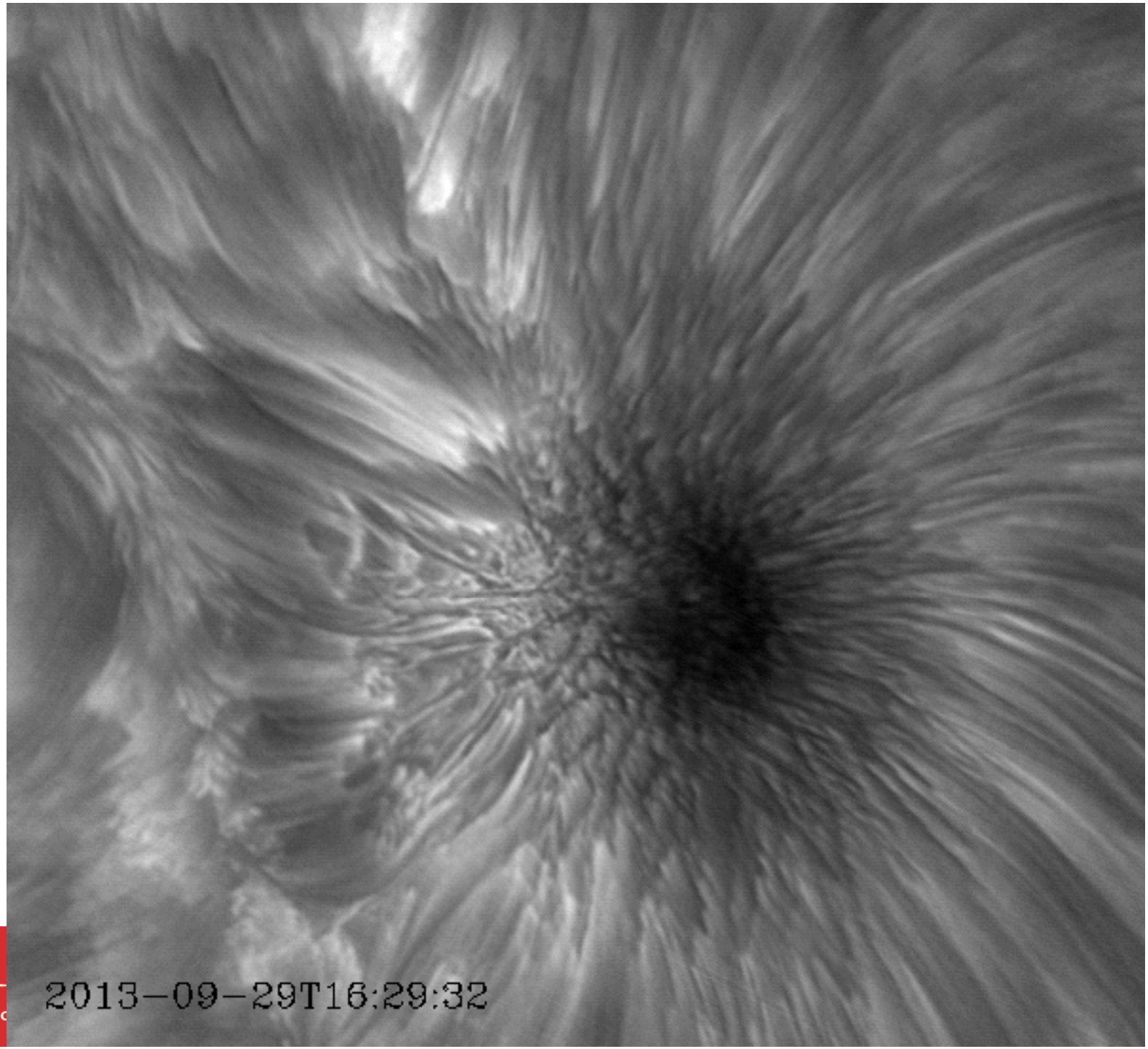

09/29/13 16:23:16

AR 11850 NST Hα



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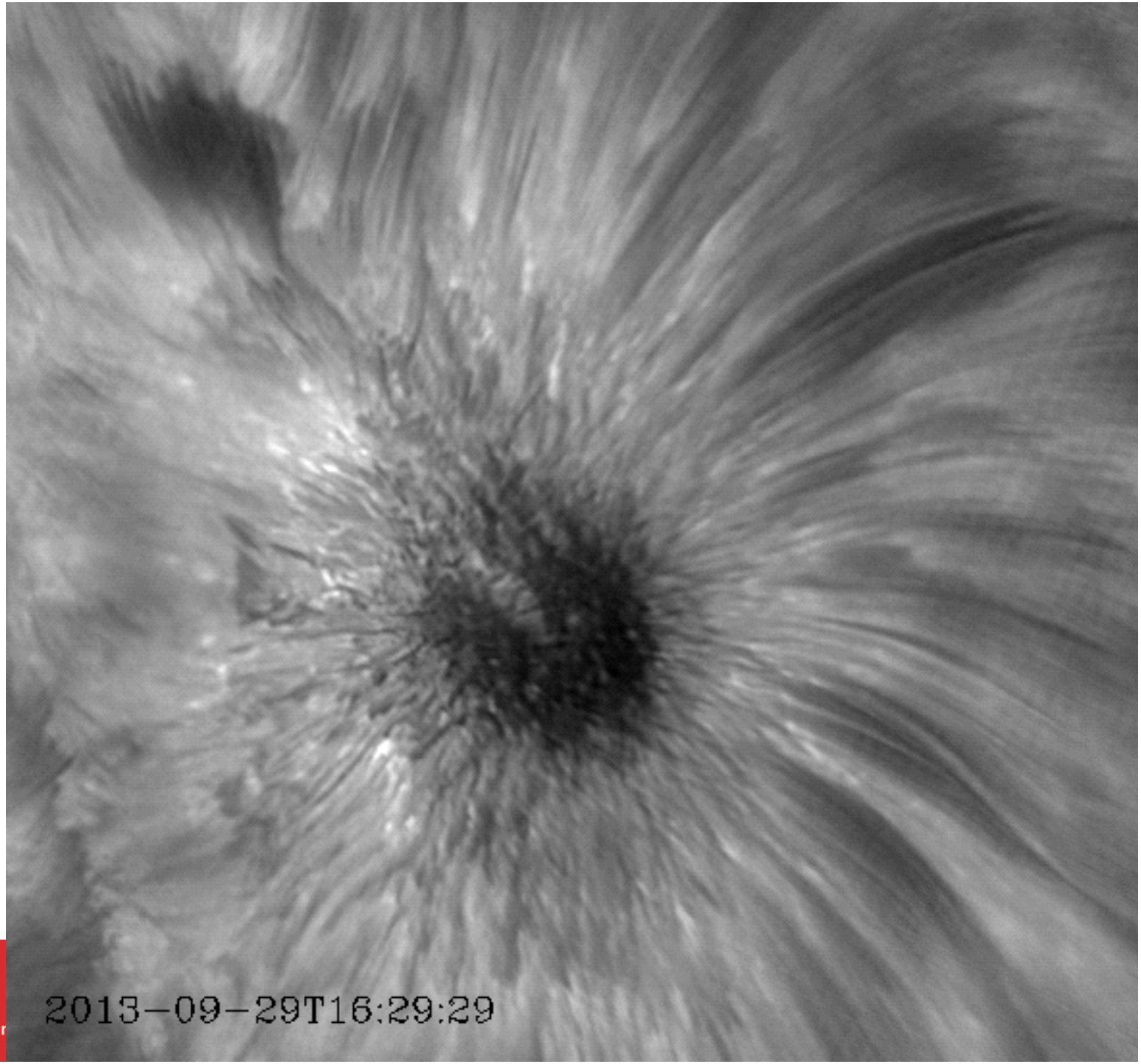
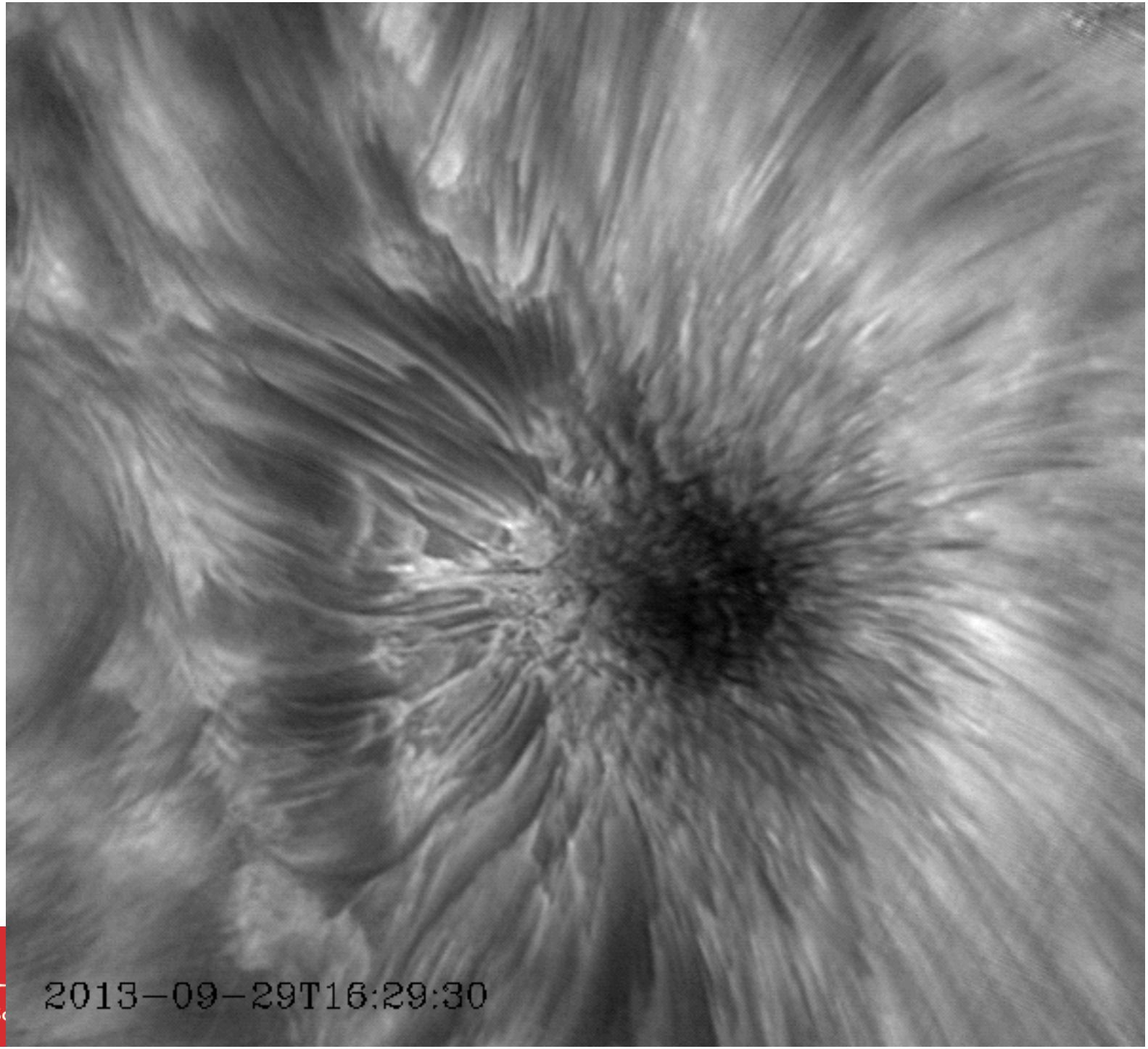
AR 11850 NST Hα–0.4



NJIT New Jersey's Scier

AR 11850 NST Hα+0.4



NJIT New Jersey's Sc

AR 11850

NST

Hα+0.8

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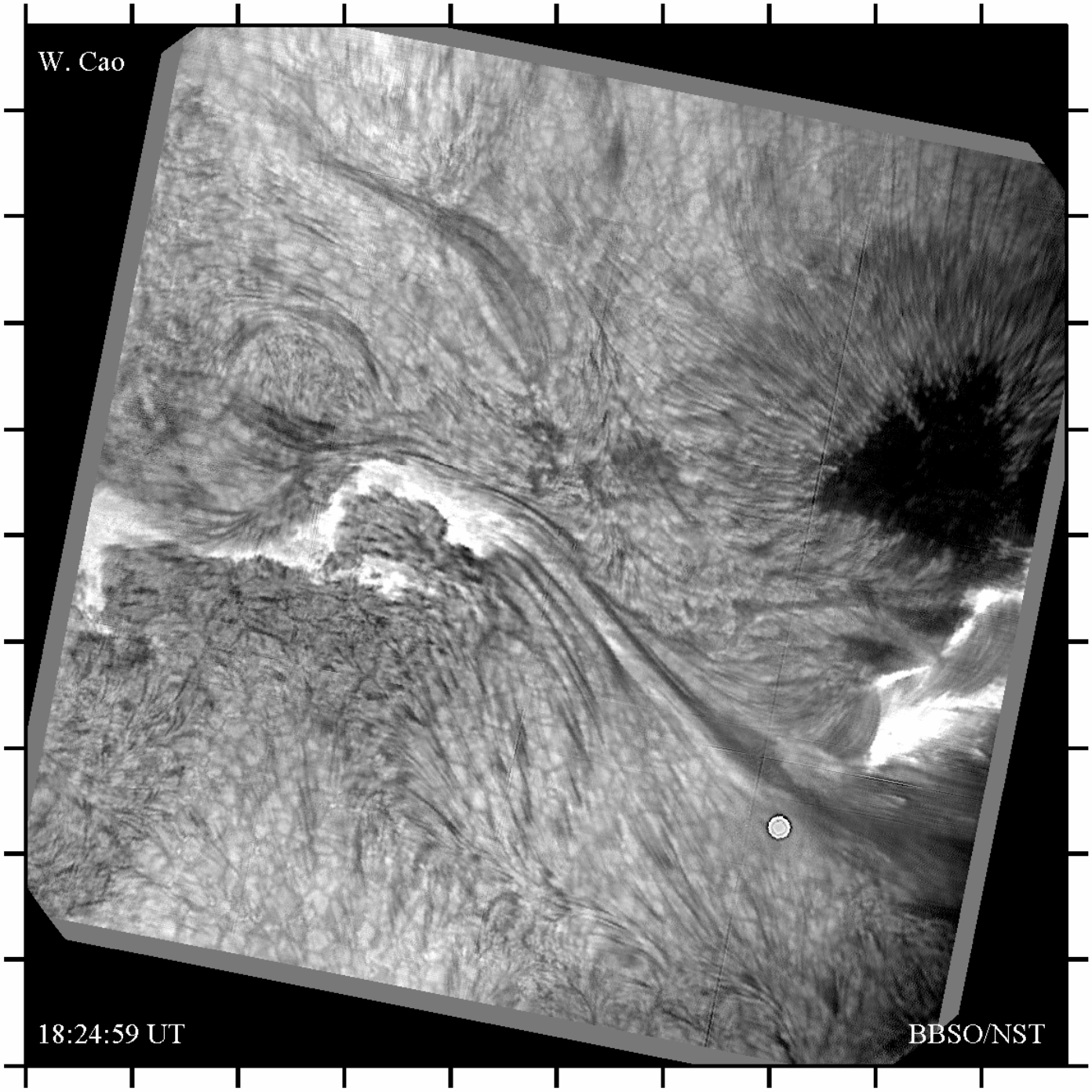
Two Ribbon Flare as Never Seen Before 8/27/2013



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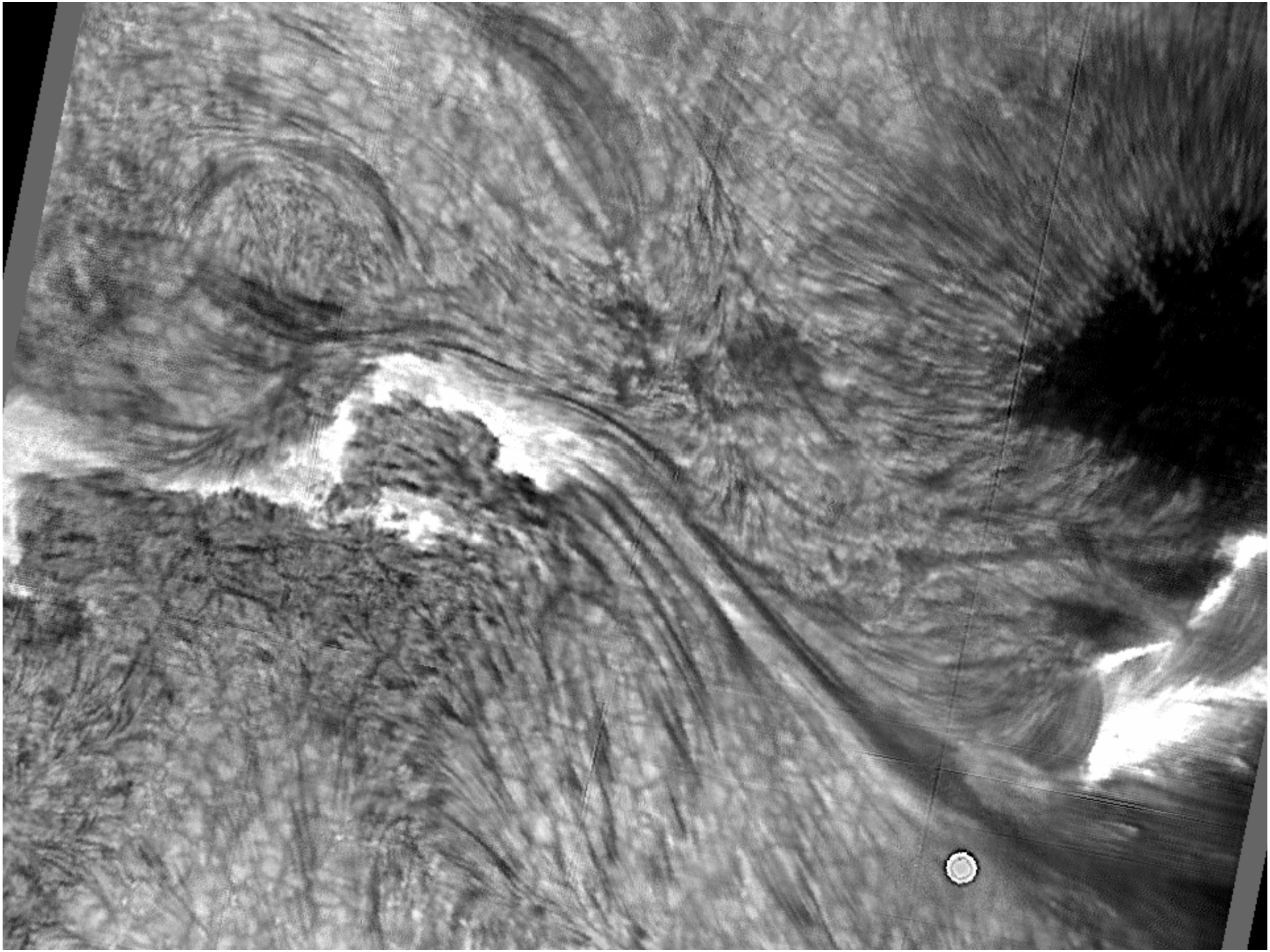

Summary

- The 1.6 m NST will be the largest aperture, highest resolution solar telescope until 2019 when 4 m ATST becomes operational.
- NST and its instruments will provides unprecedented high resolution photometric, spectroscopic and polarimetric data covering from the spectral range from 400 nm to 5 μm, to probe the solar atmosphere from the deepest photosphere to the base of the corona, and from the quietest to the most active Sun.
- The initial results reveal super-fine structure of solar flares and sunspots, and help to interpret the lower resolution observations from Hinode and IRIS.