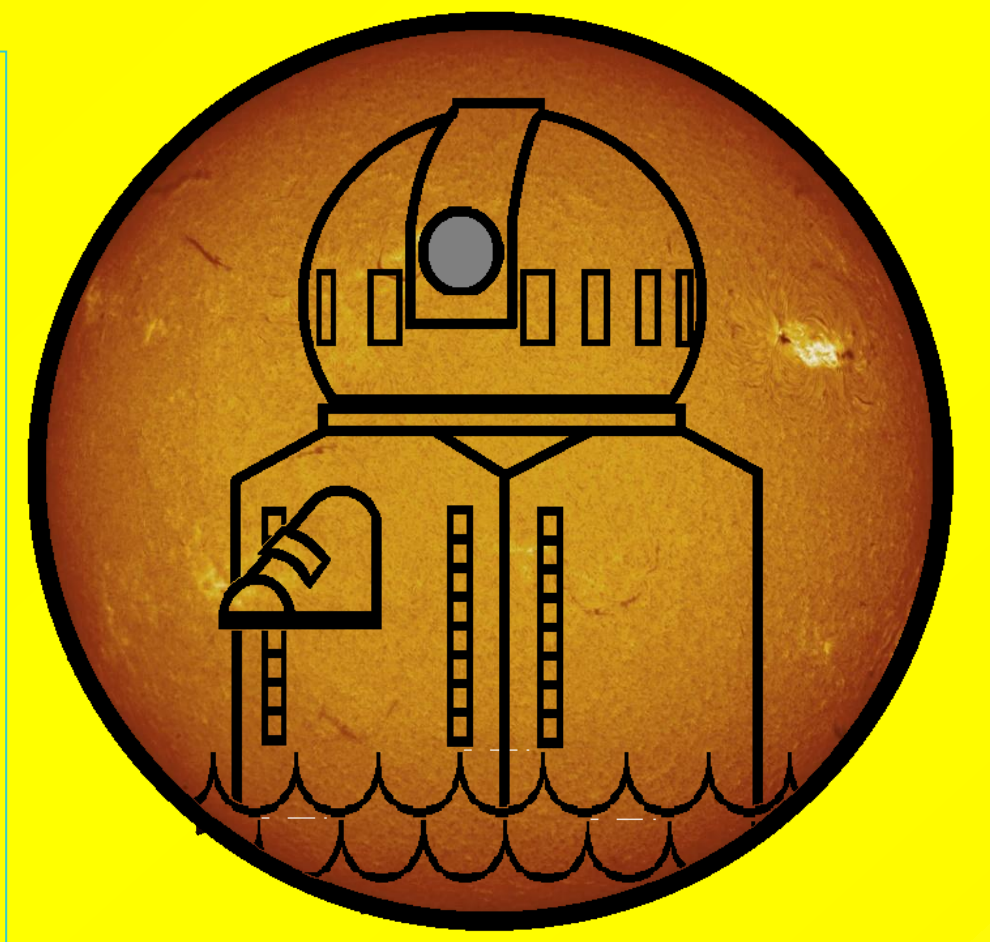


# BBSO/NST Instrumentation Images



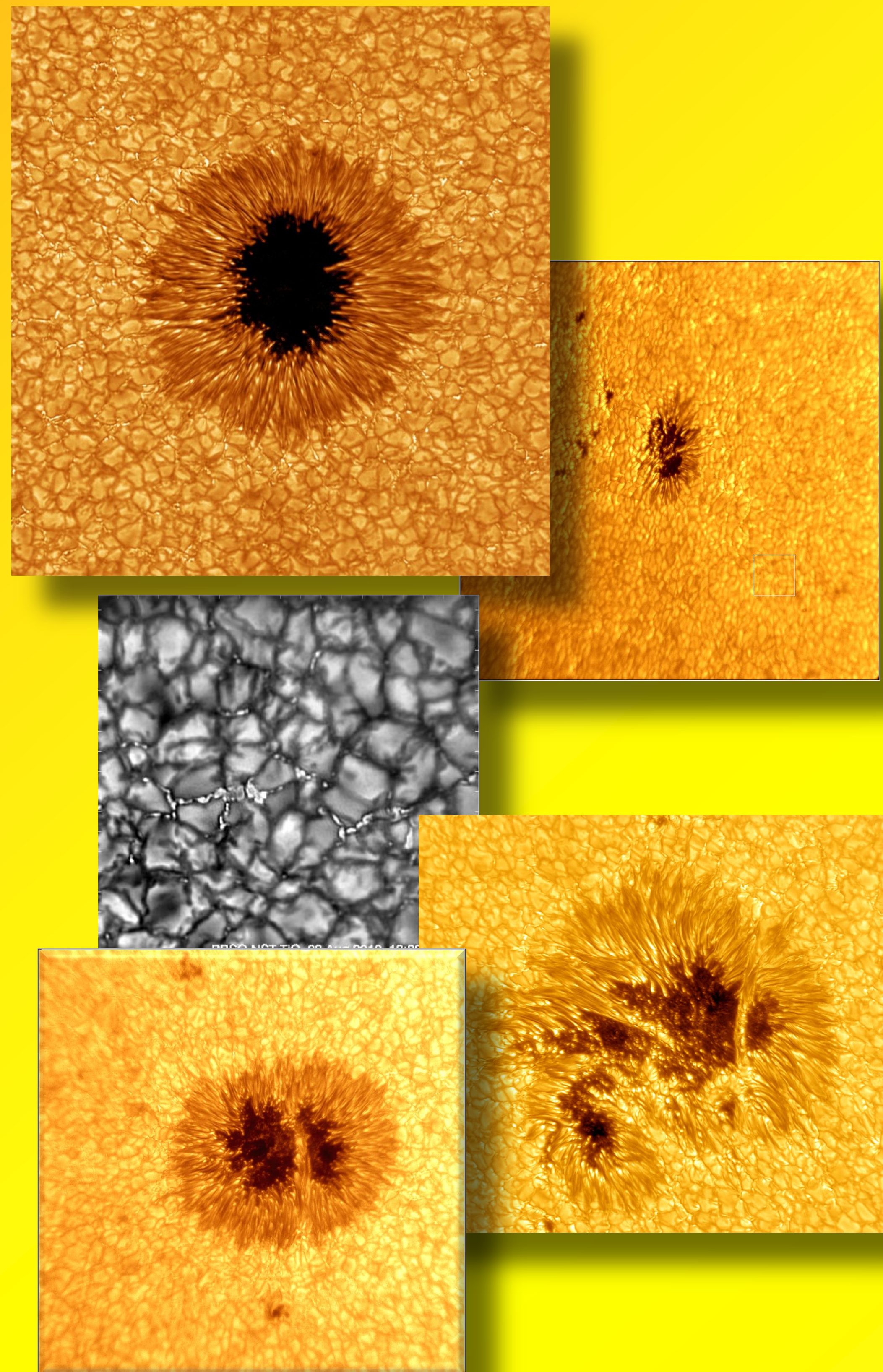
The Big Bear Solar Observatory (BBSO), operated by the New Jersey Institute of Technology (NJIT), is home to the 1.6-meter (63") aperture New Solar Telescope (NST). The NST is the highest resolution solar telescope in existence and equaled in aperture by only one other solar telescope. The telescope saw first light in early 2009. Since then, the facility has built a suite of state-of-the-art visible and infrared instrumentation to produce the highest possible spatial and temporal resolution data of our star. The telescope is equipped with cutting-edge Adaptive Optics systems that correct for the blurring effects of our atmosphere resulting in images that can be as sharp as if the telescope were located in space. The location for BBSO was chosen with great care for its superb image stability and good weather. The lake surrounding the telescope provides a natural inversion layer that minimizes atmospheric thermal turbulence that would normally blur the daytime image. The goal of the BBSO/NJIT solar astronomers is to understand the nature of the Sun and its dynamics, which have such a profound impact on our life on Earth. Detailed here are descriptions of the current BBSO facility focal plane instruments as well as examples of images taken by each.



## Broadband Filter Imagers

The Broadband Filter Imagers (BFIs) collect filtergrams of the AO-corrected field using a high-speed 2048x2048 pixel CCD. Filtergrams are typically taken in short bursts of 100 files every 15 to 30 seconds. Images are then post-facto speckle reconstructed to achieve diffraction-limited images (0.06 arcseconds in G-band, 0.09 arcseconds at TiO).

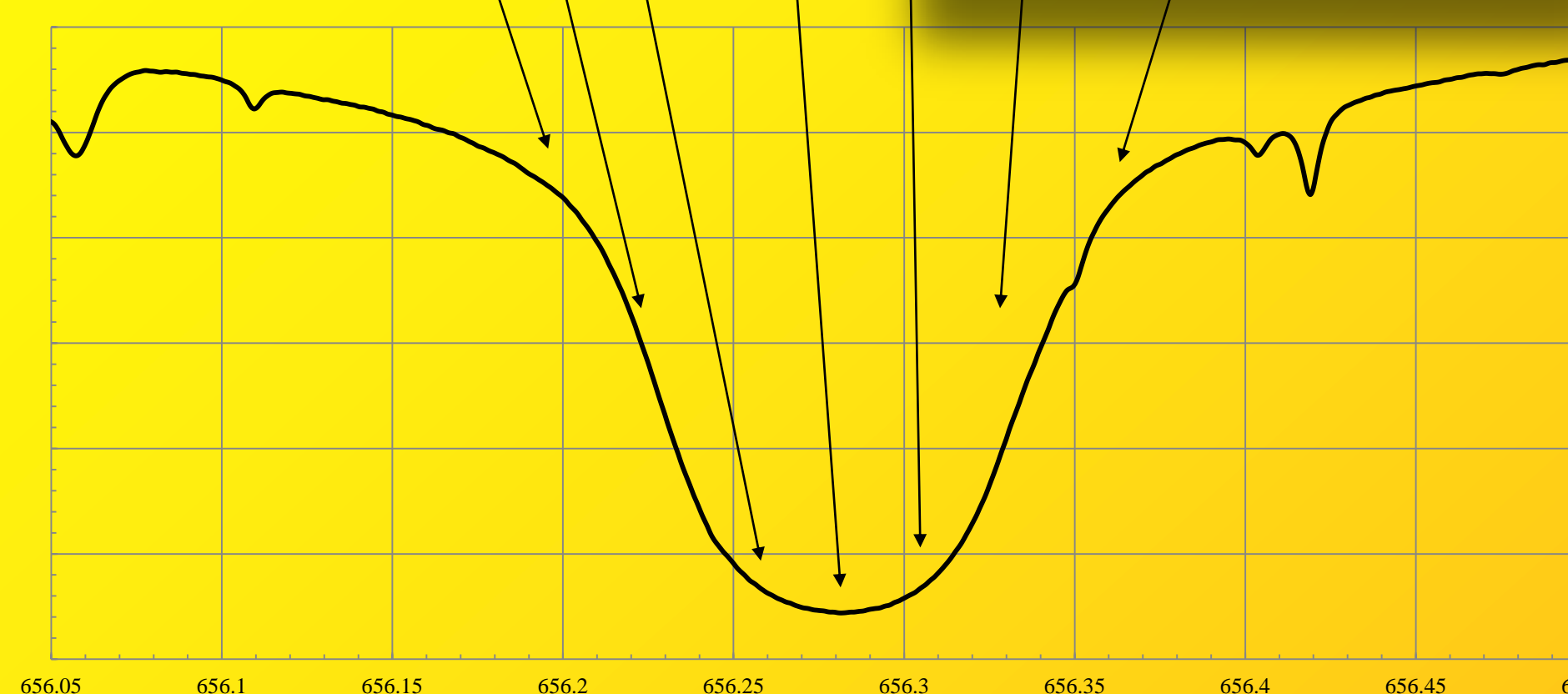
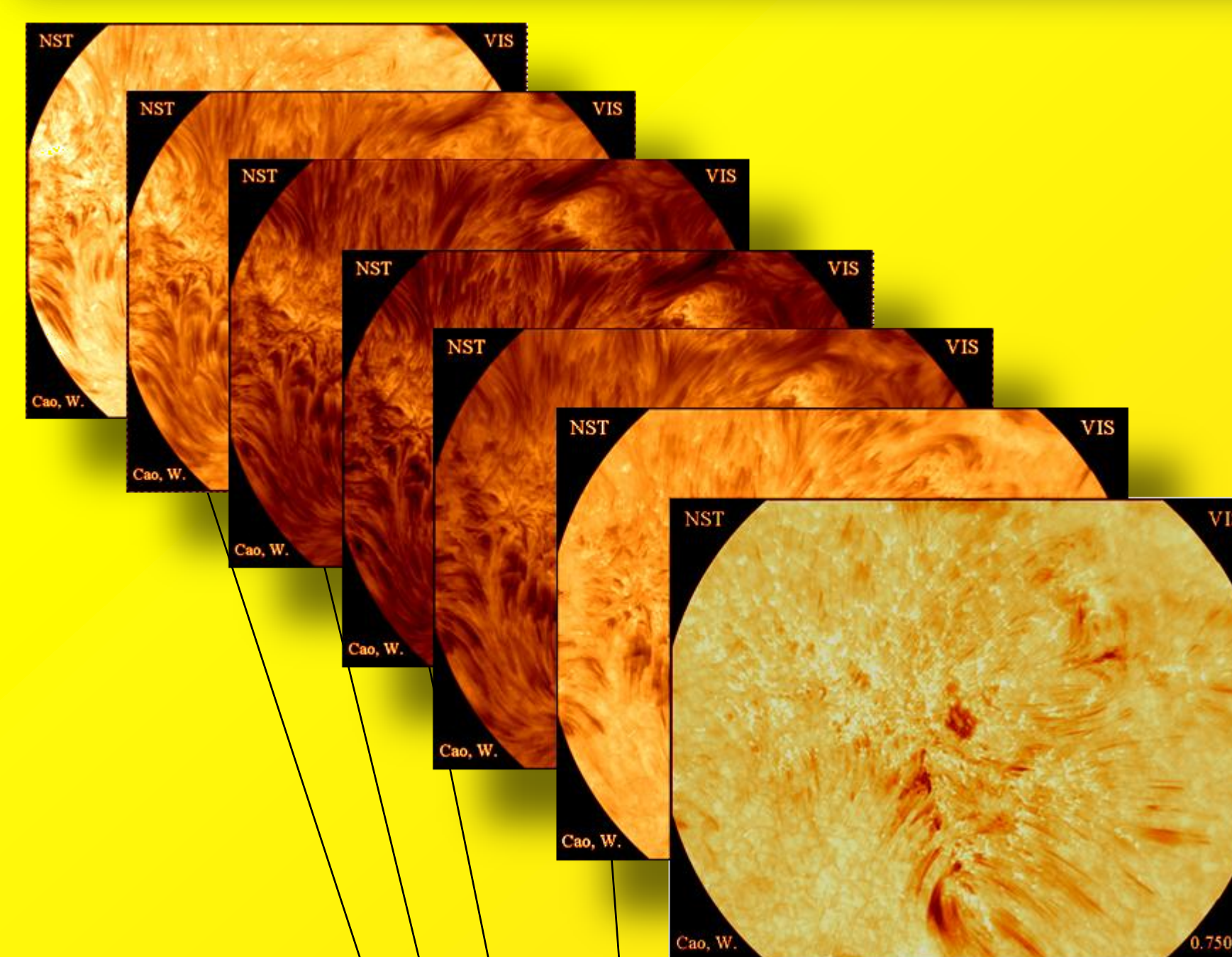
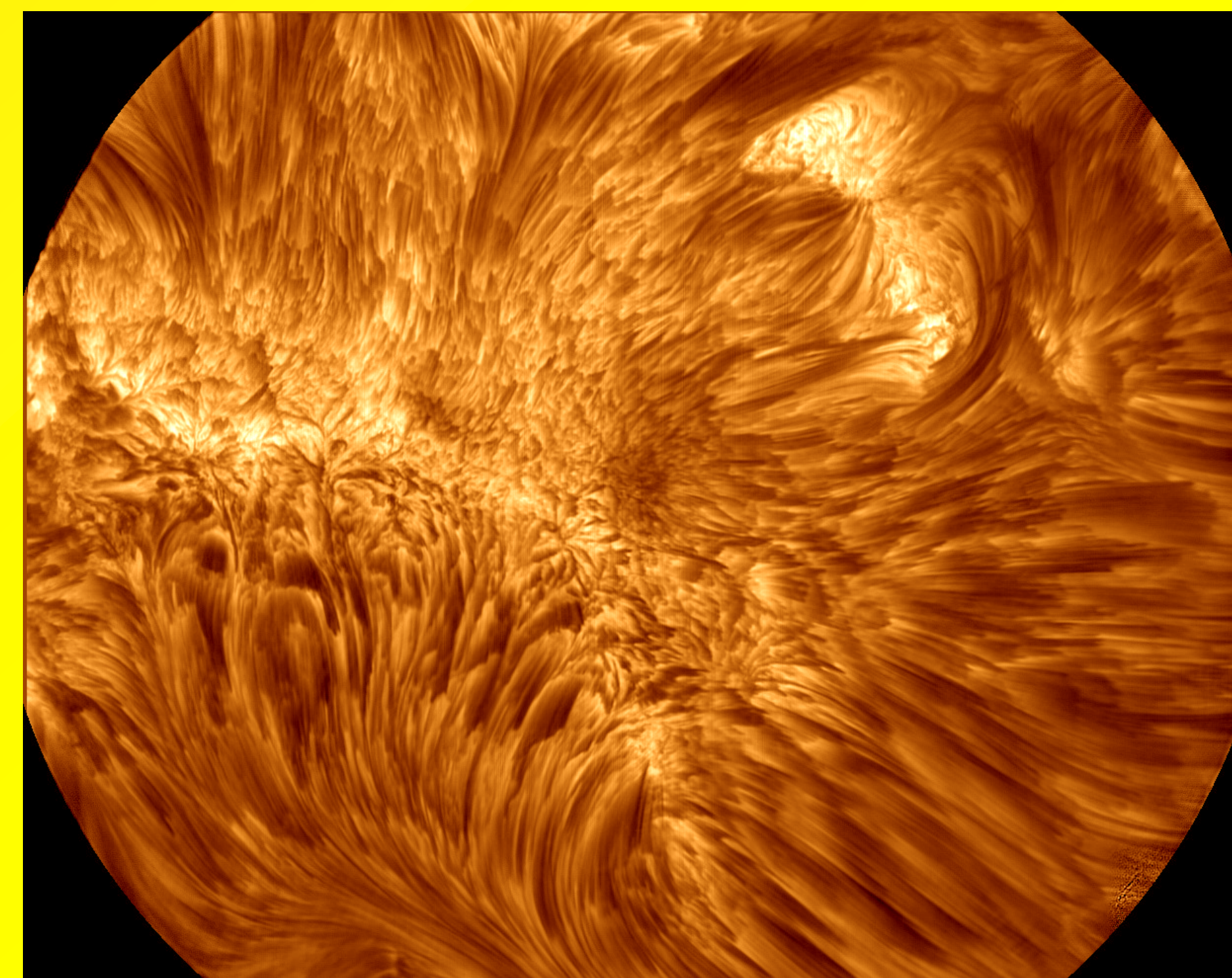
Species	Wavelength	Bandpass	Field of view	Image scale	Cadence
G-band	430.5 nm	5 Å	55" by 55"	0.027"/pix	15 sec
TiO	705.7 nm	10 Å	70"	0.034"/pix	15 sec



## Visible Imaging Spectrometer

The Visible Imaging Spectrometer (VIS) operates in the visible wavelength range of 550 nm to 700 nm. VIS's Fabry-Pérot etalon produces a bandpass of 0.007 nm over a 70 arcsecond field of view. Available spectral lines include H $\alpha$ , Fe I 630 nm and the Na I D2 line (589 nm). The spectrometric measurement cadence can reach 10 s.

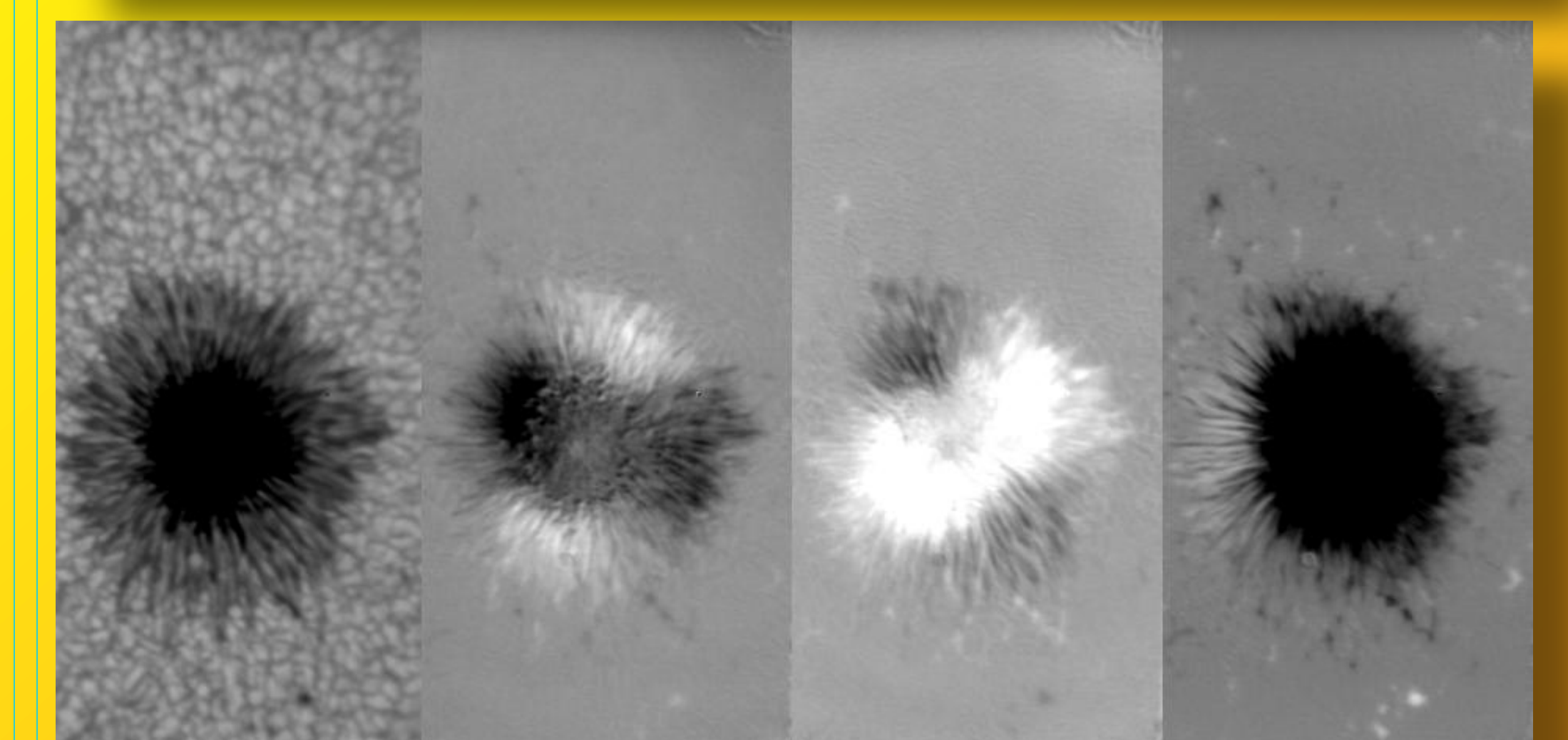
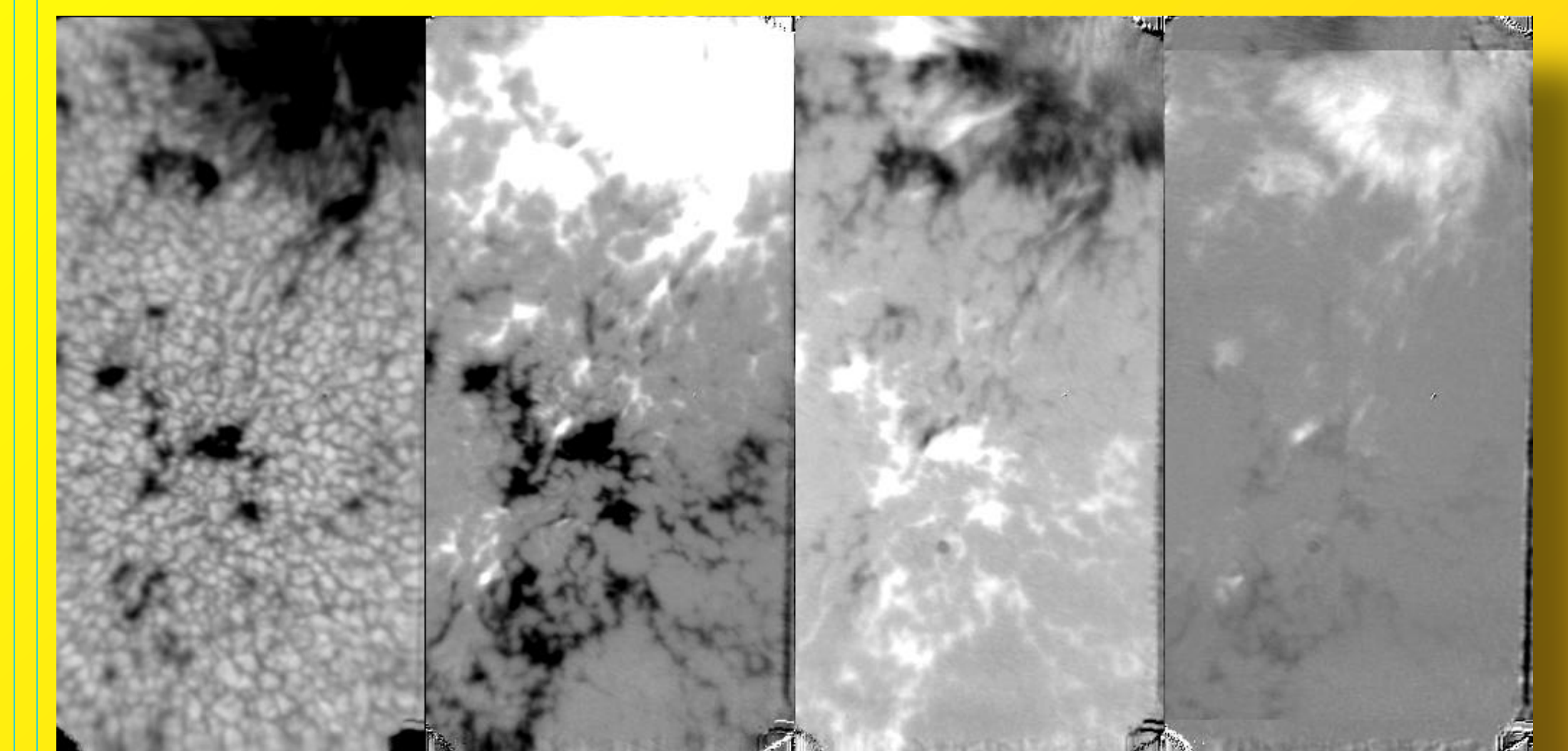
Species	Wavelength	Bandpass	Field of view	Image scale	Spectroscopy
H $\alpha$	656.3 nm	0.07 Å	70" round	0.034"/pix	10 sec
Na I D2	589.9 nm	0.07 Å	70" round	0.034"/pix	10 sec



## Near InfraRed Imaging Spectropolarimeter

The Near InfraRed Imaging Spectropolarimeter (NIRIS) utilizes dual Fabry-Pérot etalons that provide an 85 arcsecond field of view and scan cadence of 1 sec for spectroscopic and 10 sec for full Stokes polarimetric measurements. The dual-beam optical design images two simultaneous polarization states onto a 2024x2048 HgCdTe closed-cycle helium cooled IR array that runs at  $\sim 83^\circ\text{C}$  above absolute zero ( $-273.15^\circ\text{C}$ ,  $-459.67^\circ\text{F}$ ). The primary spectral lines for NIRIS are the Fe I 1565 nm which is the most sensitive probe of magnetic fields in the deepest photosphere and He I 1083 nm that is the best currently available diagnostic of upper chromospheric magnetic fields.

Species	Wavelength	Bandpass	Field of view	Image scale	Vector spectro-polarimetry
Fe I	1564.85 nm	0.1 Å	85" round	0.083"/pix	10 sec
Fe I	1565.29 nm	0.1 Å	85" round	0.083"/pix	10 sec
He I	1083.25 nm	0.05 Å	85" round	0.083"/pix	10 sec
Si I	1082.70 nm	0.05 Å	85" round	0.083"/pix	10 sec



**BBSO**

Big Bear Solar Observatory

**NJIT**

New Jersey's Science & Technology University