SWAP AT THREE YEARS

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P2SC ☀ Royal Observatory of Belgium

SWT6 ☀ ESWW9 ☀ Brussels, Belgium ☀ 2012 November 6

OVERVIEW

I. Calibration and Operational Status

II. Degradation (or not)

III. New Data Products and Science

I. CALIBRATION AND OPERATIONAL STATUS

EXISTING CALIBRATION STEPS

- Dark Subtraction
- Pixel Map Correction
- Despiking
- Image Orientation

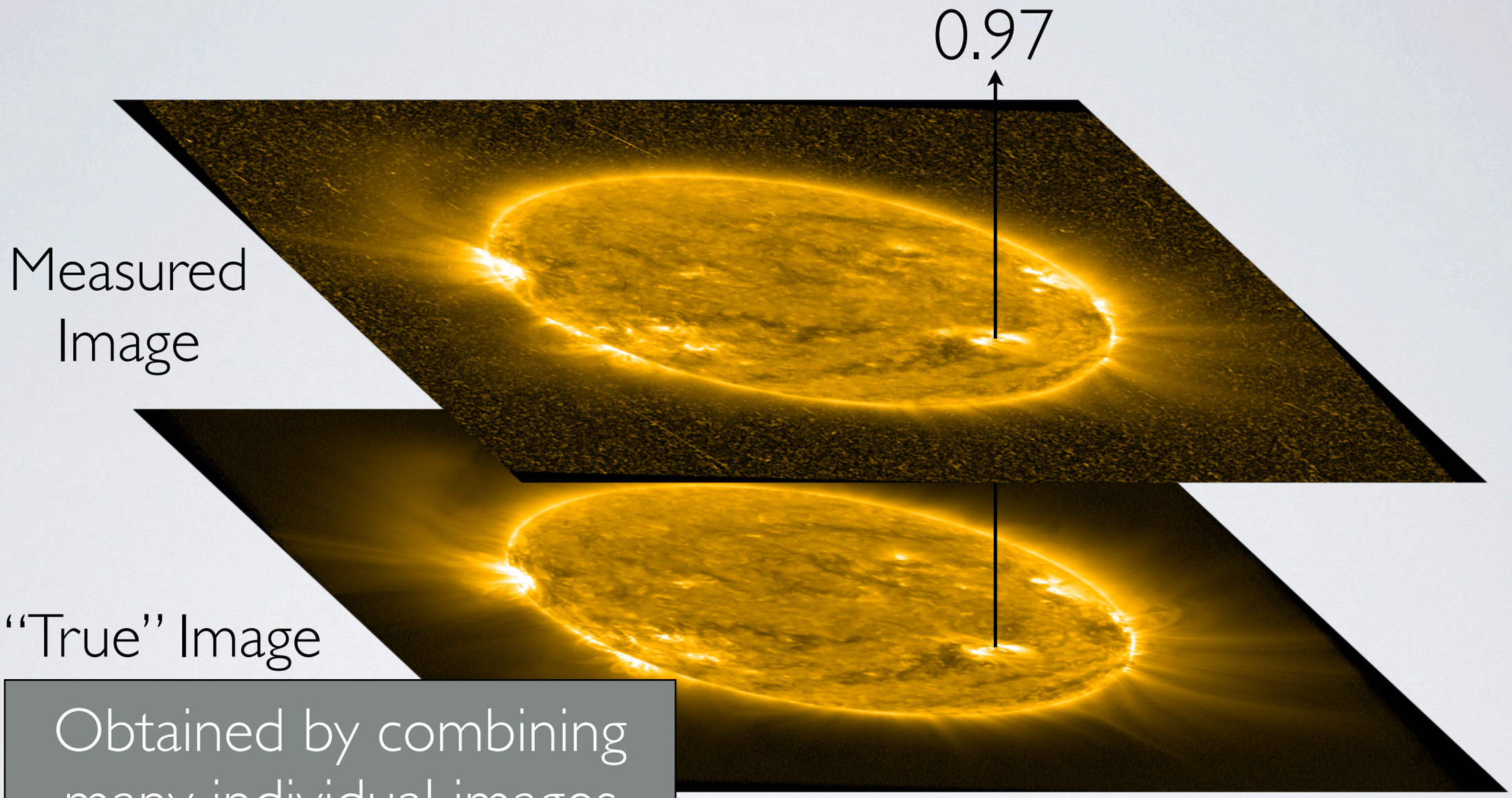
MAJOR OUTSTANDING ISSUES SEPTEMBER 2012

- Flat field/gain calibration
- Stray light, especially far off-limb
- Horizontal banding in dark regions

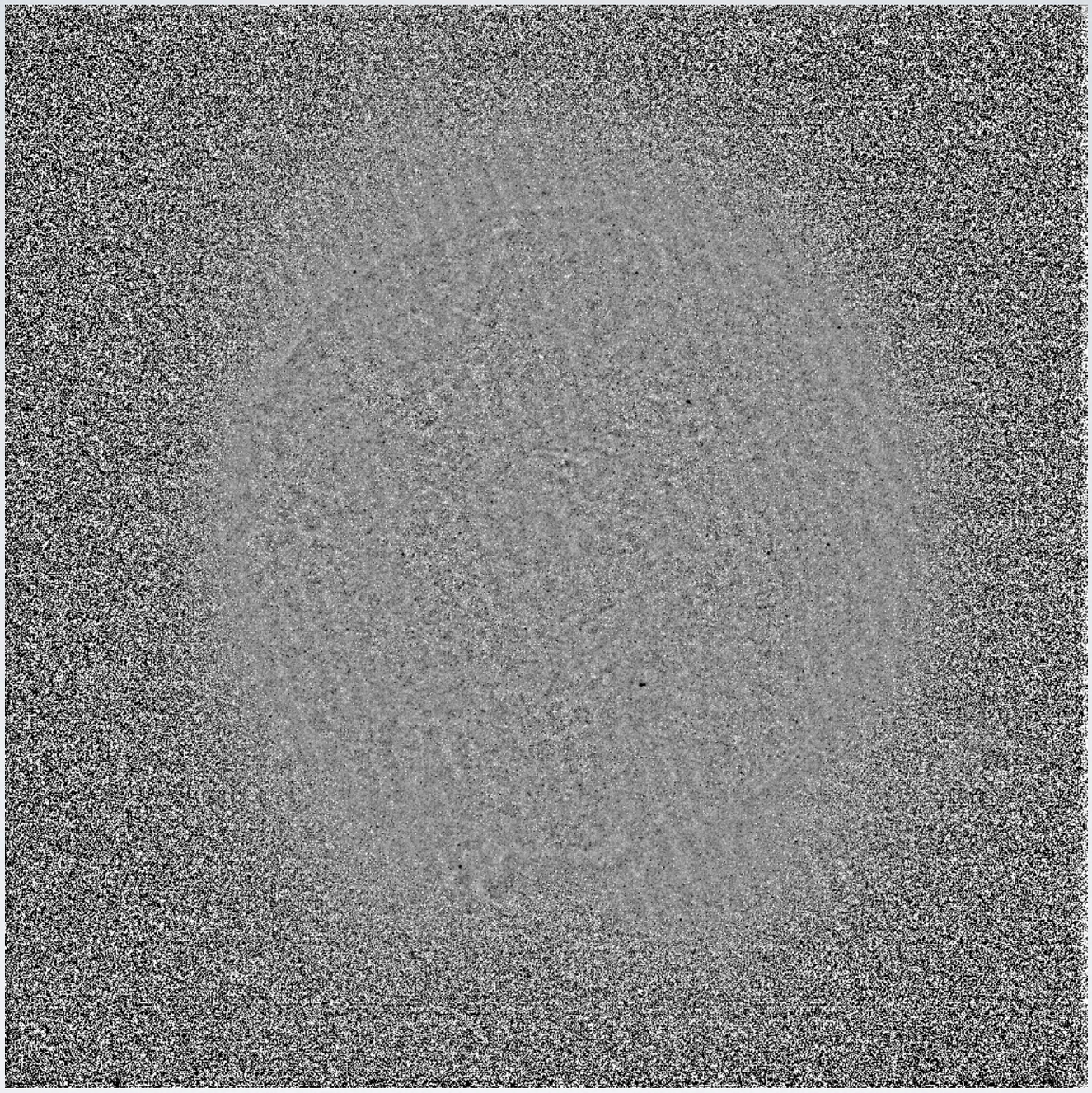
MAJOR OUTSTANDING ISSUES OCTOBER 2012

- ~~Flat field/gain calibration~~
- ~~Stray light, especially far off limb~~
- ~~Horizontal banding in dark regions~~

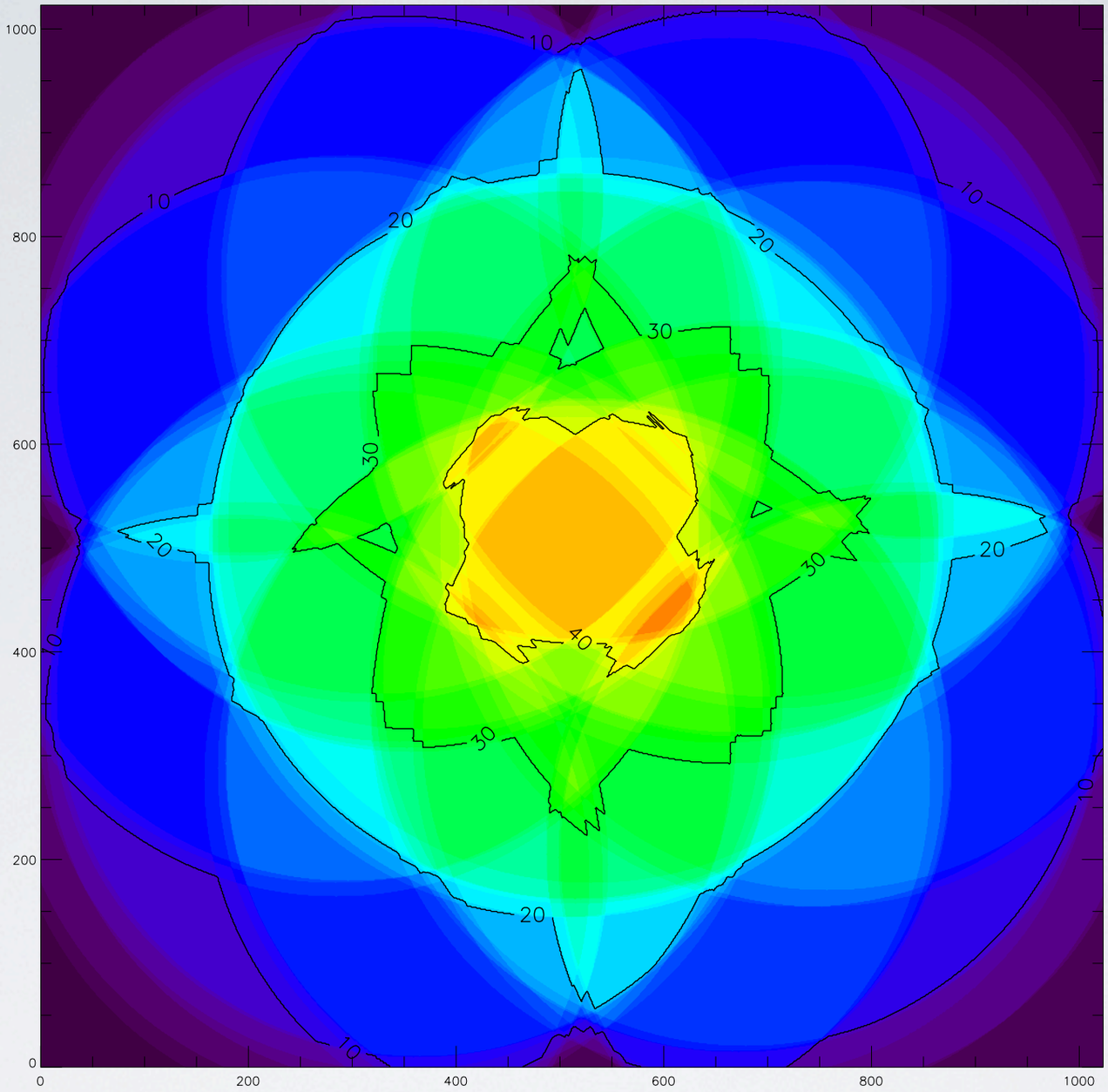
FLAT FIELD


0.97
Measured Image
"True" Image
Obtained by combining many individual images

TECHNIQUE

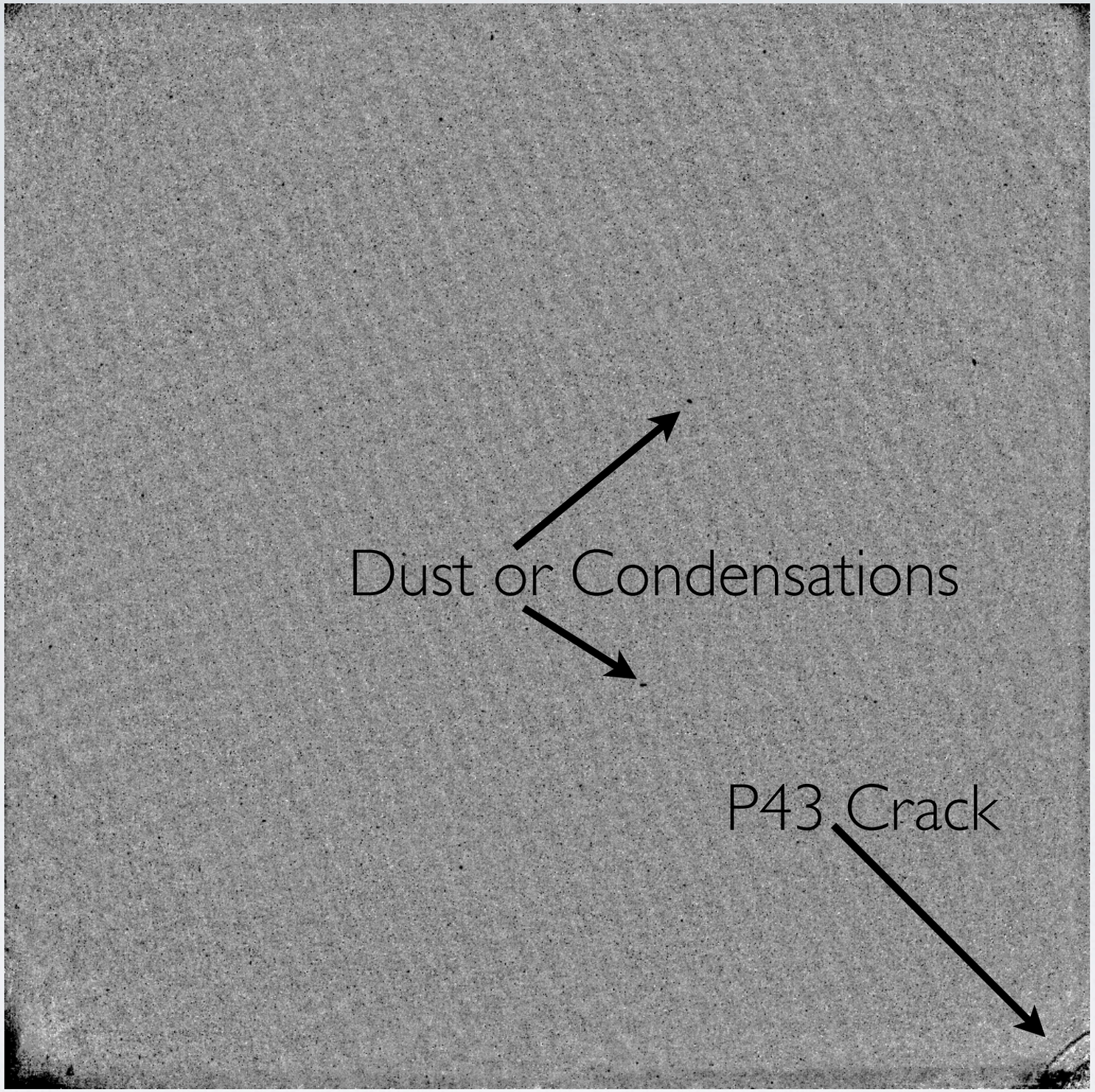


TECHNIQUE



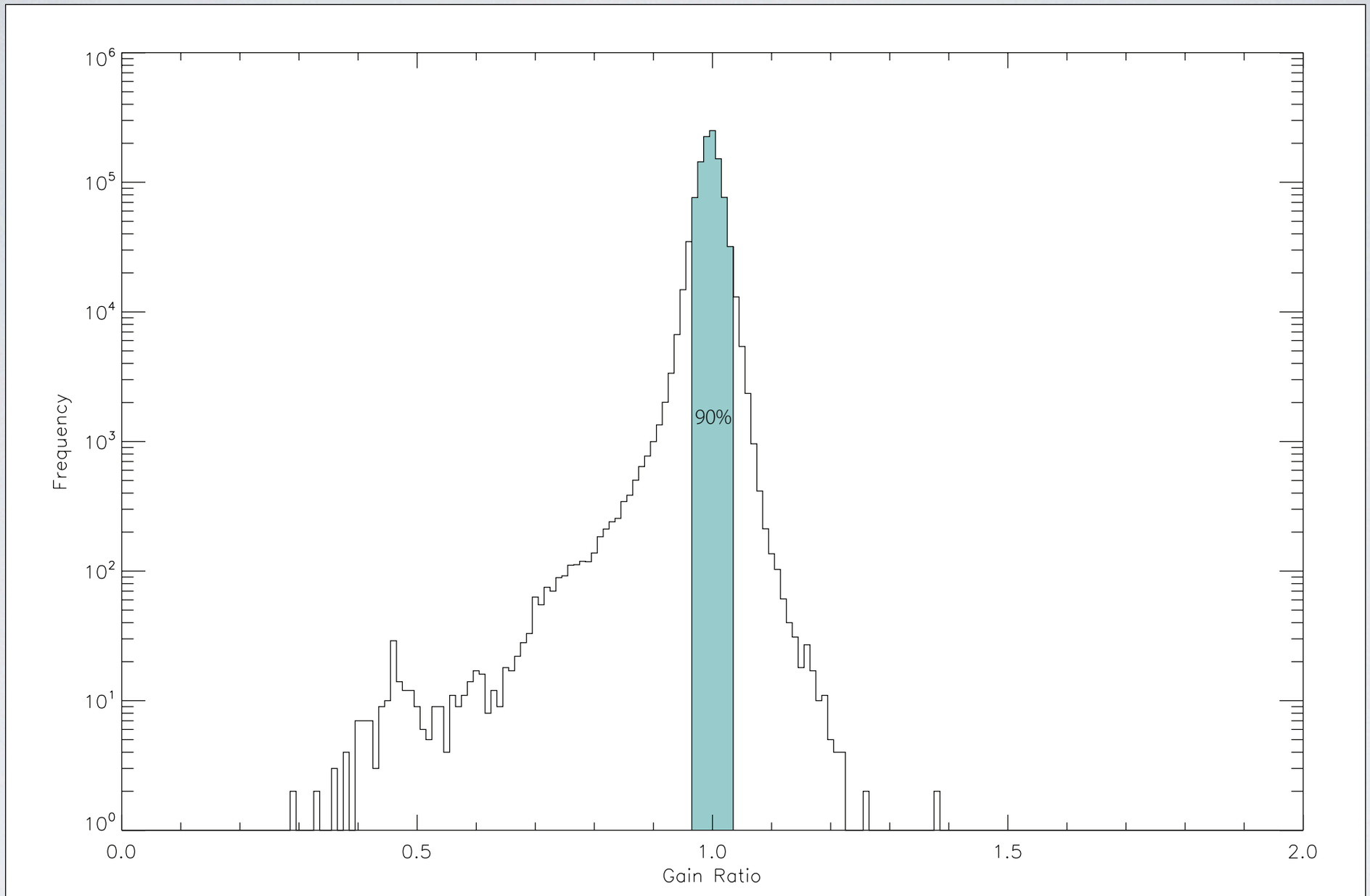
INPUT

980 Images ☀ 13 Offpoint Positions ☀ 56 Unique Measurements



RESULTS

Display Scale: 0.9–1.1

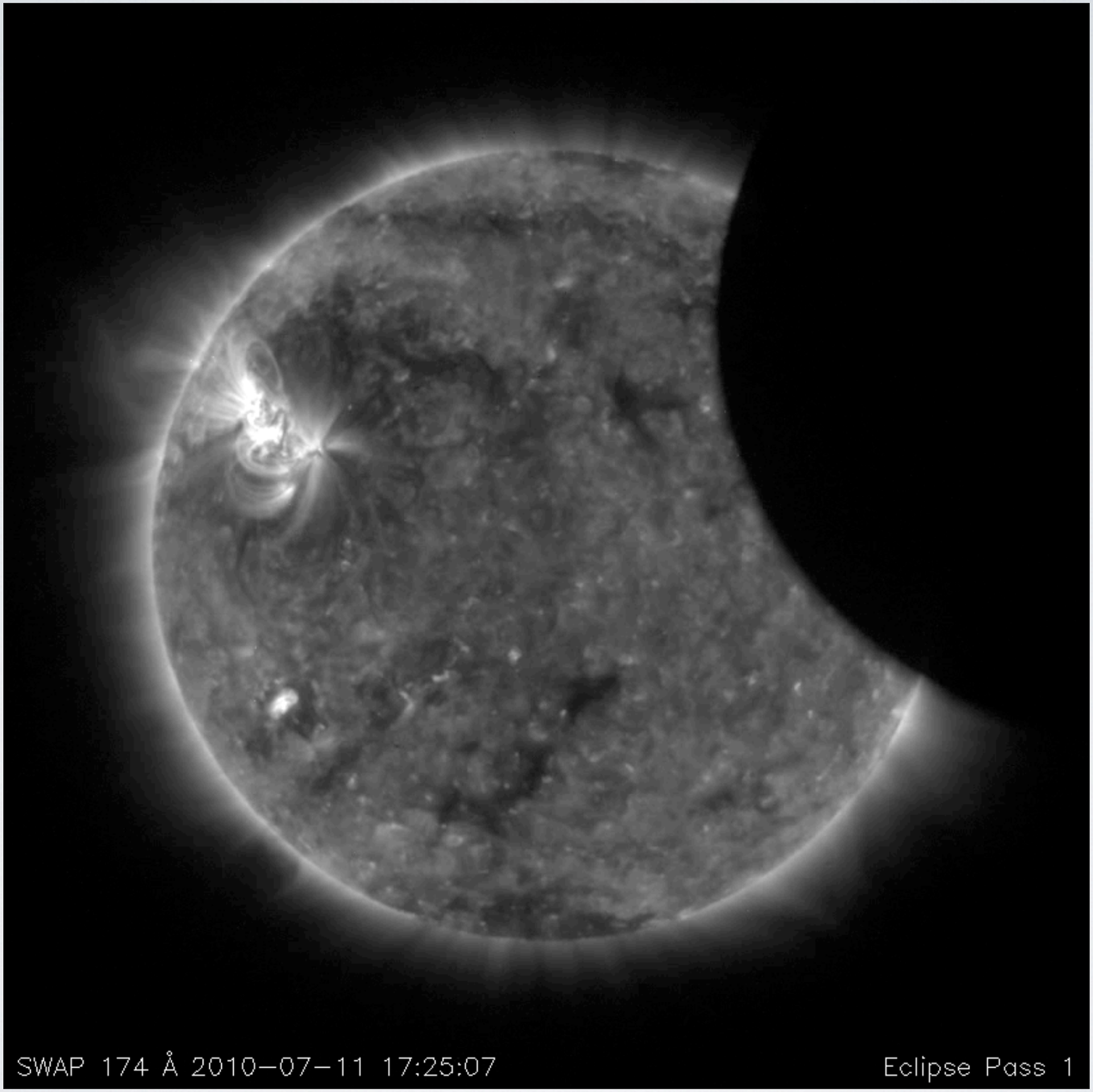


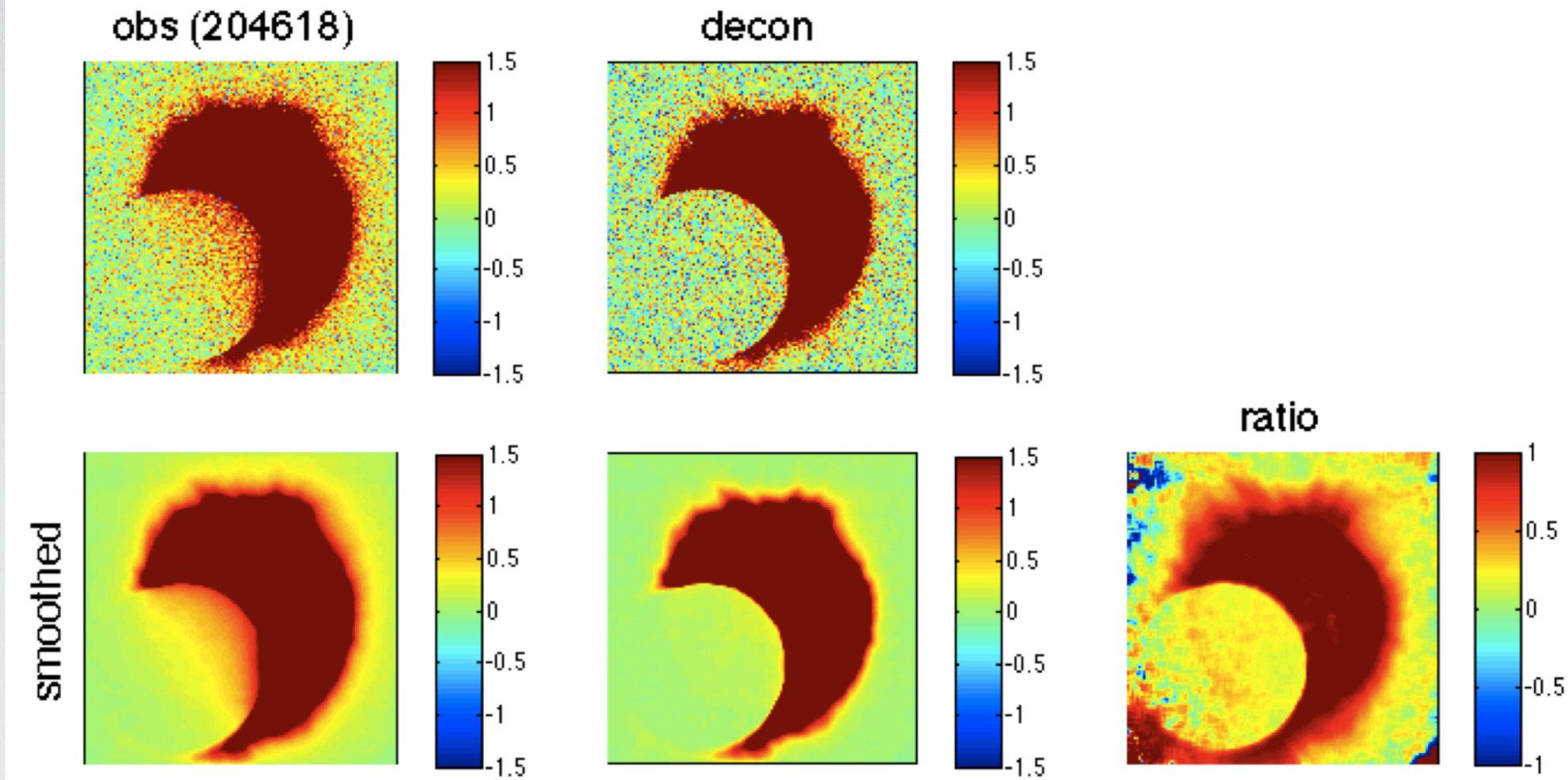
RESULTS

90% of pixels have gain ratio between 0.97–1.03

PSF & STRAY LIGHT

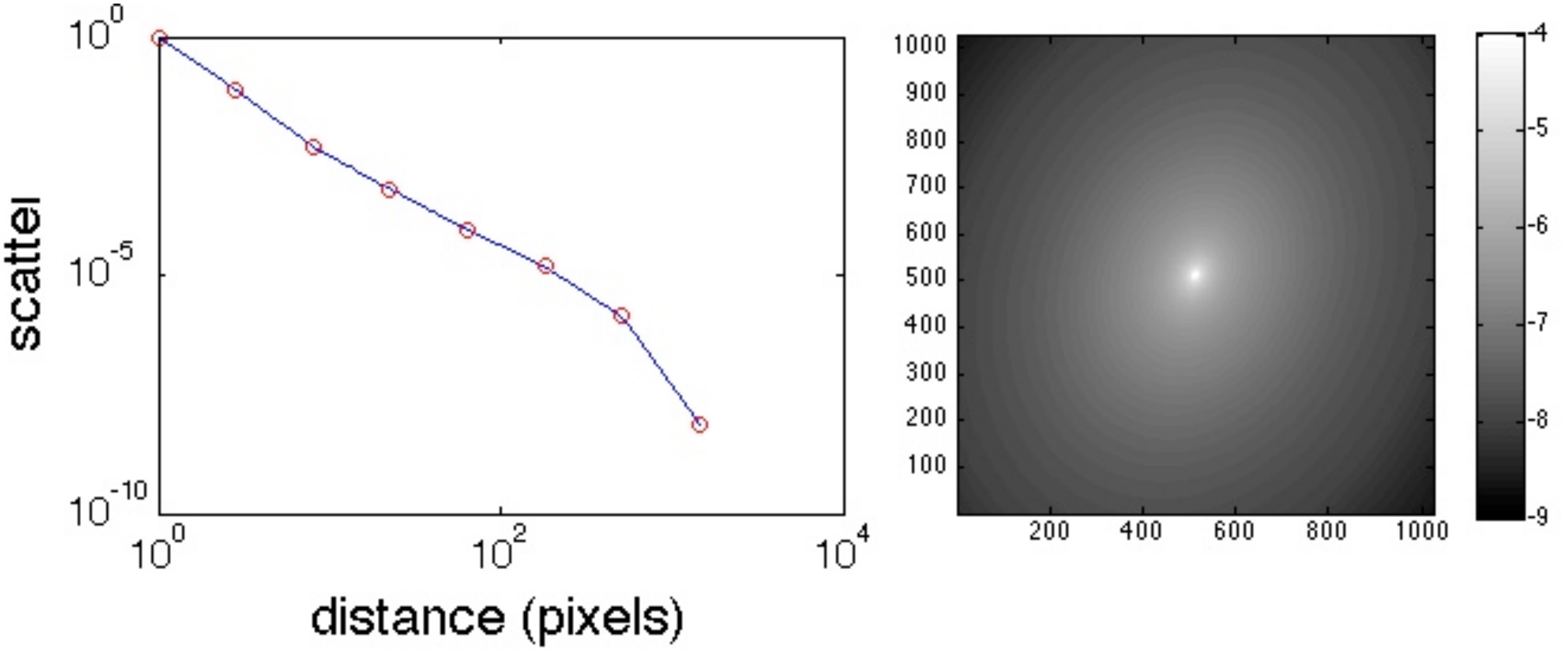
Special Thanks to PROBA2 GI Paul Shearer


SWAP 174 Å 2010-07-11 17:25:07
Eclipse Pass 1



BLIND DECONVOLUTION

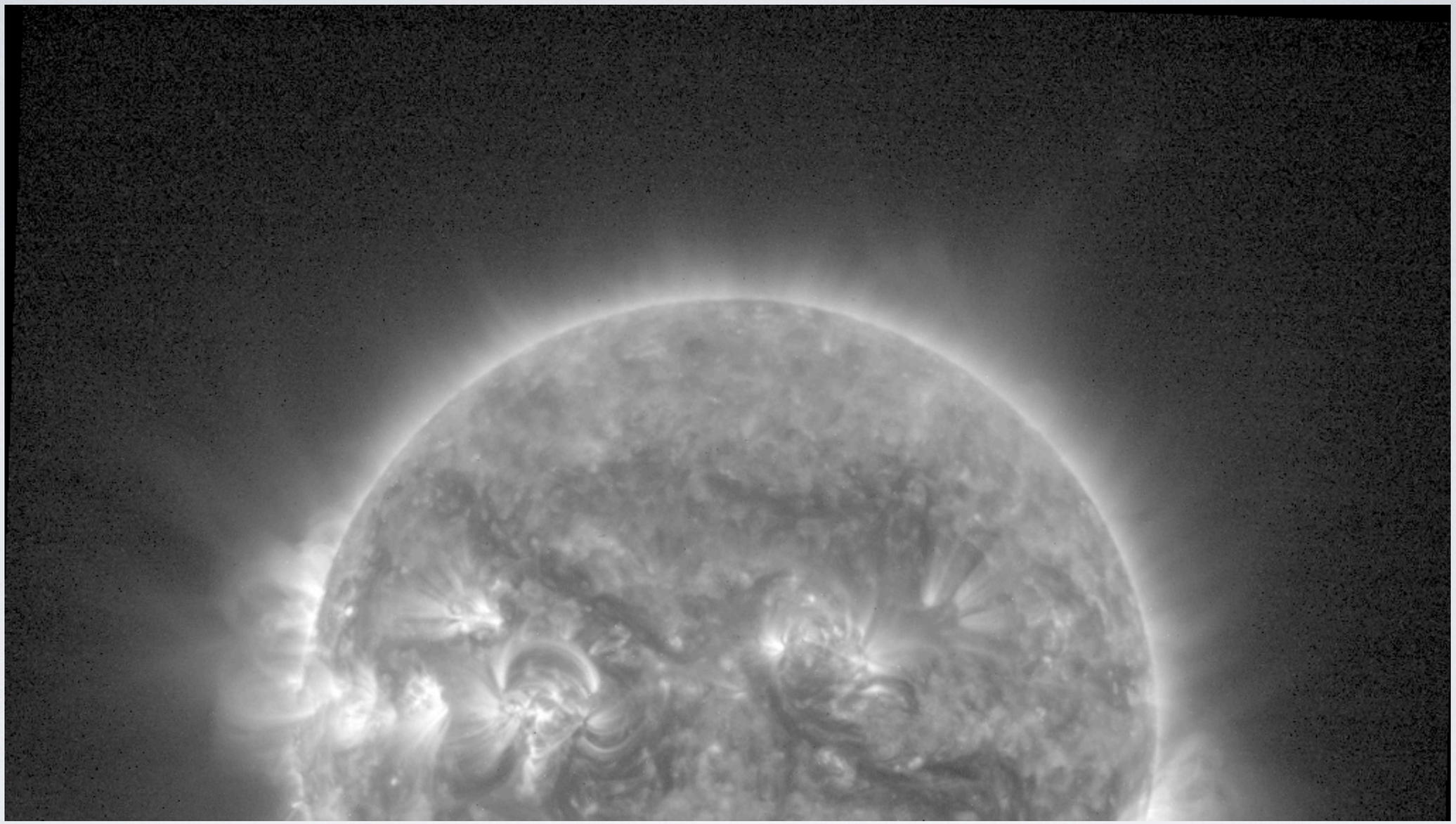
Paul used lunar transits to model SWAP's PSF



MODELED PSF

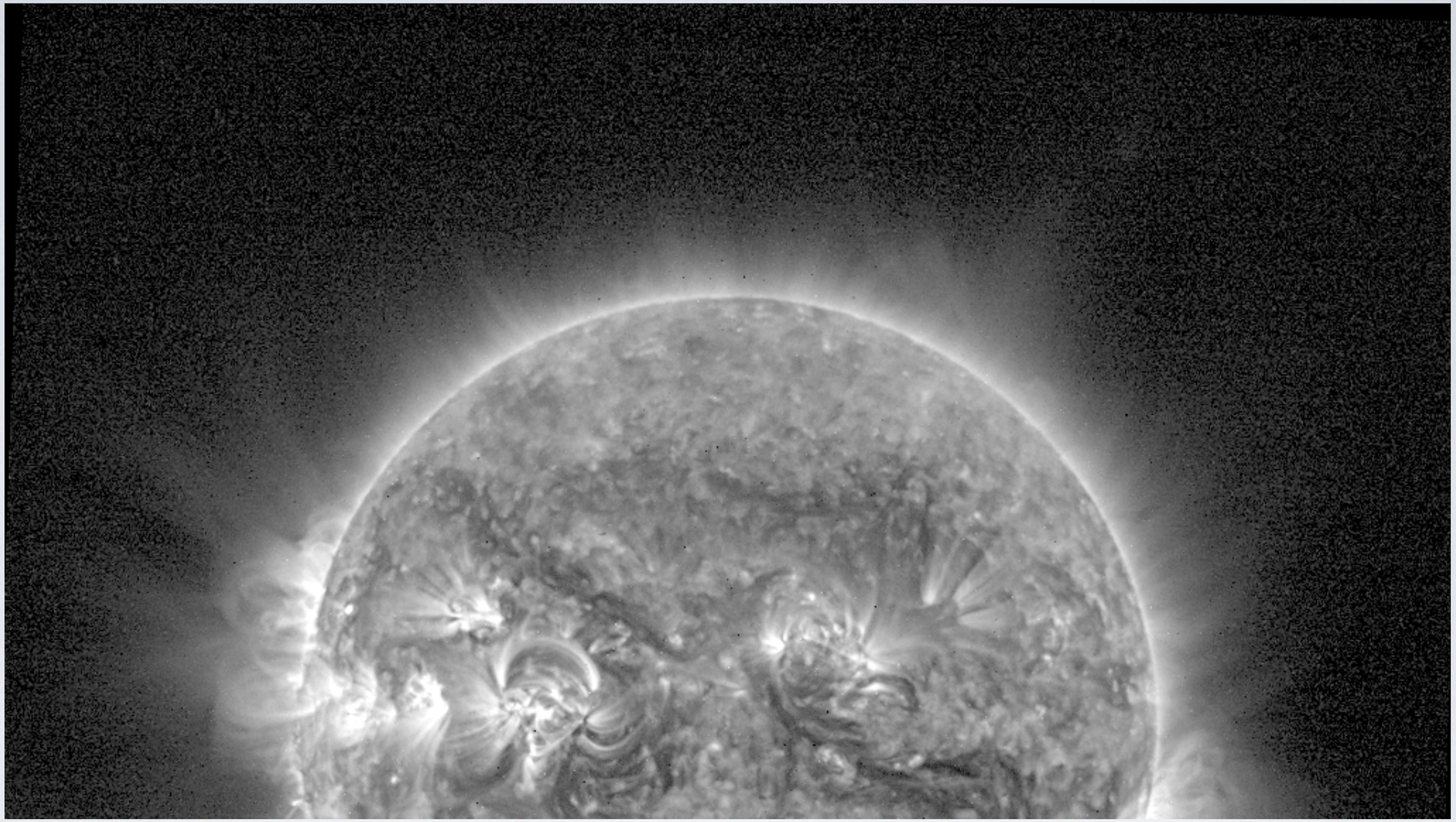
Paul's results show SWAP's PSF is anisotropic and is rotated about 30° from vertical.

APPLIED CORRECTIONS



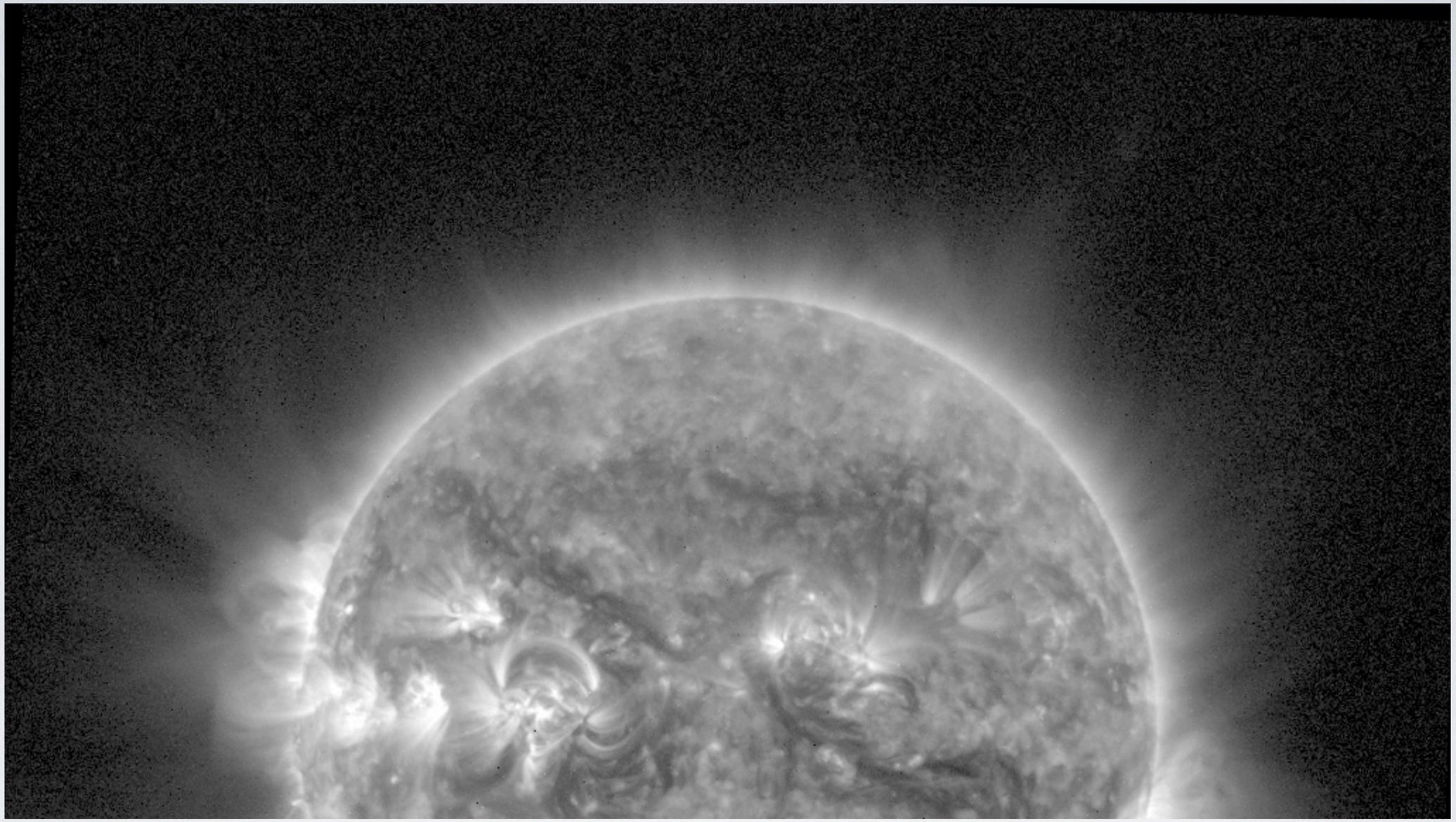
NOMINAL LEVEL 1 IMAGE

No PSF Correction Applied



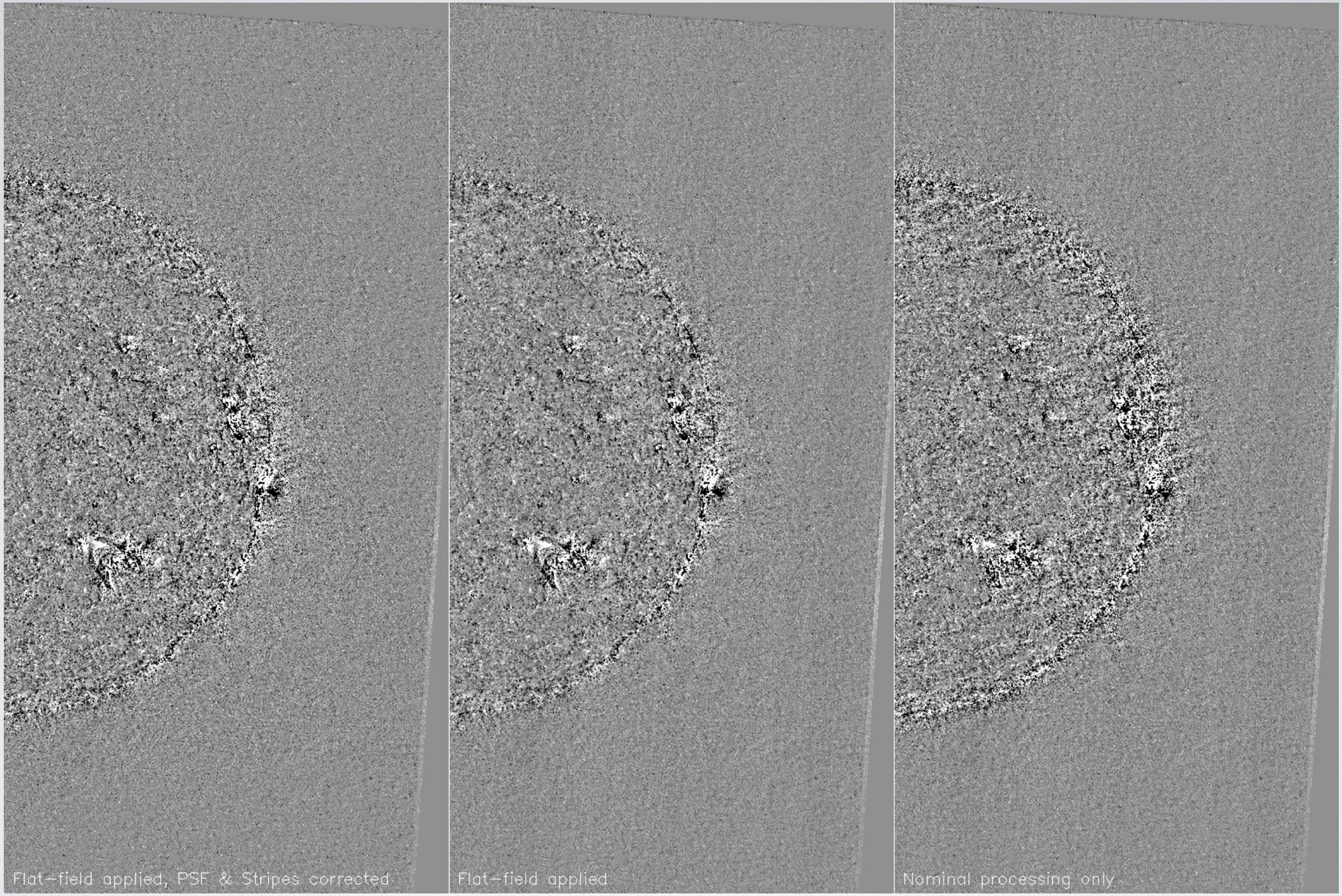
PSF CORRECTED IMAGE

No Banding Correction Applied



FULLY CORRECTED IMAGE

PSF Deconvolution & Band Correction Applied

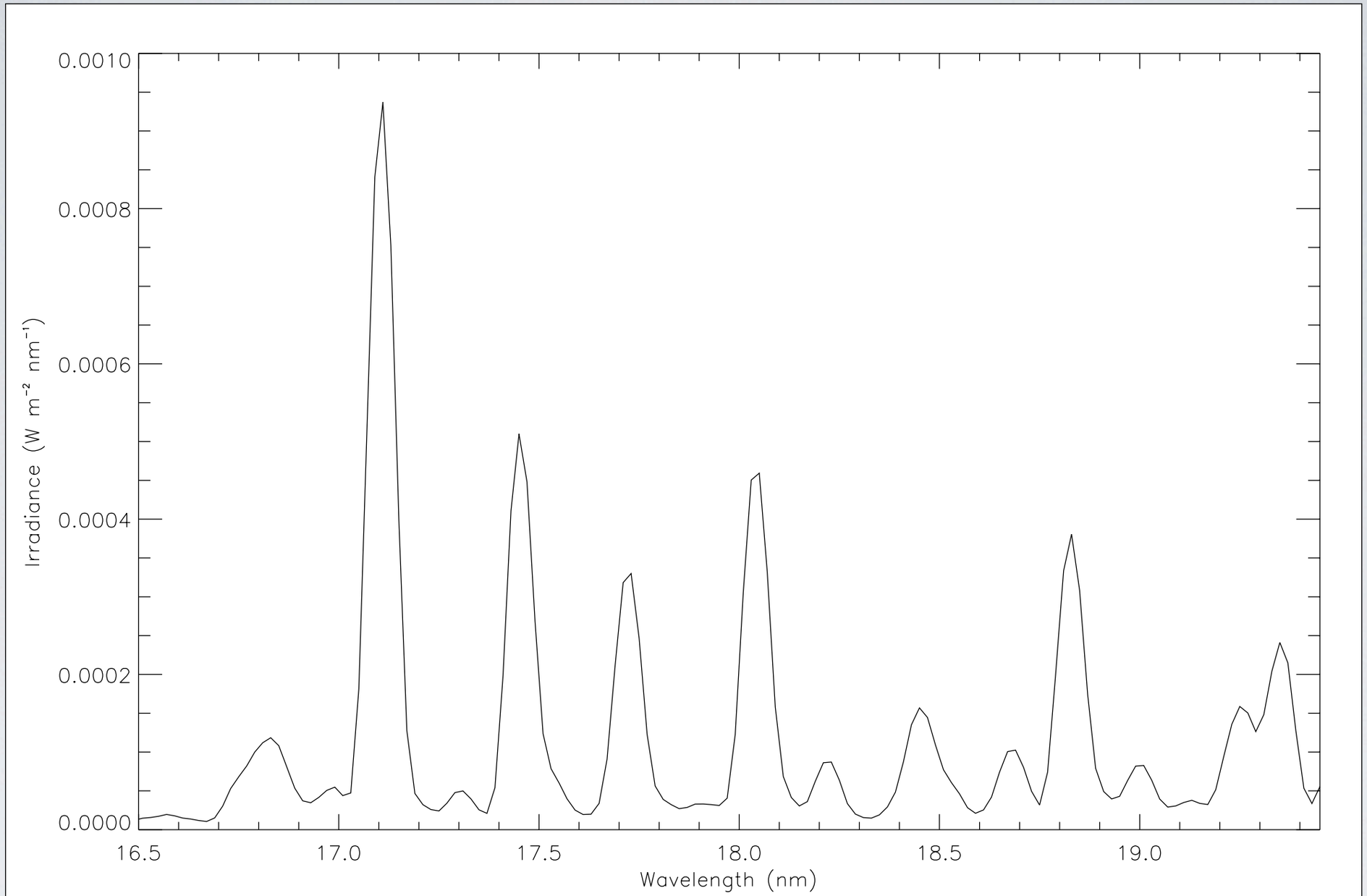


RUNNING DIFFERENCE

II. DEGRADATION (OR NOT)

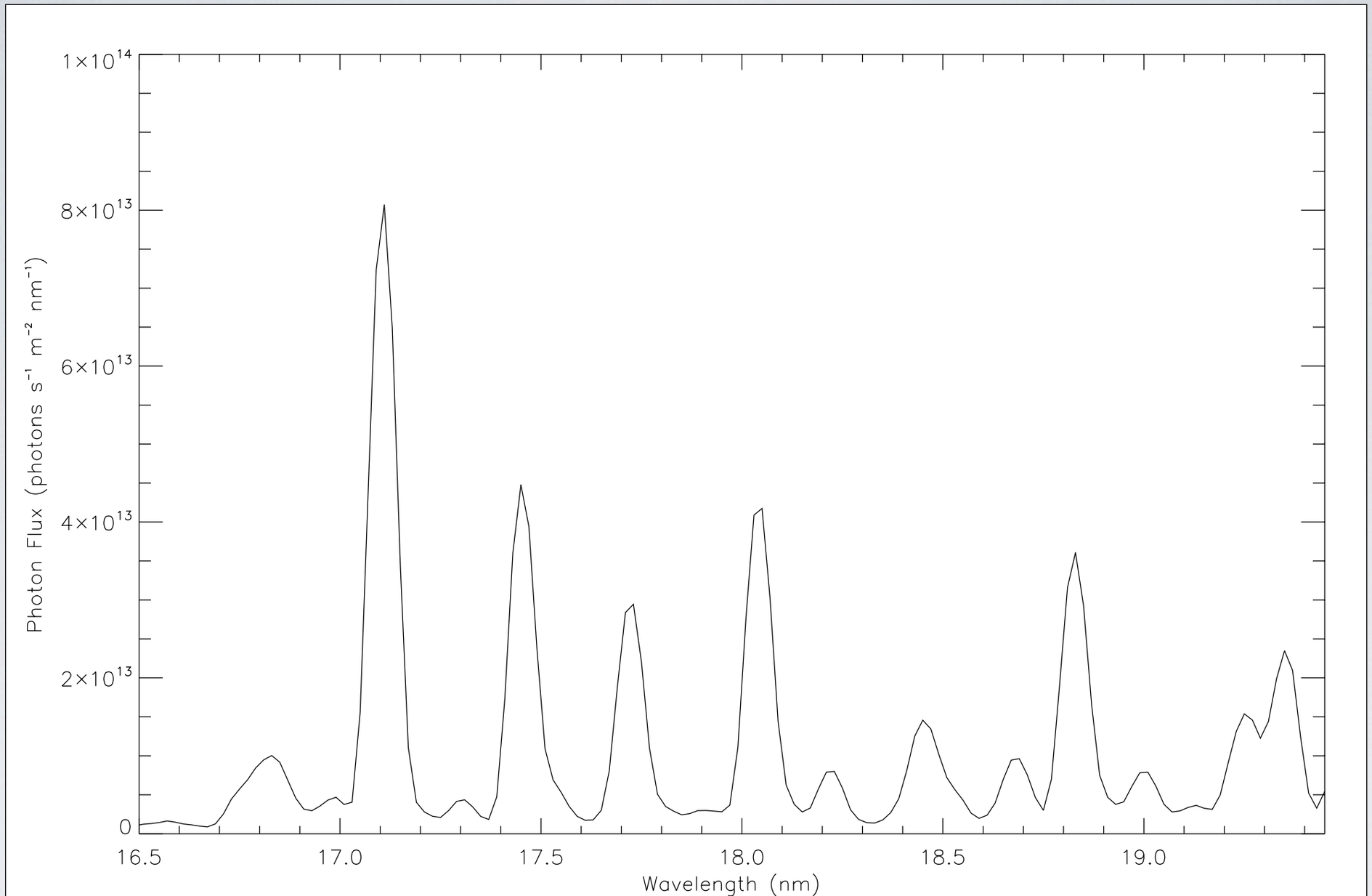
OPTICAL RESPONSE

Major challenge is the lack of in-orbit, standard EUV source



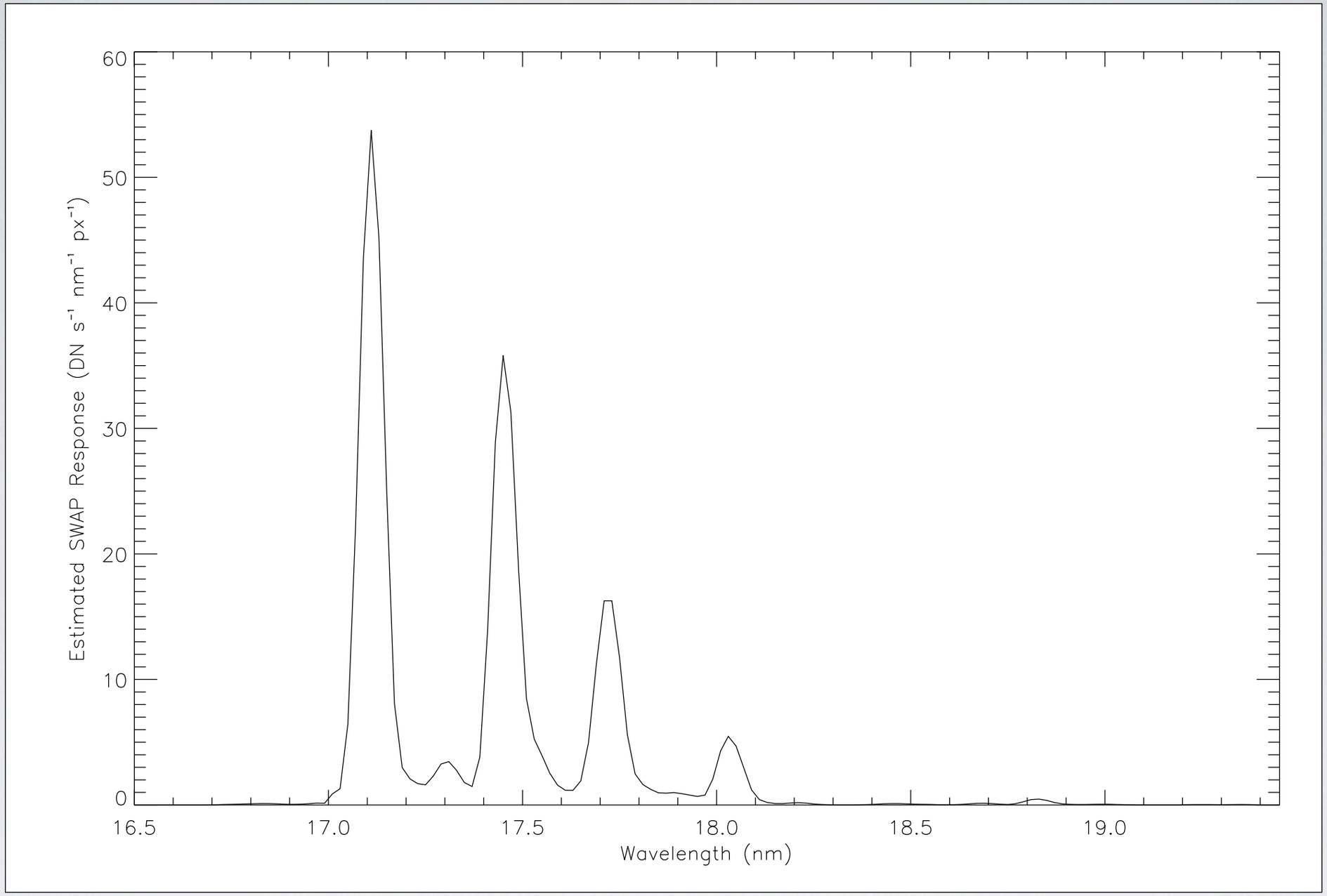
SOLAR IRRADIANCE

EVE Irradiance near SWAP Bandpass



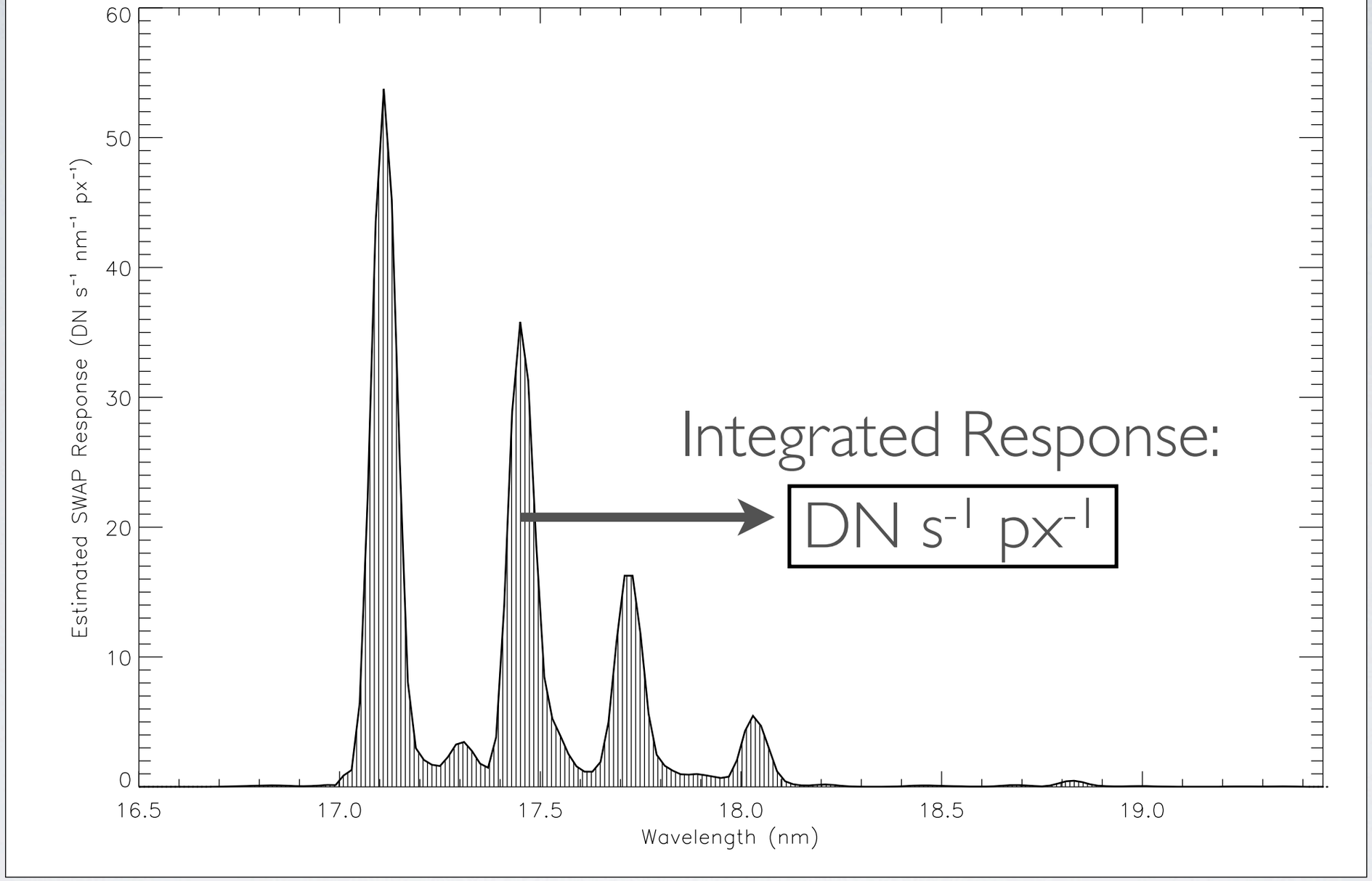
PHOTON FLUX

Photons s^{-1} m^{-2} nm^{-1}



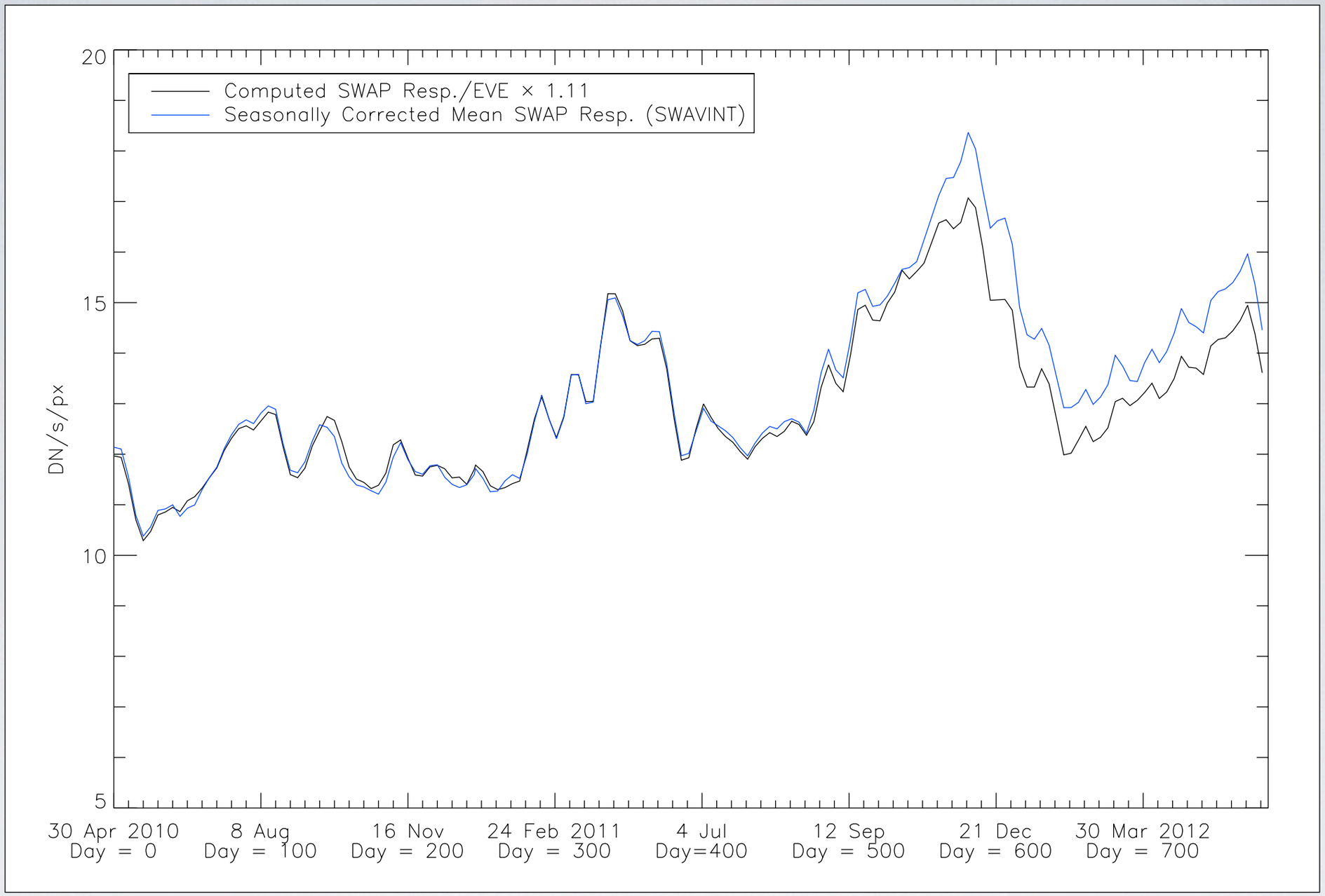
ESTIMATED SWAP RESPONSE

Photon flux modulated by SWAP bandpass



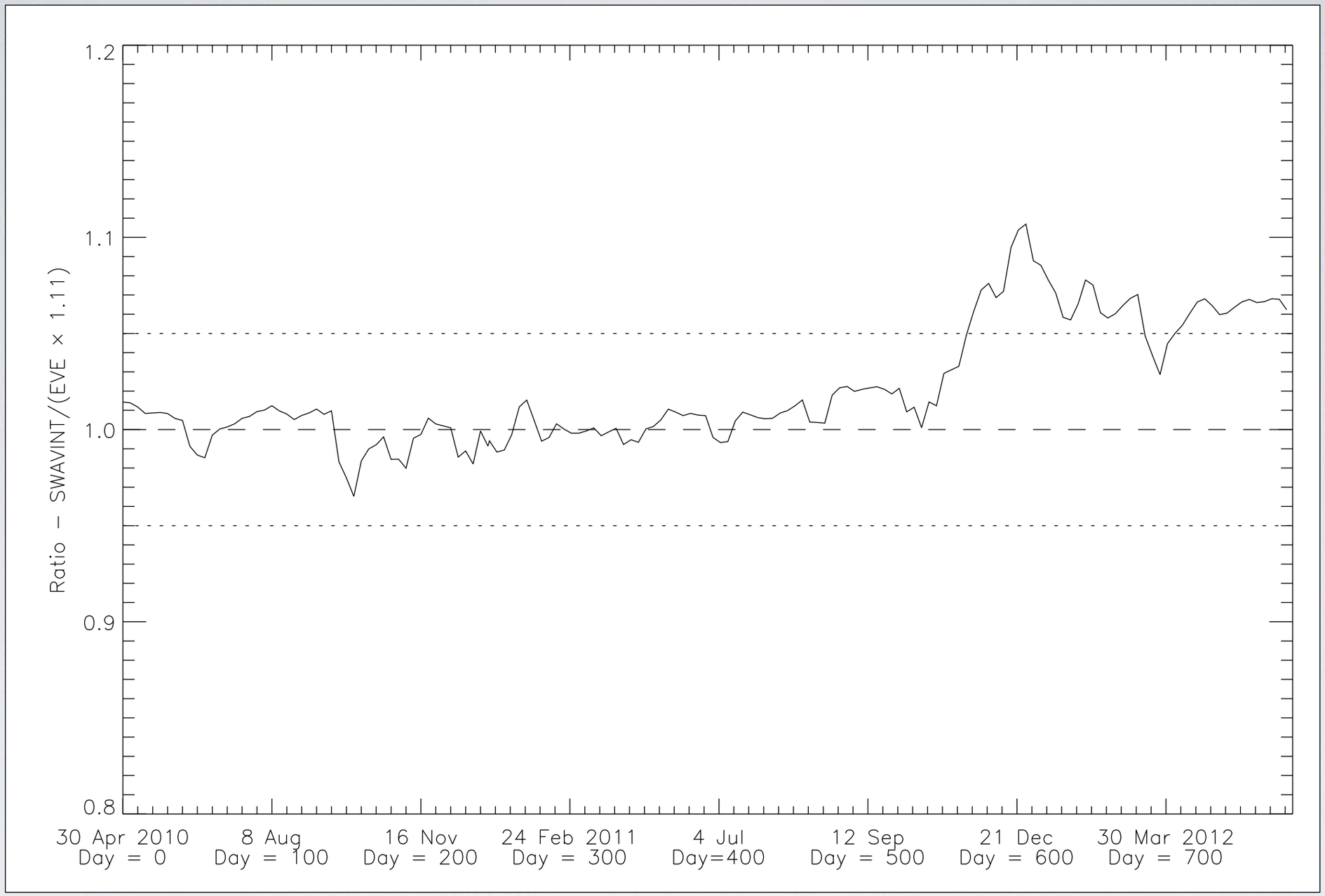
ESTIMATED SWAP RESPONSE

Photon flux modulated by SWAP bandpass



IRRADIANCE EVOLUTION

SWAP (Blue) vs. EVE (Black)



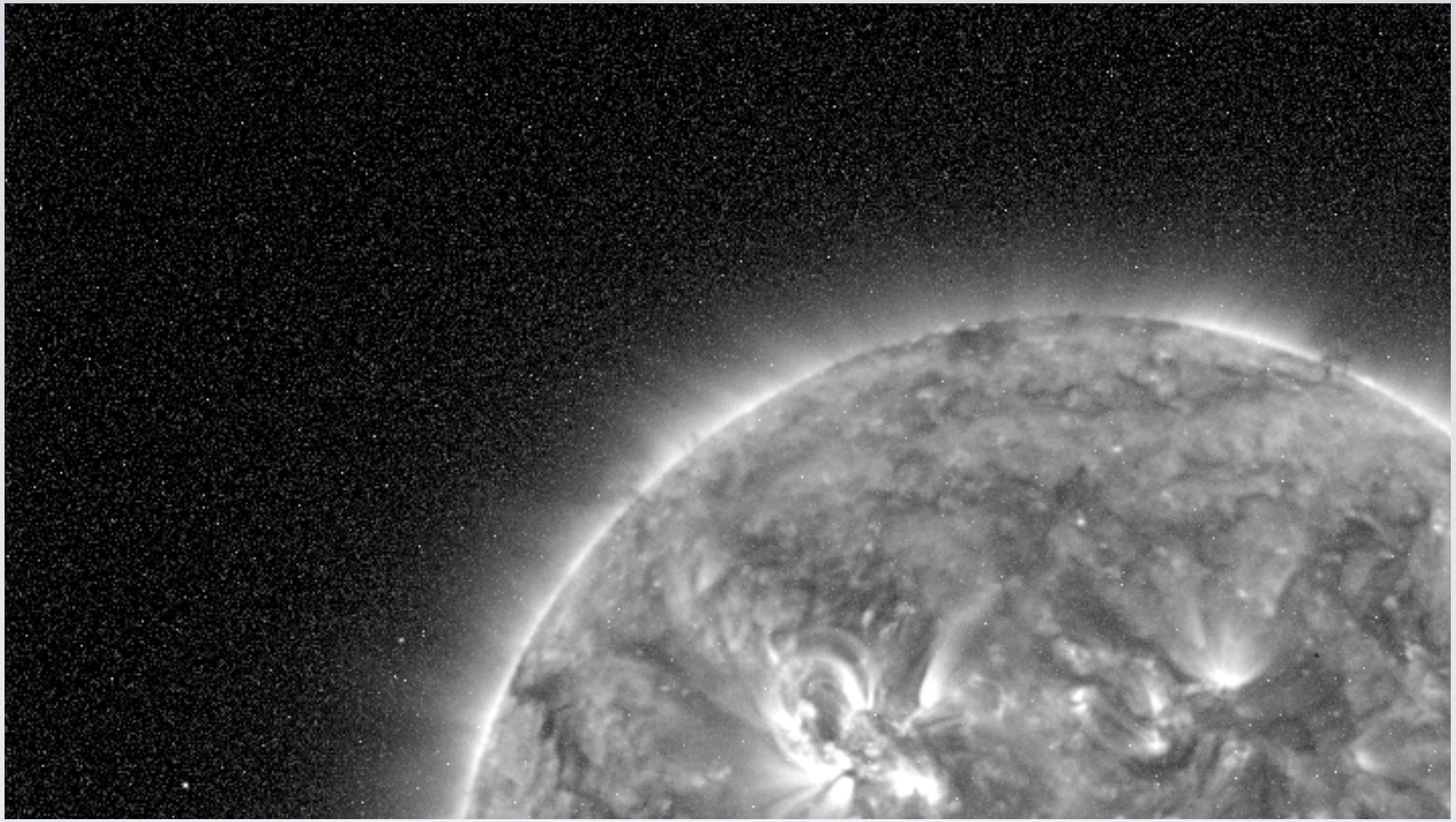
IRRADIANCE EVOLUTION

SWAP (Blue) vs. EVE (Black)

OPTICAL DEGRADATION

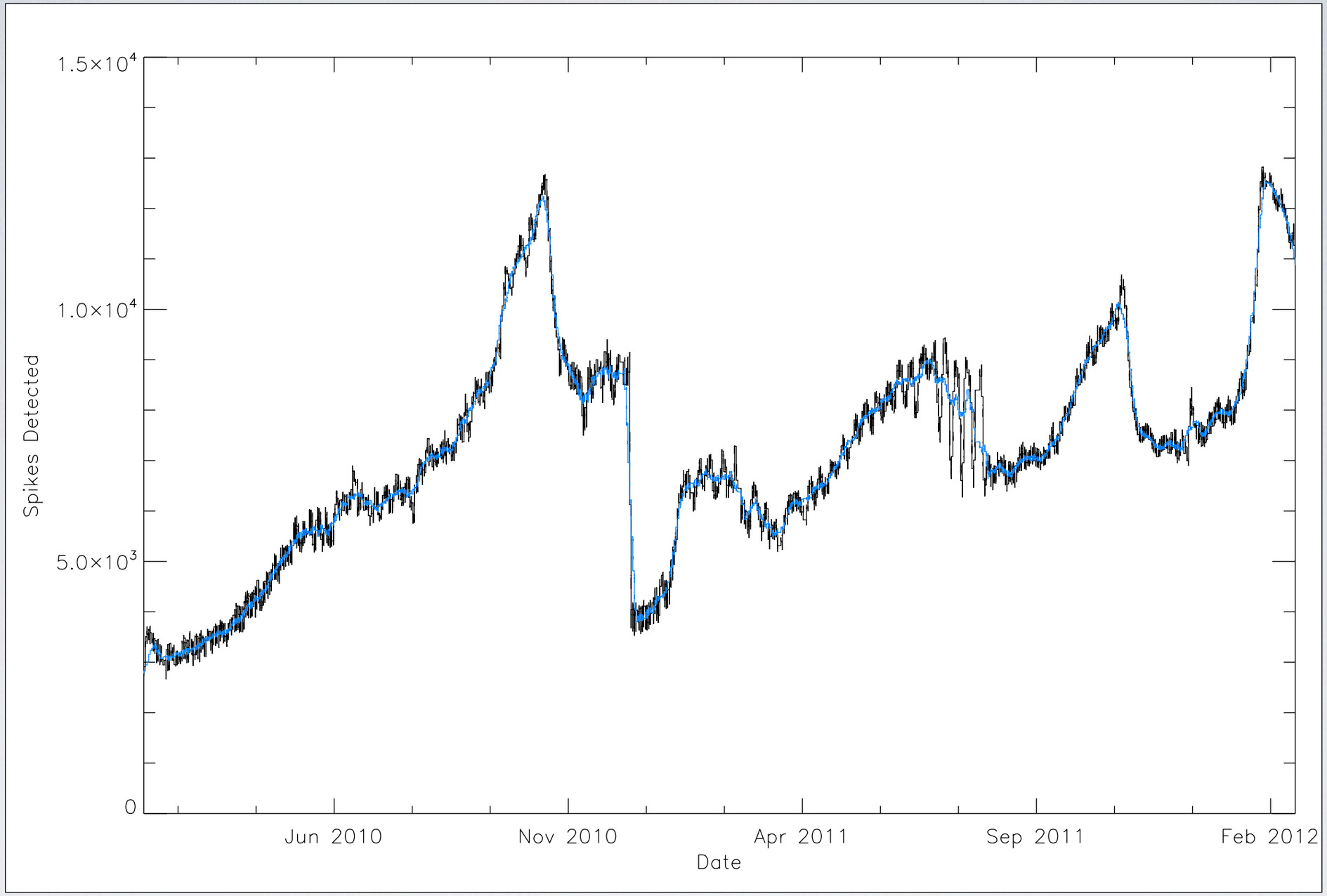
- SWAP optical path response is apparently not degrading
- EVE response may be degrading or changing
- **More concrete conclusions are difficult—deep discussion with EVE team still needed**

DETECTOR NOISE



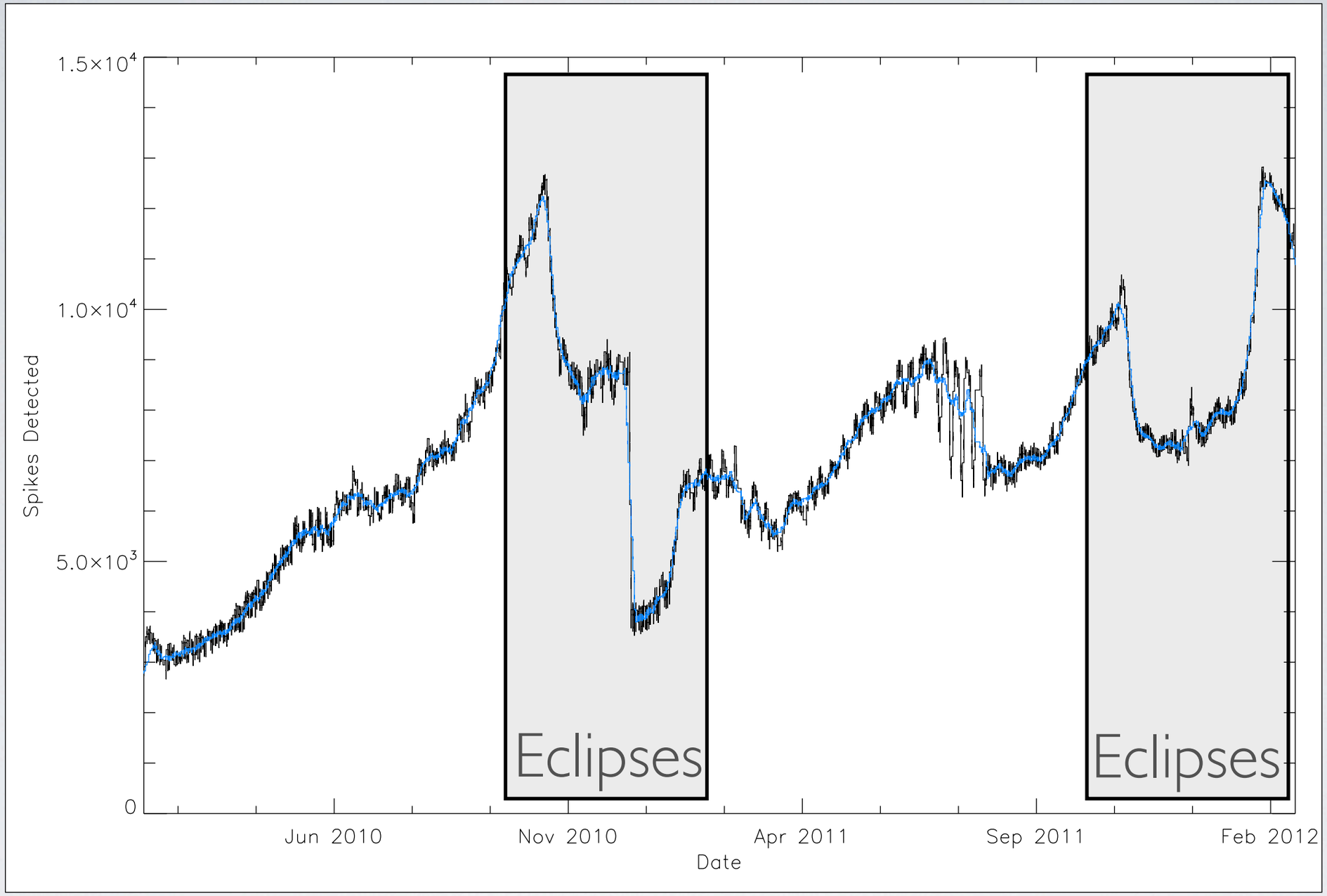
SWAP LEVEL-0 IMAGE

Bright pixels are removed during image calibration



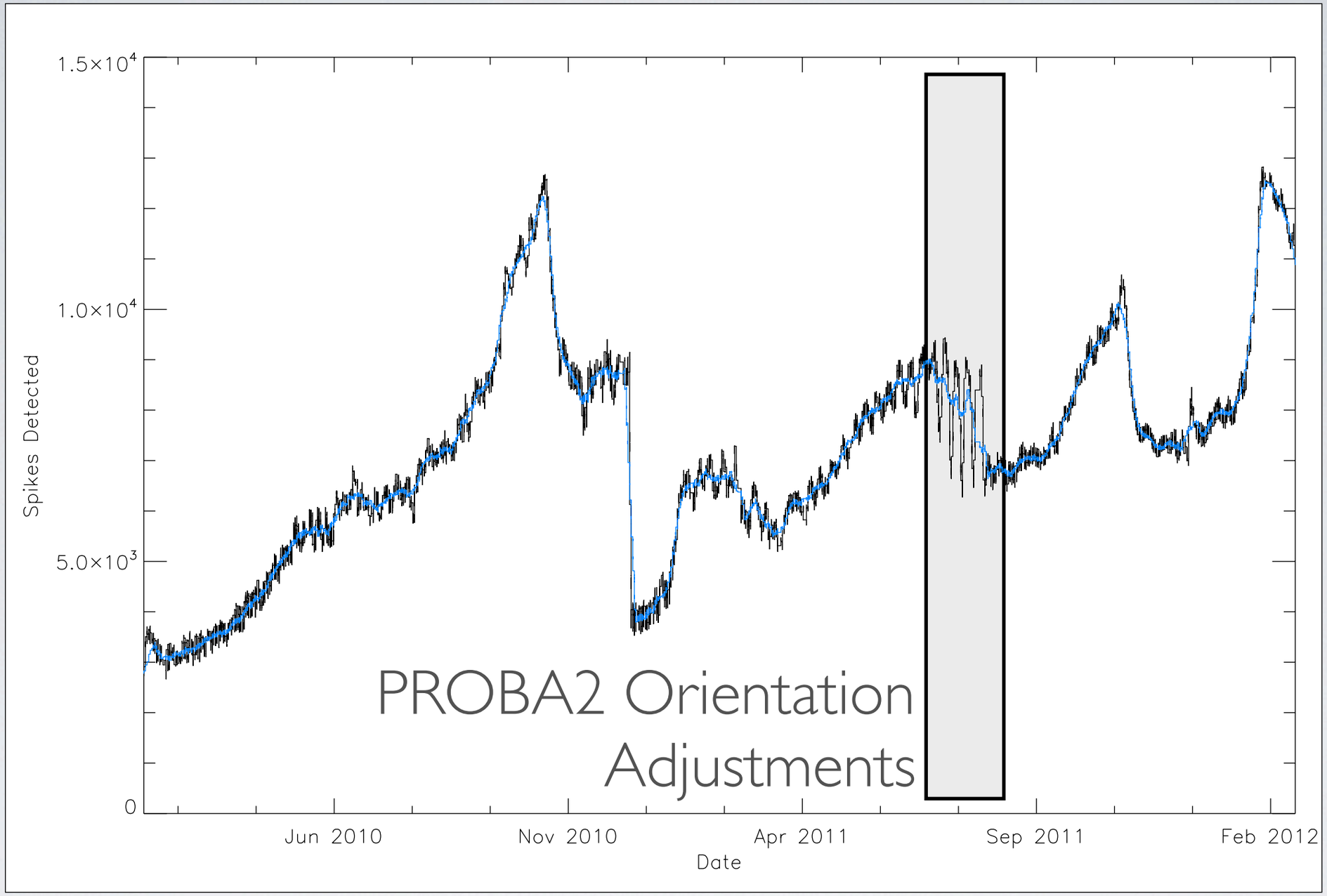
HOT PIXEL DETECTIONS

Rate of detections in nominal SWAP data images



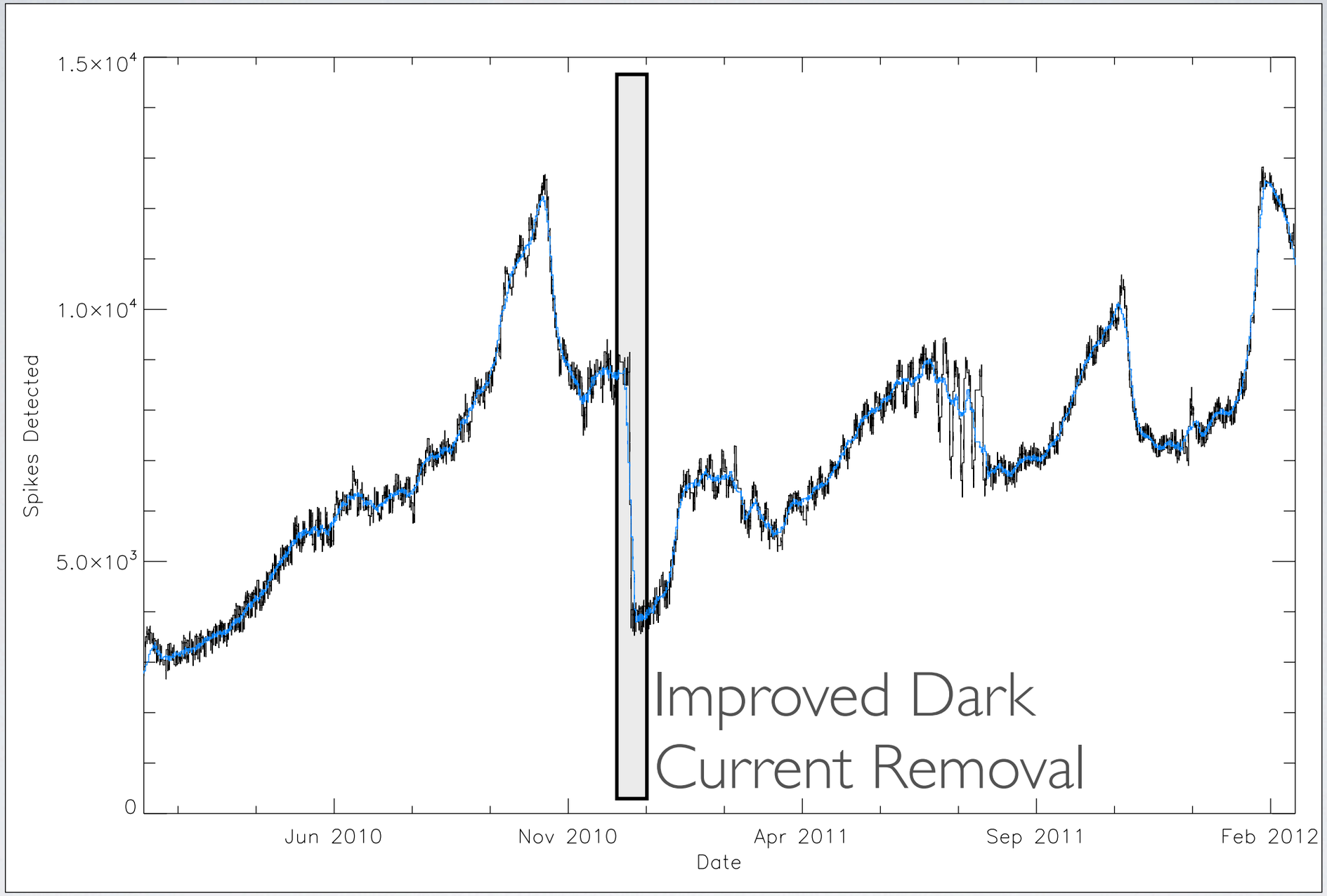
HOT PIXEL DETECTIONS

Eclipses reduce temperature and spike rates

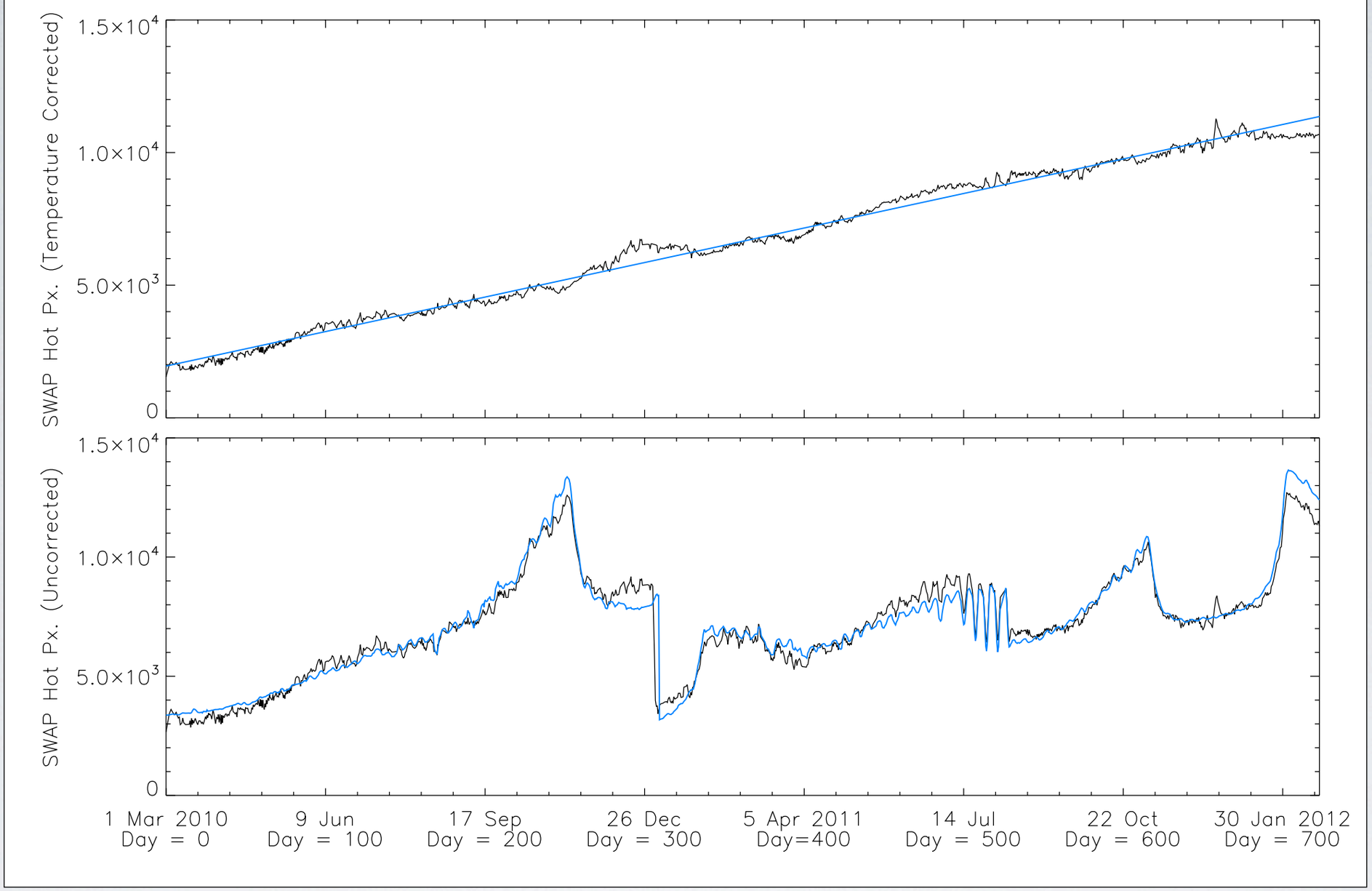


HOT PIXEL DETECTIONS

Roll-Orientation Adjustment reduced temperature as well



HOT PIXEL DETECTIONS



HOT PIXEL DETECTIONS

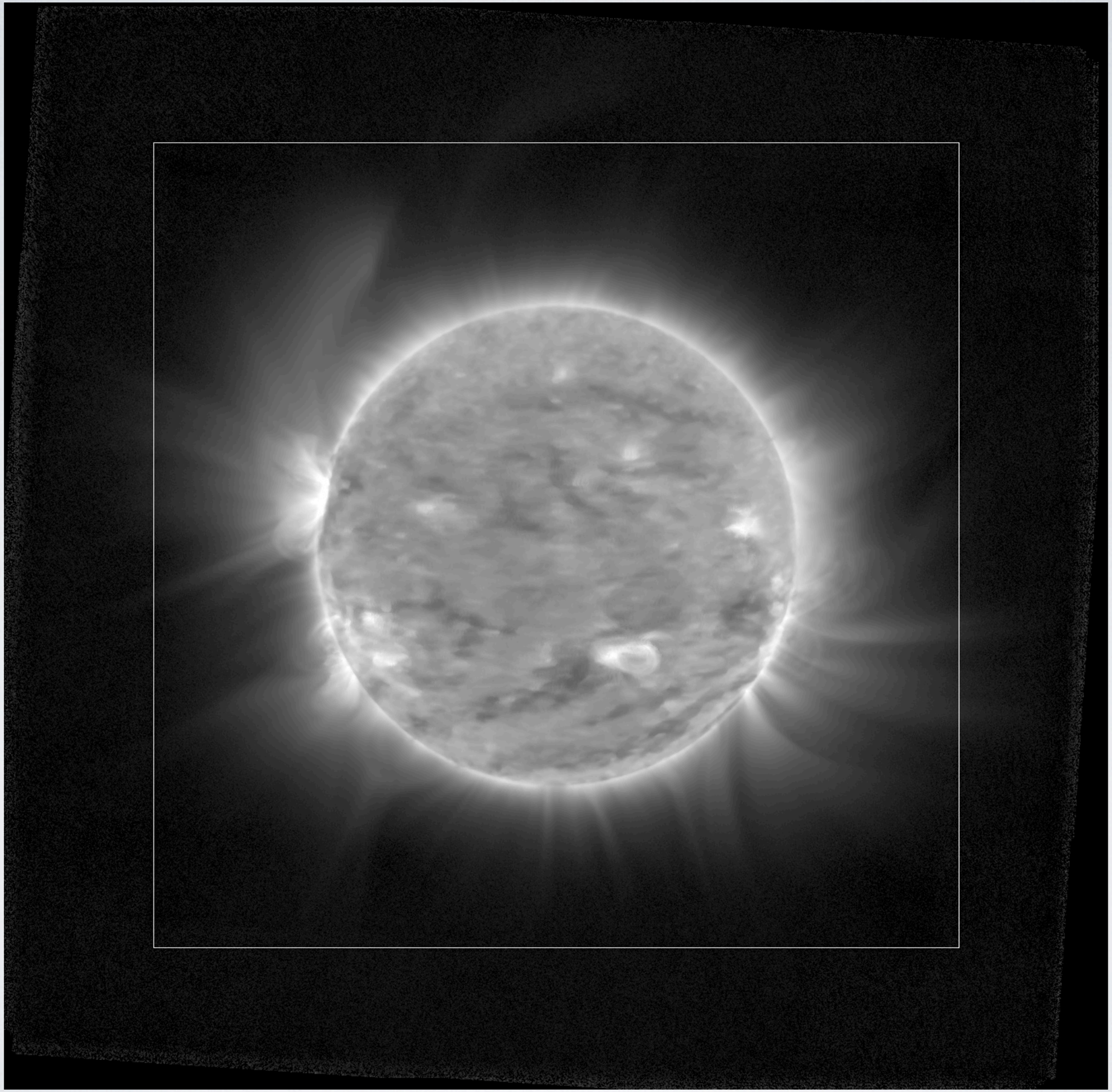
Temperature Corrected

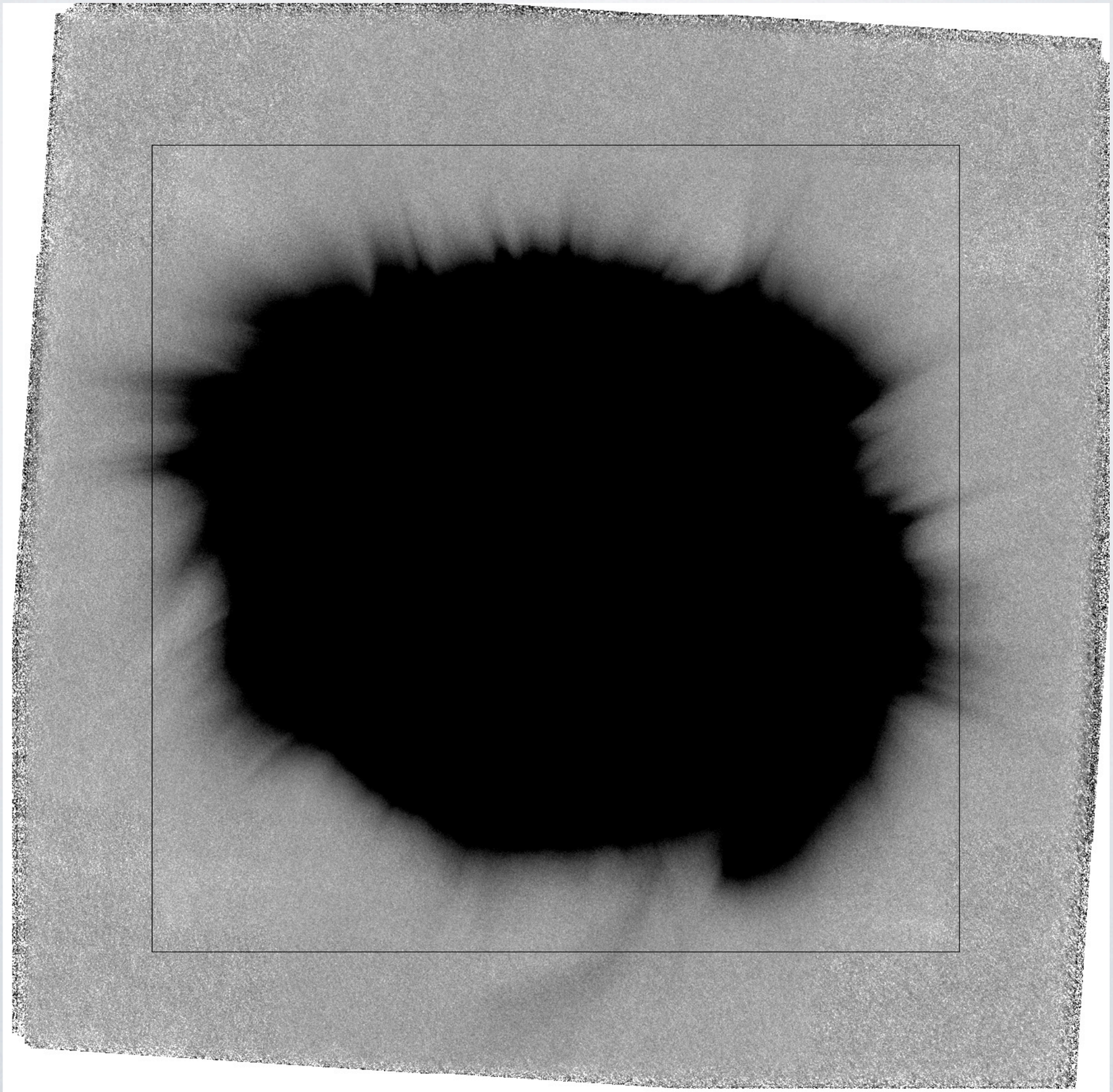
≈13 New Spikes/Day ⇒ 4700/Year

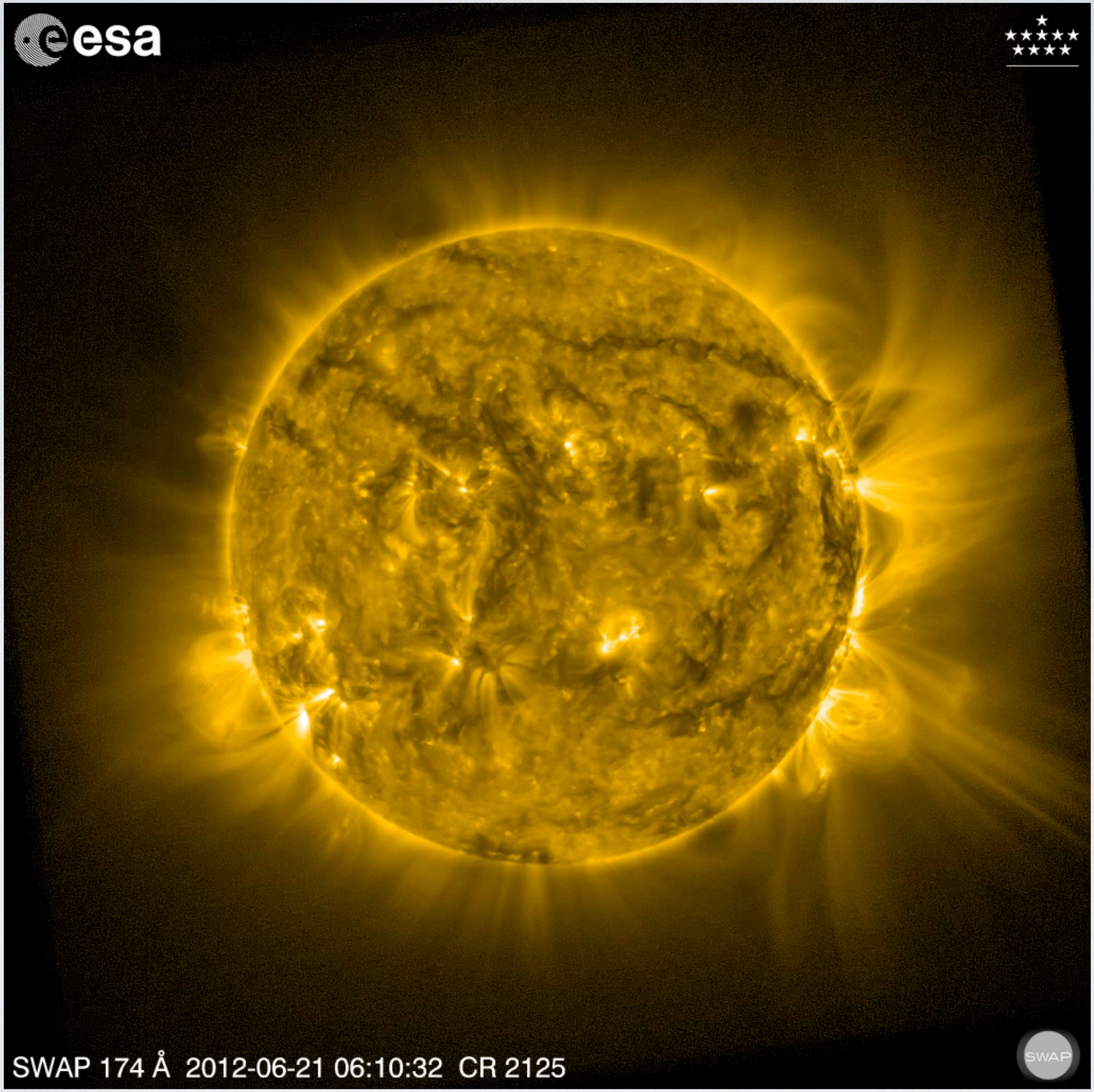
DETECTOR DEGRADATION

- Not all new spike detections are malfunctions
- Spikes are strongly related to evolution of dark current
- Spikes are also related to changes in calibration scheme
- **Detector is degrading at significantly less than 0.5% per year**

III. NEW DATA PRODUCTS AND SCIENCE






esa
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SWAP

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