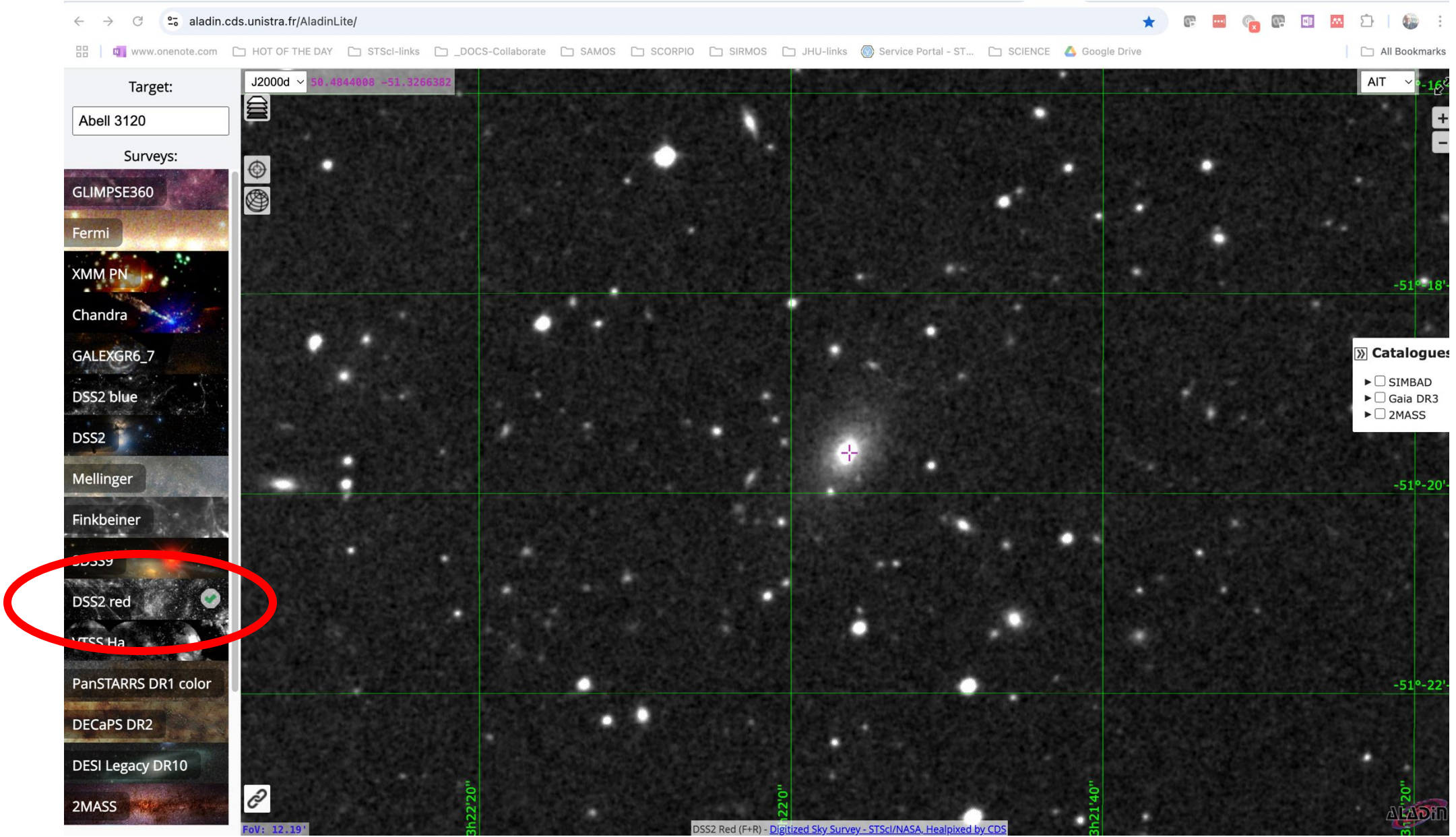
SAMOS Spectroscopic Pipeline

V1.0

12/19/2024

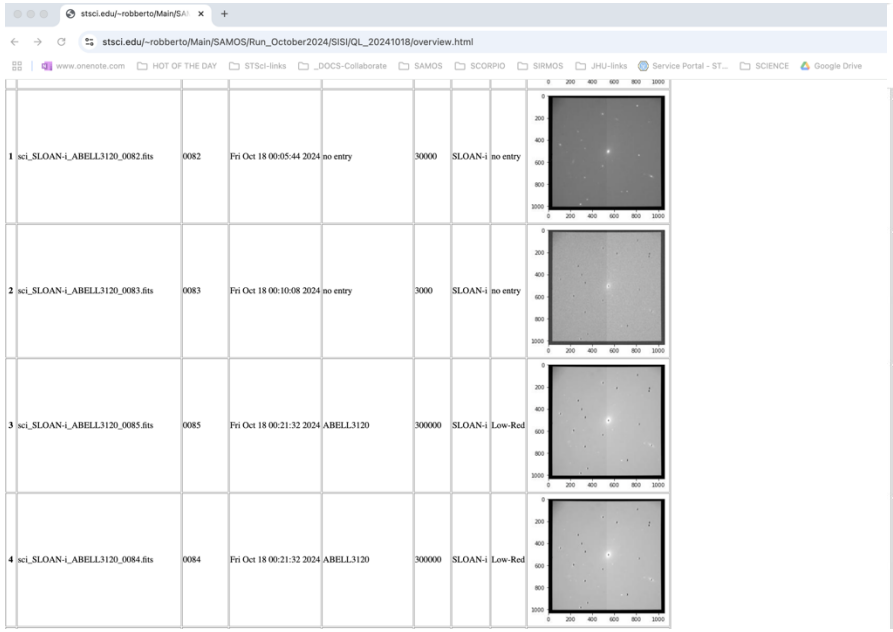
Galaxy Cluster Abell 3120



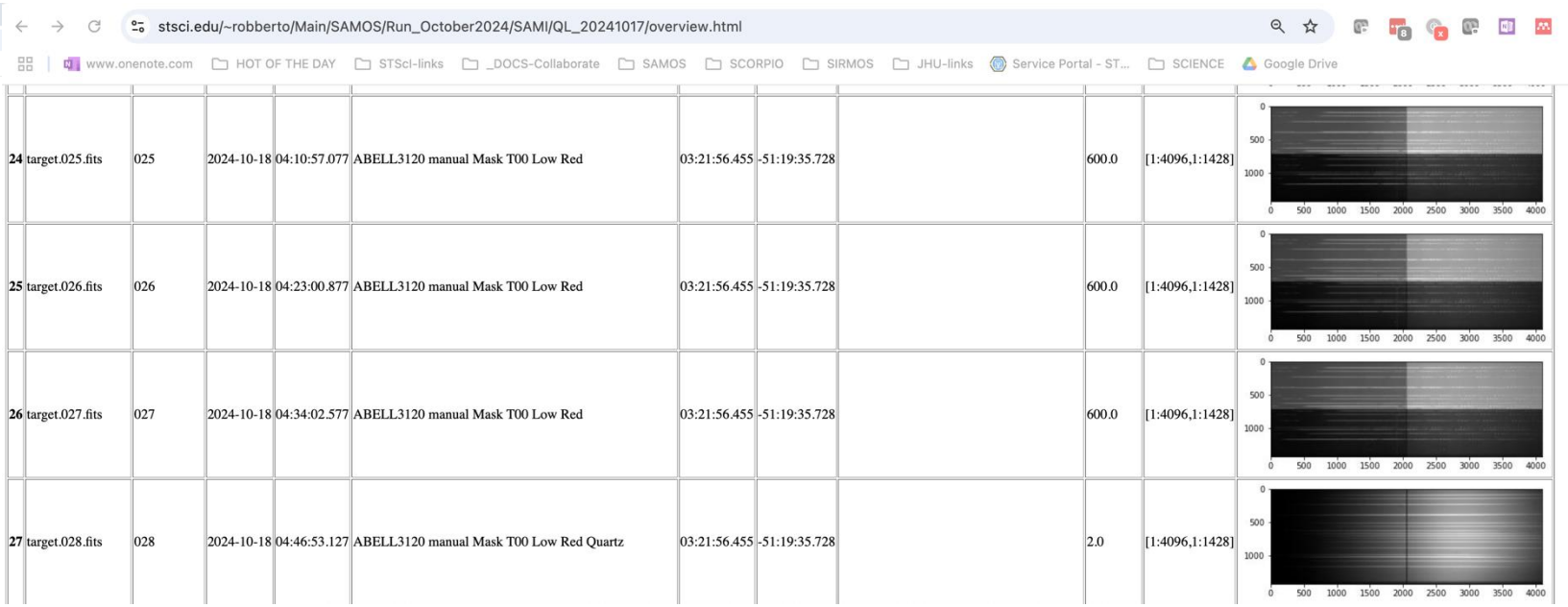
Preparatory Work

- All raw images are collected and organized in directories, one for each night.
- Fits headers finalized, as needed
- For inspection, a Python script creates “log-books” for both SAMI and SISI images, with basic parameter and image postage stamps, visible as public. html file.

Log book examples

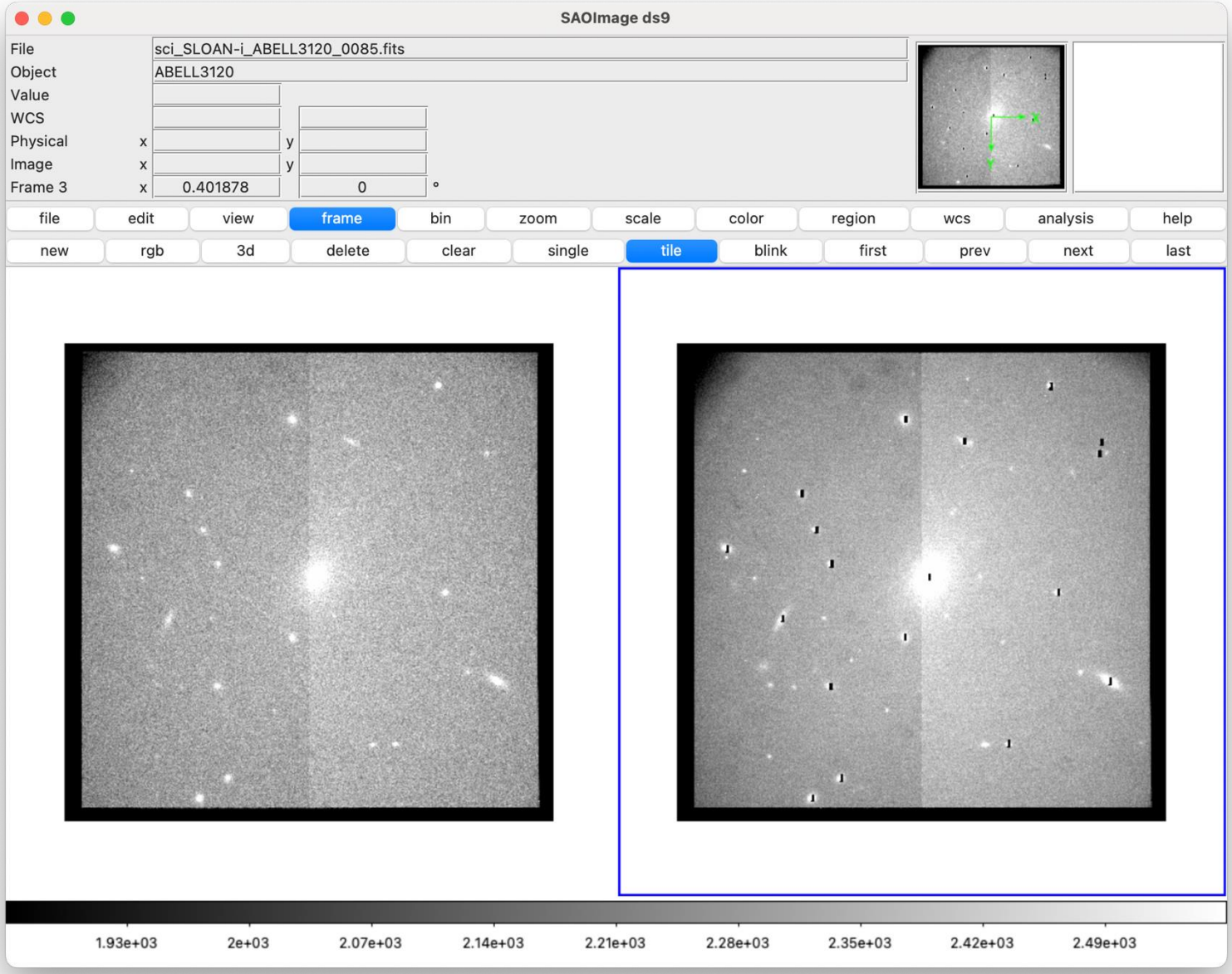


1	sci_SLOAN-i_ABELL3120_0082.fits	0082	Fri Oct 18 00:05:44 2024	no entry	30000	SLOAN-i	no entry	
2	sci_SLOAN-i_ABELL3120_0083.fits	0083	Fri Oct 18 00:10:08 2024	no entry	3000	SLOAN-i	no entry	
3	sci_SLOAN-i_ABELL3120_0085.fits	0085	Fri Oct 18 00:21:32 2024	ABELL3120	300000	SLOAN-i	Low-Red	
4	sci_SLOAN-i_ABELL3120_0084.fits	0084	Fri Oct 18 00:21:32 2024	ABELL3120	300000	SLOAN-i	Low-Red	

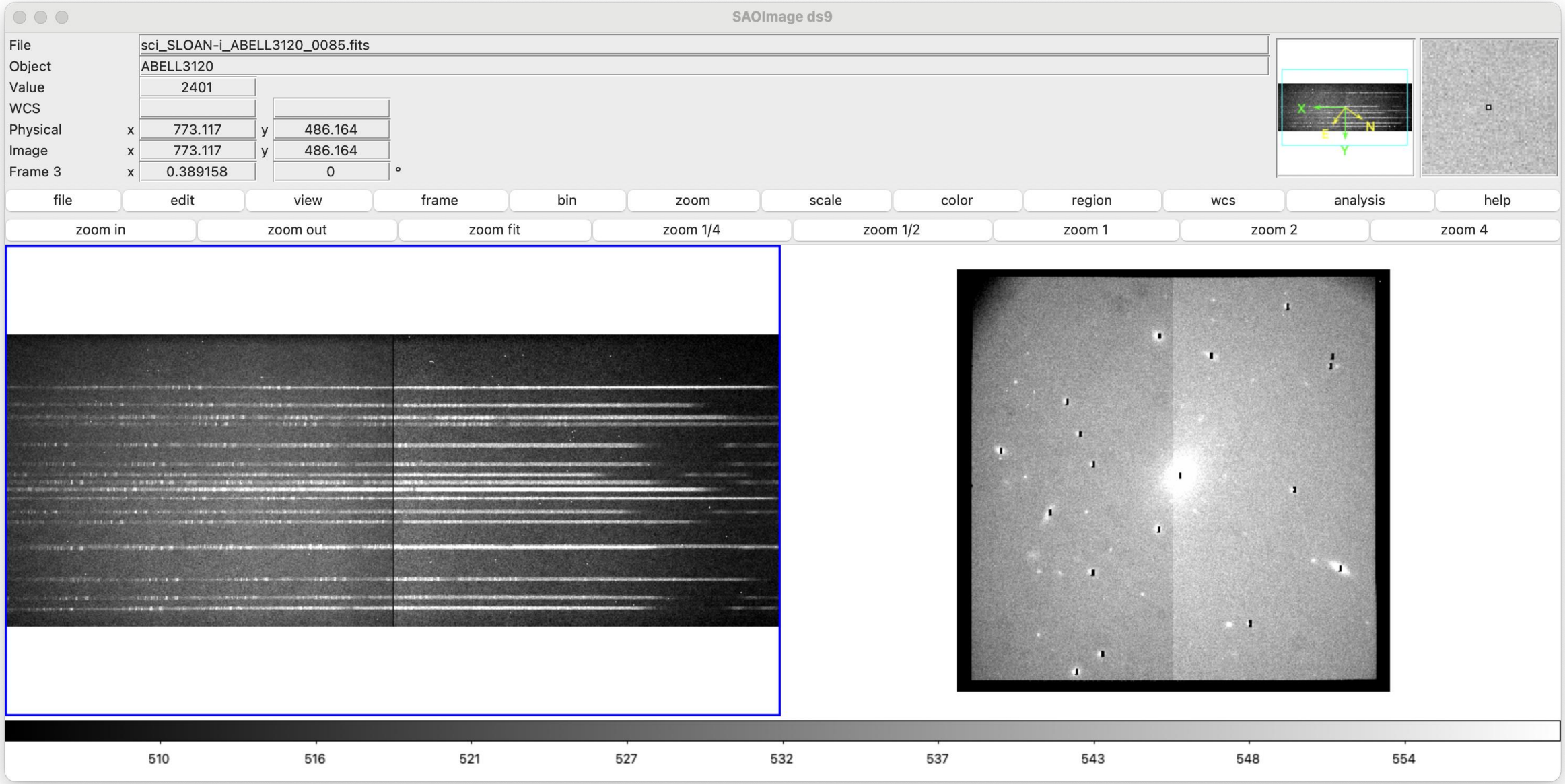


24	target.025.fits	025	2024-10-18	04:10:57.077	ABELL3120 manual Mask T00 Low Red	03:21:56.455	-51:19:35.728		600.0	[1:4096,1:1428]
25	target.026.fits	026	2024-10-18	04:23:00.877	ABELL3120 manual Mask T00 Low Red	03:21:56.455	-51:19:35.728		600.0	[1:4096,1:1428]
26	target.027.fits	027	2024-10-18	04:34:02.577	ABELL3120 manual Mask T00 Low Red	03:21:56.455	-51:19:35.728		600.0	[1:4096,1:1428]
27	target.028.fits	028	2024-10-18	04:46:53.127	ABELL3120 manual Mask T00 Low Red Quartz	03:21:56.455	-51:19:35.728		2.0	[1:4096,1:1428]

SISI images before/after slit upload

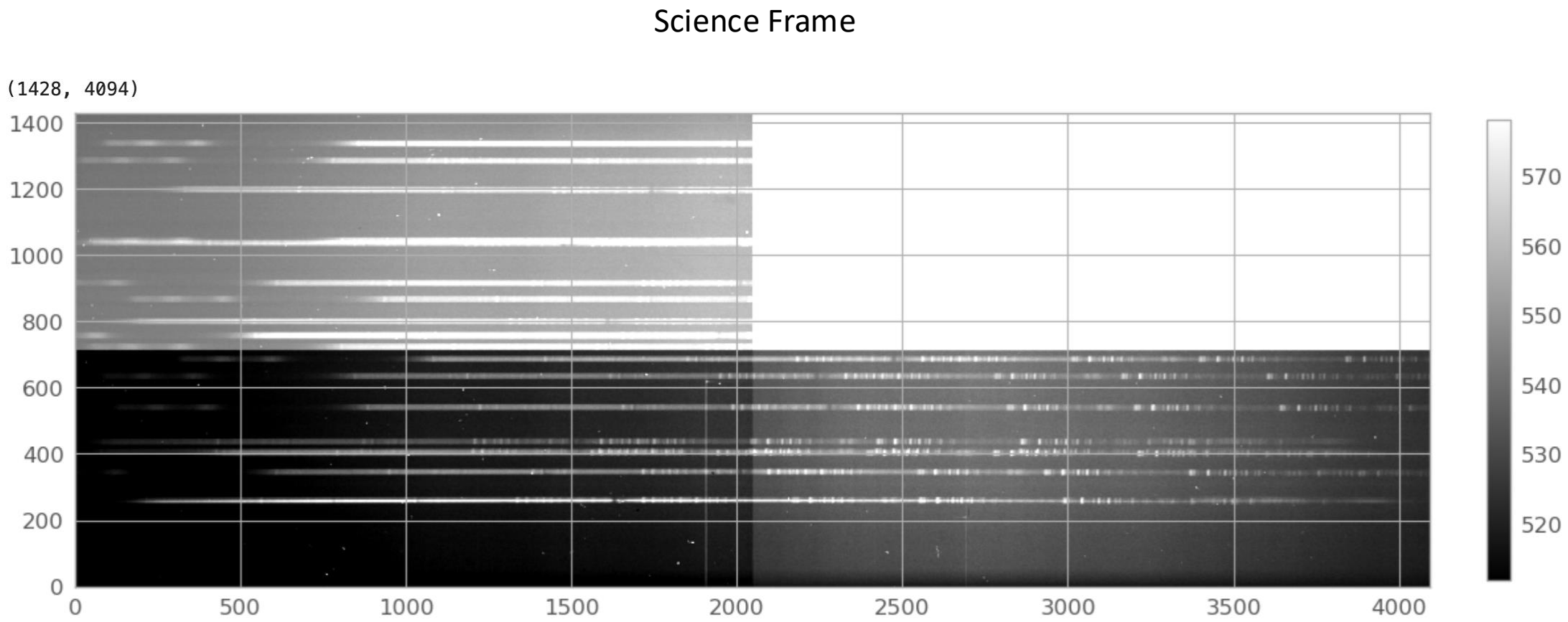


SAMI spectra taken simultaneously

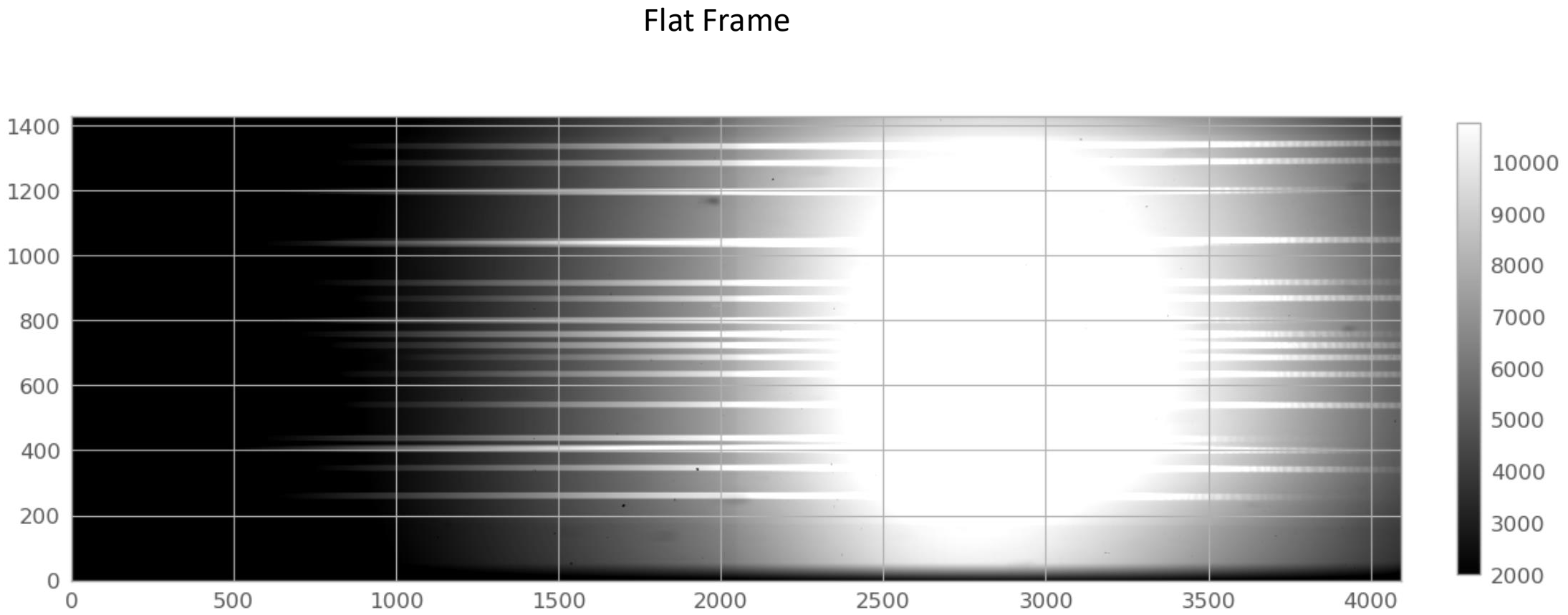


PART 1: full field calibration

Cleanup: remove cosmic rays (currently uses LA_COSMIC)

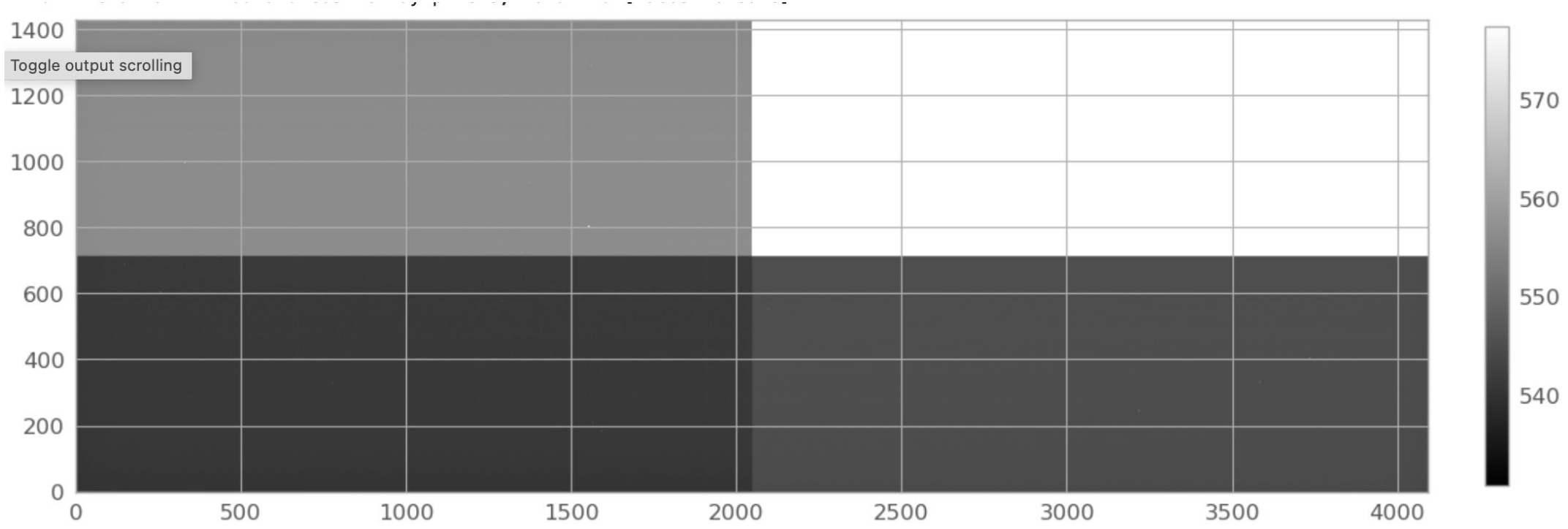


Calibration: remove cosmic rays (currently uses LA_COSMIC)



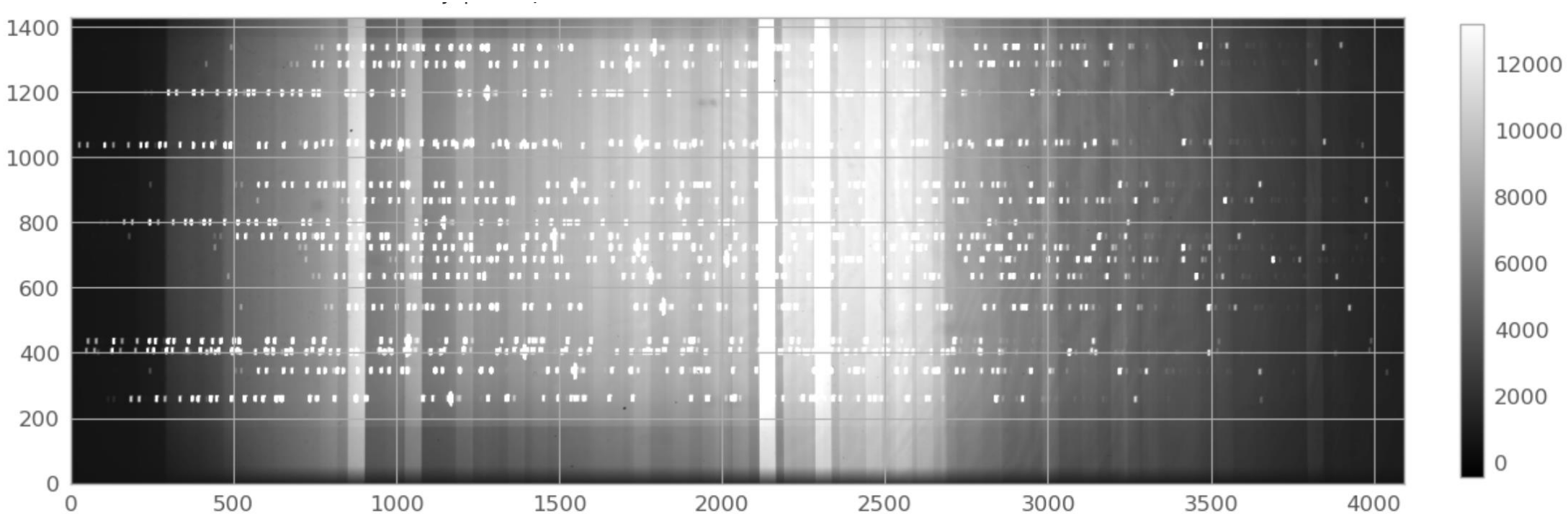
Calibration: remove cosmic rays (currently uses LA_COSMIC)

Bias Frame

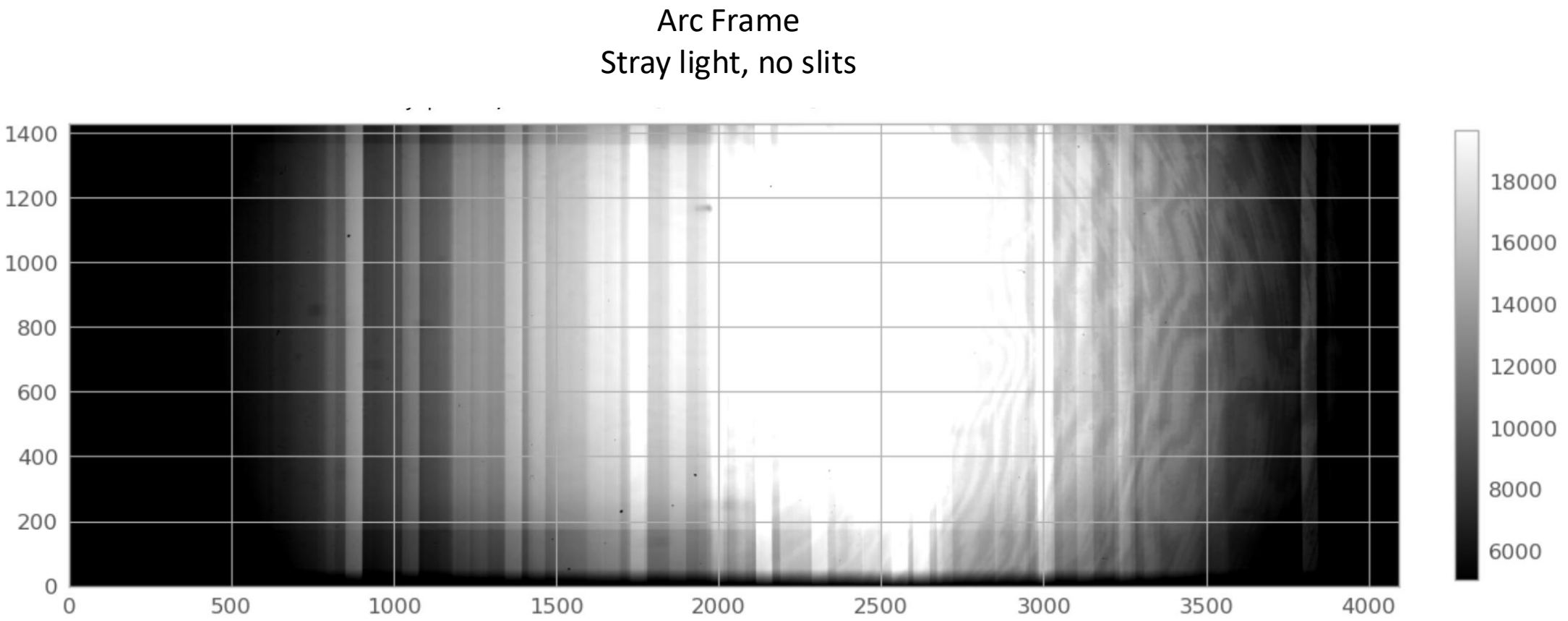


Calibration: remove bias

Arc Frame
stray light from blasting cal.source

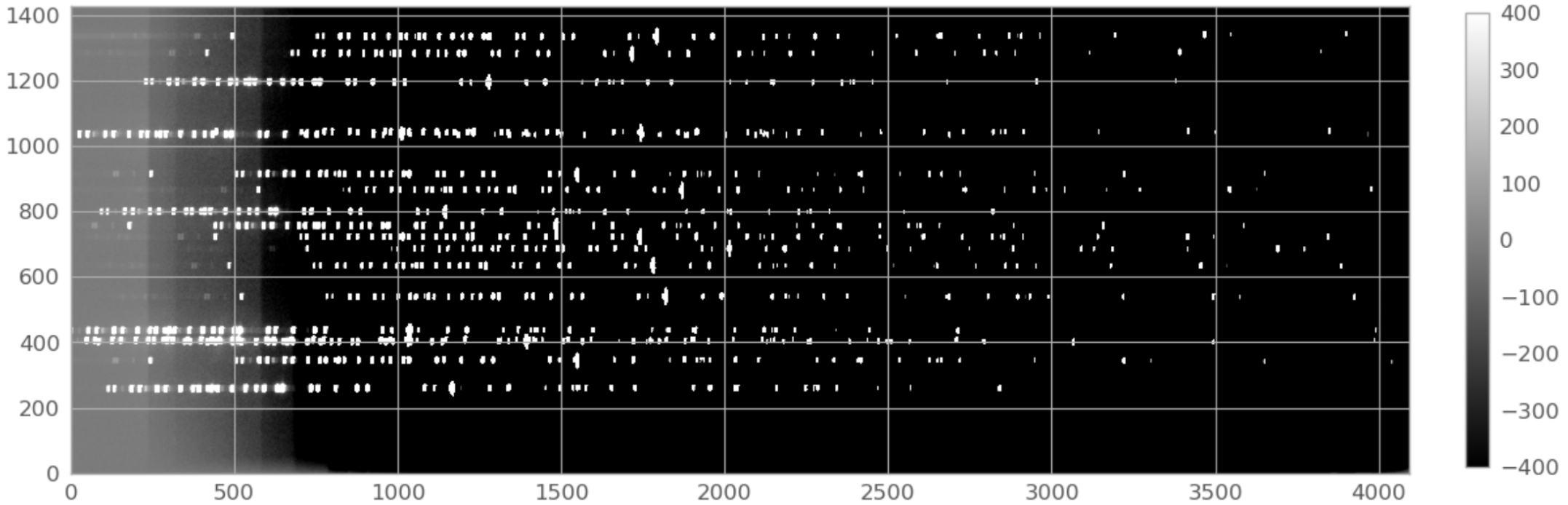


Calibration: remove cosmic rays (currently uses LA_COSMIC)

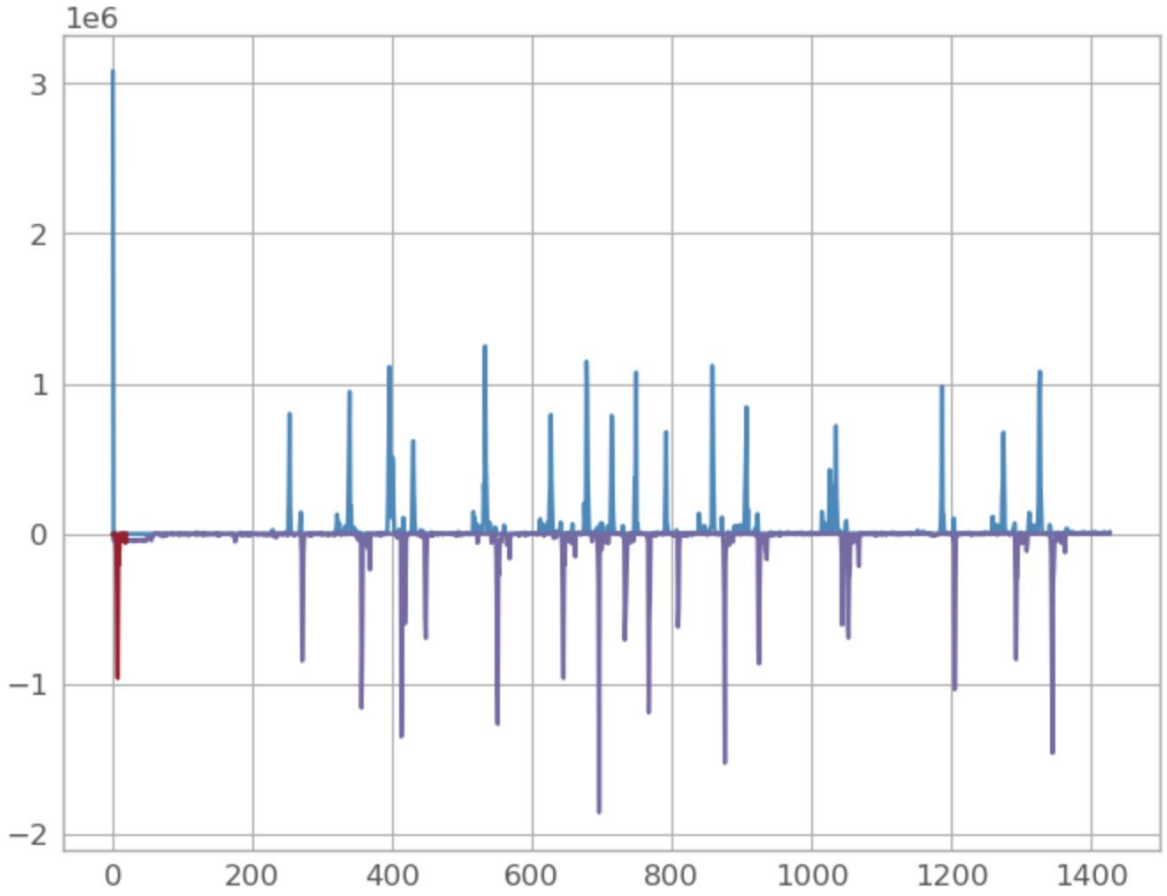


Calibration: remove cosmic rays (currently uses LA_COSMIC)

Arc Frame
after stray light subtraction

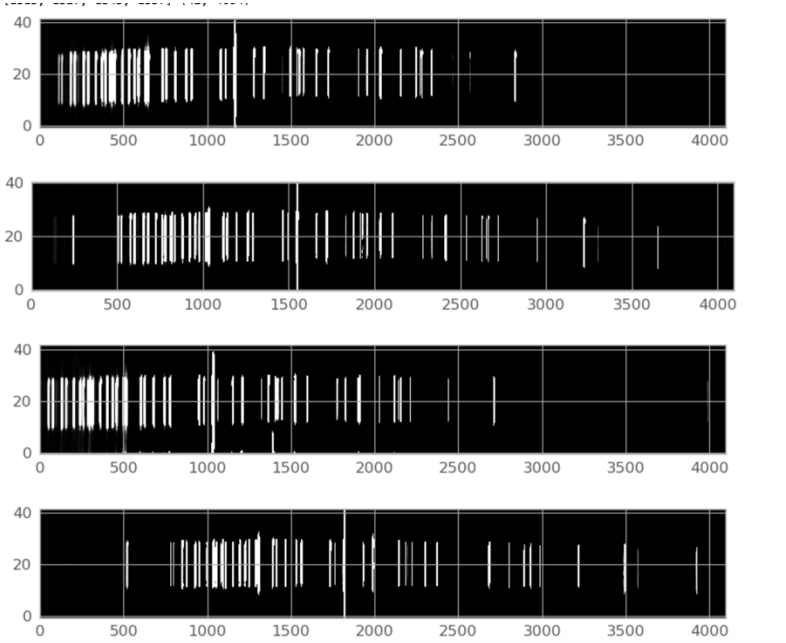


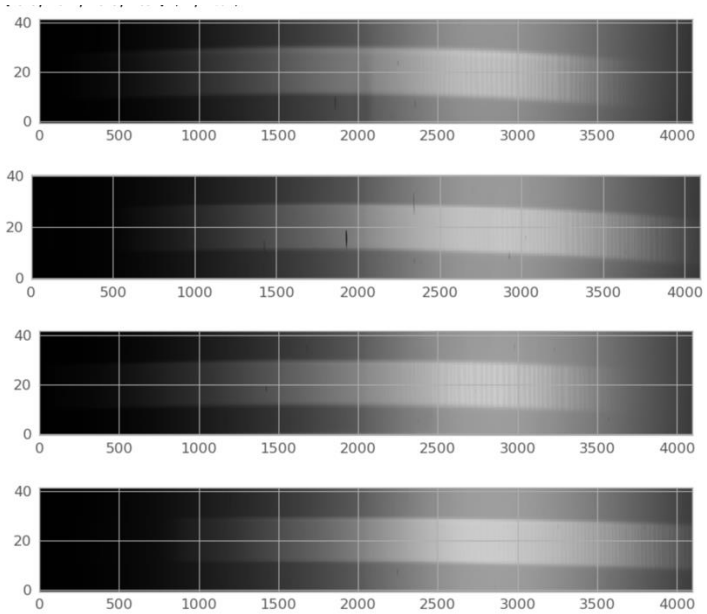
Use shift & diff to find edges of traces

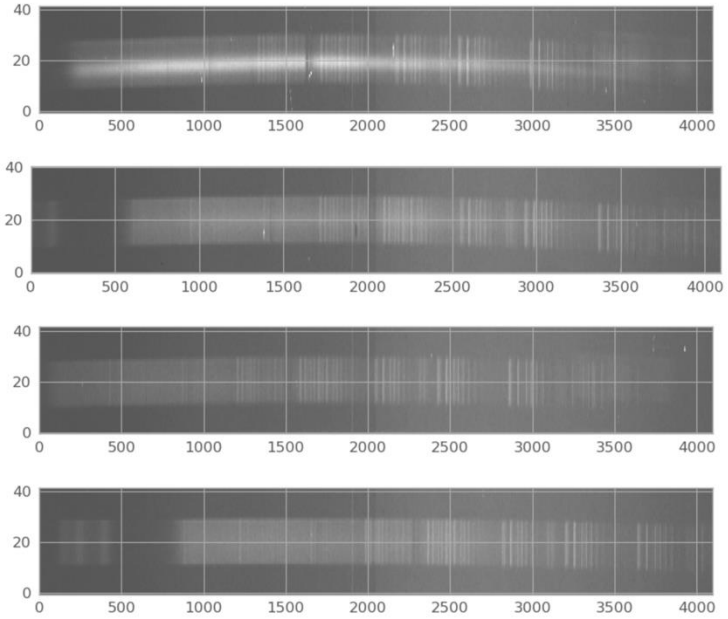


at center field, uses arc frame

Extract the 2d spectra…



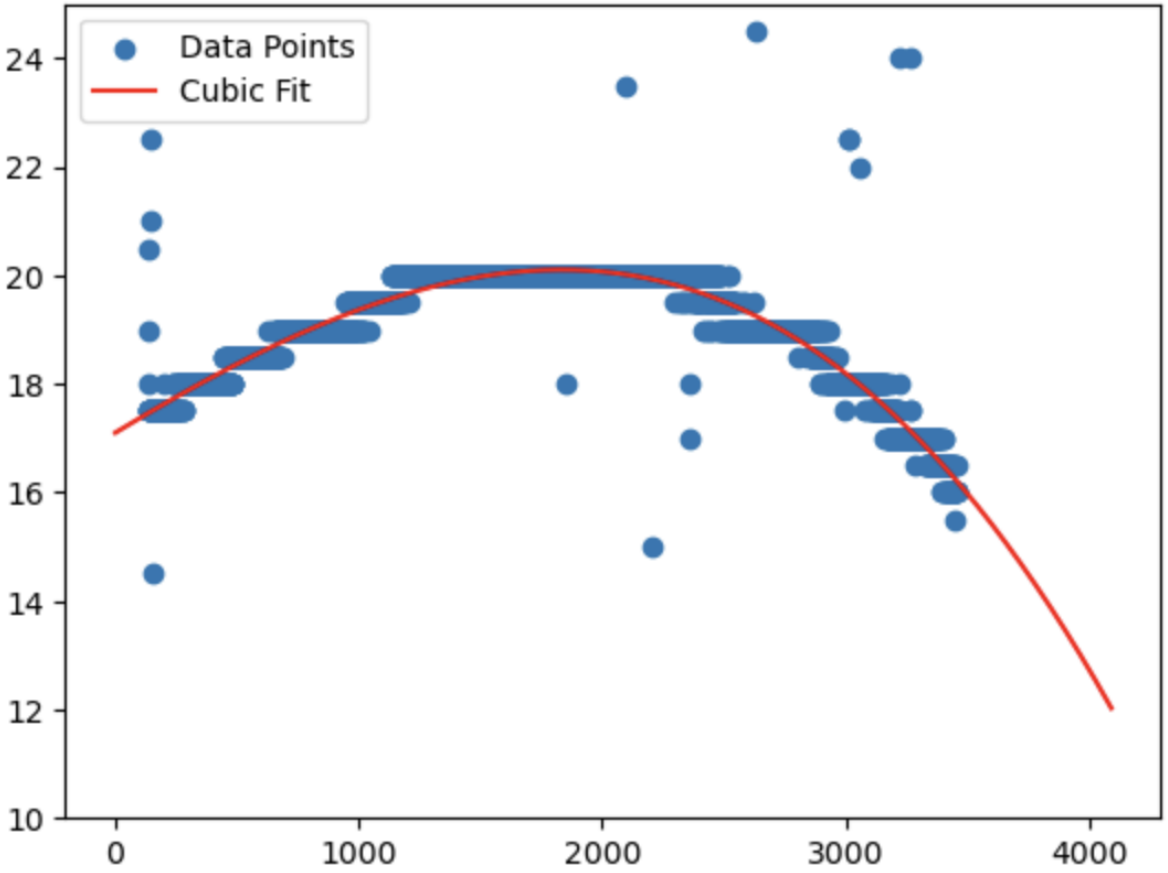


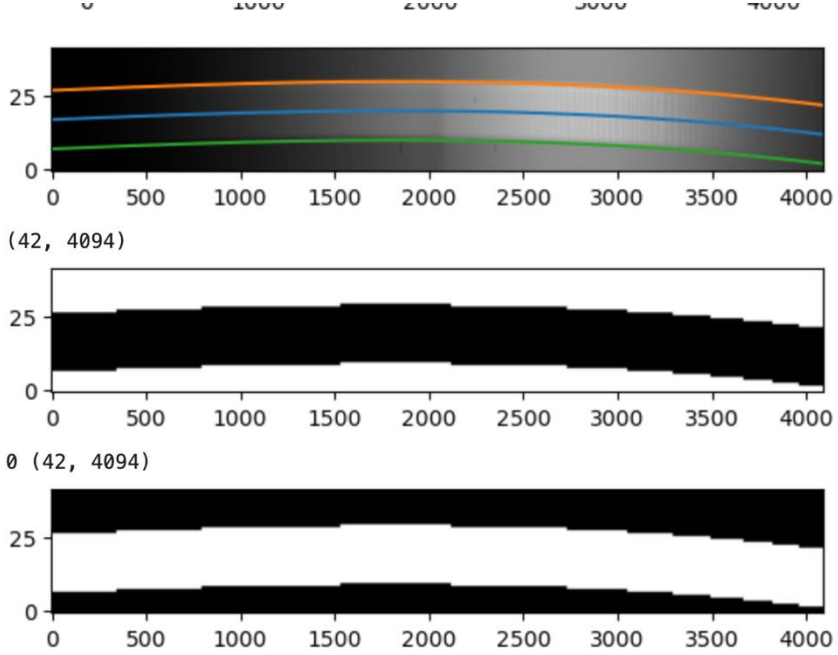


PART 2: process individual strips

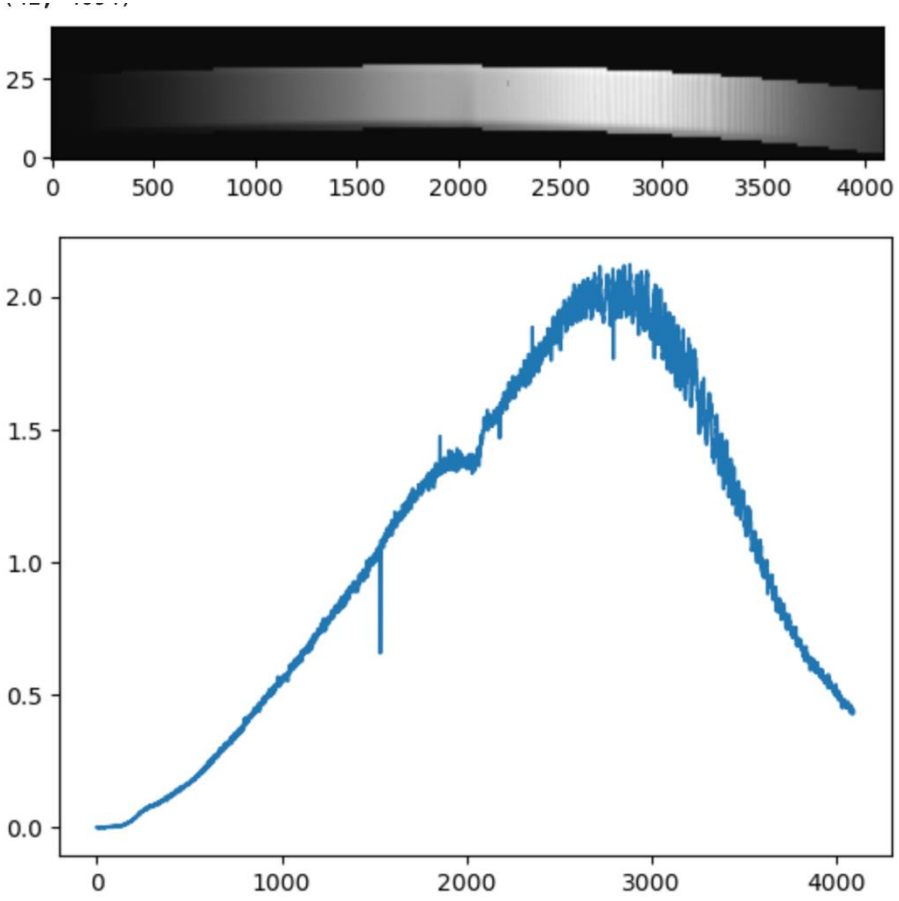
- Iterative process, one example shown

Find curvature and map traces

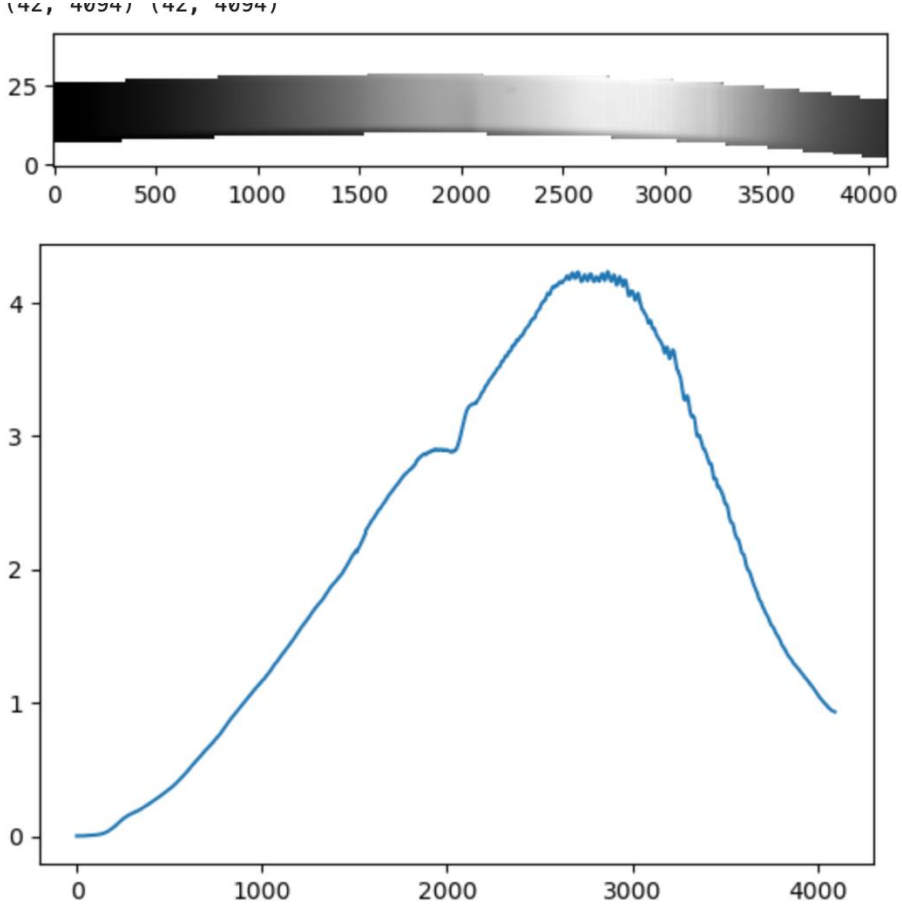




Extract Flat Field

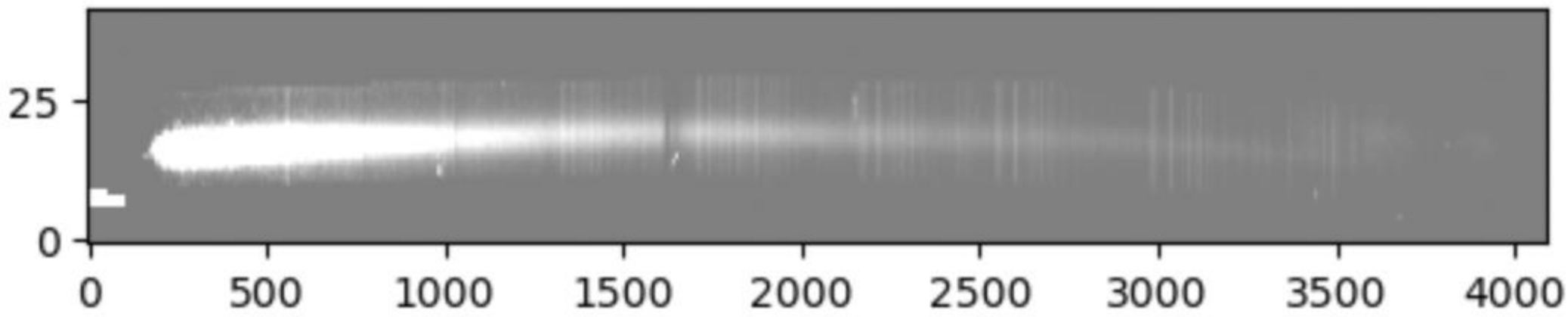


original

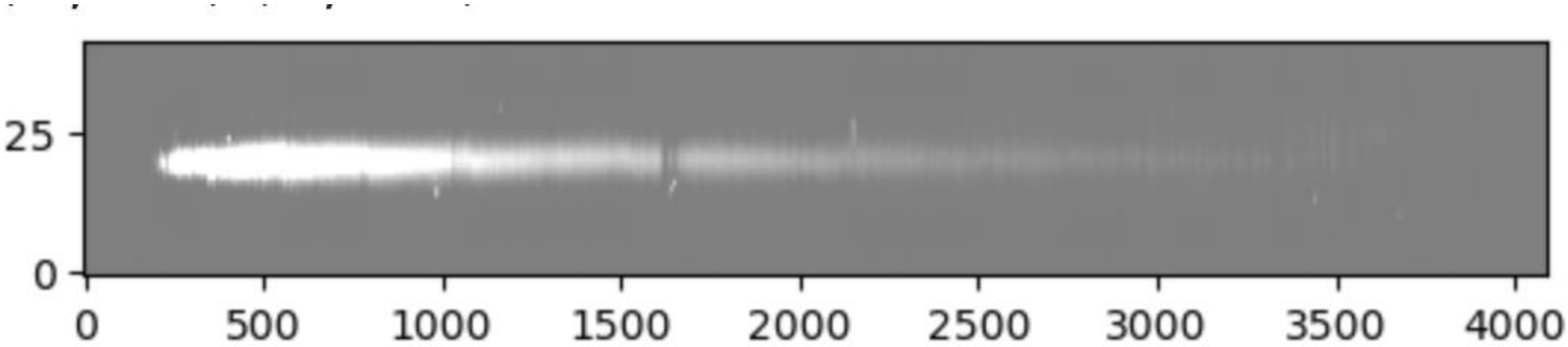


smoothed

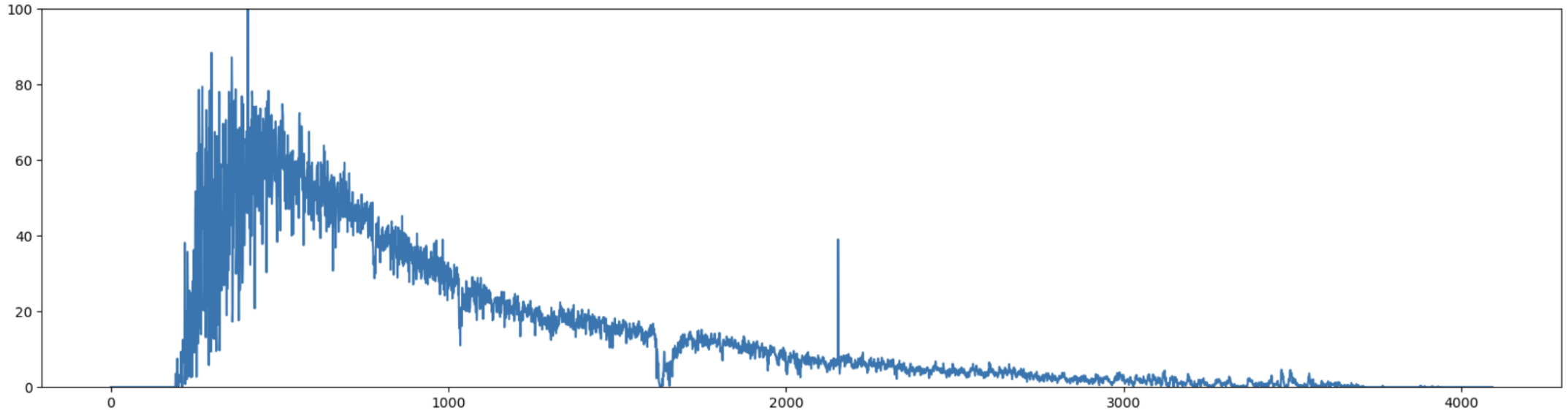
Extract stellar trace and apply flat field



Rectify stellar spectrum

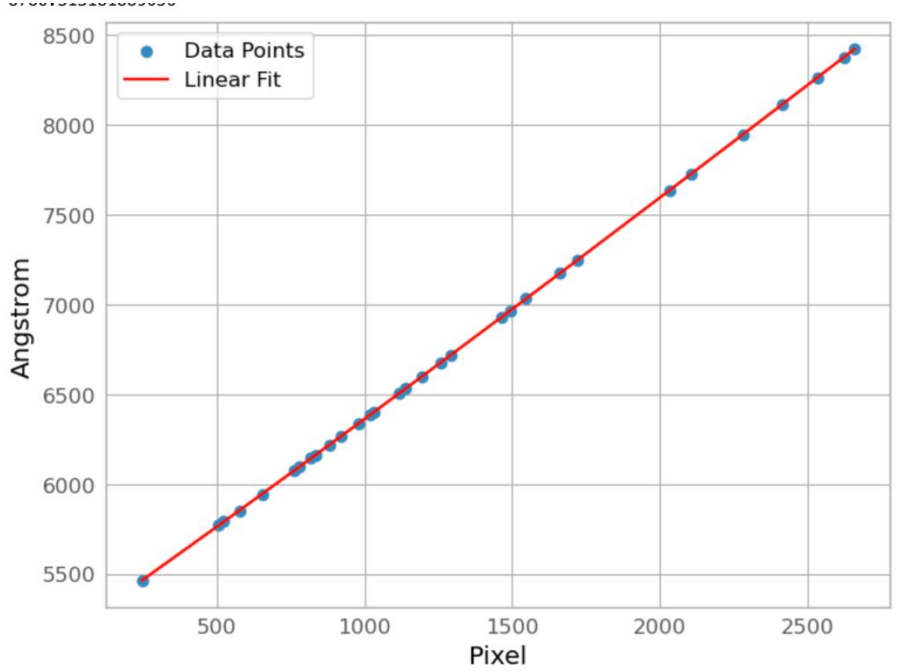


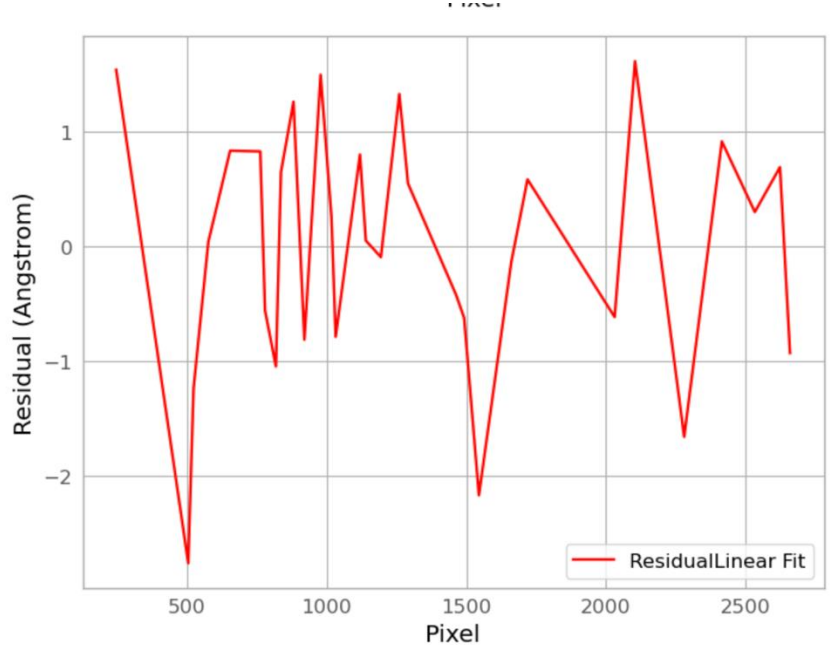
Coadd to obtain 1d spectrum



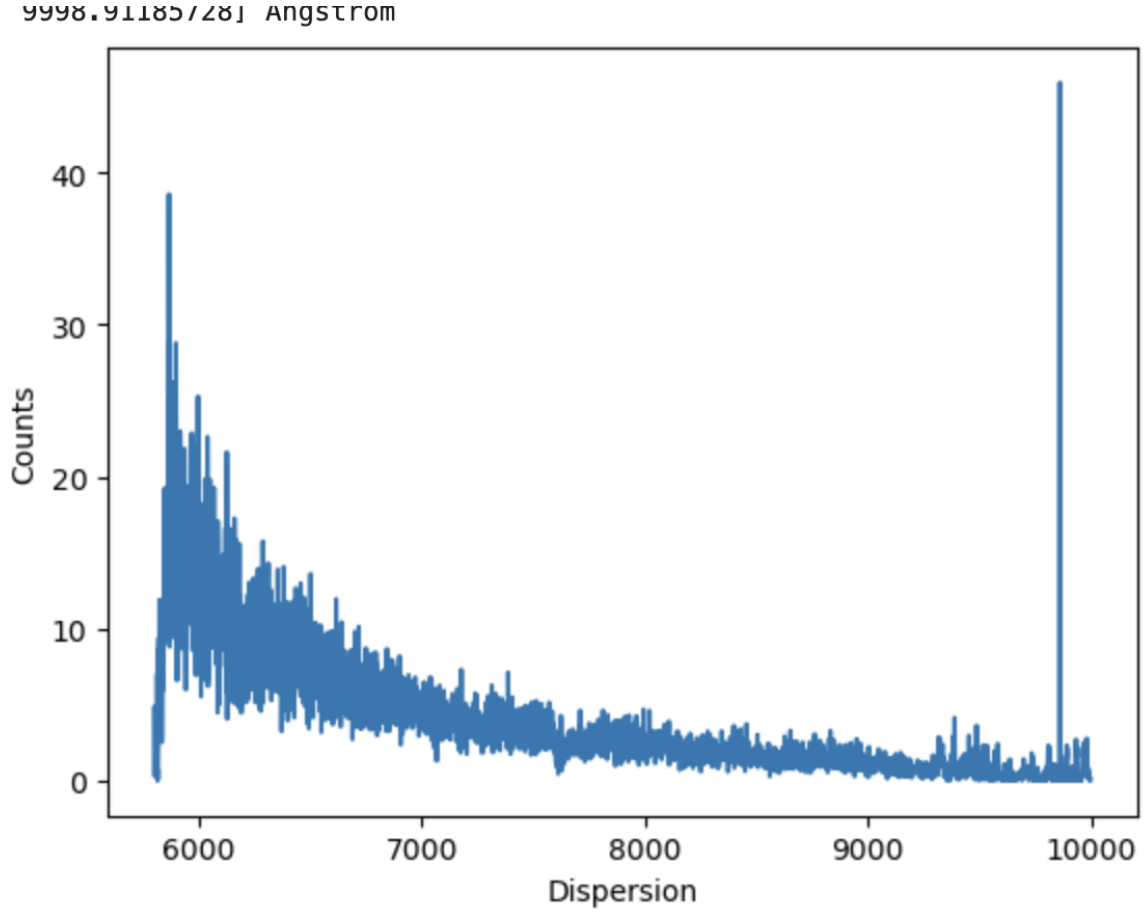
PART 3: wavelength calibration

- Identify lines and fit with 3rd order polynomial. Residuals < 1 A





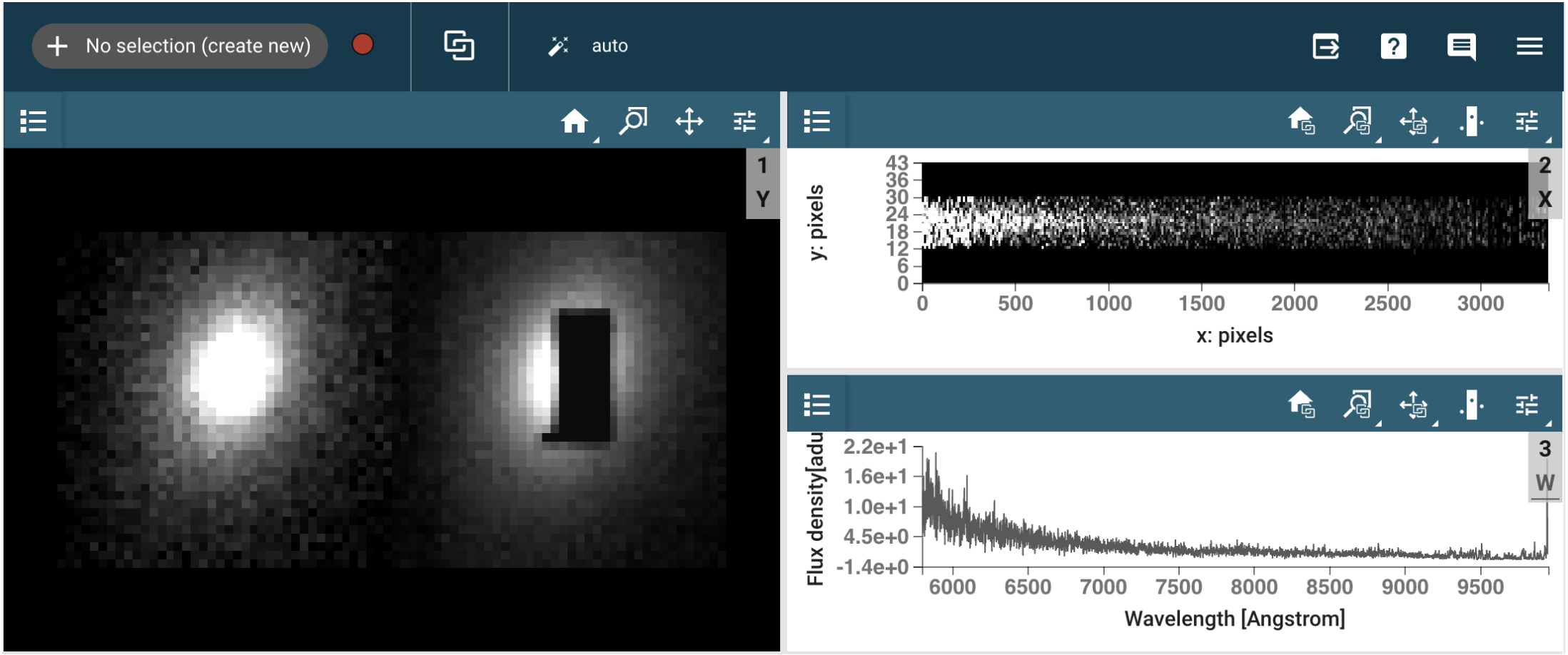
A wavelength calibrated spectrum



Final step

- Calibration to flux, requires spectrophotometric standard

Final: put everything together in MOSViz



Notes:

- Requires final list of slit pushed to the DMD in SIMI (x,y) pixels
  - Uses WCS and mapping CCD/DMD
- From SISI images slit losses can be precisely estimated. It allows absolute calibration of flux of each target vs. spectrum of spectrophotometric standard