VERA C. RUBIN OBSERVATORY

Intro to AuxTel/LATISS processing

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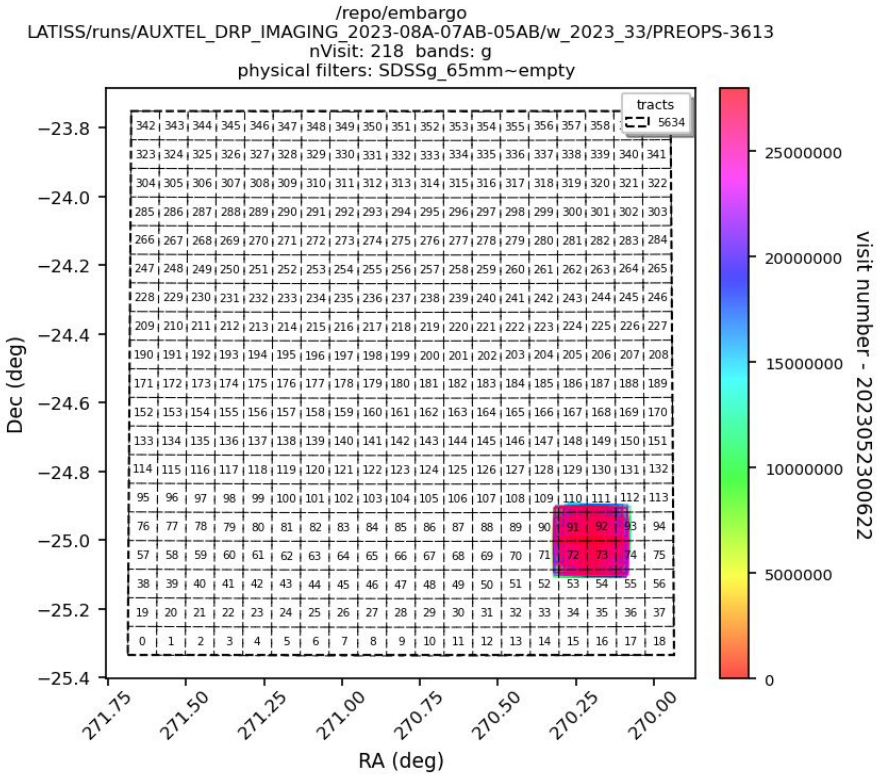
A few naming conventions and hardware details

- REPO: /repo/embargo
  - (i.e replace /repo/main with this)
- Bands: g, r, i
- Physical Filter Names:
  - SDSSg_65mm~empty, SDSSr_65mm~empty, SDSSi_65mm~empty
- Detectors: just the one! detId = 0
- Skymap name: latiss_v1
- Exposure/Visit Naming Scheme: YYYYMMDDNNNNN (e.g. 2023082900503)
- Exposure time: typically 30 sec
- FOV: ~6.7 x 6.7 arcmin
- Pixel scale for LATISS is 0.1 arcsec/pixel (HSC is ~0.167, LSSTCam is ~0.2)
  - has consequences for may config override settings

A few naming conventions and hardware details…

- Example data query:
- inCollection: LATISS/defaults
- dataQuery: "instrument='LATISS' AND detector=0 AND (exposure.day_obs>=20230509 and exposure.day_obs<20230914) AND exposure.observation_type='science' AND (exposure.science_program='AUXTEL_PHOTO_IMAGING' OR exposure.science_program='AUXTEL_DRP_IMAGING')"

Skymap…a LOT of Patches per Tract!

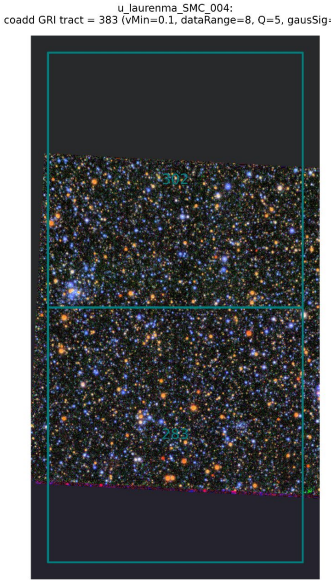


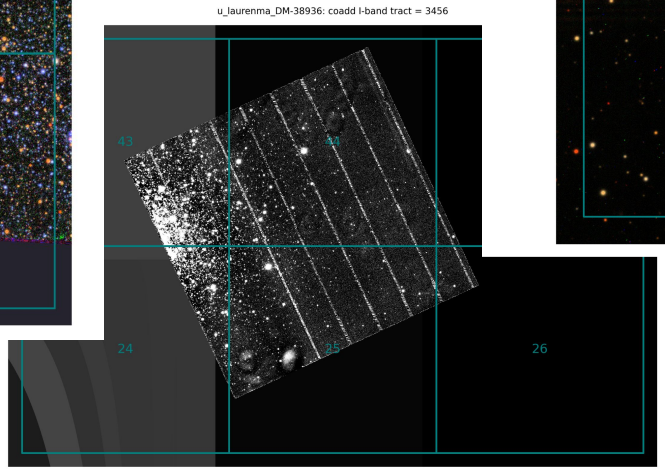

```
config.skyMap.name = "rings"
config.skyMap["rings"].numRings = 120
config.skyMap["rings"].projection = "TAN"
config.skyMap["rings"].tractOverlap = 1.0/60
config.skyMap["rings"].pixelScale = 0.1
config.skyMap["rings"].tractBuilder = "cells"
```

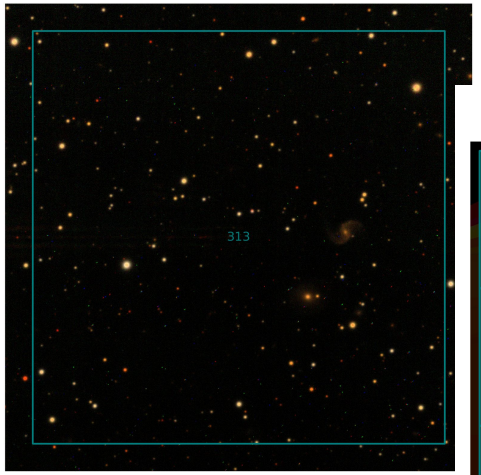
Plot created with (see DM-40489):

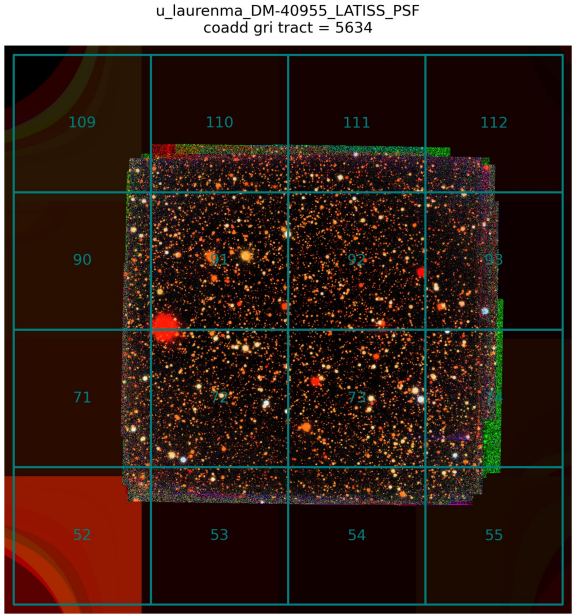
```
$SKYMAP_DIR/doc/_static/skymap/showVisitSkyMa
p.py /repo/embargo --collections
LATISS/runs/AUXTEL_DRP_IMAGING_2023-08A-07AB-0
5AB/w_2023_33/PREOPS-3613 --tracts 5634
--bands g --saveFile
"/sdf/home/l/laurenma/public_html/RC3/showVis
it_LATISS_5634_g_trimToTract_withPatch.png"
--trimToTract --showPatch
```

Fields with a Range of Object Density Have Been Observed









AuxTel Processing (stolen from PCW 2023: System Performance All-Hands)

- AuxTel is our testbed for how to do V&V on LSSTCam
- Currently focusing on the “10am processing”, where we run as much of the DRP pipeline as we can after each observing run (or on multiple runs combined). “Piloted” by Huan Lin as a V&V + Campaign Management joint project.
- Incrementally stepping up the scope and complexity of the processing, as we confirm that more basic steps work correctly.

AuxTel Processing: Latest, best “10am processing” collection

- Latest, best “10am processing” collection is
  - LATISS/runs/AUXTEL_DRP_IMAGING_2023-09A-08ABC-07AB-05AB/d_2023_09_25/PREOPS-3780 in /repo/embargo

- Naming convention includes:
  - AuxTel observing runs: “2023-09A-08ABC-07AB-05AB”, i.e. 8 runs from May to Sep.
  - DM stack: “d_2023_09_25” = latest weekly at the time, w_2023_38, plus changes in DM-40555 needed to run fgcm
  - Jira ticket: “PREOPS-3780”

AuxTel Processing: DRP pipeline

- ${DRP_PIPE_DIR}/pipelines/LATISS/DRP.yaml
  - Same since w_2023_39
  - Processing done via PanDA (links below to PanDA monitoring for each step)
  - Clustering included to improve efficiency (defined in this file)
- step1: **isr, characterizeImage, calibrate, writePreSourceTable, transformPreSourceTable**
- step2a: **consolidatePreSourceTable, consolidateVisitSummary, isolatedStarAssociation**
- step2bcde: **finalizeCharacterization, fgcmBuildFromIsolatedStars, fgcmFitCycle, fgcmOutputProducts, updateVisitSummary, makeCcdVisitTable, makeVisitTable**
- step3a: **makeWarp, assembleCoadd, detection, mergeDetections, deblend, measure, mergeMeasurements, forcedPhotCoadd, writeObjectTable, transformObjectTable**
- step3b: **consolidateObjectTable**
- step4: **writeRecalibratedSourceTable, transformSourceTable, consolidateSourceTable**

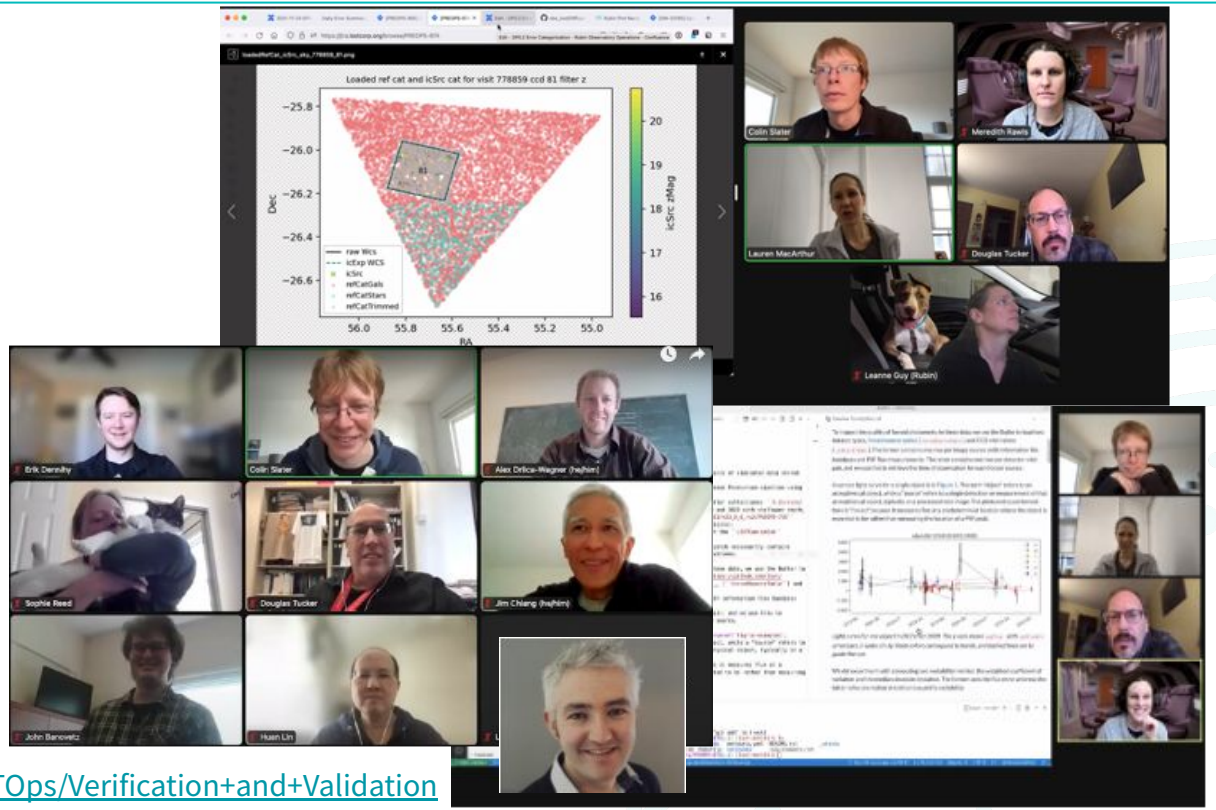
AuxTel Processing: Outputs

- 1810 calexp
  - 1967 input exposures, but 157 failures in step1 (in **characterizeImage** due to lack of psf stars, and in **calibrate** due to wcs fit failures)
- 296 deepCoadd_calexp
- 99 objectTable
- 8 tracts (5614, 5615, 5616, 5634, 5839, 8188, 10643, 10644)
  - Example depth histograms and maps for the deepest tracts (5614, 5615, 5634) available in this notebook for a previous 5-run processing (PREOPS-3613)
  - Depth plots need **healSparsePropertyMaps** to be run, not yet included in DRP.yaml

The Current V&V Team (feel free to hit us up with any processing questions!)

Colin Slater (Lead, UW)

John Banovetz (SLAC)
James Chiang (SLAC)
Alex Drlica-Wagner (FNAL)
Huan Lin (FNAL)
Lauren MacArthur (Princeton)
James Mullaney (Sheffield)
Andrei Nomerotski (BNL)
Meredith Rawls (UW)
Sophie Reed (Princeton)
Douglas Tucker (FNAL)



Meeting Notes:
https://confluence.lsstcorp.org/display/LSSTOps/Verification+and+Validation

Intro to V&V Team

- Validation of what?
  - V&V is an **Operations** team — we're thinking about "normal" on-sky data-taking and data releases, not construction verification. Our goal is to ensure the quality of the released **data products**.
- Quality of the released **data products**:
  - We want to be watching the processing, looking at the input data, looking for weird edge cases, looking for signs of something going awry.
  - "Eyes on the data" is key
  - Team draws on a wide-range of expertise, from across the construction project and from other surveys, to give us visibility into as many steps from images -> catalogs as possible.

Operations with AuxTel Imaging Survey

(stolen from PCW 2023 Update from Science Pipelines)

- In March 2023, during JTM, we deployed a production environment to process LATISS data in real time.
- Since then, automatic operating with every AuxTel run. Analysis next day.
  - **2023-05-11**: 59/283 ran ISR 20%
  - **2023-05-23,24**: 25/40 and 50/58 ran Single Frame Processing 76%
  - **2023-07-20**: 104(+70)/178 ran ApPipe and populated APDB 98%
- We learned some lessons in every run, tweaked system/fixed issues as problems arise, and deployed an improved version for the next run.
  - Example: intermittent collision because init-outputs were not purged.
  - Example: tweak the bucket notification consumption configs to avoid timeout.
  - Development and improvements continue.

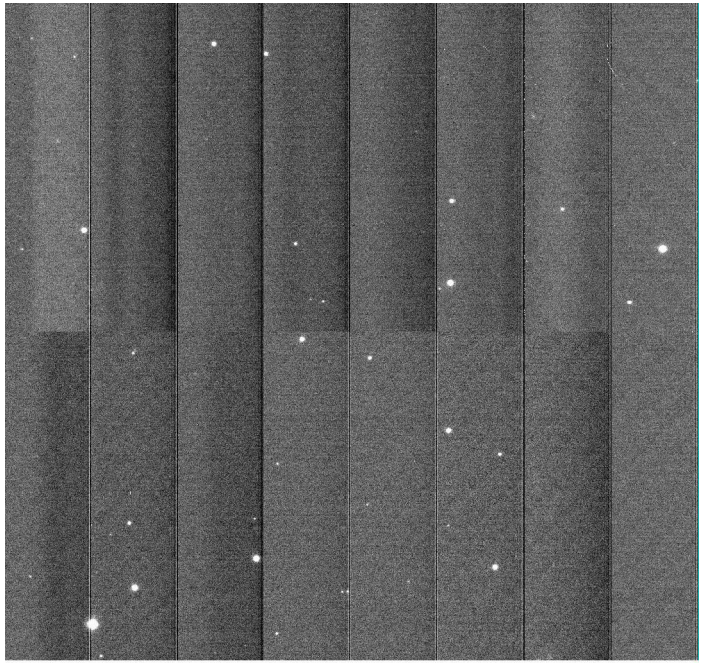
- More complete pipeline payload
- Higher success rate of real-time pipeline processing 

What's new in **Instrument Signature Removal**

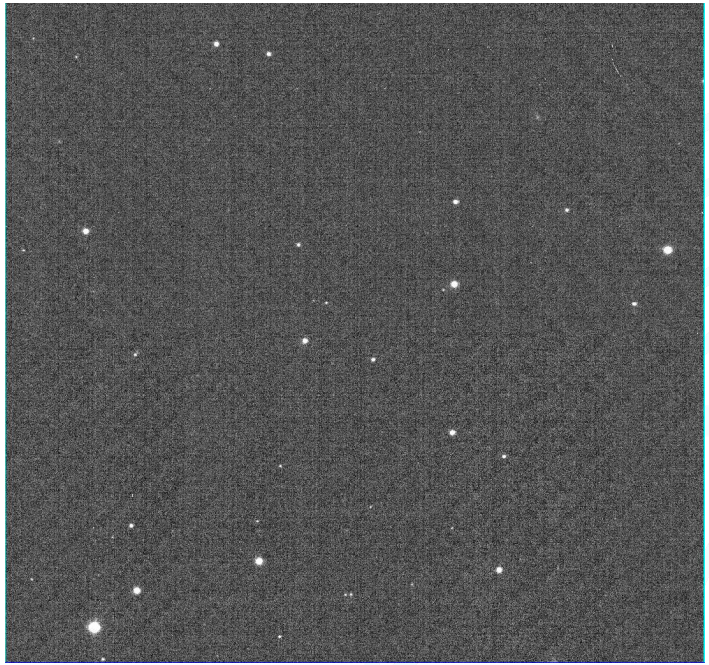
Over the last year, we improved ISR on AuxTel LATISS:

(stolen from PCW 2023 Update from Science Pipelines)

Post-ISR CCD **2022:**



To **2023**:

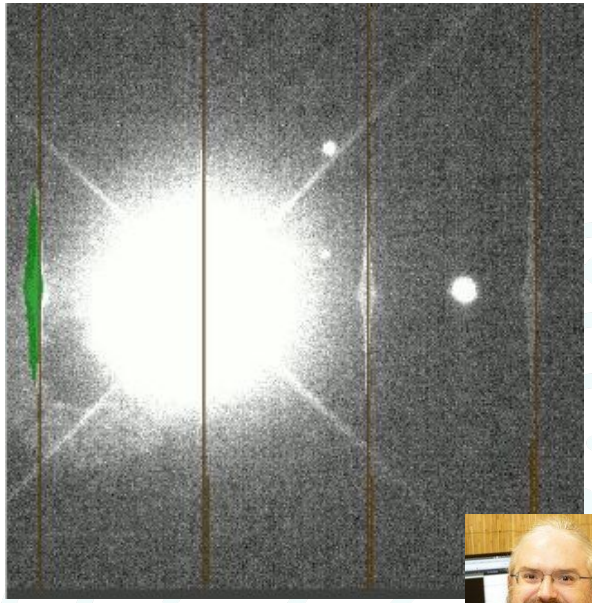


@Chris Waters

What's new in **Instrument Signature Removal**
Where we've been

(stolen from PCW 2023 Update from Science Pipelines)

- The major improvements in ISR processing in the past year:
  - Parallel overscan enabled.
  - Sequencer improvements.
  - Crosstalk coefficients measured (for LATISS).
  - Charge-transfer inefficiency correction.
  - Initial analysis of lateral E-field features (e.g. tree rings).
  - Defect generation from combined calibrations.
  - Addition of flux conserving Brighter-Fatter correction.
  - Header provenance.
  - Automated process for daily calibration taking, reduction, and verification.

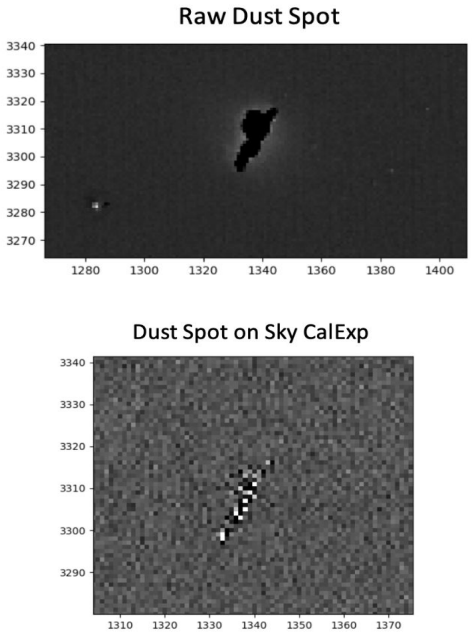


Andrés Plazas Malagón

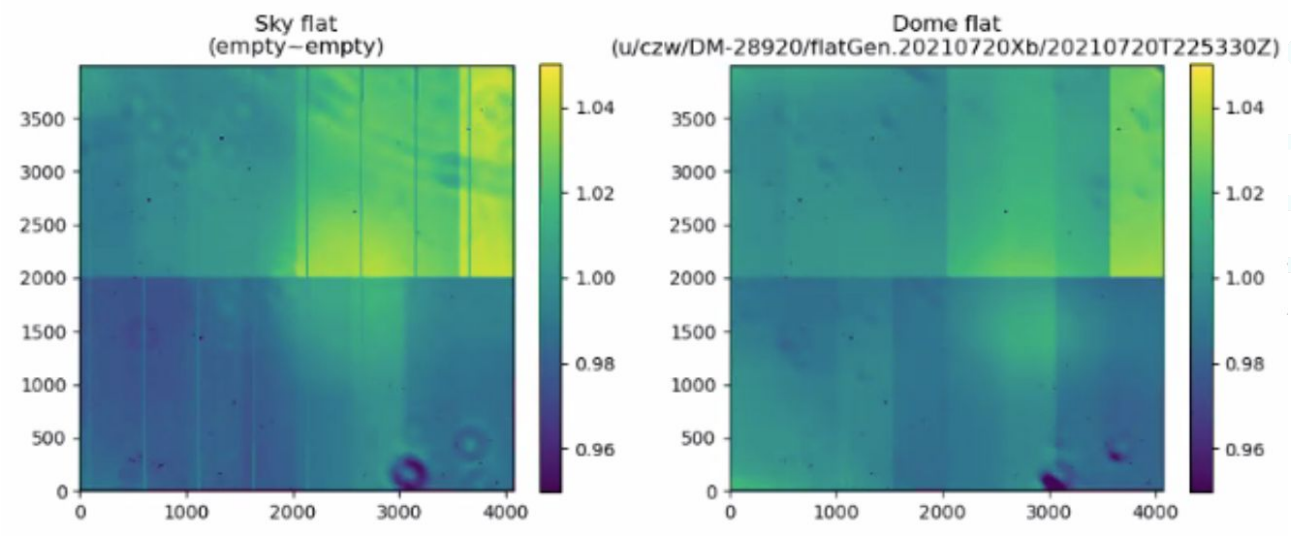
@Chris Waters

“Fun” features…

“Dust” Spots on Detector

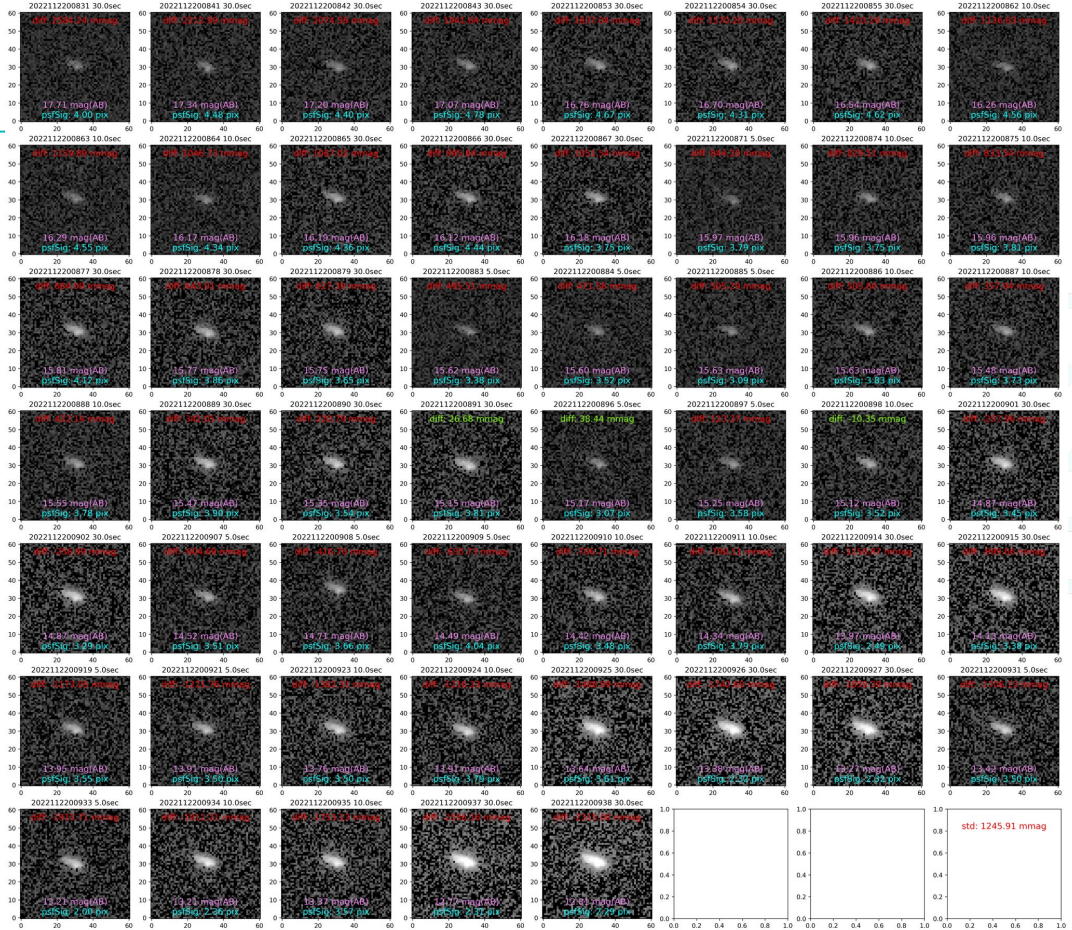


…and on FLATS



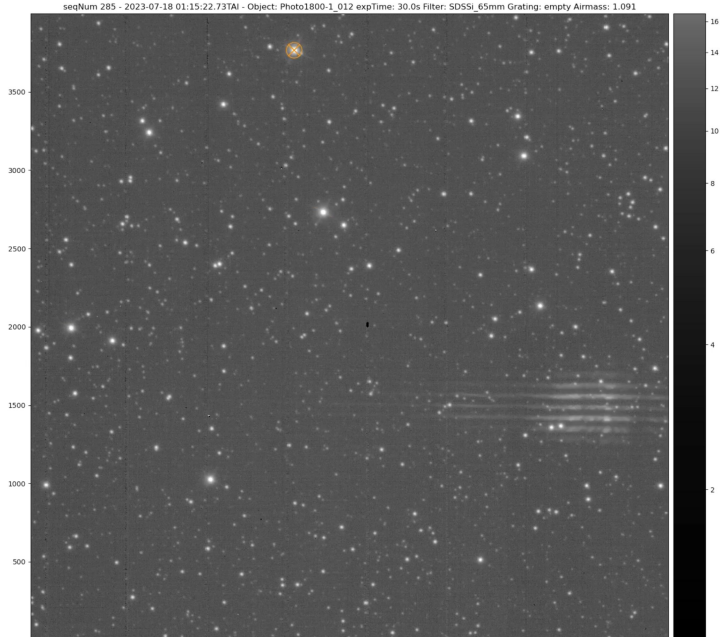
“Fun” features…

…and detected (into twilight when they’re “lit”) as stars!

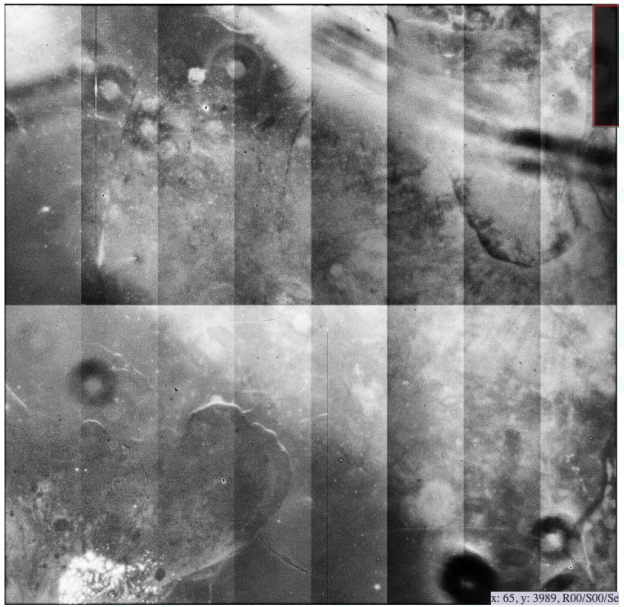


“Fun” features…

The “waffle” (stray/scattered light…pinhole is helping diagnose



“Coffee Stain” (surface effect/charge build-up?)



RubinTV is Awesome!

For quick-look at postISR images and myriad other metadata & plots, RubinTV is an invaluable resource.

Watch movie (from 2023-09-21 run)!