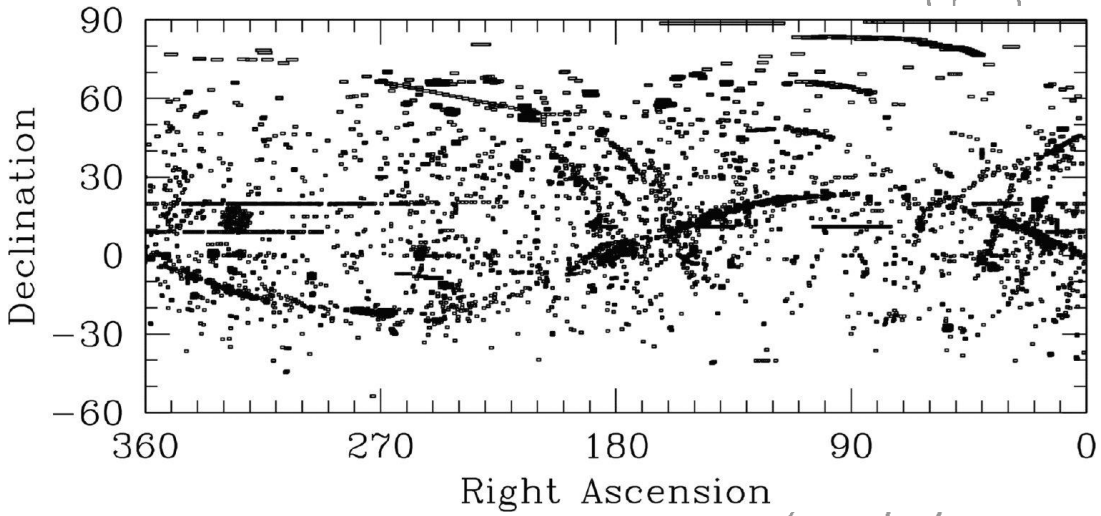
The Suprime-Cam Legacy Archive at the Canadian Astronomy Data Centre

National Research Council Canada | Conseil national de recherches Canada
Stephen Gwyn Canadian Astronomy Data Centre
Canada

Motivation

Increasing the value of the Suprime-Cam archive

- For many telescopes, half the papers are archival
- Another way to state this is that an archive doubles the value of the facility
- MegaPipe for MegaCam on CFHT produces ~30 papers per year
- Suprime-Cam vs. MegaCam
  - Same excellent seeing
  - Slightly smaller area
  - Much deeper
- Suprime-cam archive is an extremely valuable data set
  - 5000 square degrees
  - 82000 images
- **The Suprime-Cam Legacy Archive seeks to increase the value of the archive by providing science ready data products to astronomers**
- Many thanks to Ikuru Iwata for suggesting it
- Many thanks also to Hisanori Furusawa and Tsuyoshi Terai for invaluable advice



Warning
Boring talk ahead

(Unless you are a data pipeline otaku, you should take a short break now)

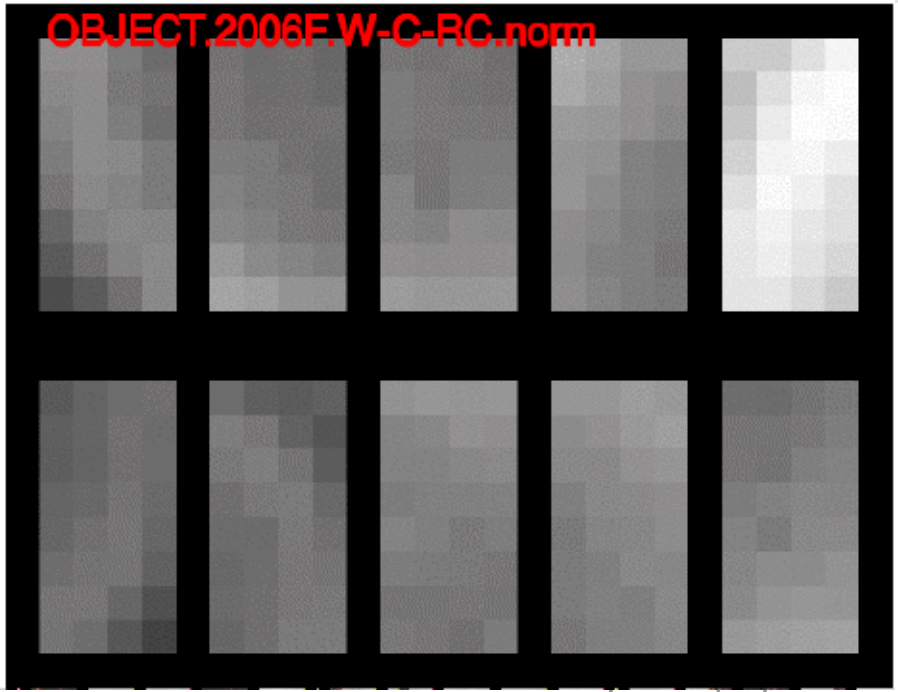
Detrending

- Bias removal and flatfield done with sdfred (Ouchi, Furusawa, Komiyama and Yagi)
- Bias frames built on a run-by-run basis
- Flat fields built from (in order of decreasing preference)
  - night sky flats (object flats)
  - twilight flats
  - dome flats
- Object flats produce slightly deeper images
- Object and twilight flats have better photometric flatness

Detrending

Photometric superflat

- Zeropoint varies across the focal plane by 5-10%
- Measured on a run-by-run, filter-by-filter basis by comparison with Pan-STARRS
- Typically small variations (depending on flat type)
- Occasionally large variations (detector change)
- Corrections applied as photometric super flat to each image before further processing



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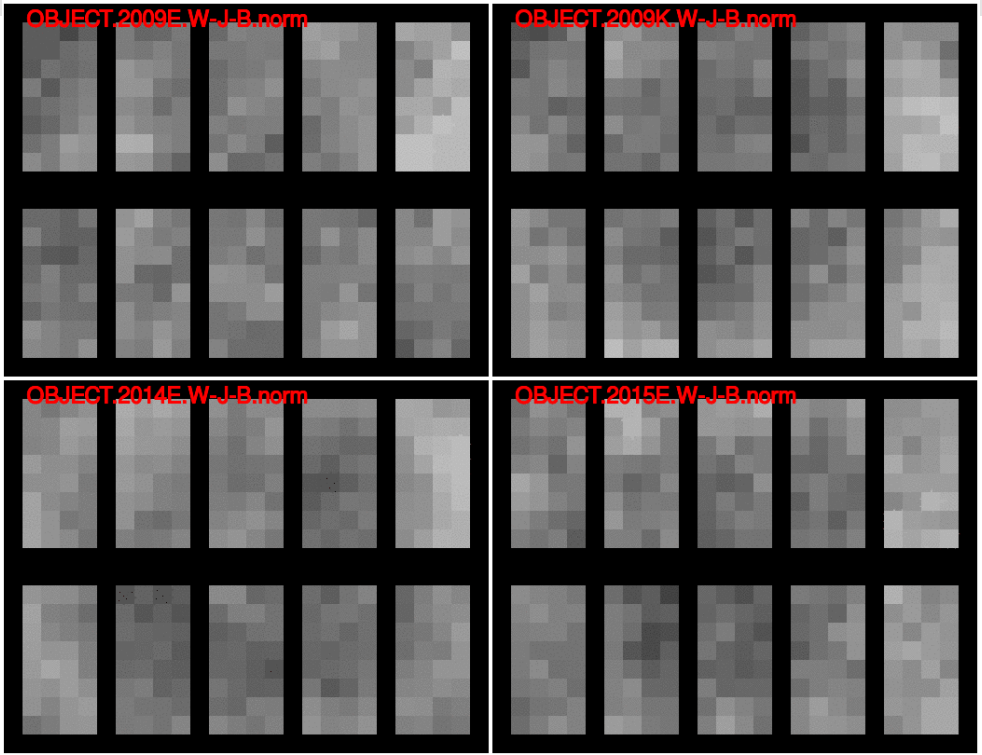
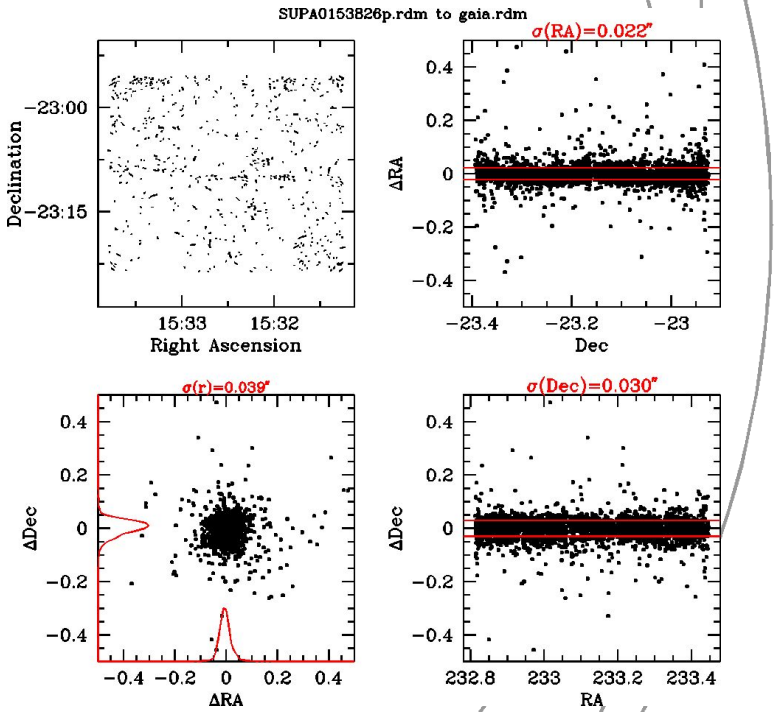


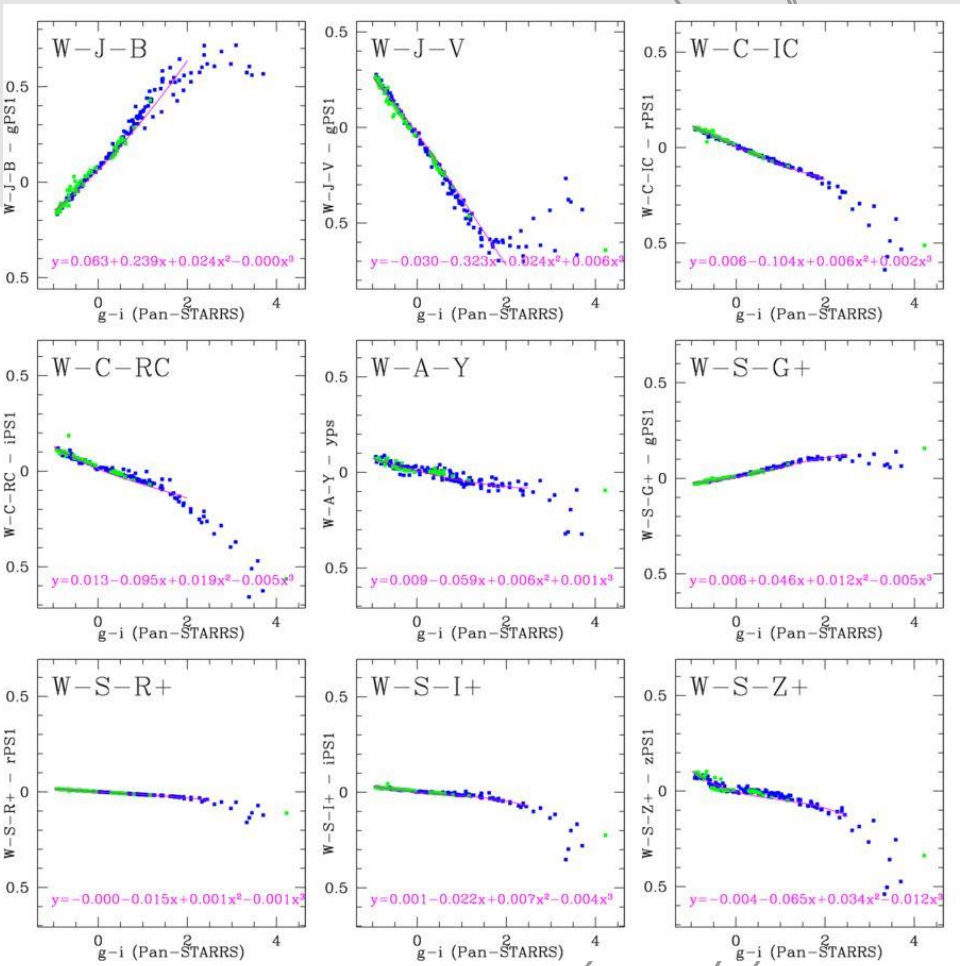
Astrometric calibration

- Astrometric calibration done using GAIA DR2 as a reference
- Each image calibrated completely independently
- Include effects proper motion
- Distortion model:
  - radial distortion: 5th order polynomial
  - chip shift and skew 1st order corrections chip-by-chip
  - Removes potential for over fitting
- Astrometric residuals measured:
  - with respect to GAIA
  - between overlapping images
  - typically 30-40 mas



Photometric calibration

- Photometric calibration is done using Pan-STARRS 3PI as a reference
- Convert PS ugriz into Suprime-Cam photometric system using 3rd order polynomial based on synthetic photometry using Pickles and CALSPEC spectra
- Use PS stars as in-field standards
- Conversion is relatively simple for Sloan filters, less, so for others
- Each image measured independently
- Measure photometric residuals:
  - With respect to Pan-STARRS
  - between overlapping images
  - 0.01-0.03 magnitudes



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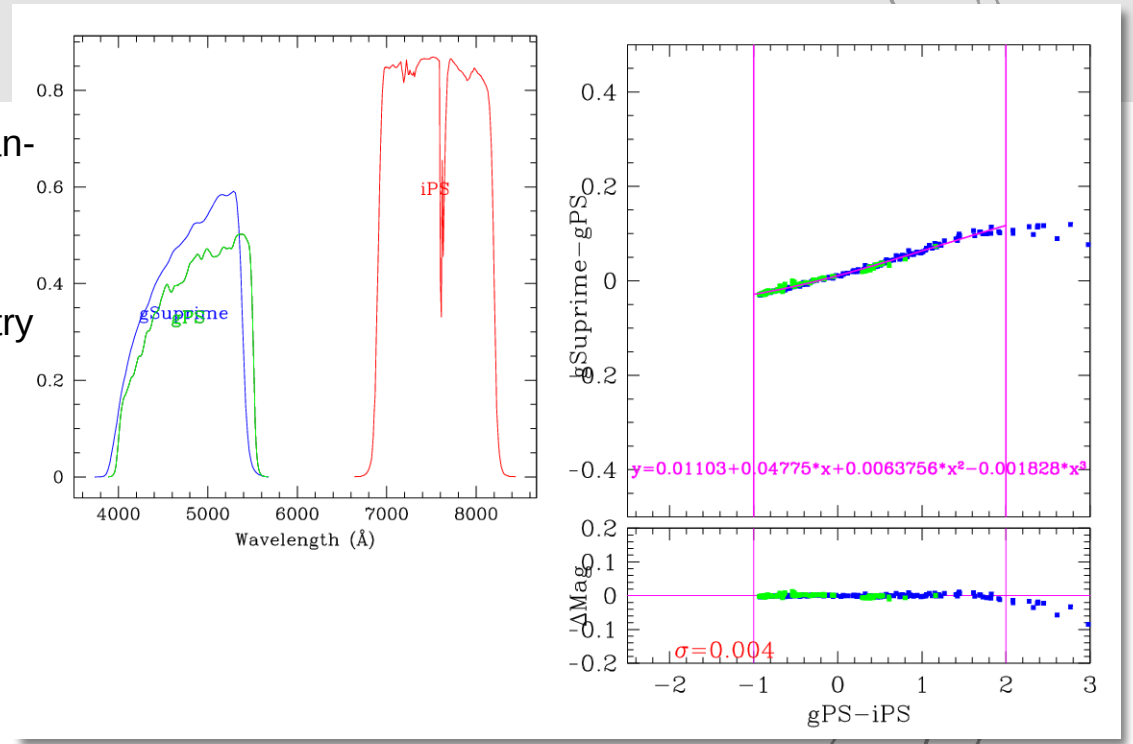

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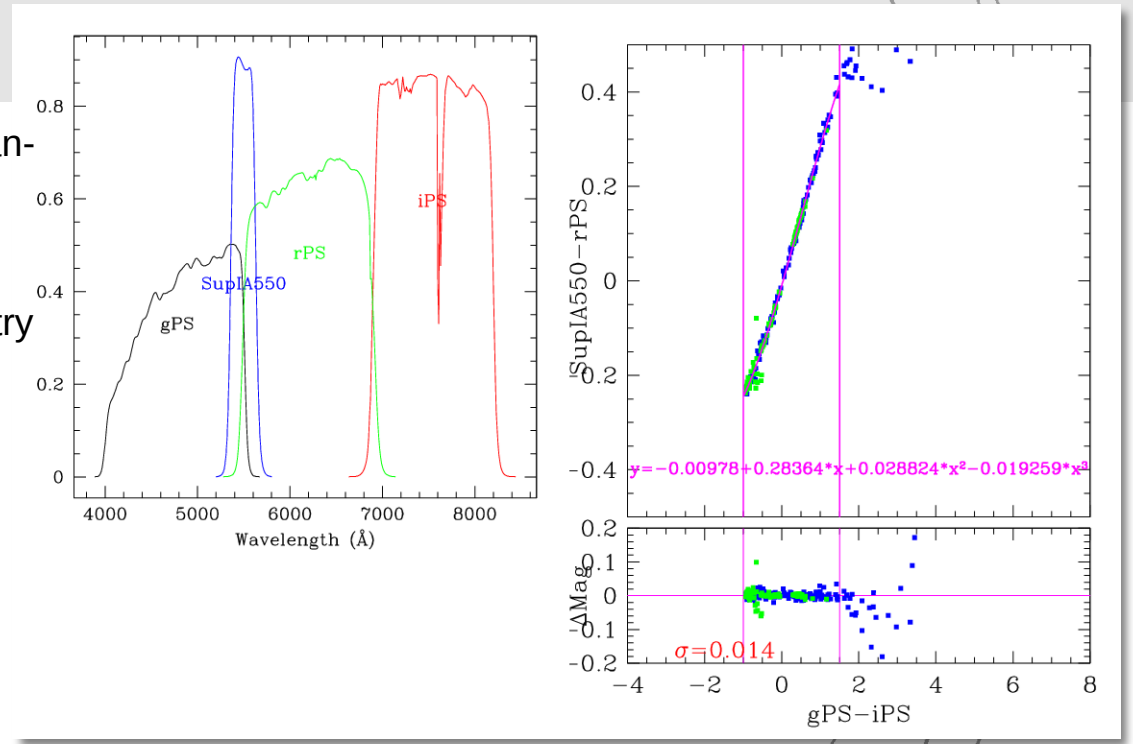

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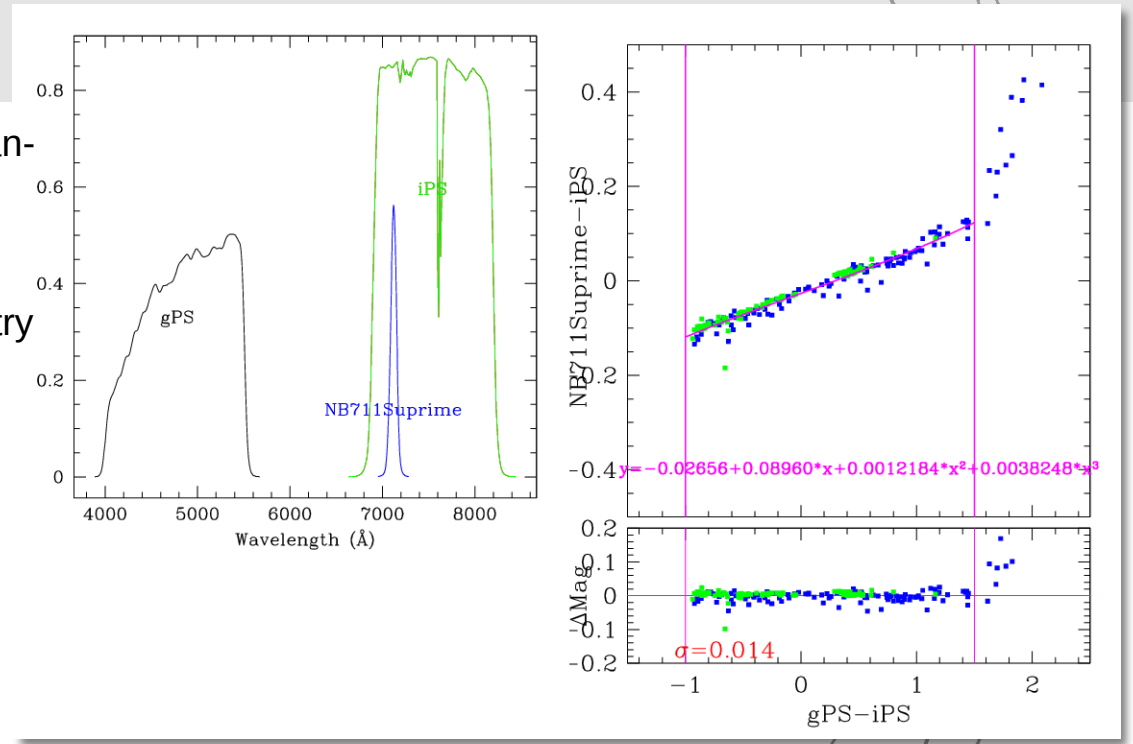
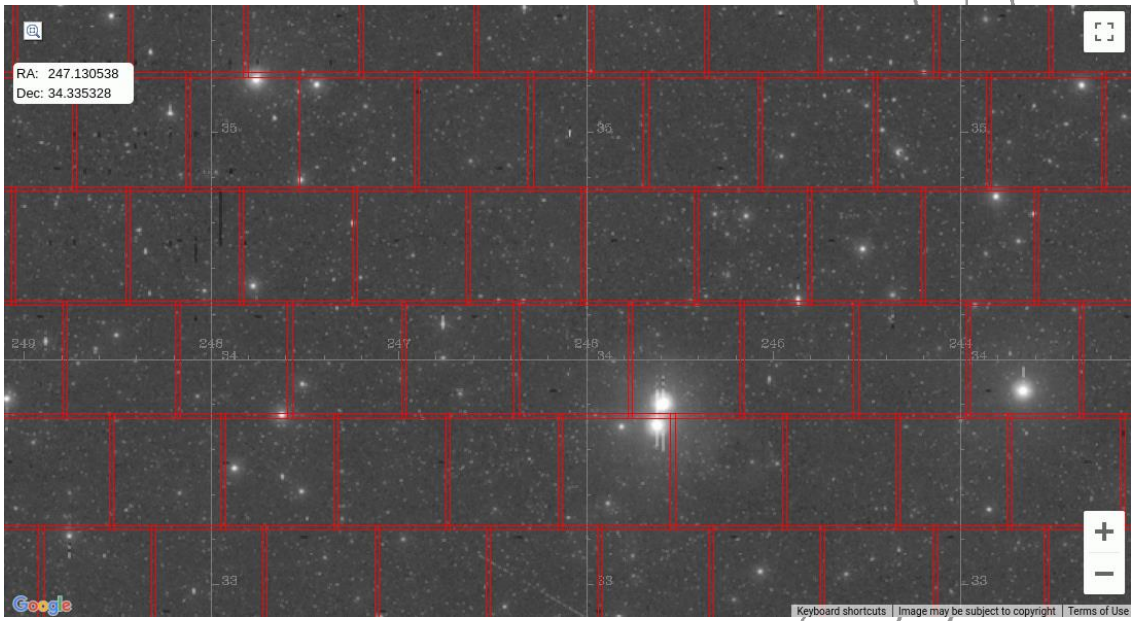


Resampling and coadding

- Resampling using astrometric calibration
- Scaling using photometric calibration
- Reject pixels using masks
- Coadd using a clipped mean
- Resample two ways:
  - Regular grid:
    - 10k x 10k pixel tiles
    - Spaced 0.5 degrees in Dec and RA
    - Same grid used for CFHT
  - Natural grouping of using a friends of friends algorithm



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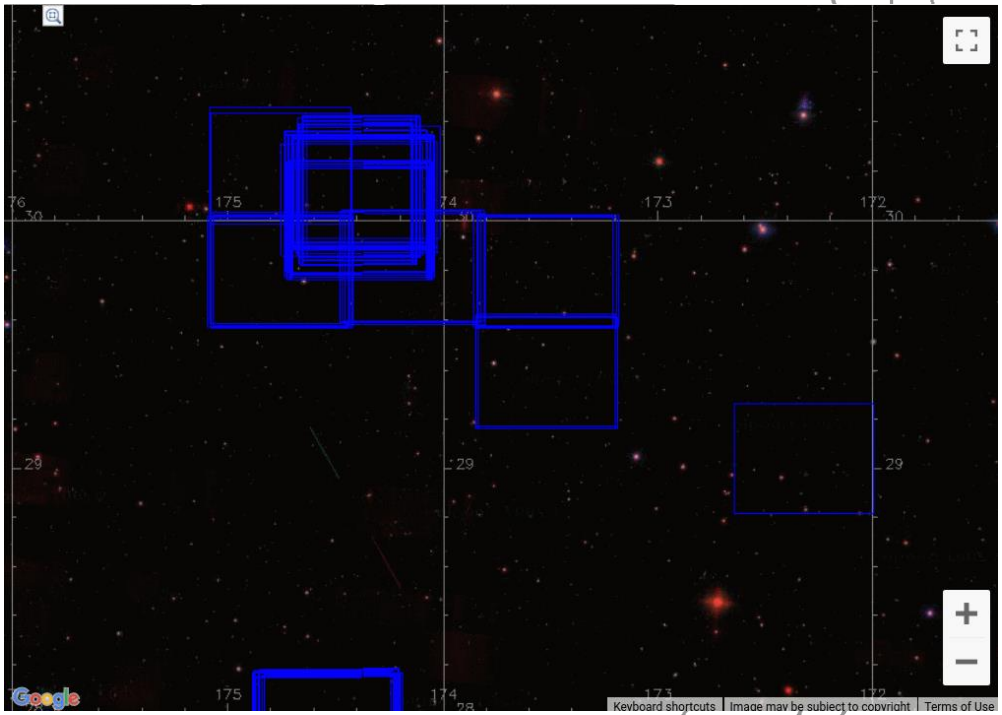

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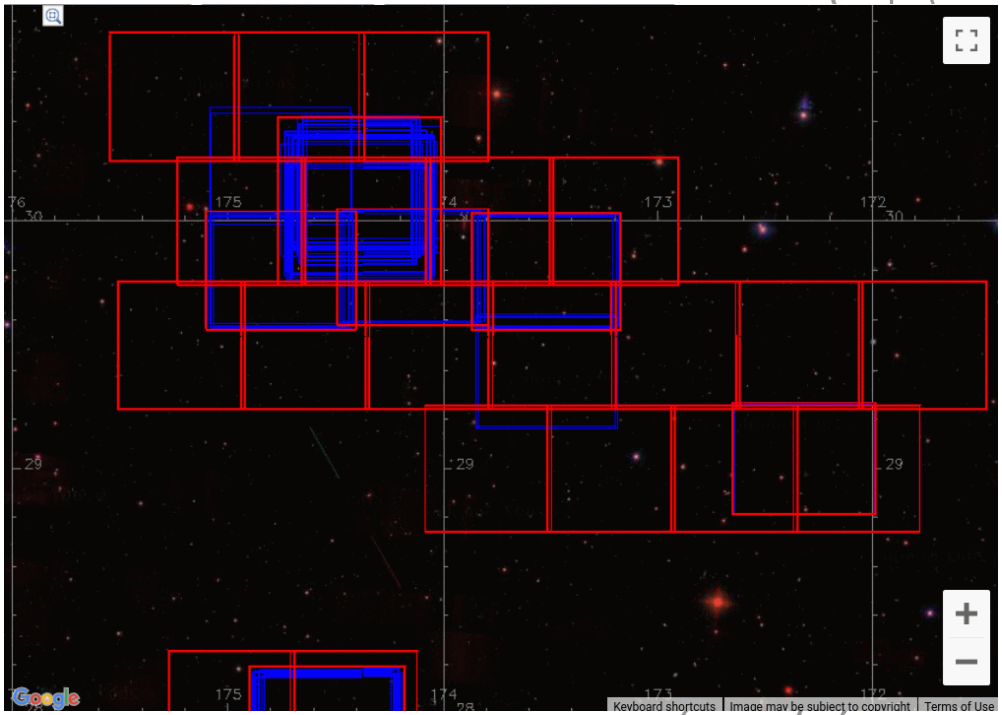
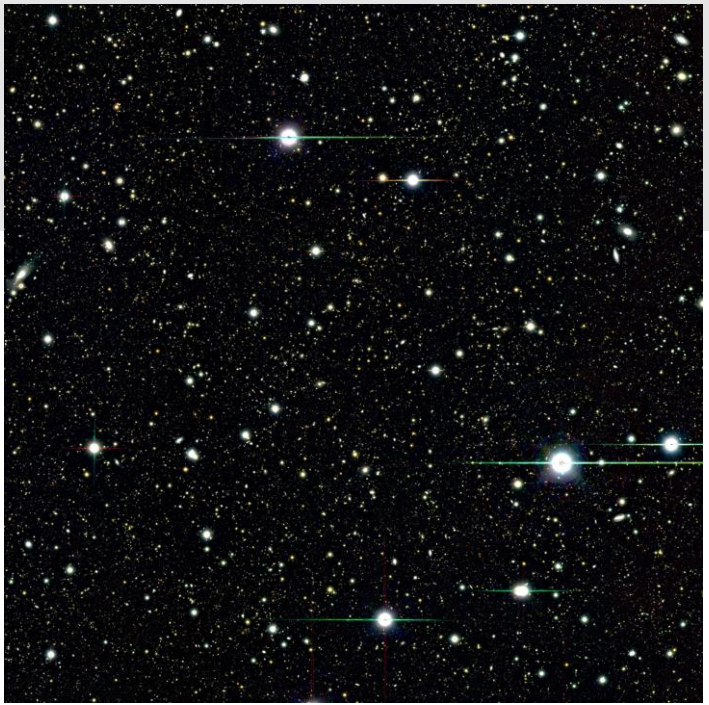
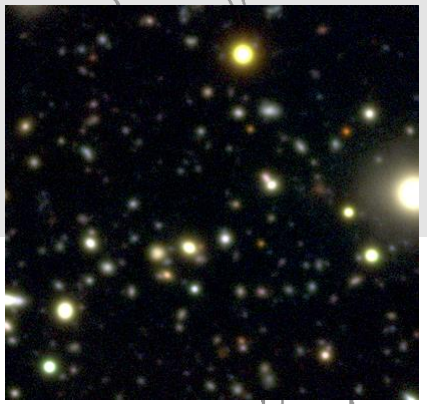
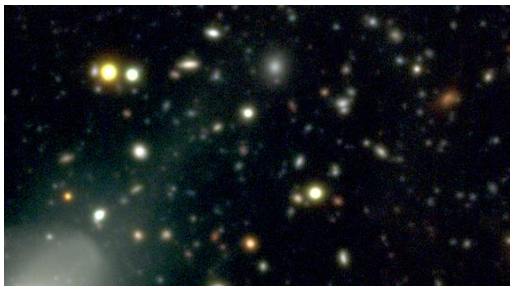


Data products

- Individual calibrated images and associated masks
  - Useful for synoptic studies (e.g. moving objects, variables)
- Coadded images and associated, weight maps and catalogs
- Not available:
  - full source catalog equivalent to the NOIRLab Source Catalog
  - merged, all image catalog



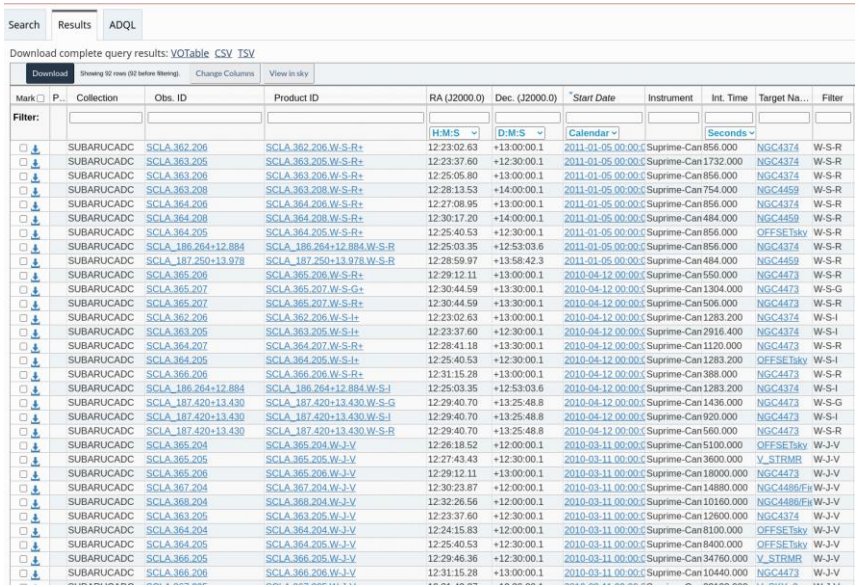


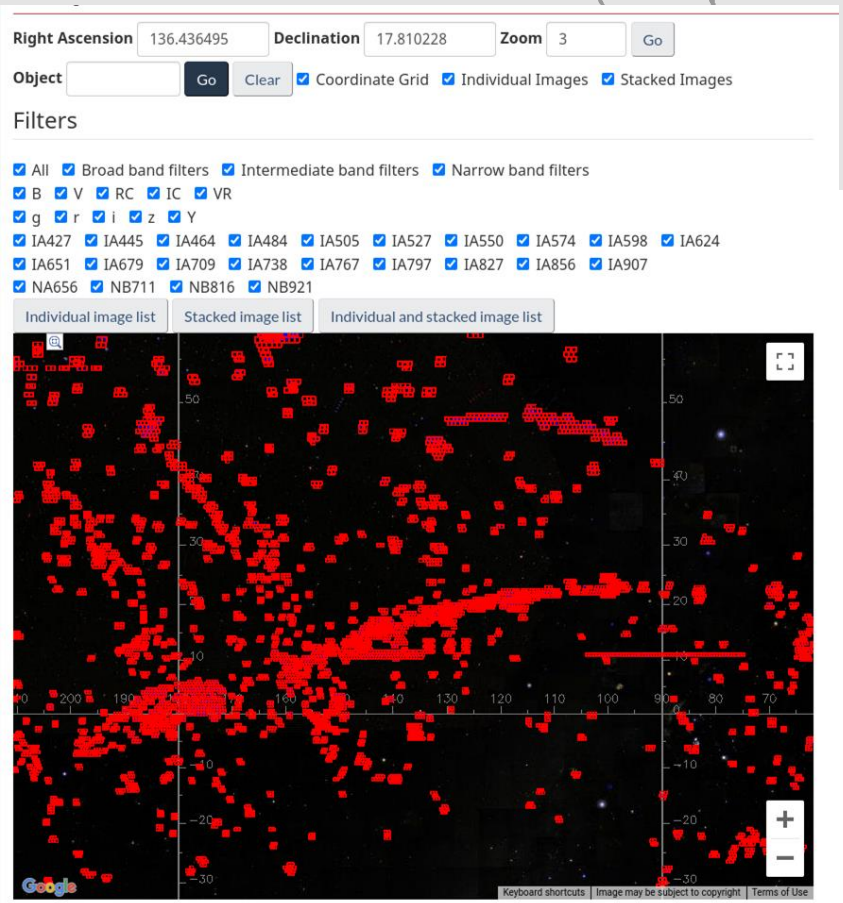


Data interface

- Graphical Search Tool
- Regular query interface
- Programmatic VO tools
- Provide direct, persistent links to data

https://www.cadc-ccda.hia-iha.nrc-cnrc.gc.ca/en/scla/





Summary

- The Suprime-Cam Legacy Archive as processed the data from the Suprime-Cam camera
- Astrometric precision: 30 mas
- Photometric precision: 10-20 mmag
- Available data:
  - Calibrated individual images
  - Coadded images
- It is hoped that the SCLA will contribute to increase of the re-use of the Suprime-Cam data