

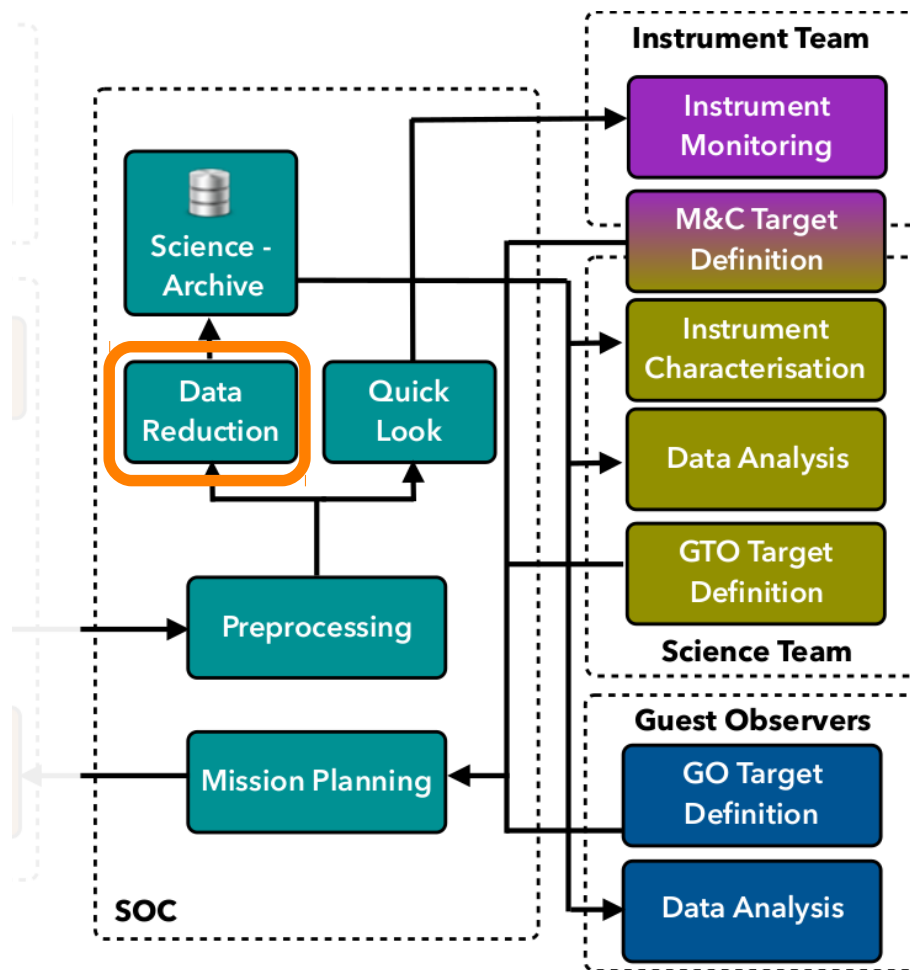
Data Reduction Pipeline

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Meunier, Pascal Guterman

@IA/CAUP: Sérgio Sousa, Nuno Santos

DR in context



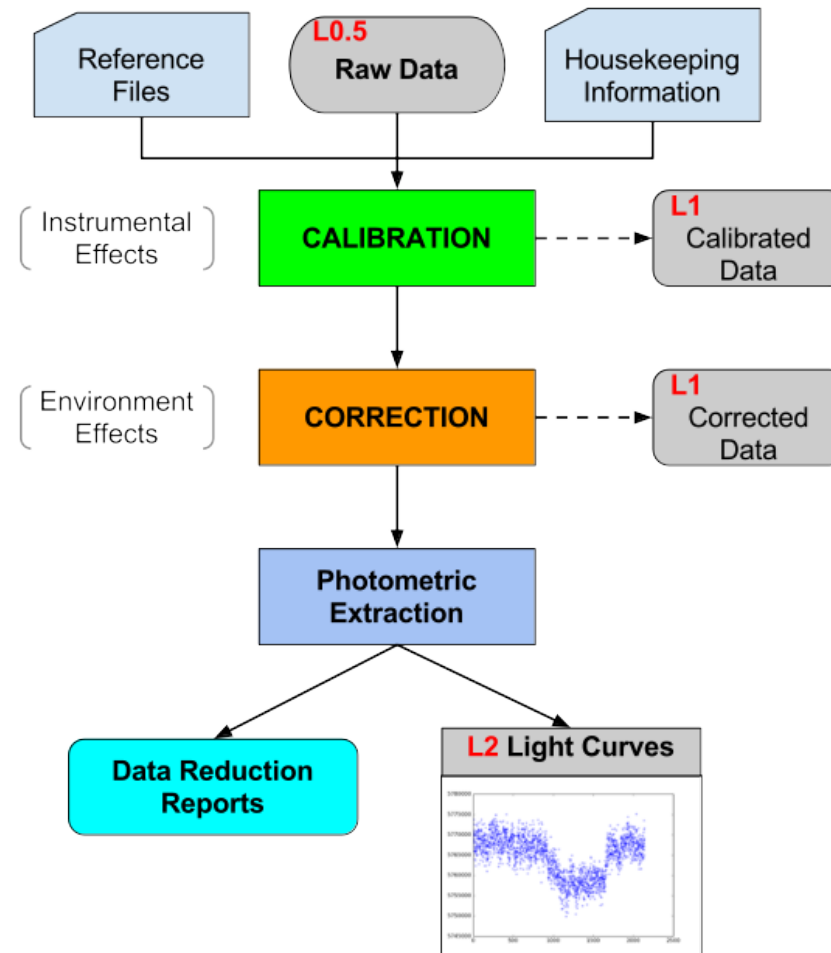
See Mathias Beck's Presentation



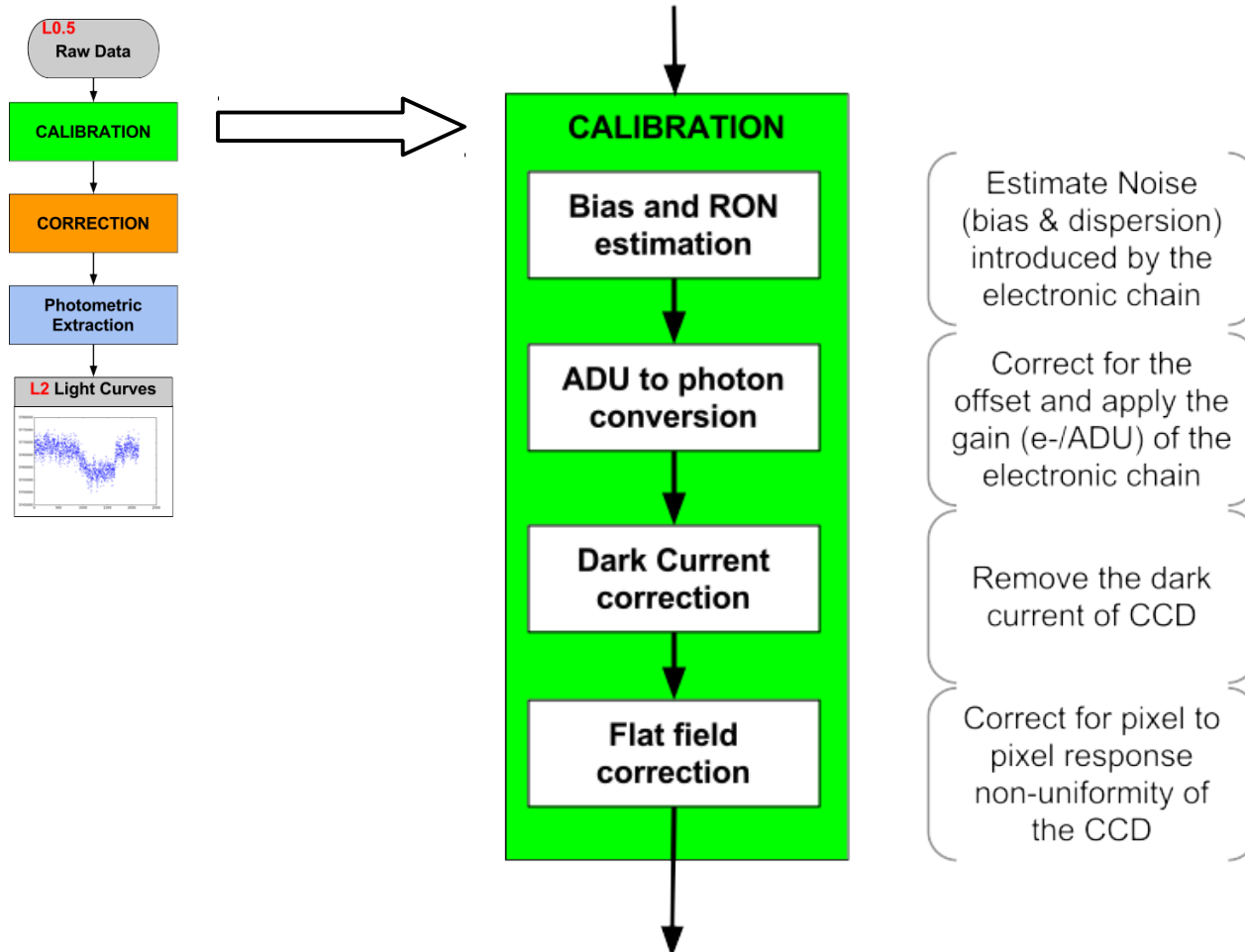
DR Specs Sheet

- Need to comply with high level requirements and design definitions (for development and scientific performance)
- Development facts:
 - - Python 3.4 (standards+custom made libraries)
 - - Under the framework of the SOC Infrastructure:
 - Internal tests: covering, unit, functional, performance.
 - Code compatible with SOC data product definitions and management
- Pipeline will run completely automated at the SOC@Geneva (not accessible to users)

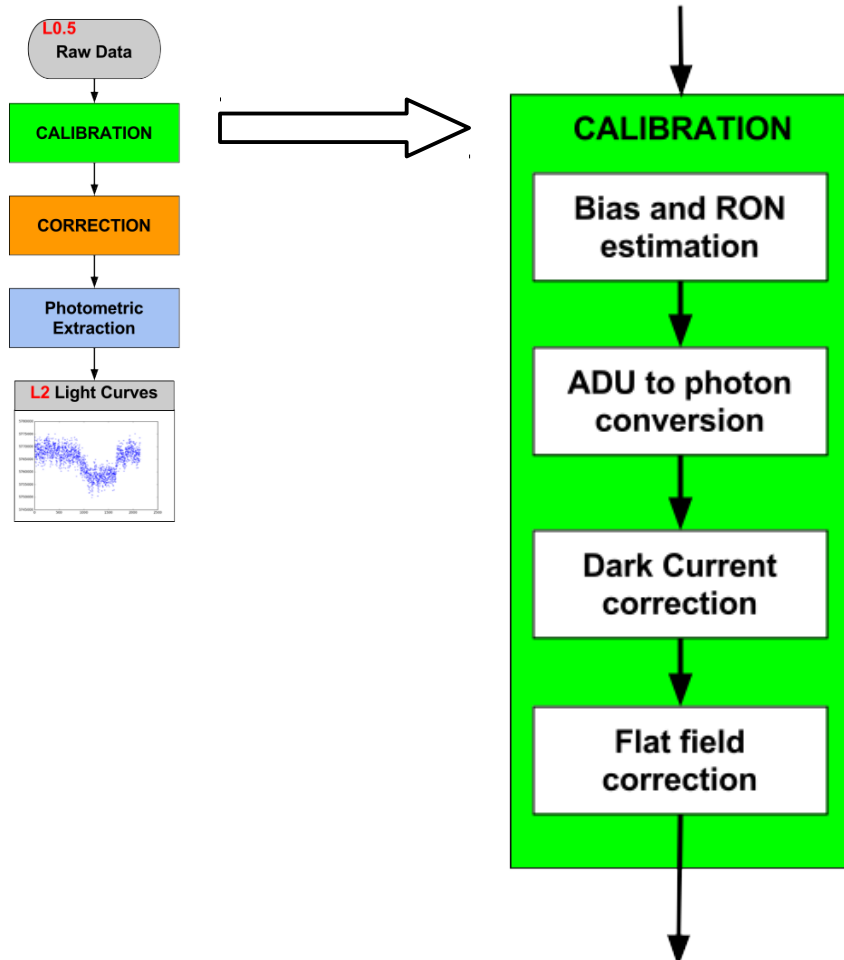
Data Reduction Overview



Calibration: Functions

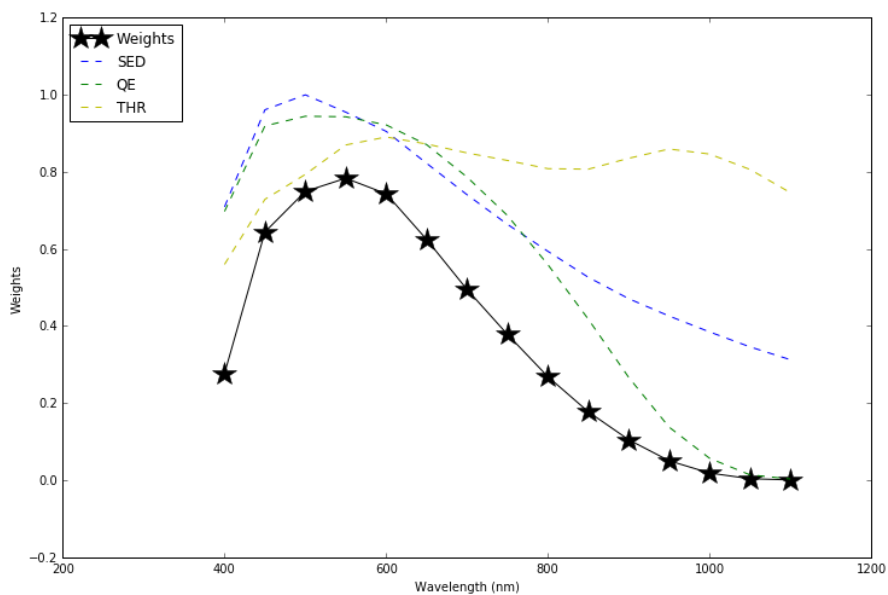


Calibration: Functions

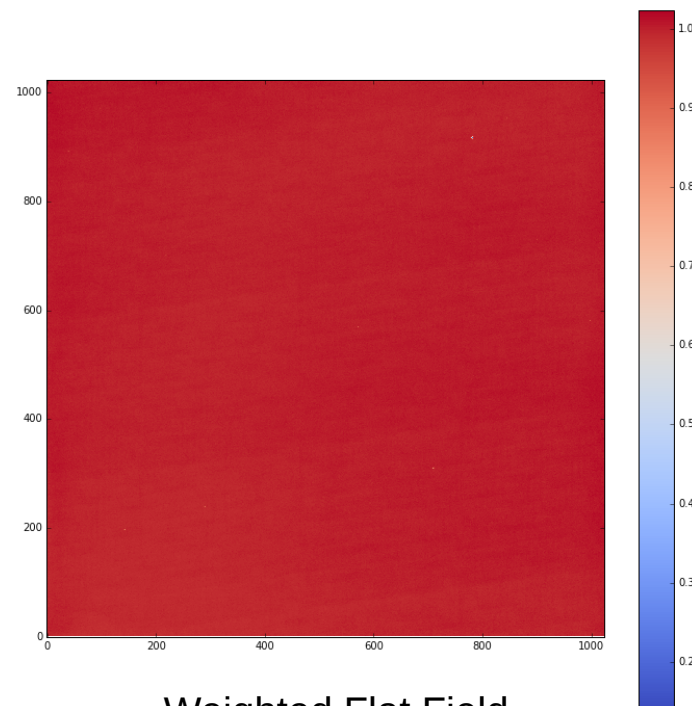


Each module will use reference files delivered by other Packages (Instrument and C&M teams)
 +
 Create calibration files (e.g. Flat Field) based on specific parameters of the target / observation mode / visit configuration.

Weighted Flat Field

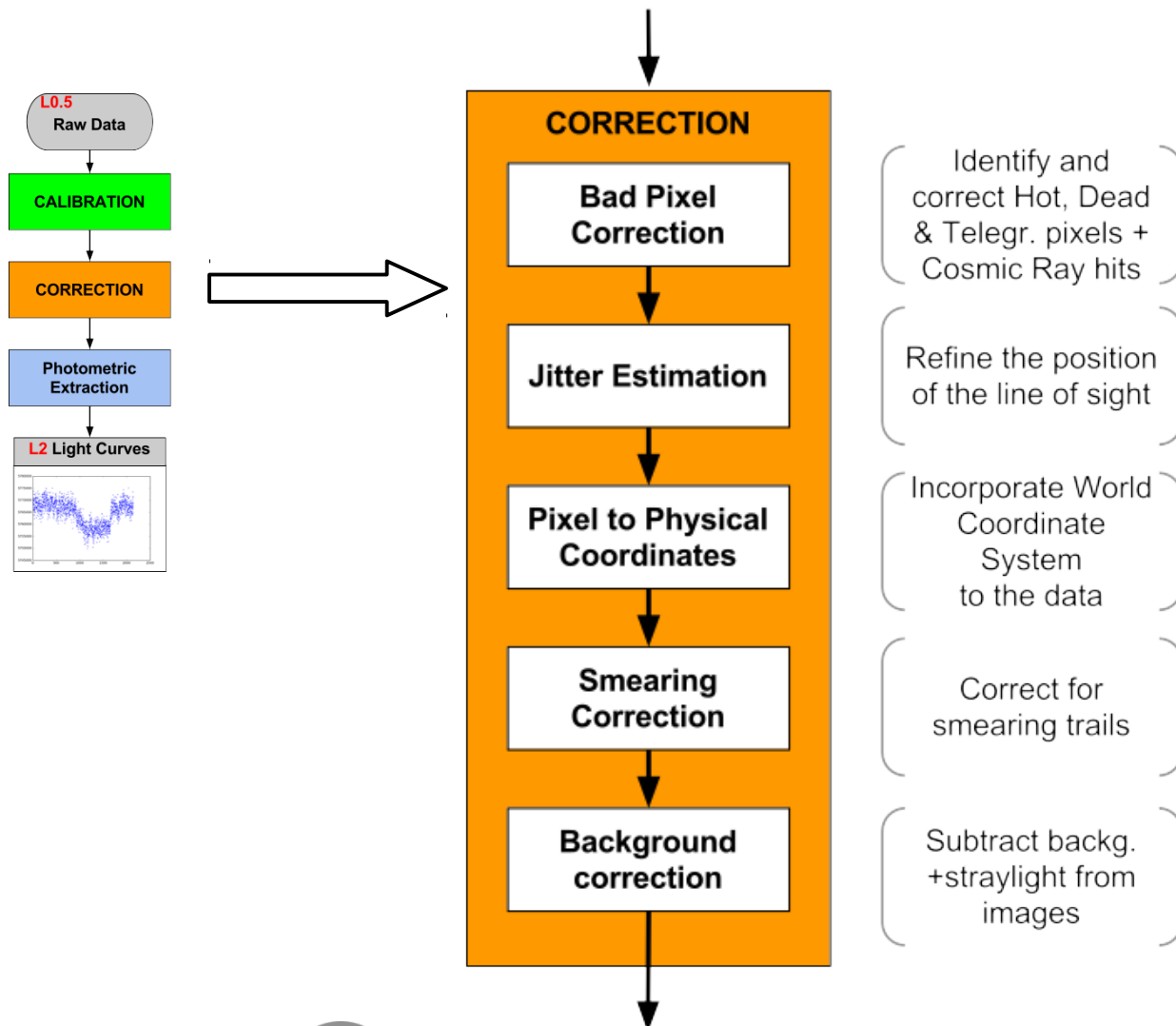


Weights used to compute the Flat Field for a given Temperature ($T=5777$ K)

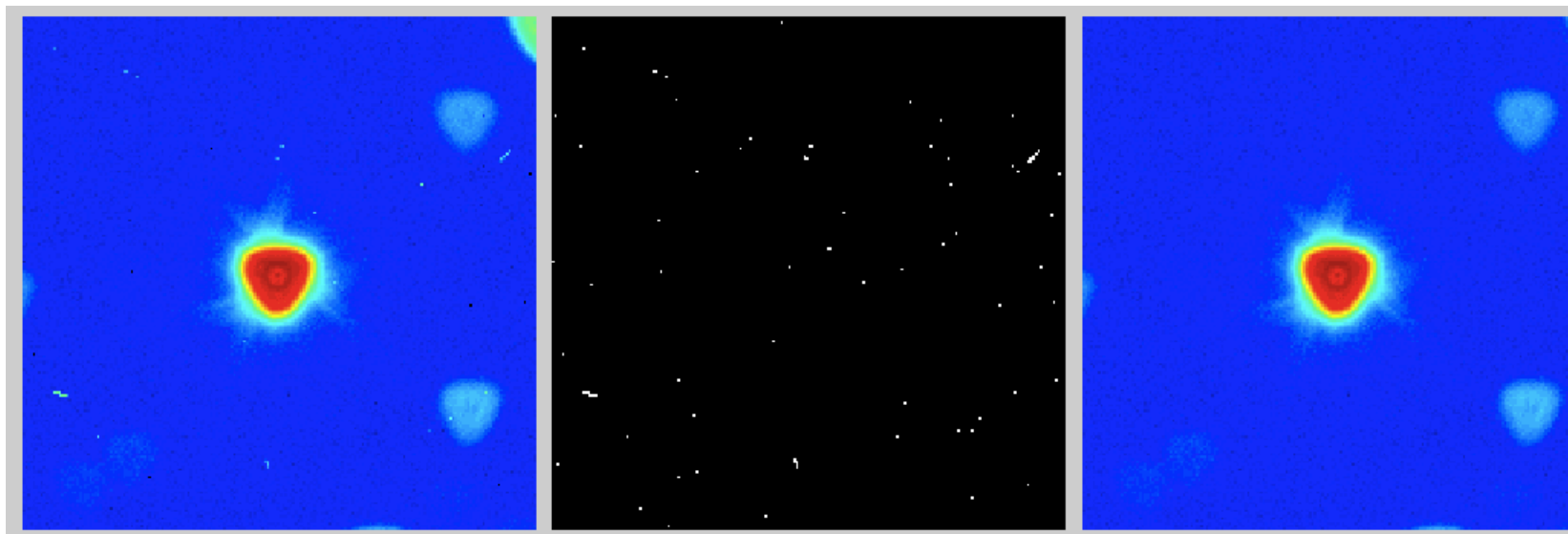


Weighted Flat Field

Correction: Functions



Bad Pixels Module Demo

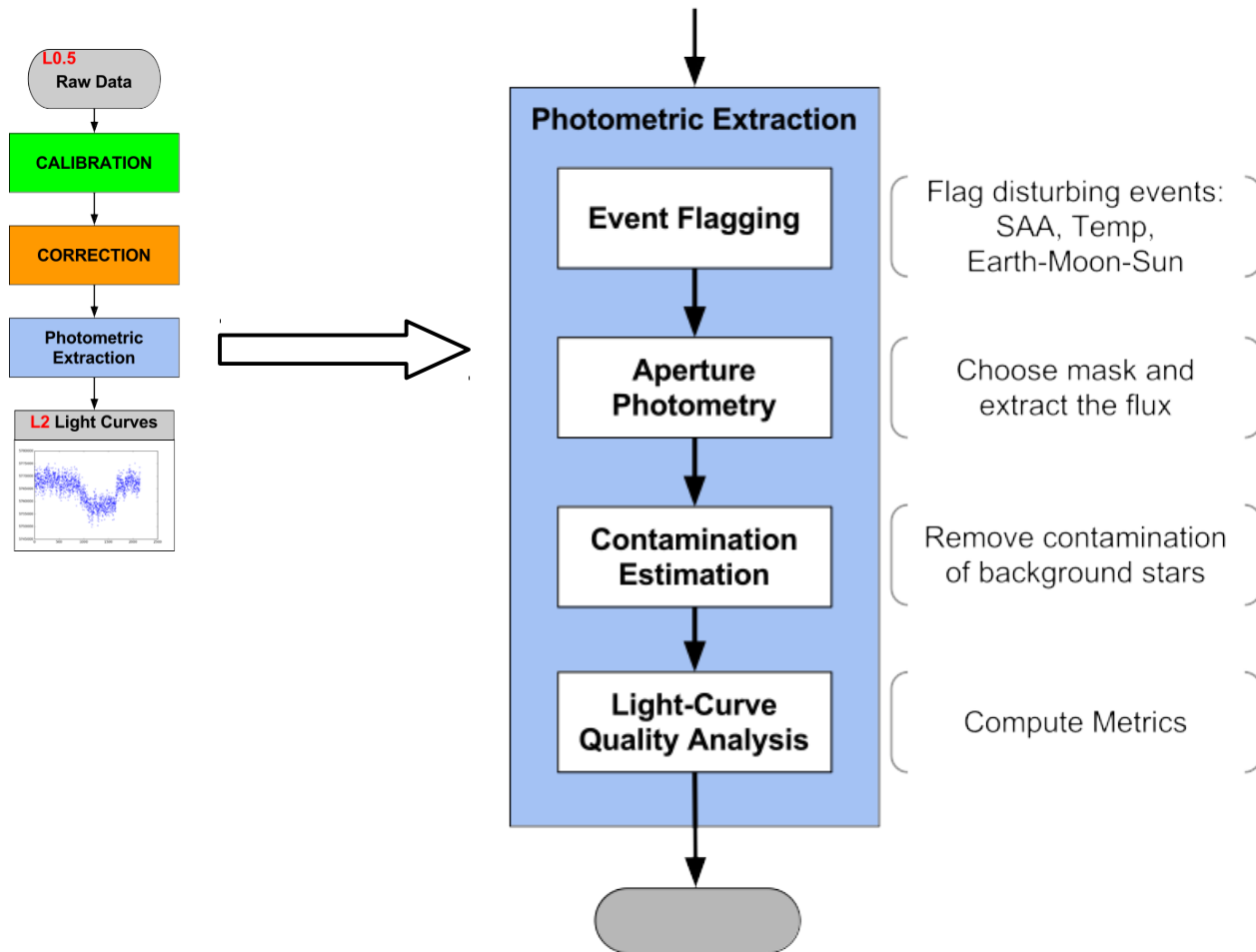


Input Data

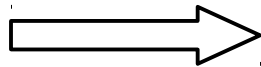
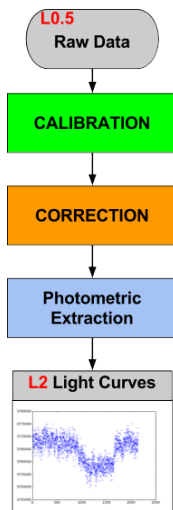
Bad Pixel Detections

Corrected Data

Photometry: Functions



Data Products of DR

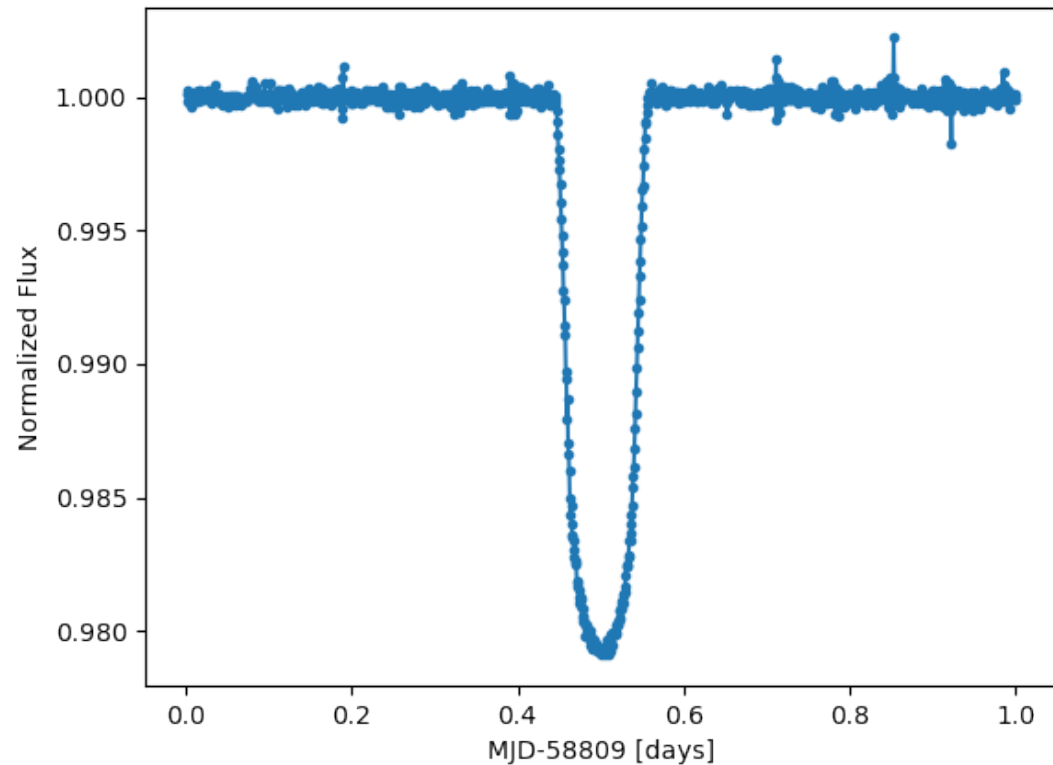
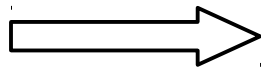
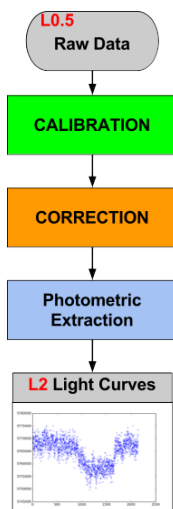


L1. Calibrated and Corrected Data

L2. Report and Light Curves

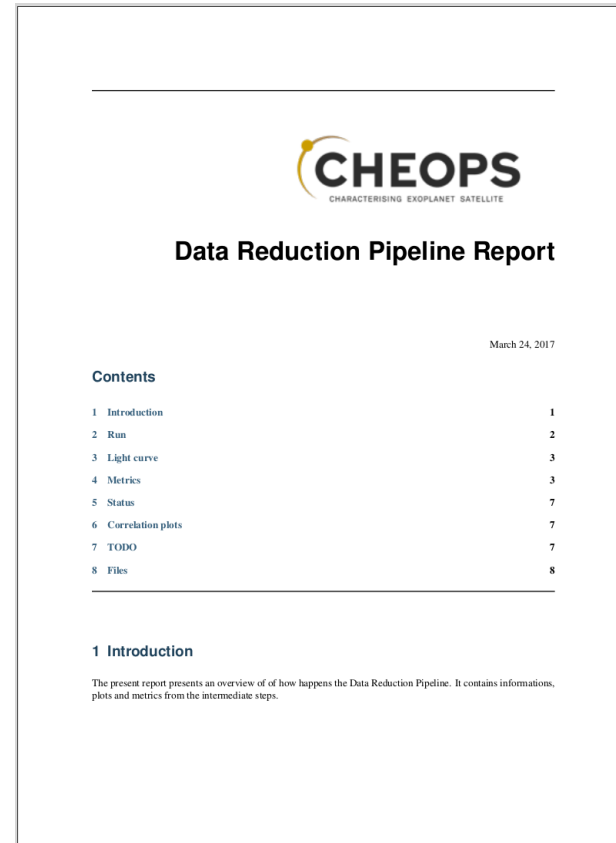
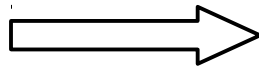
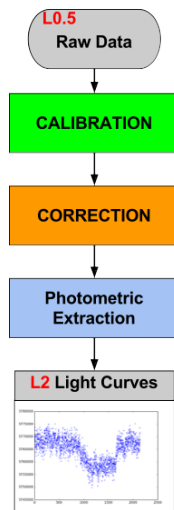
Metadata : Used values of each step of the processing will be Delivered on the L1/L2 headers.

Outputs: Light Curve




LC: will be delivered in FITS Table format

Outputs: Report



Outputs: Report



Data Reduction Pipeline Report

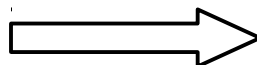
March 24, 2017

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1 Introduction

The present report presents an overview of how happens the Data Reduction Pipeline. It contains informations, plots and metrics from the intermediate steps.

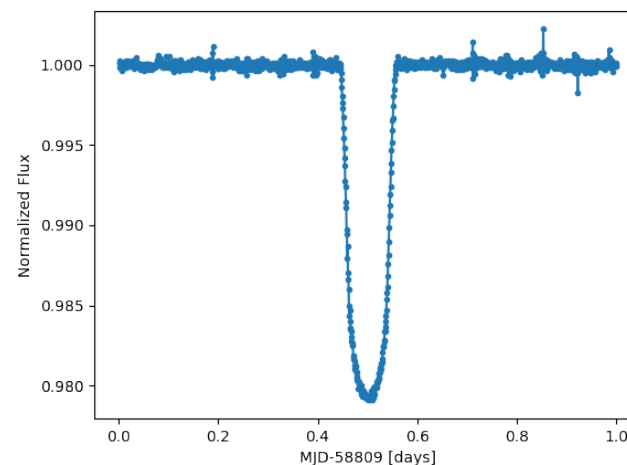


2 Run

Table 1: Run informations

Data start	2018-09-01T12:00:00.000000
Data stop	2018-09-01T12:00:00.000000
Visit id	3204
Target Name	simulation
Mag V	9.0
Spectral Type	G0
Exposure nb	300
Intergration time (s)	60.0 (3 x 20.0 s)
PI Name	CHEOPSim

3 Light curve



Outputs: Report

4 Metrics

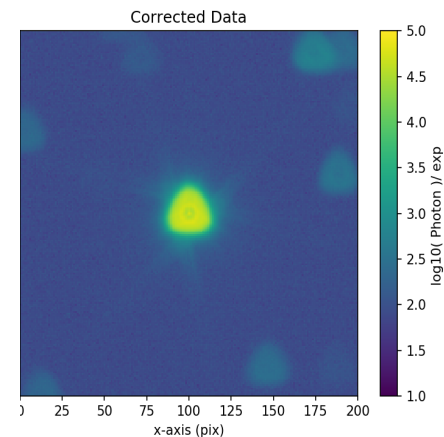
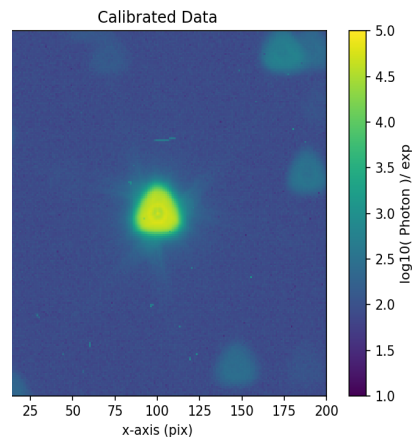
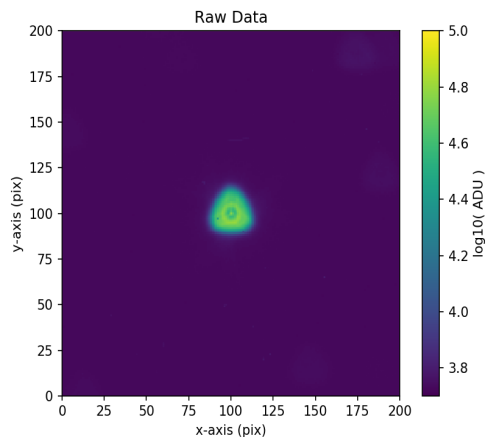
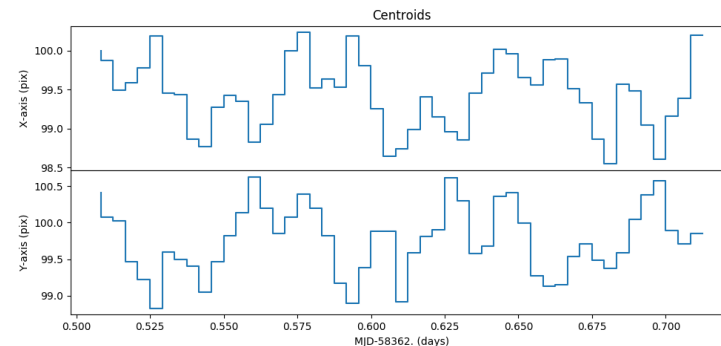
Table 2: Metrics

Flux level median (ph/exp):	1.73e+07
rob. mean (ph/exp)	1.73e+07
contamination (ph/exp)	N/A
Flux scatter rob std (ppm)	12327
MAD (ppm)	15259
p2p (ppm)	3684
cdpp 2.5h (ppm)	60
cdpp 6.5h (ppm)	0
Contamination (ratio)	0.47
Lost SAA (ratio)	TODO
Lost Straylight (ratio)	TODO
Cosmic rays detections in/out target (ppm/pixel/s)	TODO
Hot pixels in/out target (ppm/pixel/s)	TODO
Dead pixels in/out target (ppm/pixel/s)	TODO
Crazy pixels in/out target (ppm/pixel/s)	TODO

5 Status

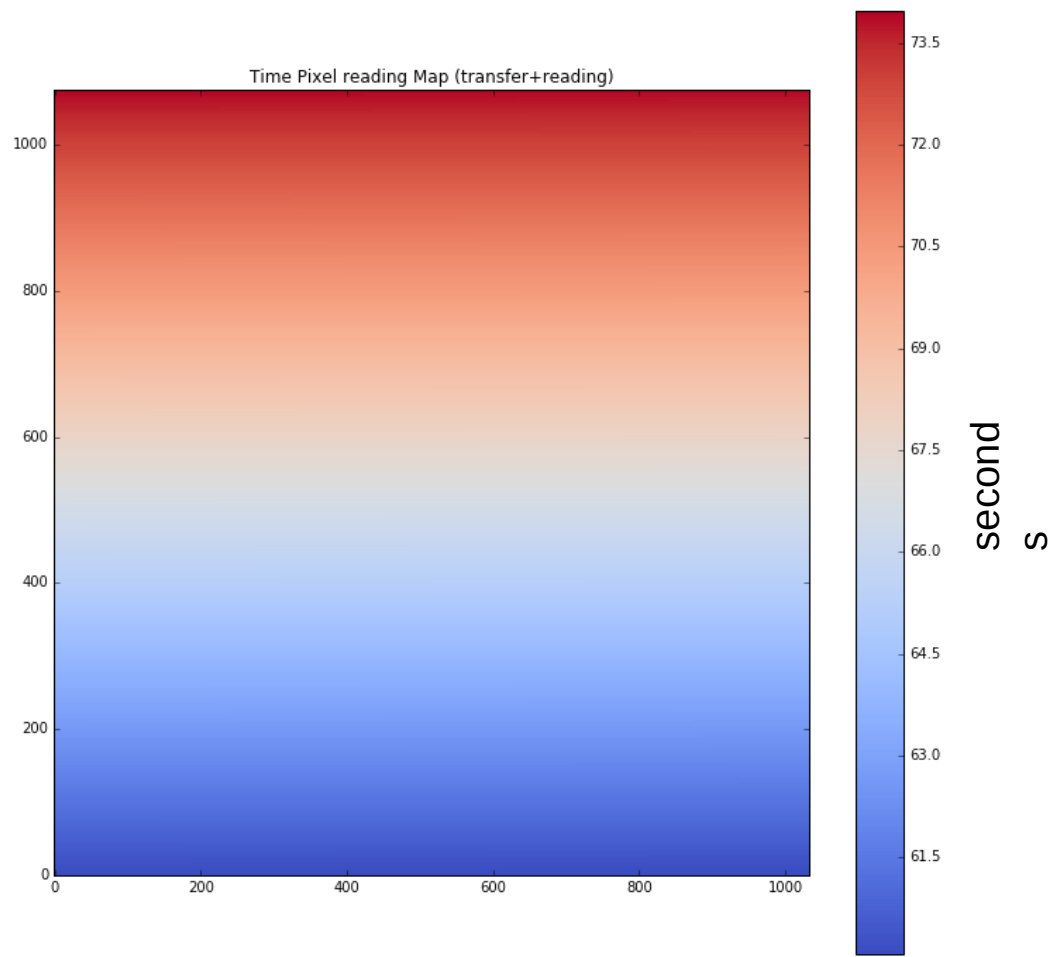
Table 3: Data Reduction Steps

Bias correction	completed
Adu -> photon	completed
Dark	completed
Flat Field	skipped
Smearing correction	skipped
Bad pixels correction	completed
Jitter estimates	completed
Background correction	completed
Photometric method	Circular aperture non weighed
Contamination estimate	completed
Event flagging	skipped
Quality analysis	completed



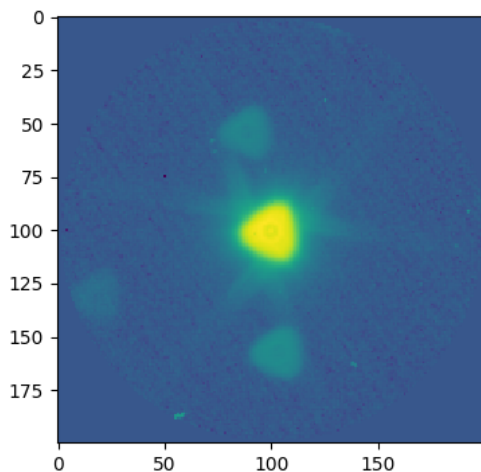
Current Studies

Dark Current Map
Based on the readout
time of each pixel

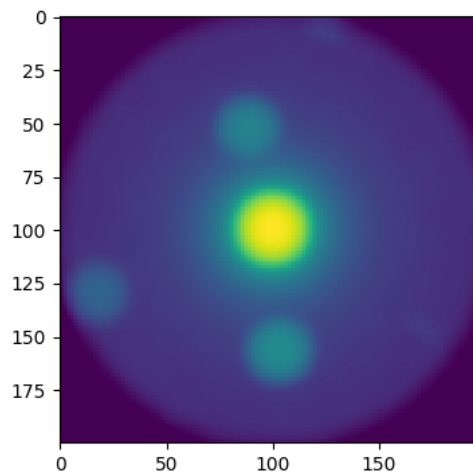


Current Studies

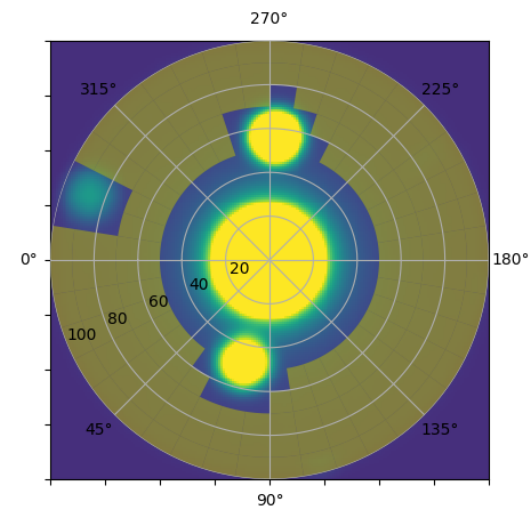
Background determination



Subarray corrected
by rotation



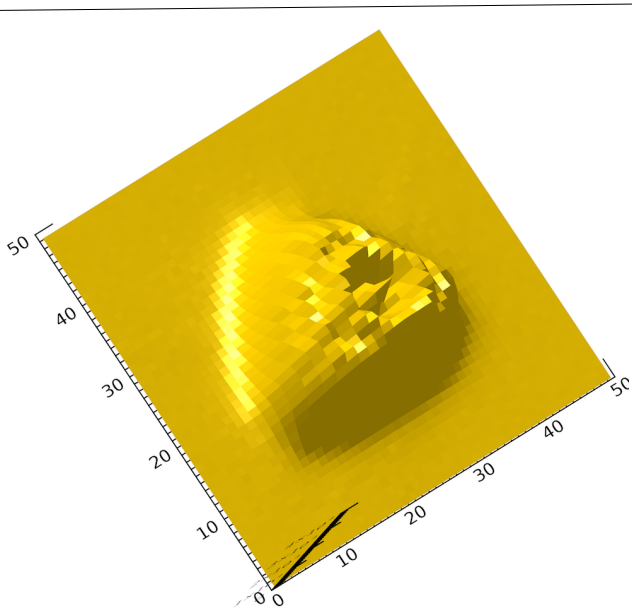
Averaged unrotated
Subarray



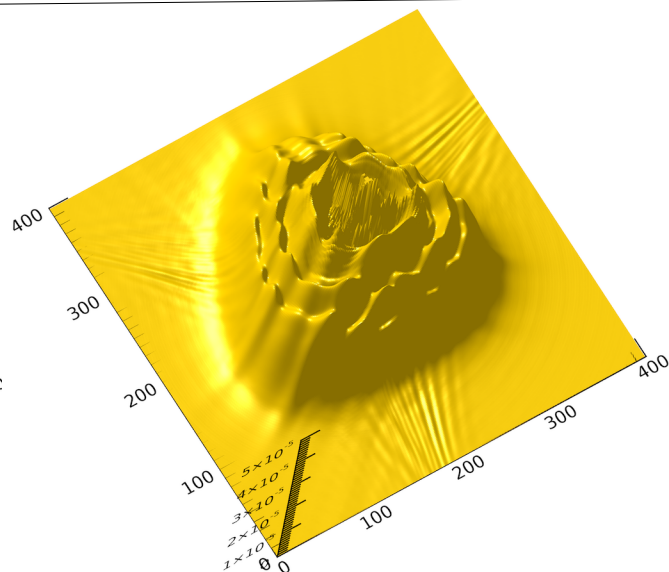
Masked Subarray for
windows (slices)
selection

Current Studies

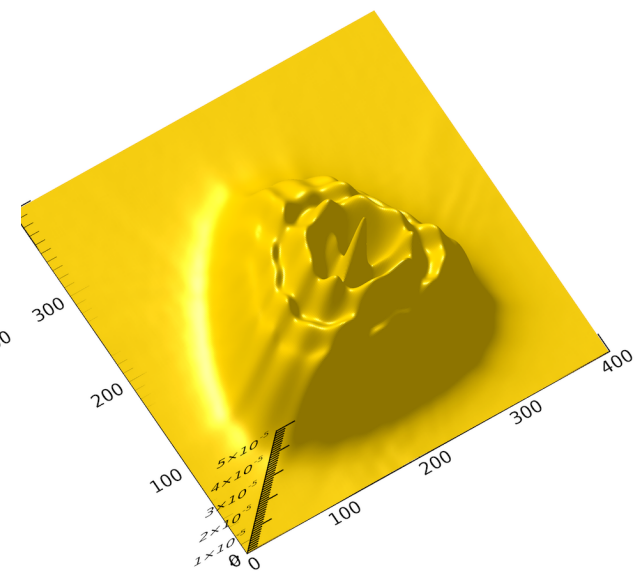
Super Resolve PSF reconstruction for photometry (and other applications)



Measure PSF
(1 frame)



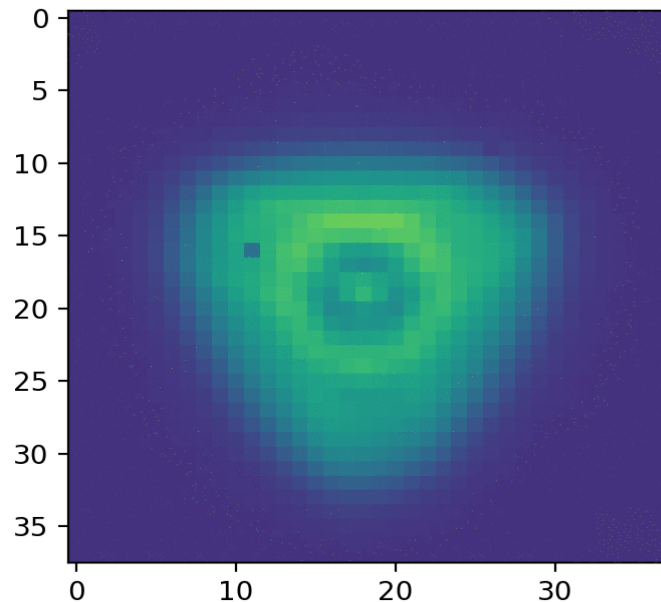
True PSF



Reconstructed PSF

Current Studies

Using imagerettes for Bad Pixel detection



Conclusions

- ③ Data Reduction Pipeline is fully working.
- ③ All functions in the DR pipeline are implemented.
- ③ Currently at performance assessment phase
 - Pipeline will be improved accordingly
- ③ We are working on simplifying internal products handling to shorten development cycle, reduce complexity, remove study-phase remaining branches and options.
- ③ In the forthcoming months, scientific performance will be assessed on various test cases
- ③ Pipeline will not be distributed to the community
 - Full documentation + 1 publication with detailed description of the used algorithms