ztfin2p3 - Pipeline status

Marie Aubert @ ZTF France - 07/11/24

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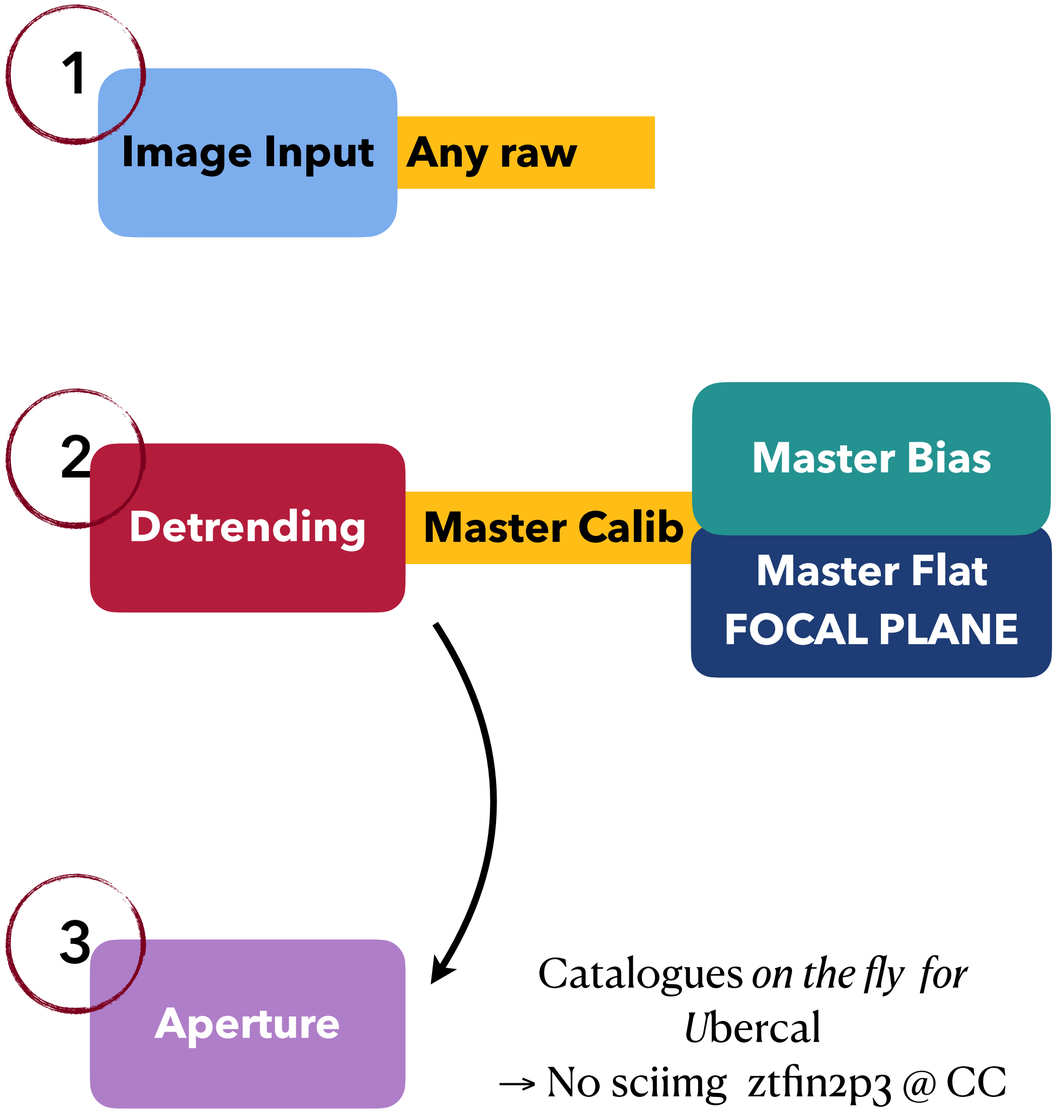
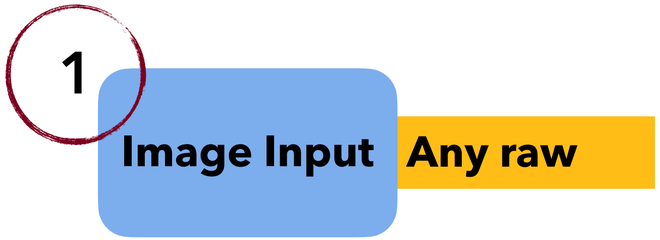
The *ztfin2p3* pipeline

How does it work ?
What does it do ?

- Image I/O and handling (e.g WCS) : `ztfimg`
- Calibration and everything else : `ztfin2p3`
- 3 Main steps from *Raw* to *Aperture catalogues* :



The *ztfin2p3* pipeline



How does it work ?
What does it do ?

- Image Input and handling (e.g WCS) : `ztfimg`

- Image Input is the basis → Applies to any raw opened in the pipeline :

Image Input :

`ztfimg.RawCCD`
`ztfimg.RawQuadrant`

1. Open
2. Pocket correction (date > 20191022)
3. Corr for NL from linearity tables / rcid **(date dependent)**
3. Corr for overscan :

- Only last five columns used for model.
- Model is cubic polynomial applied to sigma-clipped overscans

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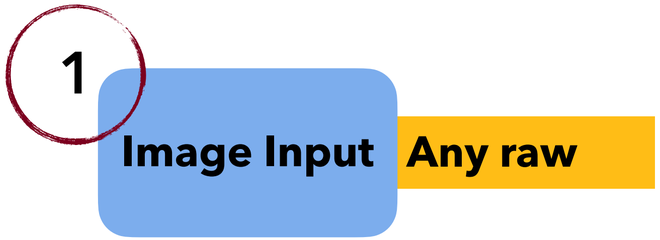

Master Calib

Master Bias

Image I/O

1. Use last 10 bias / day
2. Pixel-level sigma-clipped (3) median

→ **Store (with Header → package versions)**

→ **Image are store in fits files / CCD.**

```
ztfin2p3.pipe.newpipe
class BiasPipe
```

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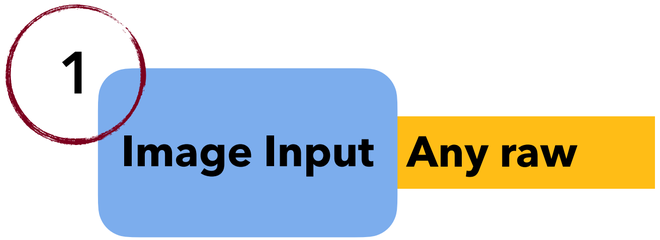

Master Calib

Master Flat

Image I/O

Master Bias

1. Pixel-level sigma-clipped (3) median **/ LED**
2. Normalize flat / **LED / CDD** with **CCD Median**
3. Average CCD & norm to get **Flat / Filter**
4. Re-open everything to estimate **median level at Focal Plane level**
   → **Store in Header**
   → **Image are store as CCD normalized in fits files.**

```
ztfin2p3.pipe.newpipe
class FlatPipe
```

The *ztfin2p3* pipeline

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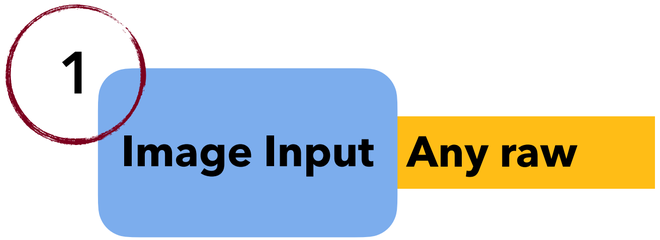


Master Calib

Image I/O

Master Bias

Master Flat FOCAL PLANE

Detrending

1. Get the nearest calib files → CCD, filter, date matching.
2. Open raw file with ztfimg (1)
3. Correct for bias ($I_{\rm raw} - I_{\rm master\,bias}$)
4. Correct for flat at focal plane level $I_{\rm sci} = \frac{I_{\rm bias\,corr}}{I_{\rm Flat}} \times \frac{\rm N_{fp}}{\rm N_{ccd}}$
5. Separate $I_{\rm sci}$ into four quadrant → IPAC like sci format.
6. Get associated headers & go from there

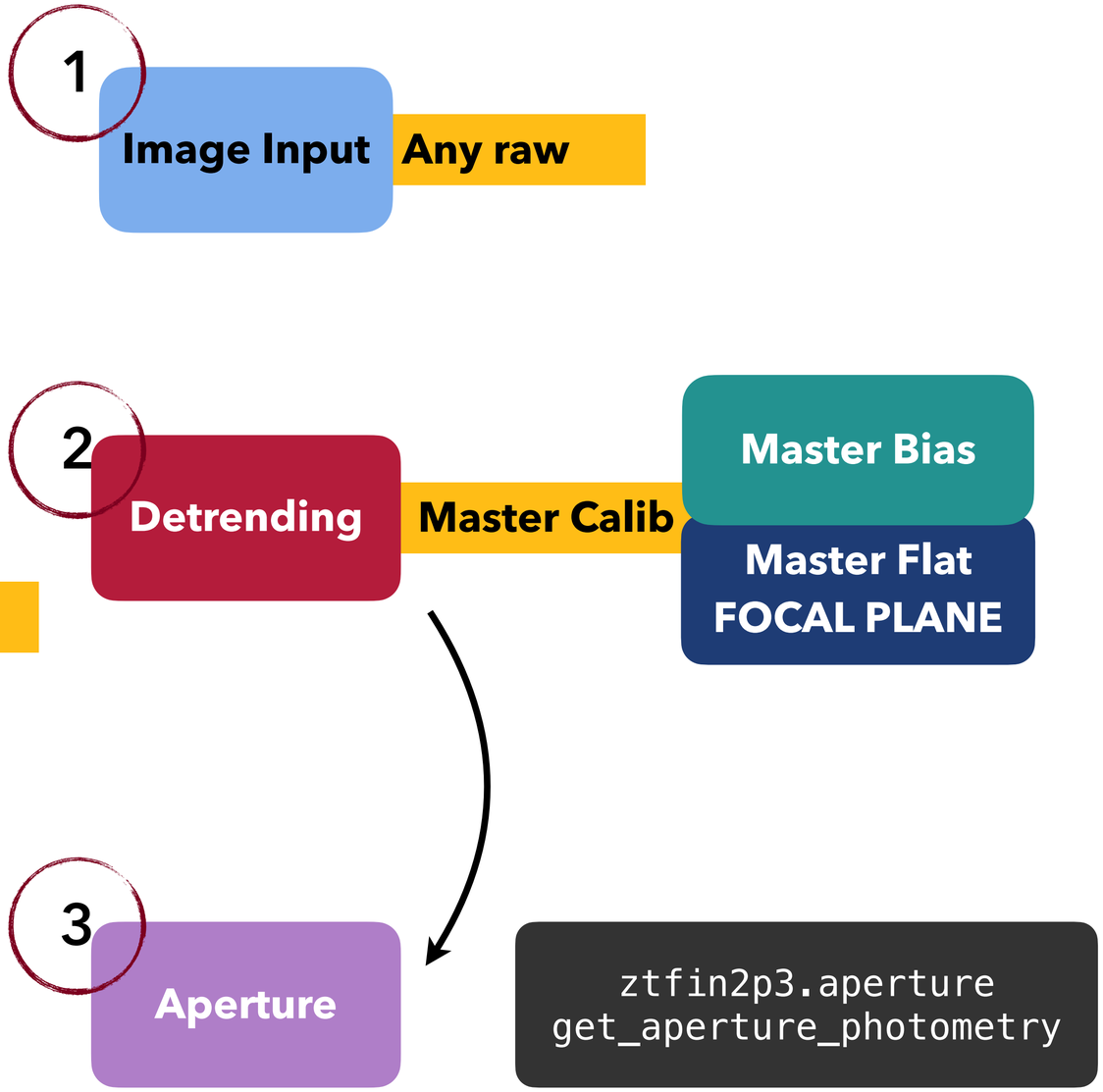
```
ztfin2p3.science
build_science_image
build_science_header
```

```
#Output :
ztfimg.ScienceQuadrant
x4
```

The *ztfin2p3* pipeline

How does it work ?
What does it do ?

- Image I/O and handling (e.g WCS) : `ztfimg`
- Calibration `ztfin2p3`



Master Calib

Image I/O

Detrending

Aperture

1. Match Image to source catalogue to each quad : **GAIA DR3 - Ben ver.**
2. R.A , Dec to ra,dec with pec-vel
3. → (x, y) quadrant coord.
4. `sep` package aperture
5. Format and store to parquet

Status of the pipeline

→ Ready to run (until the next issue)

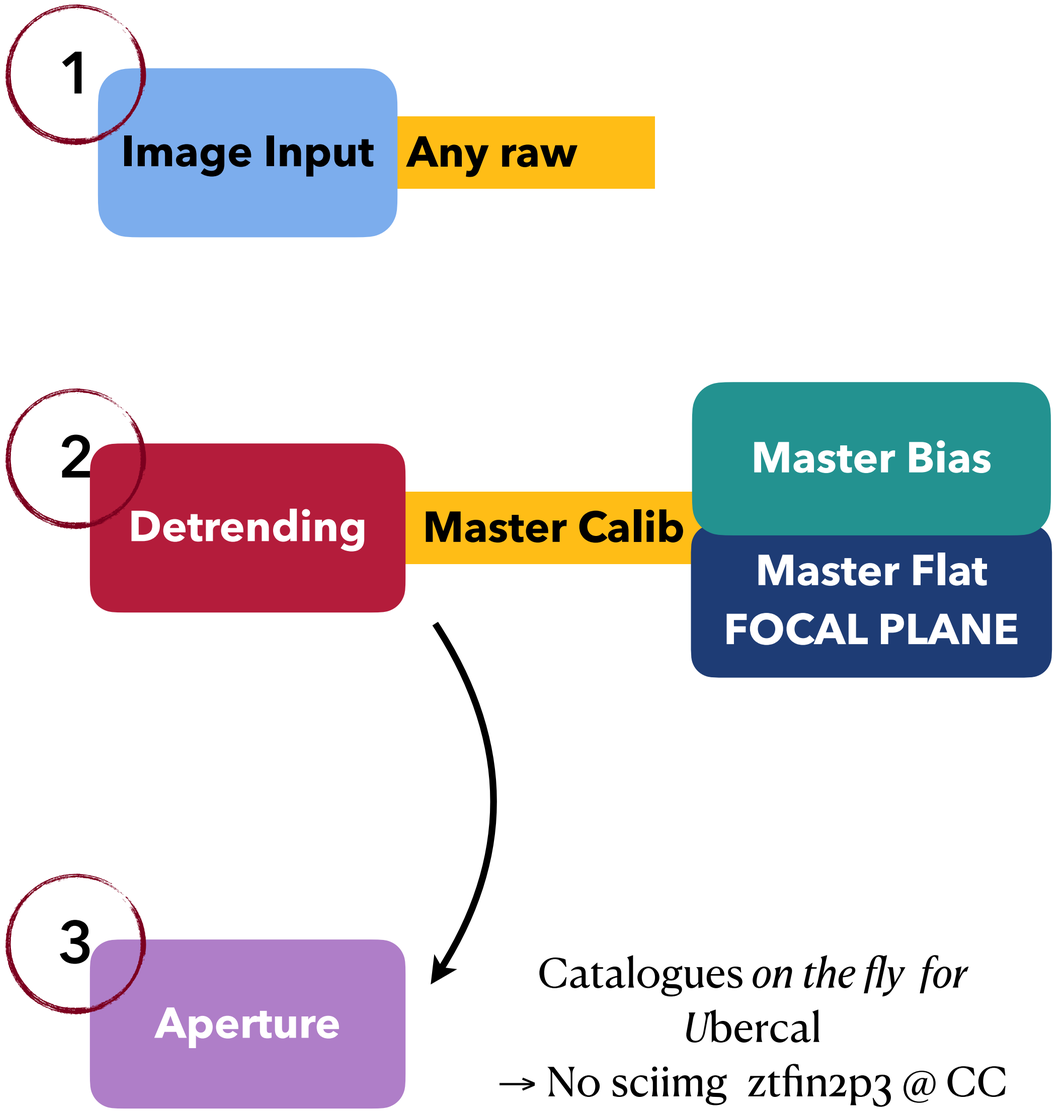
Implementation aspects are coded.

Simon did a lot of refactoring & developed command line environments.

Simple command line commands :
(*please don't run them unless discussed)*

```
$ ztfin2p3 run calib [options]

$ ztfin2p3 run d2a[options]
```



Catalogues *on the fly for* *U*bercal
→ No sciimg ztfin2p3 @ CC

Interacts with CC Slurm → Create relevant batch job izy pizy.

Pipeline validation — as it is

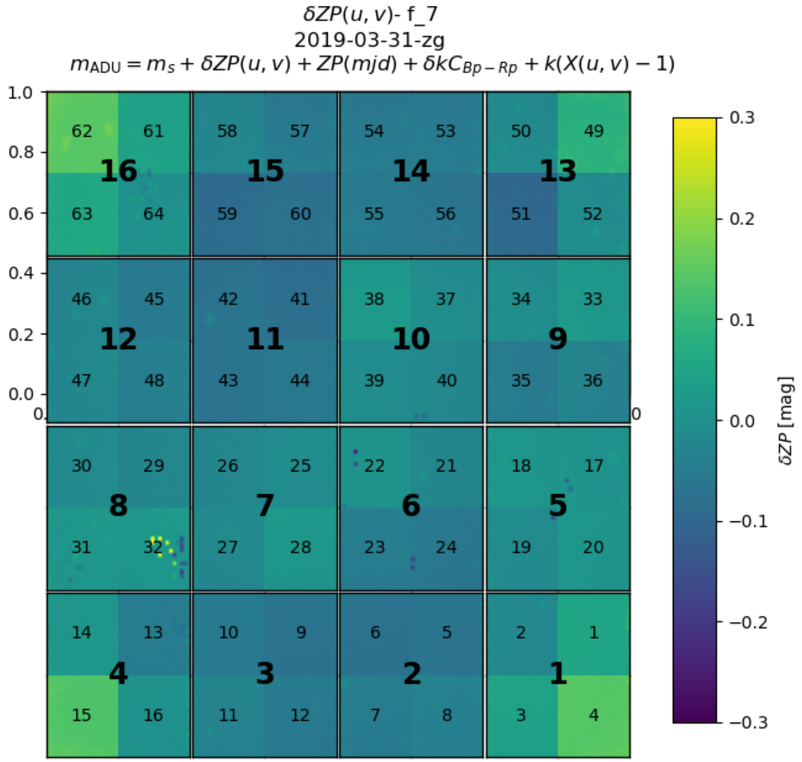
In progress

- Pipeline will be tested both ways :
  - Starflats fits to aperture catalogues
  - Check with Uberflats if overlap possible (for now - toy sample for Ben)

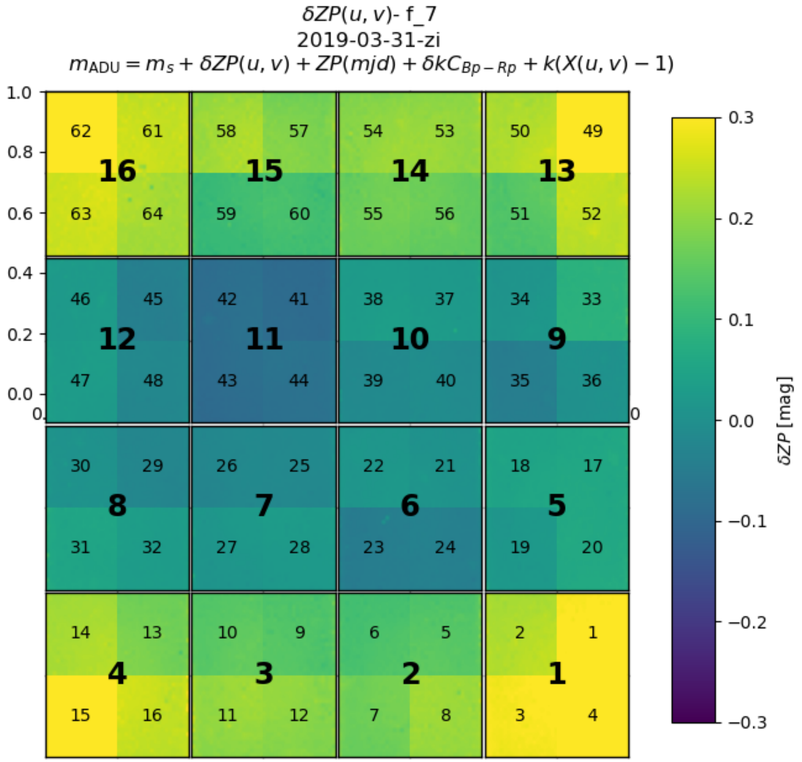
- Ran : 2019-03-31 in the three bands.

Starflats 2019-03-31

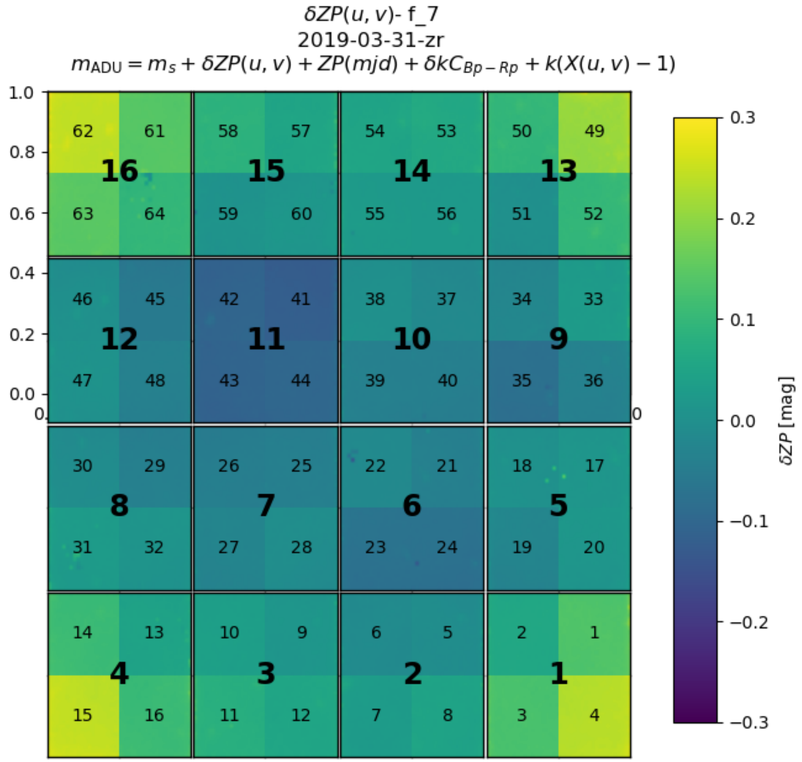
Focal plane residuals with CCD normalization



zg



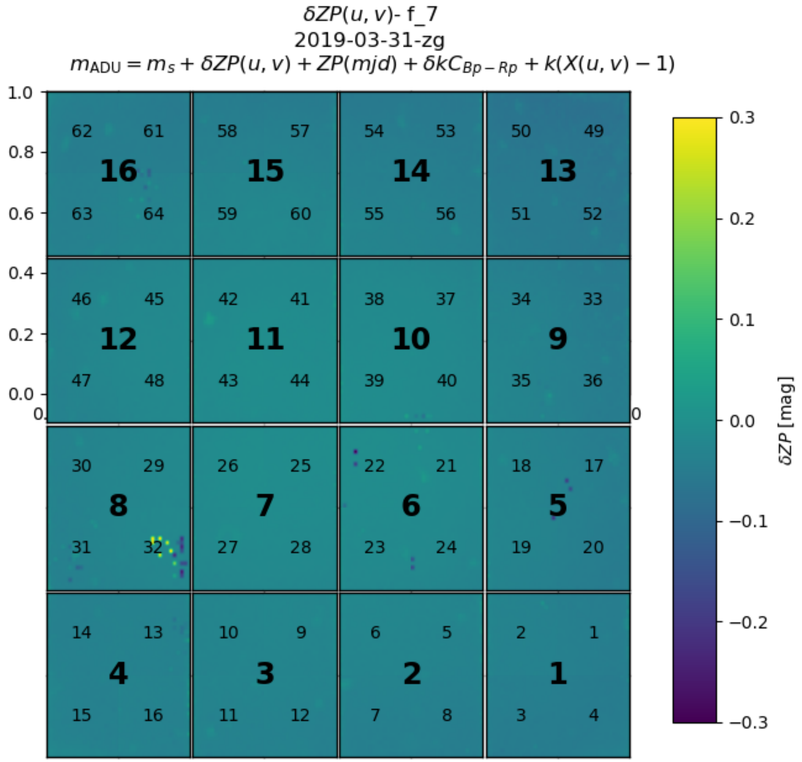
zr



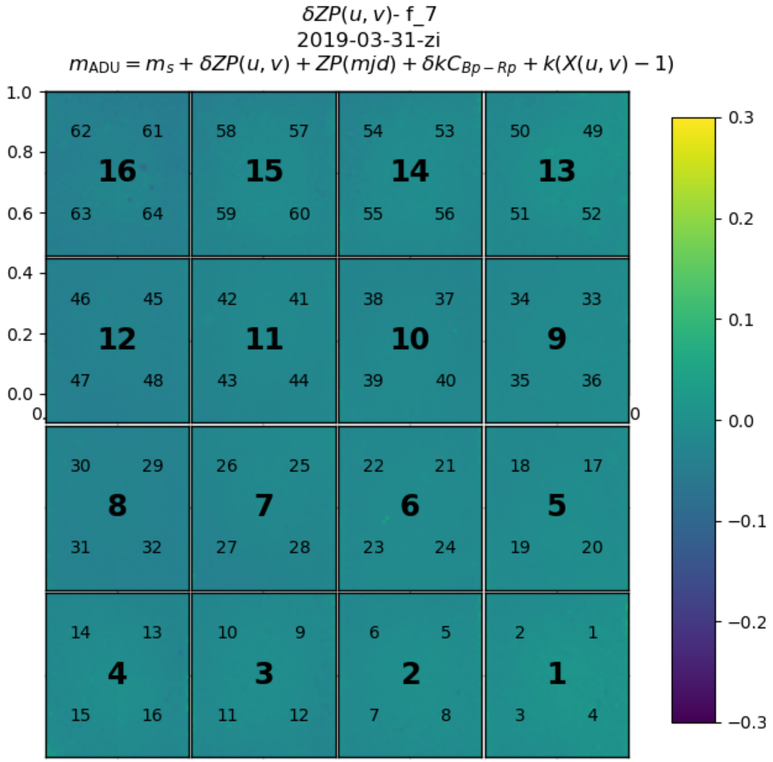
zi

Pipeline validation — as it is

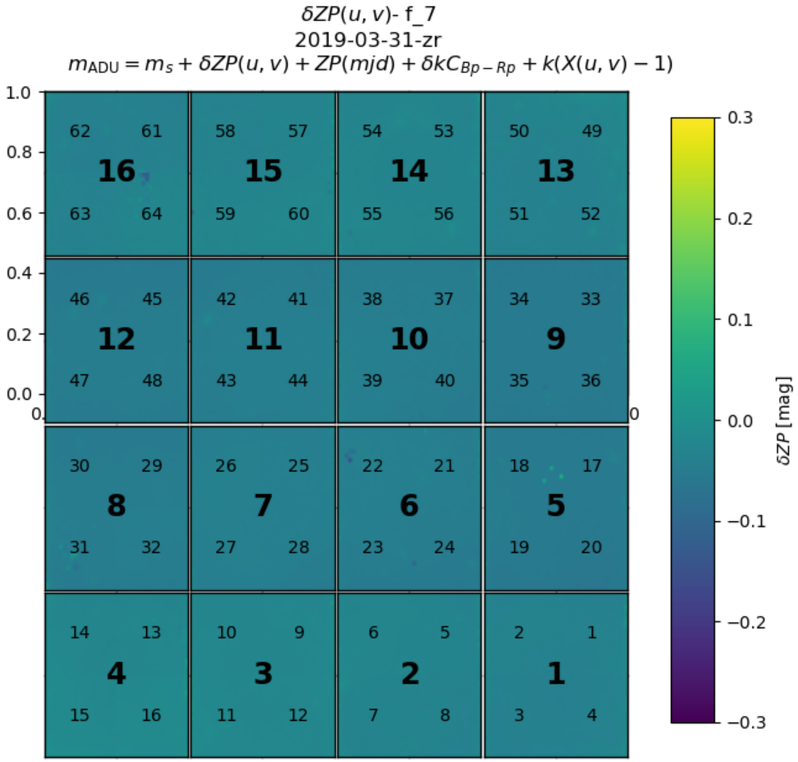
Focal plane residuals with Focal Plane normalization



zg



zr



zi

Pipeline validation — as it is

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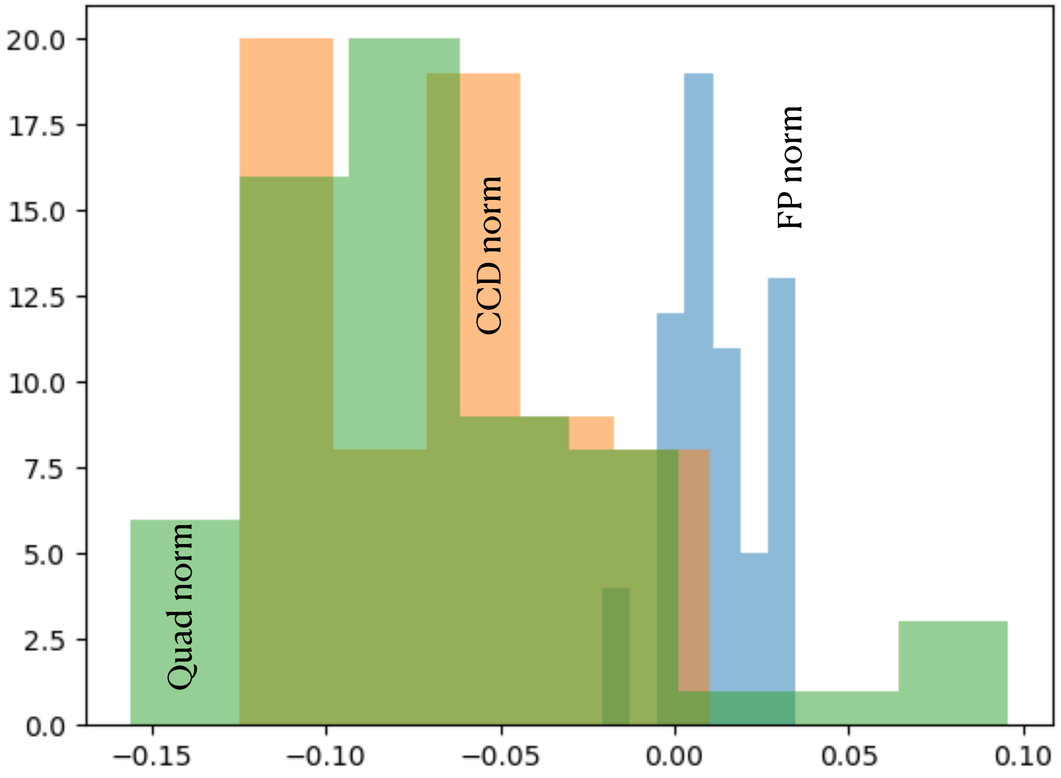
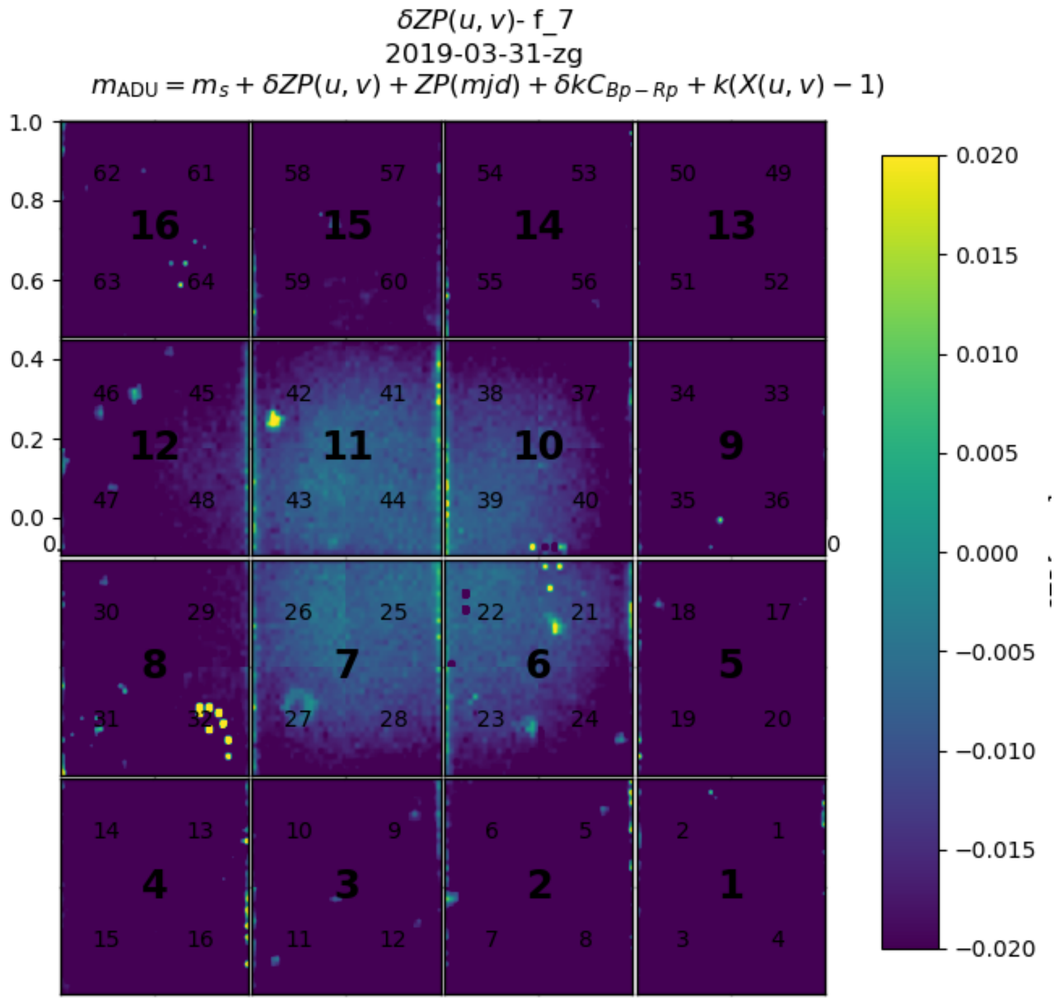


Fitted gain / Quadrant



Pipeline validation — as it is

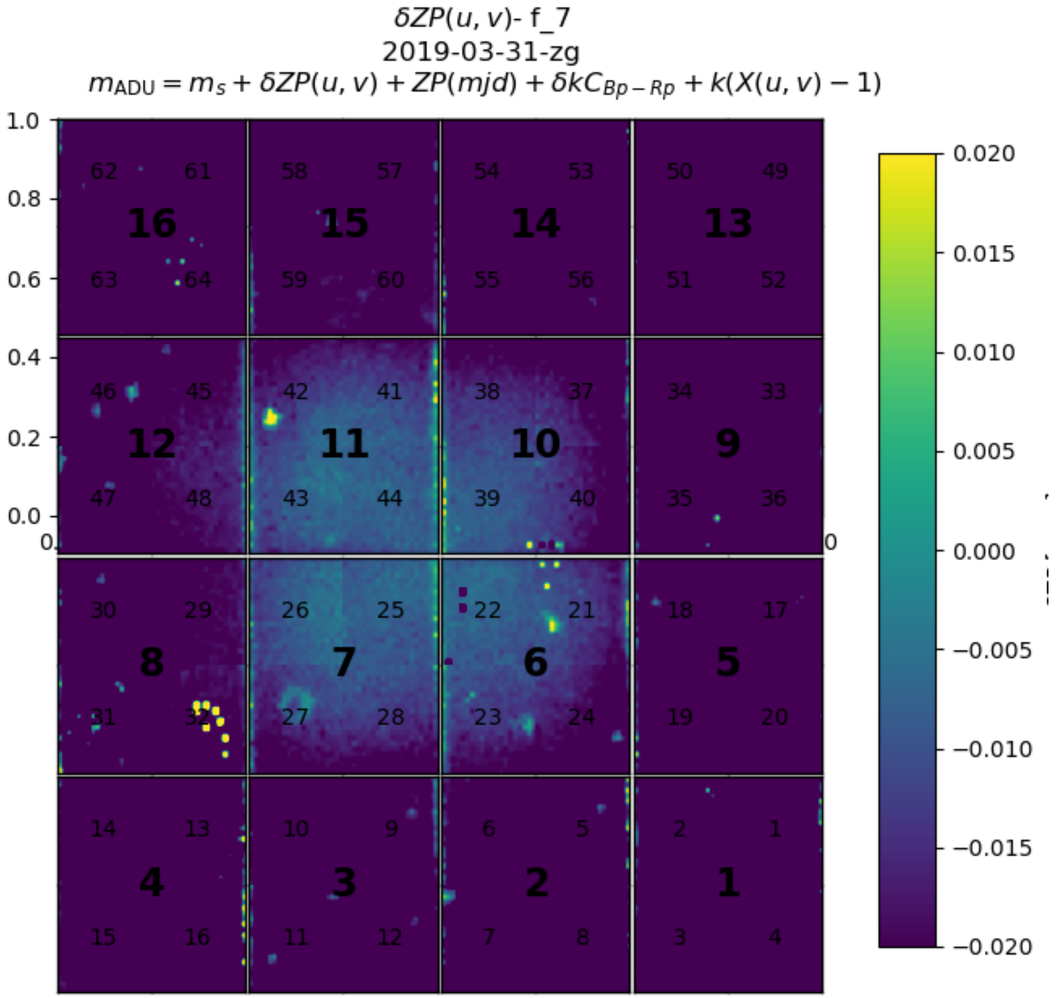
Focal plane residuals with Focal Plane normalization

Focal plane residuals :

- Uniform but some residual vignetting
  → Off centering of the flat fields ?
  → Some flatness issue
- Some residuals gain jumps as well.

Checks to be done with other starflats.
(bands and date → persistent behaviour ?)

Need to validate that with pocket as well.



Starflats & Pipeline validation :

→ Halted because no much room @ CCIN2P3

Now addressing concerns :

★ What's done : → See previously

★ Missing aspects in pipeline :

→ *Fringe is TBD, Pocket needs dual validation in 2021 and 2023 (after NL changes), BF @ Nicolas ?*

→ *Validation thingies → finish star flat*

★ Stored in pipeline :

→ *Aperture catalogue, some images for SM (needs to discuss the strategy in **detail**) .*

★ Room @ CC :

→ *1.2PB as temporary fix but we are at 1.09PB. Cleaning will be done*

★ Strategy (on-disk, on the fly) long-term data management: ?

★ Bookkeeping : Not per say.

Conclusion & what needs doing by Dec. 2024

Personnel vision on what needs to be done.

- Check that downloaded data is OK : **(in progress)**
  → No corrupted raw files & mask files.
  → All necessary masks are there.
  → No missing header.

2019 special :
Before removing check that nothing will be lost

- **Remove data (soon) : (probably Sebastien / Mickaël)**
  → List files **NOT** to be deleted.

- **Personal to do list :**
  → Finish creating data for starflats (**with Pocket validation as well**)
  → SM needs to check how they run their pipeline.
  → Check stability of flats for some Ubercal period hints.
  → `fringez` implementation.

Pipeline vs Needs of subsequent analyses ?

➡ What’s your opinion on the matter ?