Detrending pipeline Plans for DR2.5 ZTF-IN2P3 @ LPNHE Marie Aubert – PostDoc @ LPC

11/01/24

Detrending process (for the newbies & the oldies)

16 x 4 x (3080, 3078) is a total focal plane image.

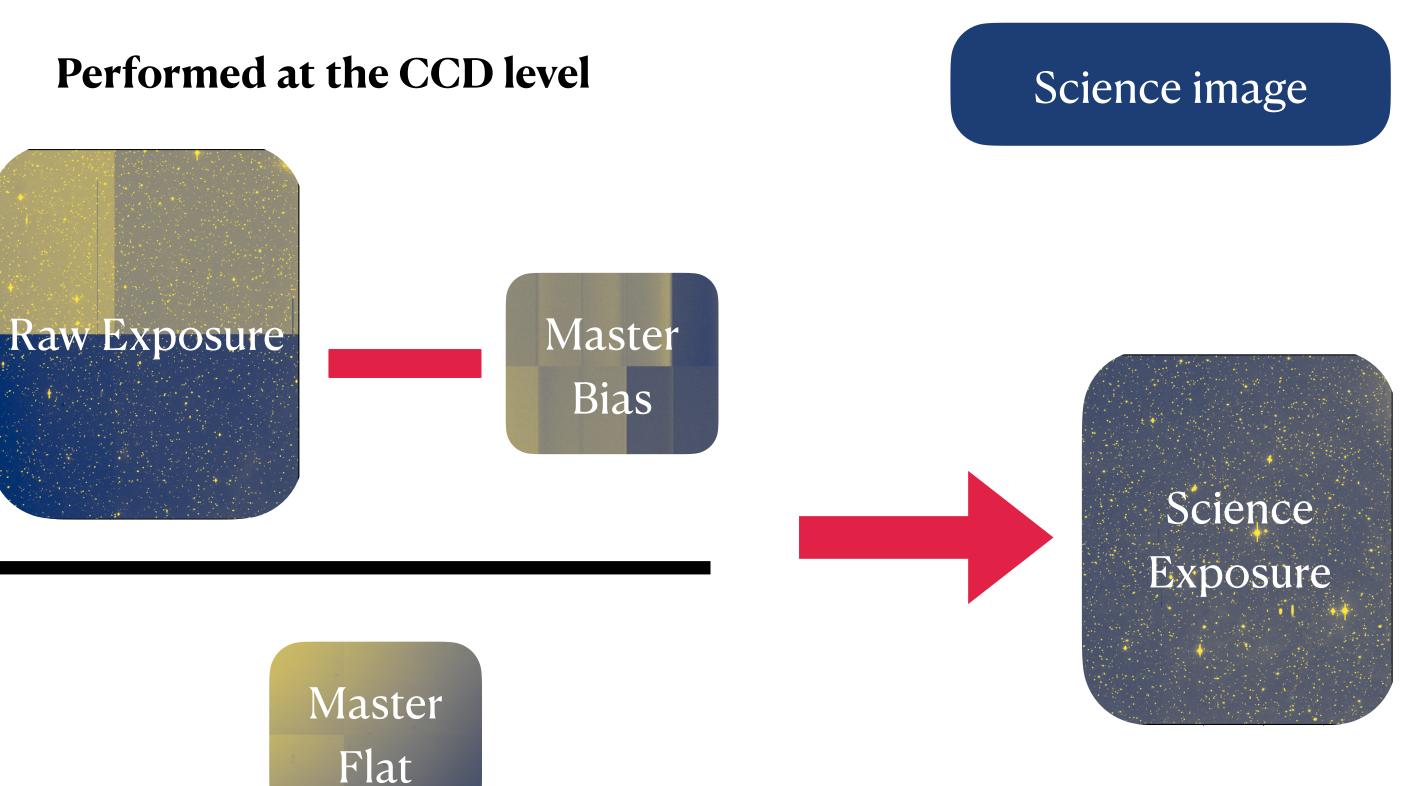






Lots





IN2P3 Detrending flow

At each time a **raw** image is opened :

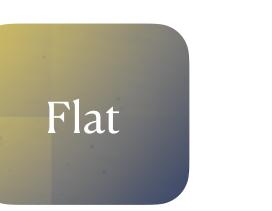
- Overscan correction applied, model computed on [5,25] pixel range. 1.
- Linearity corrections. 2.





10/day to remove dilation effects.

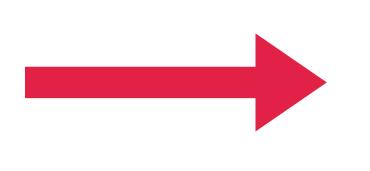
 \rightarrow Reduced to 1 master bias.



$$5-7/led/day$$

N led = 11

Each corrected by master bias \rightarrow 3 filter master flat.





Status : Testing current detrending to aperture process

Now have a proper script that goes from Raw to Aperture photometry.



10/day to remove dilation effects.

- \rightarrow Reduced to 1 master bias
- \rightarrow On disk

Simon Conseil has joined to help in dev/optimization

Current strategy to be tested : 1 job / day / CCD

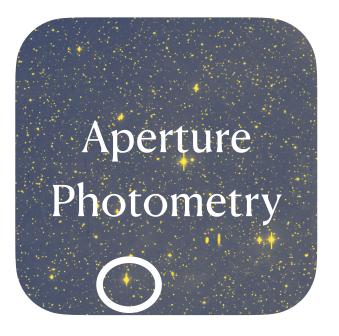


5-7/led/day $N_led = 11$

Each corrected by master bias \rightarrow 3 filter master flat. \rightarrow On disk



 \rightarrow On the fly



 \rightarrow On disk



Starflats and new detrending.

Aperture photometry applied on : \rightarrow ztfin2p3 ccd-flatfielded data \rightarrow ztfin2p3 focalplane-flatfieldded data

CCD

$\begin{split} \delta ZP(u,v) &- 10 \text{ pix} \\ 2019-03-31-zr \\ m_{\text{ADU}} &= m_s + \delta ZP(u,v) + ZP(mjd) + \delta k C_{Bp-Rp} + k(X(u,v)-1) \end{split}$										
62	61	58	57	54	53	50	49			
63	6 64	59	. 5	55	. 4	51	. 3 52			
46	45	42	41	38	37	34	33			
47	2 48	43	. 1 44	39	. 0 40	35	3 6			
30	29	26	25	22	21	18	17			
31	3 2	27	28	23	5 24	19	20			
14	13	10	9	6	5	2	1			
15	16	11	3 12	7	2 8	3	4			

m _{adu}	$m_{s} = m_{s} + m_{s}$
62	61
63	6 64
46	45

- 0.3

- 0.2

- 0.1

0.0

-0.1

-0.2

-0.3

5ZP [mag]

$\begin{split} \delta ZP(u,v) &- \operatorname{apfl}_7\\ 2019-03-31-zr\\ m_{ADU} &= m_s + \delta ZP(u,v) + ZP(mjd) + \delta k C_{Bp-Rp} + k(X(u,v)-1) \end{split}$											
62 1	61 6	58	57 5	54	53 4	50	49 3		0.4		
63	64	59	60	55	56	51	52		- 0.3		
46	45	42	41	38	37	34	33		- 0.2		
⊥ 47	2 48	43	1 44	39	. 0 40	35	9 36		- 0.1		
30	29	26	25	22	21	18	17		- 0.0 0.1		
31	3 32	27	28	23	6 24	19	5 20		0.2		
14	13	10	9	6	5	2	1		0.3		
15	16	11	3 12	7	2 8	3	4		-0.4		

Data = all available starflats

Data processed with LPNHE starflat procedure

IPAC Quadrant + Leander aperture

<i>δZP</i> (<i>u</i> , <i>v</i>) - 10 pix 2019-03-31-zr											
$m_{ADU} = m_s + \delta ZP(u, v) + ZP(mjd) + \delta kC_{Bp-Rp} + k(X(u, v) - 1)$											
62	61	58	57	54	53	50	49				
1	6,	1	5	1	.4	1	3				
63	64	59	60	55	56	51	52				
46	45	42	41	38	37	34	33				
12 11 10 9											
47	48	43	44	39	40	35	36				
30	29	26	25	22	21	18	17				
8	3		7		6	Ę	5				
31	32	27	28	23	24	19	20				
14	13	10	9	6	5	2	1				
4	L I		3		2						
15	16	11	12	7	8	3	4				

Focal-Plane

[mag]

-0.1

-0.2

-0.3

-0.4



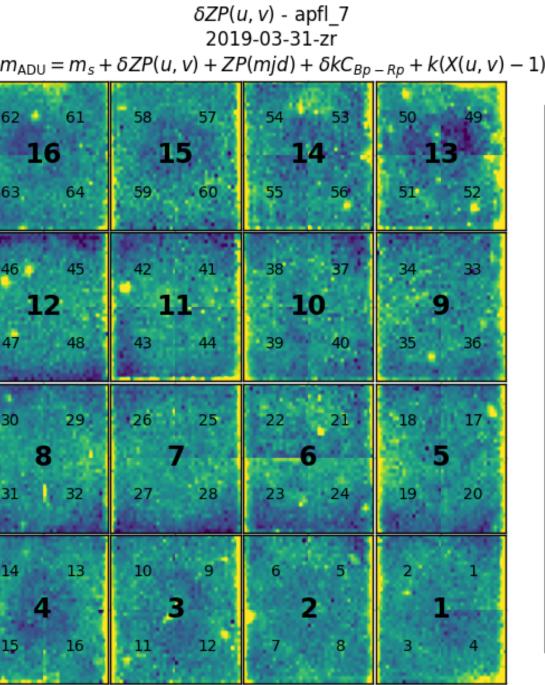
Starflats and new detrending.

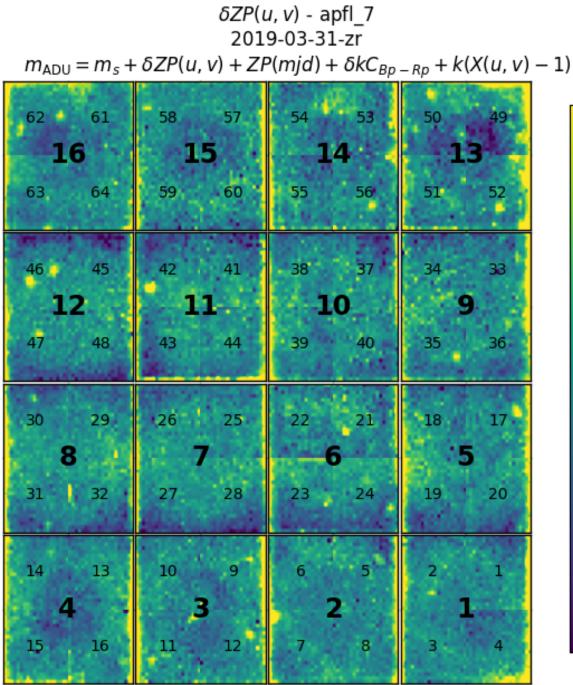
Aperture photometry applied on : \rightarrow ztfin2p3 ccd-flatfielded data \rightarrow ztfin2p3 focalplane-flatfieldded data

CCD

$\begin{split} \delta ZP(u,v) &- 10 \text{ pix} \\ 2019-03-31-zr \\ m_{\text{ADU}} &= m_s + \delta ZP(u,v) + ZP(mjd) + \delta k C_{Bp-Rp} + k(X(u,v)-1) \end{split}$											
62	61	58	57	54	53	50	49		- 0.008		
63	6 4	1 59	5 60	55	4 56	51	3 52		- 0.006		
46	45	42	41	38	37	34	33		- 0.004		
1 47	2 48	1 43	1 44	1 39	0 40	35	3 6		- 0.002		
in the second	1	1	1	10	(ind		-		- 0.000		
30 8	29 3	26	25	22	21 6	18	17 5		0.002		
31	32	27	28	23	24	19	20		0.004		
14	13	10	9	6	5 2	2	1 - 1		0.006		
15	16	11	12	7	8	3	4		0.008		

Data = all available starflats



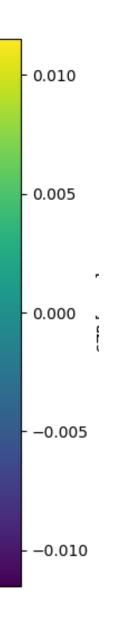


 \rightarrow Need to go forward

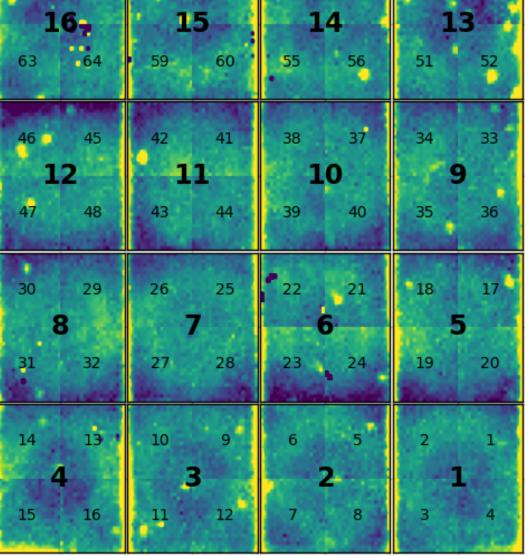
Data processed with LPNHE starflat procedure

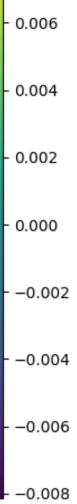
Focal-Plane

IPAC Quadrant + Leander aperture



<i>δΖΡ</i> (<i>u</i> , <i>v</i>) - 10 pix										
2019-03-31-zr										
$m_{ADU} = m_s + \delta Z P(u,v) + Z P(mjd) + \delta k C_{Bp-Rp} + k(X(u,v)-1)$										
62	61	58	57	54	53	50	49			
16,		1	5		14	- 12	3			





0.008



Thoughts on the way to DR2.5

Implementation (short-*long* term)

Pocket Effect

Overall debugging & optimization

Troubleshoot missing data (flat or bias sequence)

CCD level aperture for uncomplete CCDs $(\rightarrow Missing quadrants).$

Brighter Fatter?

(Unsure what's the status on that)

Bias, Flats combination \rightarrow will be validated with starflats (in progress).

DR2.5 choices

Low level choices / Pipeline effectiveness :

Production choices : \rightarrow e.g Flat normalization (changes the 1 job / CCD / day strategy)

Backlog **IPAC vs IN2P3**

Flats / Bias Pixel Variance Pixel masks \rightarrow **ONLY IPAC**

 $(\rightarrow I \text{ don't know how much})$ these come into play in current error propagation of current analyses)



Is ztfin2p3 designed to replace IPAC pipelines?









Limiting aspects

Download

Will need to download all raws (raw obj + raw flats + raw biases) which are not on disk. BUT also :

 \rightarrow will also need part of the header from IPAC sciimg (\rightarrow WCS). \rightarrow will also need masks for aperture.

Workarounds: \rightarrow download stuff on the fly then erase but probable big slow down (and connexion issues) \rightarrow Modify the pipeline (big change might be involved in the current developed status)

Links to :

Storage

What's on disk right now? \rightarrow Mostly IPAC sciing (600TB)



Download all raws + sciimg (or only header) + masks for a period \rightarrow Detrend to aperture \rightarrow remove all but masks AND sciimg for which we have SNIa? Workaround \rightarrow database of exposures we ran, we lack, we need to keep (e.g SM)?

Will need to make room for raws and aperture catalogues \rightarrow but ipac sciimg needed...

\rightarrow 'Readiness' of the pipeline is not necessarily the only issue.

Need to discuss needs of various pipelines and consequence : SM → needs image. On the fly strategy needs to be worked-around Ubercal → Only apcat (a priori). OK for now.

 \rightarrow Affects storage and some production choices.

Basically we need a database of what's on disk, what we need, what **can** be erased, etc etc.

Will also need some bookkeeping / cleaning / organizing of ztf/data !

Tentative simplistic block plan

Start of bookkeeping / database

CC storage preparation \rightarrow Removal &

Pocket Effect integration

 \rightarrow Pipeline + PE. (Final tests on 600?)

→ Final sciimg prod choice.



