CASU processing of VST data

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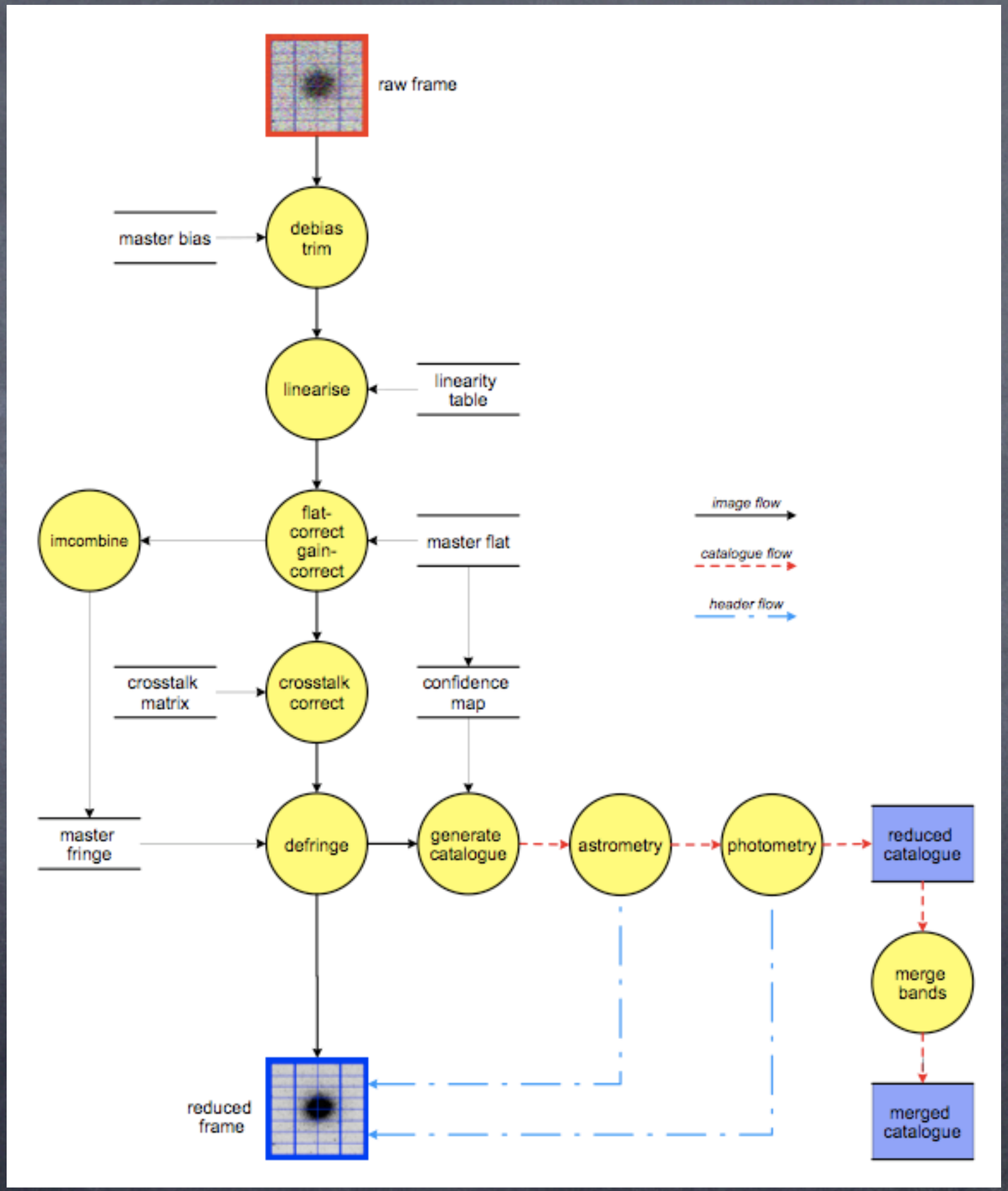
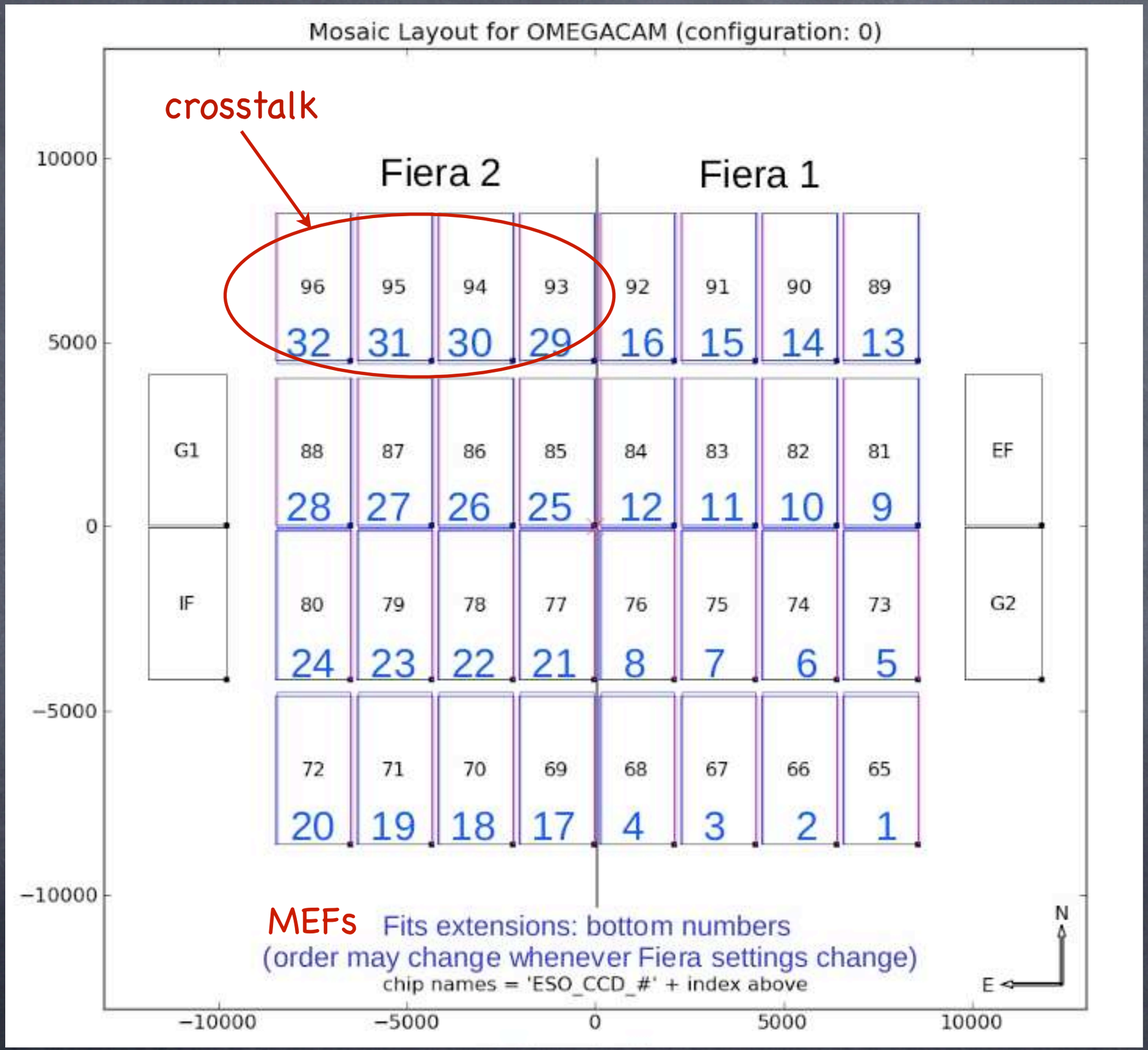
results of first-pass processing of recent VST commissioning, ATLAS and VPHAS test and SV data

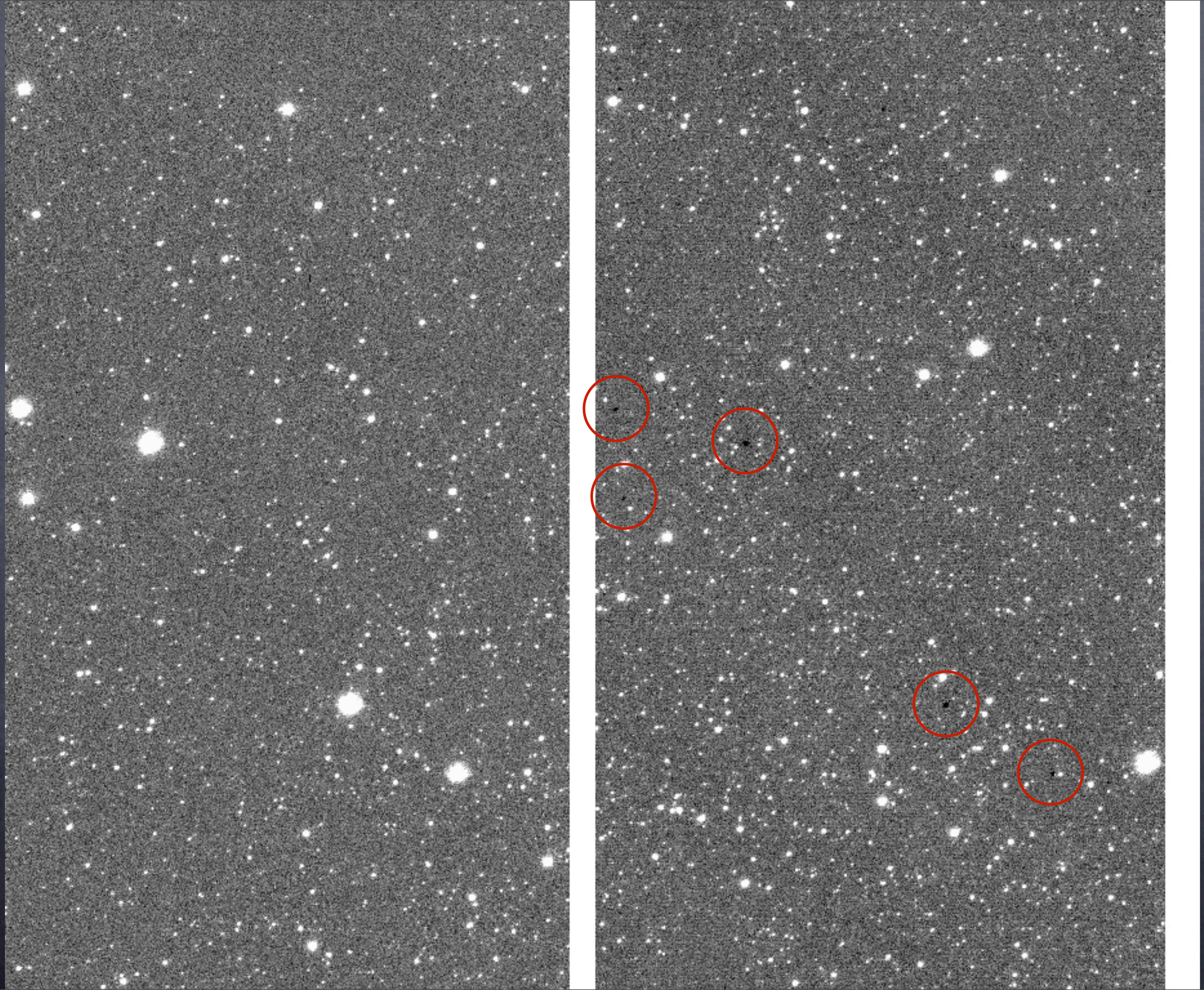
VST data flow

- raw data transfers via Internet
  - Rice-compressed MEFs 16-bit from ESO archive
- ingest & verification -> raw data archive
  - off-line tape backups
- update calibration files as necessary
  - bias, fringe frames nightly, flatfields monthly
- parallel nightly processing
  - astrometric & photometric calibration
  - band-merged science products
- check derived QC info & sample of images
  - processing web page updates
- ingest to post-processing database enables checks
  - FITS header contents, long-term trends
  - survey progress, data access http://casu.ast.cam.ac.uk/surveys-projects/vst

VST processing schema



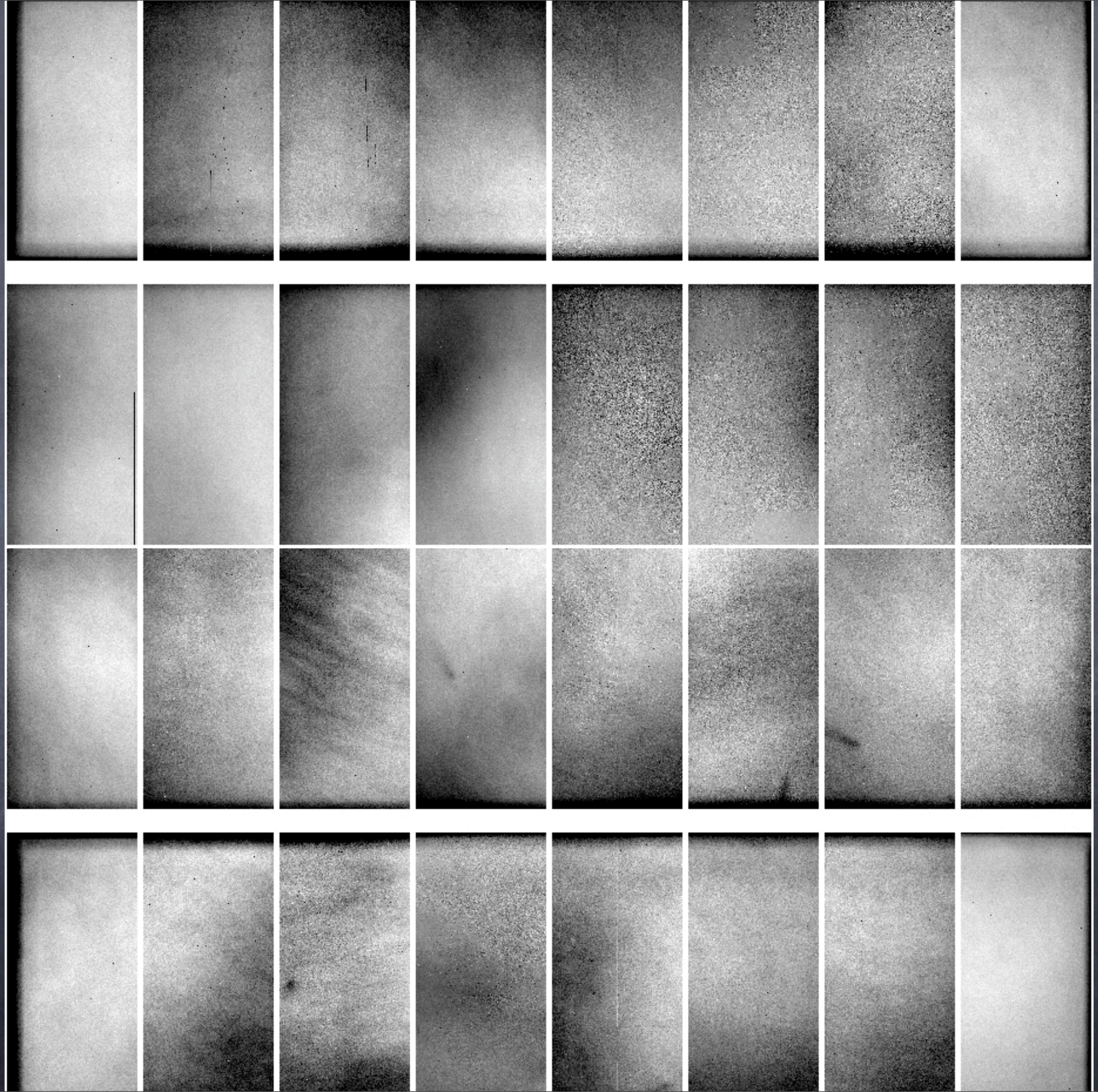

Mosaic Layout for OMEGACAM (configuration: 0)
crosstalk
Fiera 2
Fiera 1
96 95 94 93 92 91 90 89
32 31 30 29 16 15 14 13
G1
88 87 86 85 84 83 82 81
28 27 26 25 12 11 10 9
EF
IF
80 79 78 77 76 75 74 73
24 23 22 21 8 7 6 5
G2
72 71 70 69 68 67 66 65
20 19 18 17 4 3 2 1
MEFs
Fits extensions: bottom numbers
(order may change whenever Fiera settings change)
chip names = 'ESO_CCD_#' + index above
N
E
10000
5000
0
−5000
−10000
−10000
−5000
0
5000
10000



i_flat

&

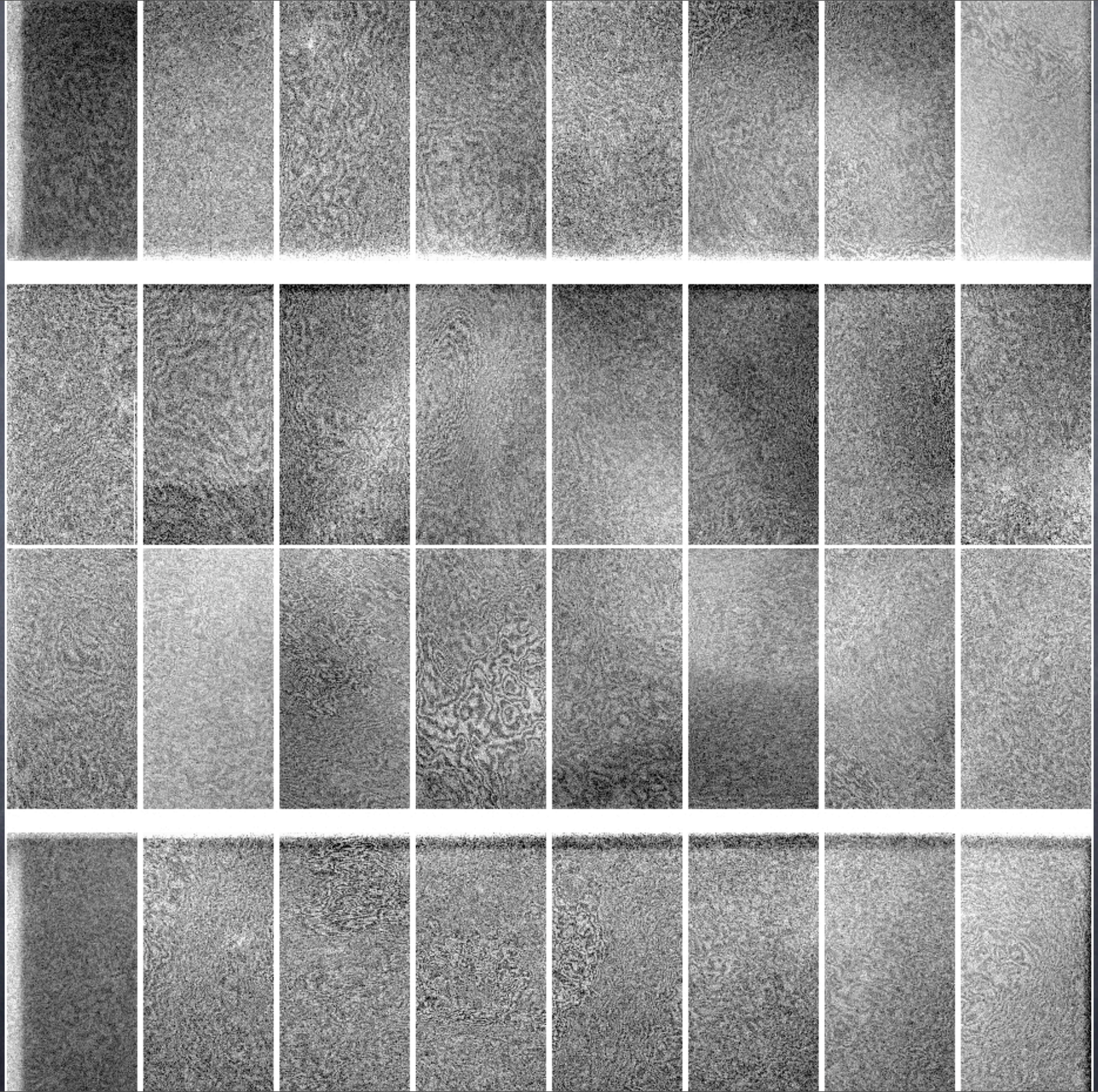
i_fringe



i_flat

&

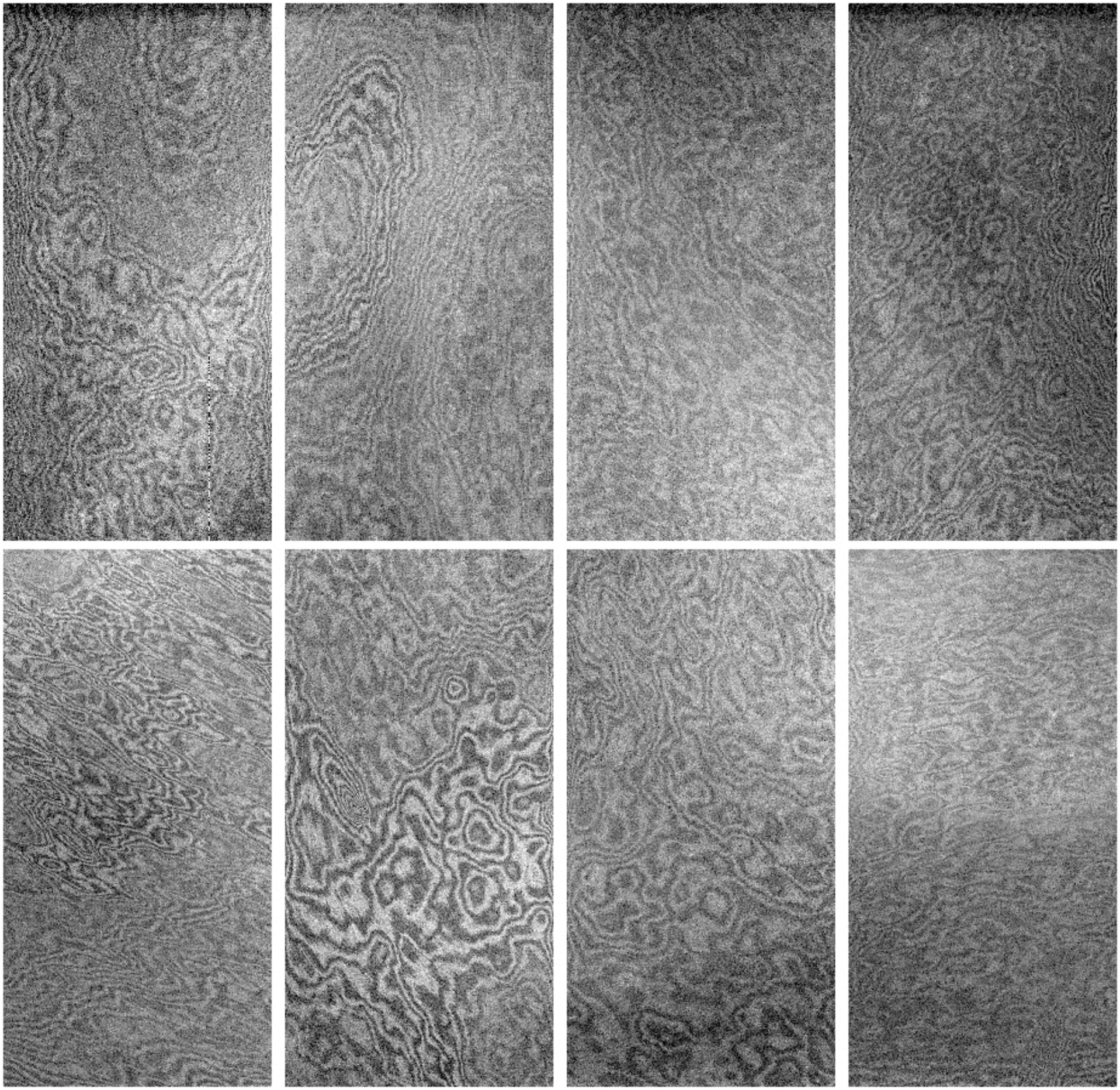
i_fringe



i_flat

&

i_fringe



i_science

@

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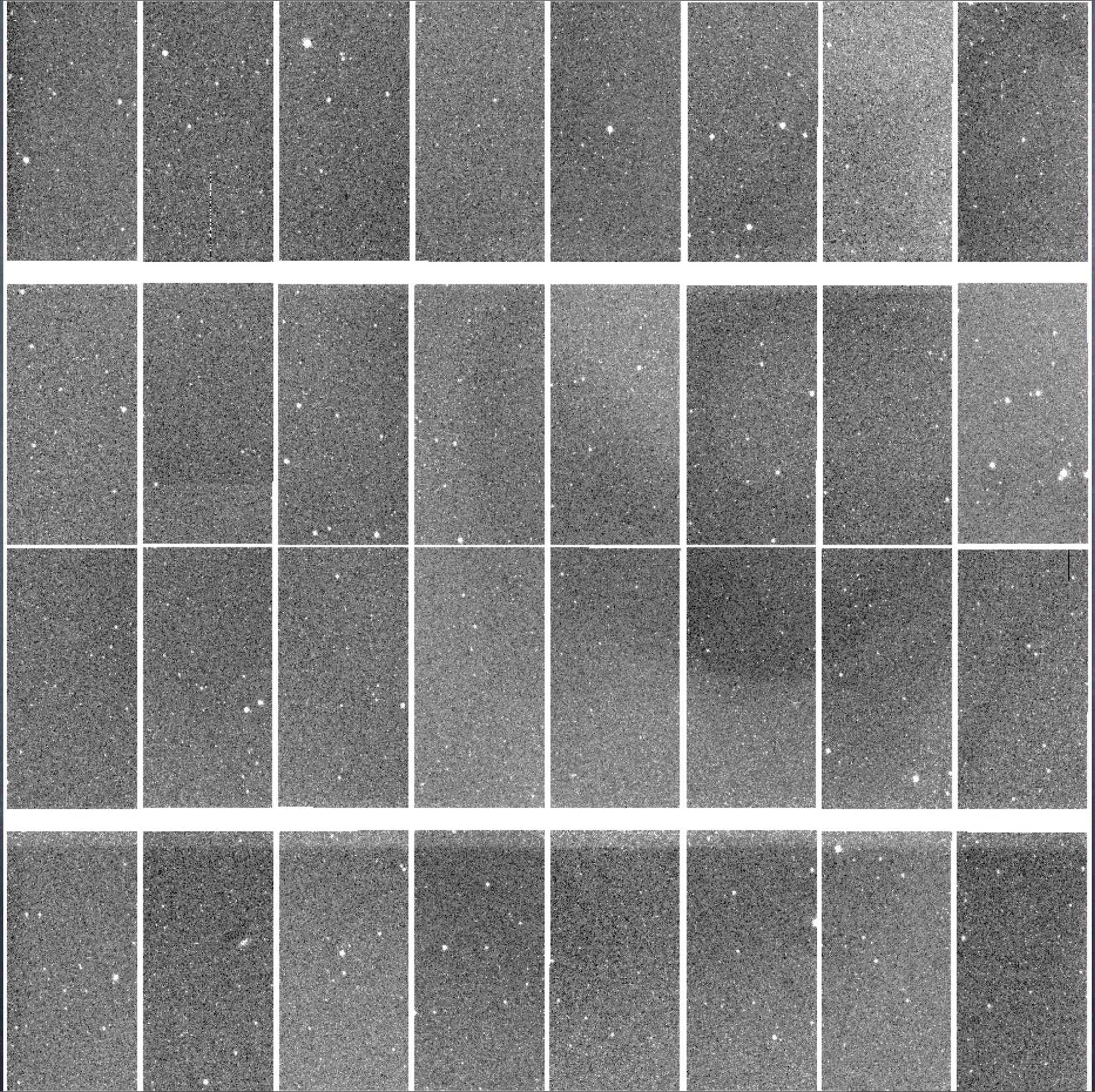
t = 115s



i_science

@

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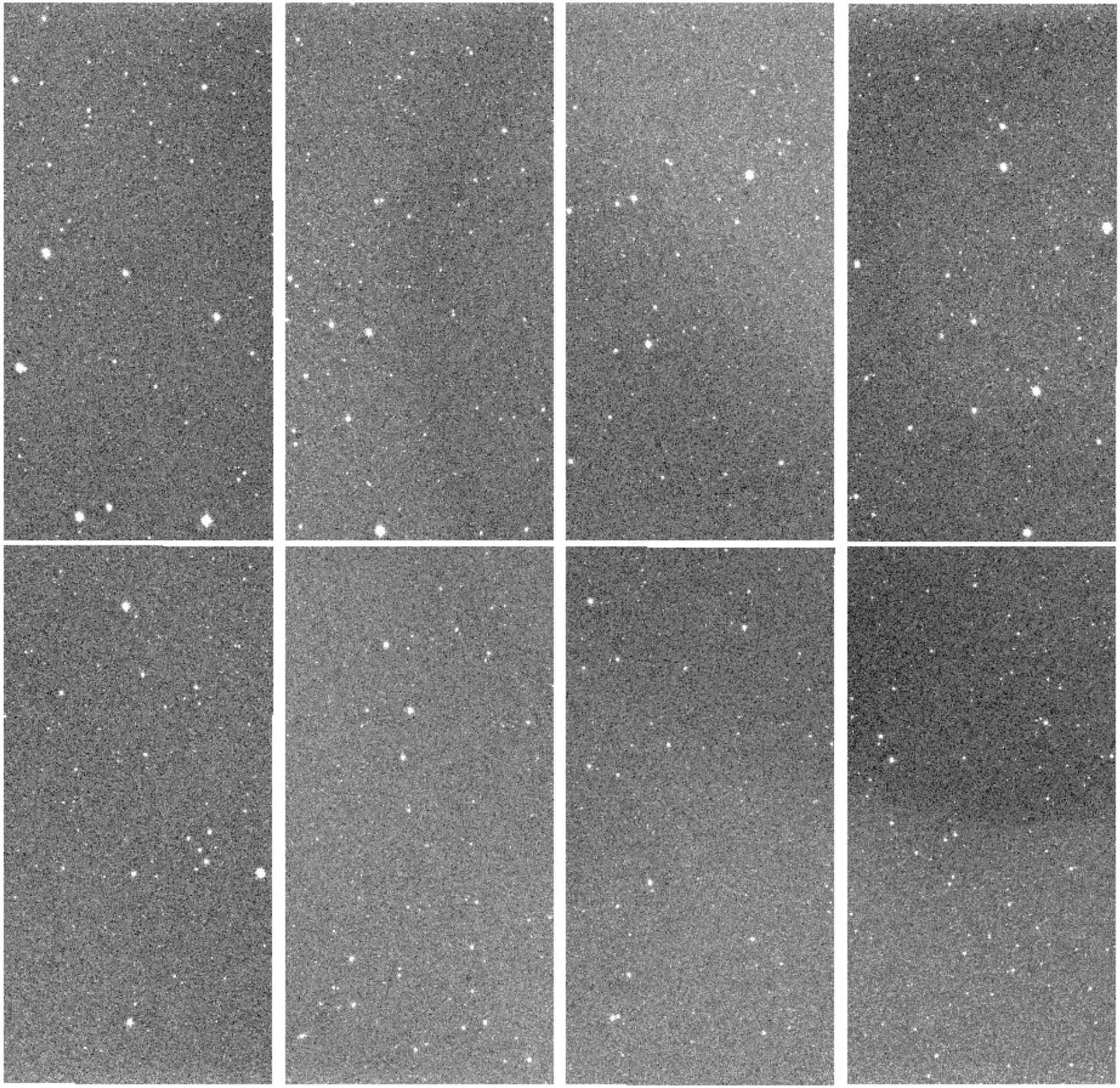


Cambridge Astronomy Survey Unit

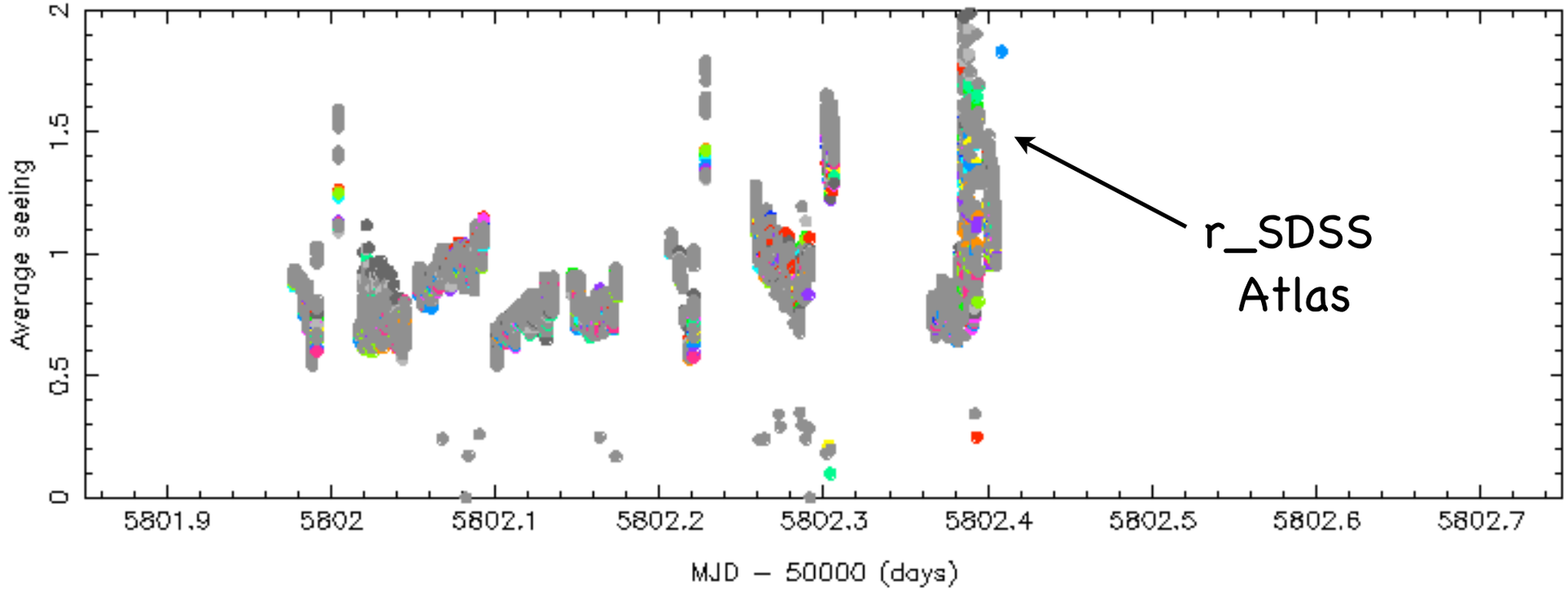
VST Data Reduction Progress: Comissioning

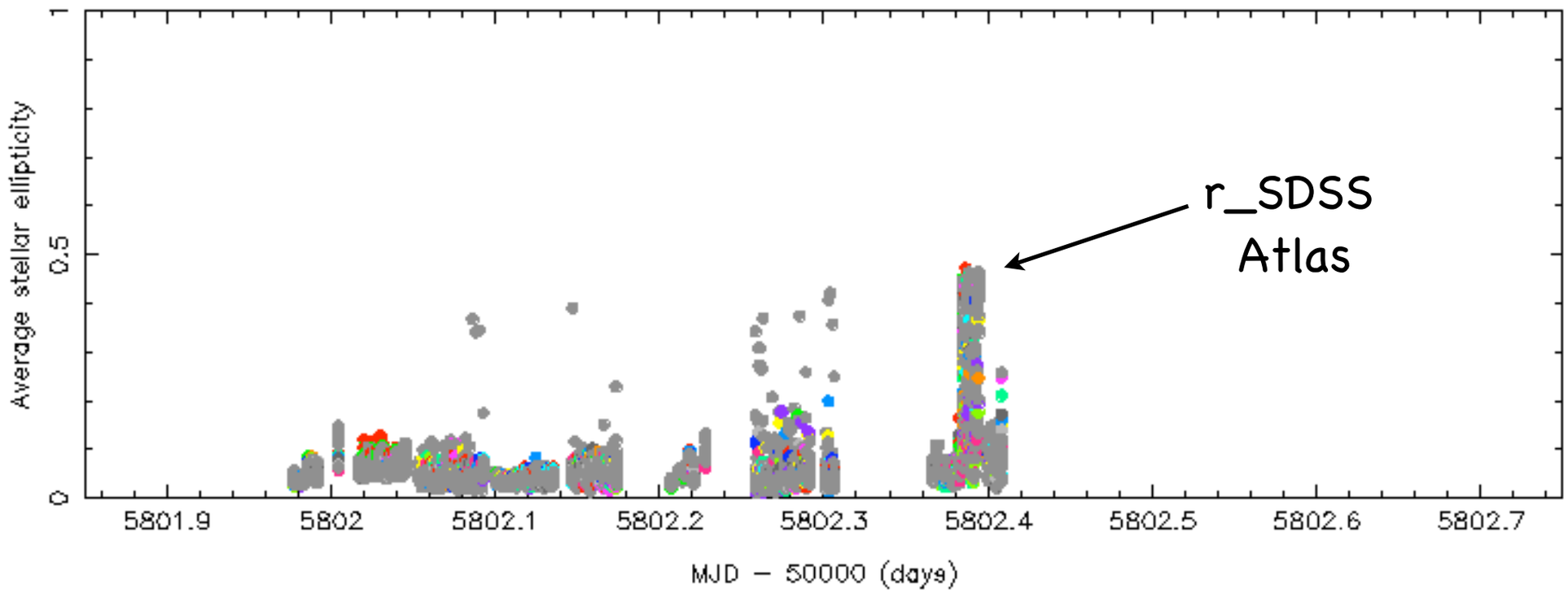
16 Aug 2011 to 14 Oct 2011

This page displays the reduction progress of VST data. Information is automatically updated hourly.

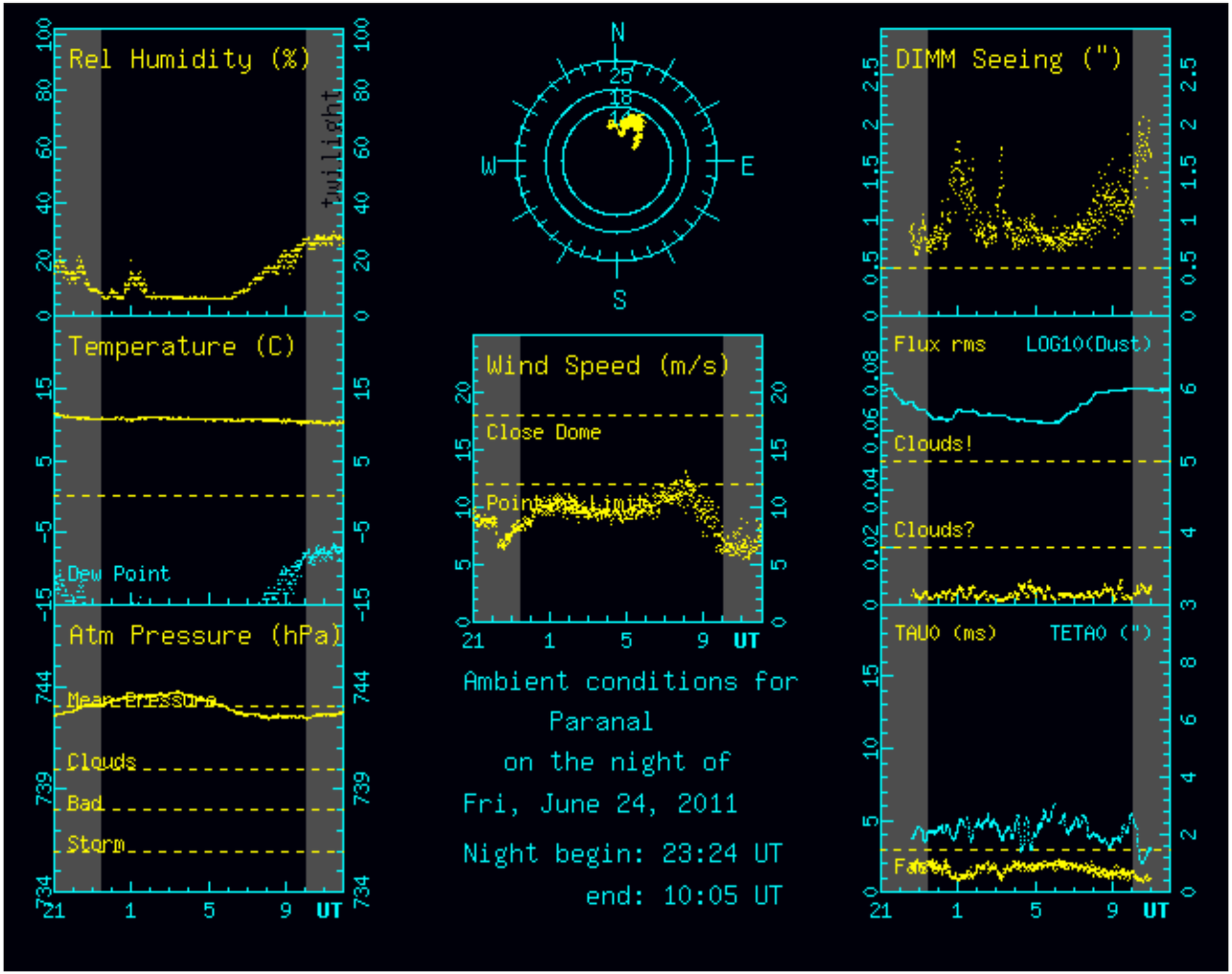
Night	Status	N_{raw}	Version	Released	Summary Plots	Photometry Plots	Summary Info	Observation Log	Paranal ambient conditions	Size raw [GB]	Full Size red [GB]
20110816	REDUCED	300	0.5		GIF1 GIF2	GIF	summary	index	nightmon	67.97	364.65
20110817	REDUCED	248	0.5		GIF1 GIF2	GIF	summary	index	nightmon	60.84	257.43
20110818	UNPROCESSED	22	0.5					index	nightmon	6.60	
20110819	REDUCED	181	0.5		GIF1 GIF2	GIF	summary	index	nightmon	45.00	158.87
20110820	REDUCED	284	0.5		GIF1 GIF2	GIF	summary	index	nightmon	60.96	368.37
20110821	REDUCED	292	0.5		GIF1 GIF2	GIF	summary	index	nightmon	63.36	348.86
20110822	REDUCED	373	0.5		GIF1 GIF2	GIF	summary	index	nightmon	82.86	485.39
20110823	REDUCED	161	0.5		GIF1 GIF2	GIF	summary	index	nightmon	28.41	268.84
20110824	REDUCED	137	0.5		GIF1 GIF2	GIF	summary	index	nightmon	21.28	204.61
20110825	REDUCED	132	0.5		GIF1 GIF2	GIF	summary	index	nightmon	26.18	160.01
20110826	REDUCED	119	0.5		GIF1 GIF2	GIF	summary	index	nightmon	22.60	174.92
20110827	REDUCED	280	0.5		GIF1 GIF2	GIF	summary	index	nightmon	43.69	481.75
20110828	REDUCED	246	0.5		GIF1 GIF2	GIF	summary	index	nightmon	45.38	354.09
20110829	REDUCED	192	0.5		GIF1 GIF2	GIF	summary	index	nightmon	38.82	207.06
20110830	REDUCED	124	0.5		GIF1 GIF2	GIF	summary	index	nightmon	21.06	163.80
20110831	REDUCED	183	0.5		GIF1 GIF2	GIF	summary	index	nightmon	47.43	135.63
20110901	REDUCED	131	0.5		GIF1 GIF2	GIF	summary	index	nightmon	34.73	82.76
20110902	REDUCED	92	0.5		GIF1 GIF2	GIF	summary	index	nightmon	26.73	63.92
20110903	REDUCED	192	0.5		GIF1 GIF2	GIF	summary	index	nightmon	53.59	81.37
20110904	UNPROCESSED	27	0.5					index	nightmon	4.67	
20110905	UNPROCESSED	127	0.5					index	nightmon	36.60	
20110906	NODATA								nightmon		
20110907	UNPROCESSED	13	0.5					index	nightmon	1.93	
20110908	NODATA								nightmon		
20110909	NODATA								nightmon		
20110910	UNPROCESSED	51	0.5					index	nightmon	14.03	
20110911	UNPROCESSED	53	0.5					index	nightmon	11.70	
20110912	UNPROCESSED	74	0.5					index	nightmon	19.35	
20110913	REDUCED	133	0.5		GIF1 GIF2	GIF	summary	index	nightmon	36.23	88.26
20110914	REDUCED	228	0.5		GIF1 GIF2	GIF	summary	index	nightmon	56.87	226.41
20110915	REDUCED	153	0.5		GIF1 GIF2	GIF	summary	index	nightmon	41.37	98.65
20110916	UNPROCESSED	10	0.5					index	nightmon	2.43	

QC diagnostics





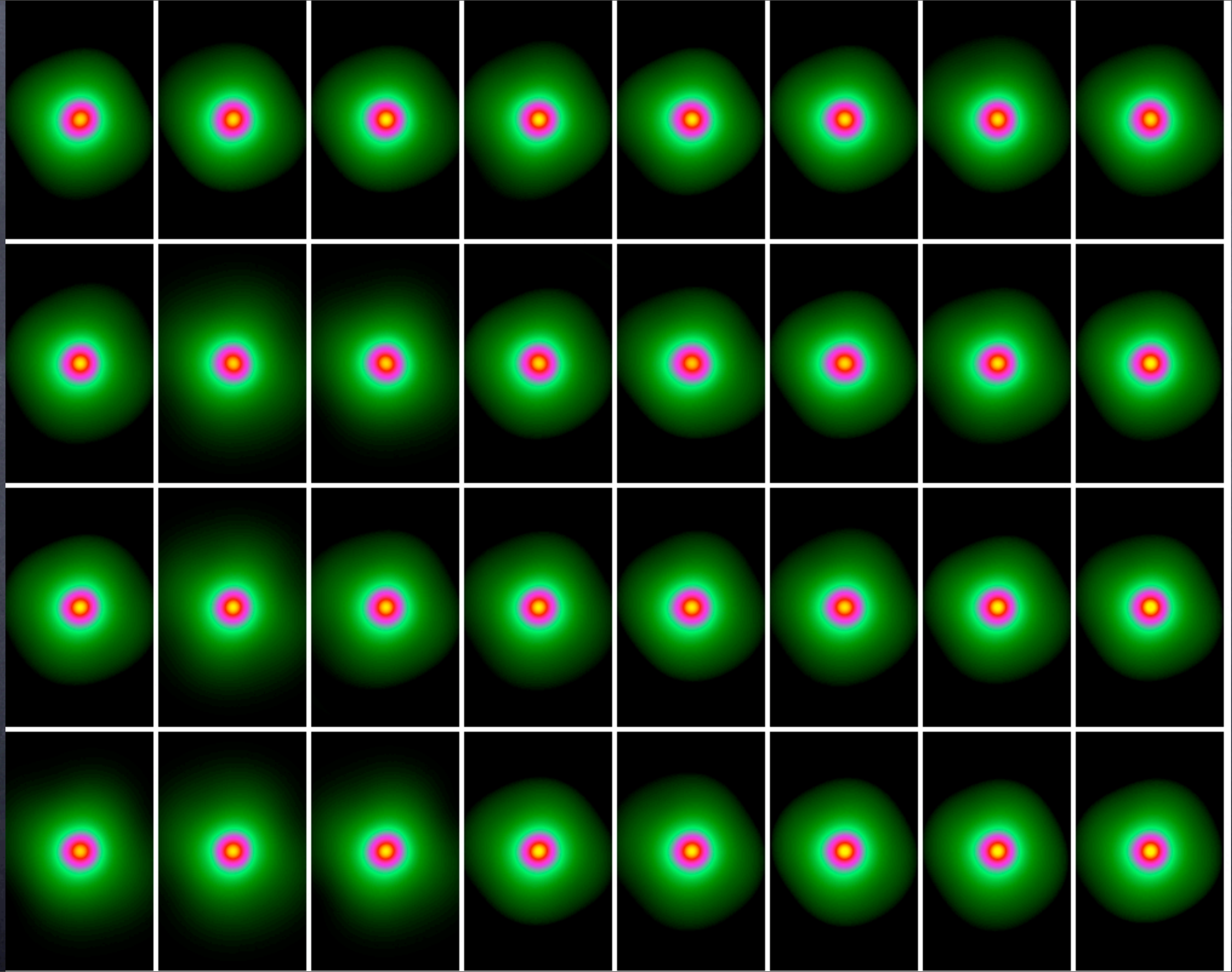
ESO monitoring of ambient conditions

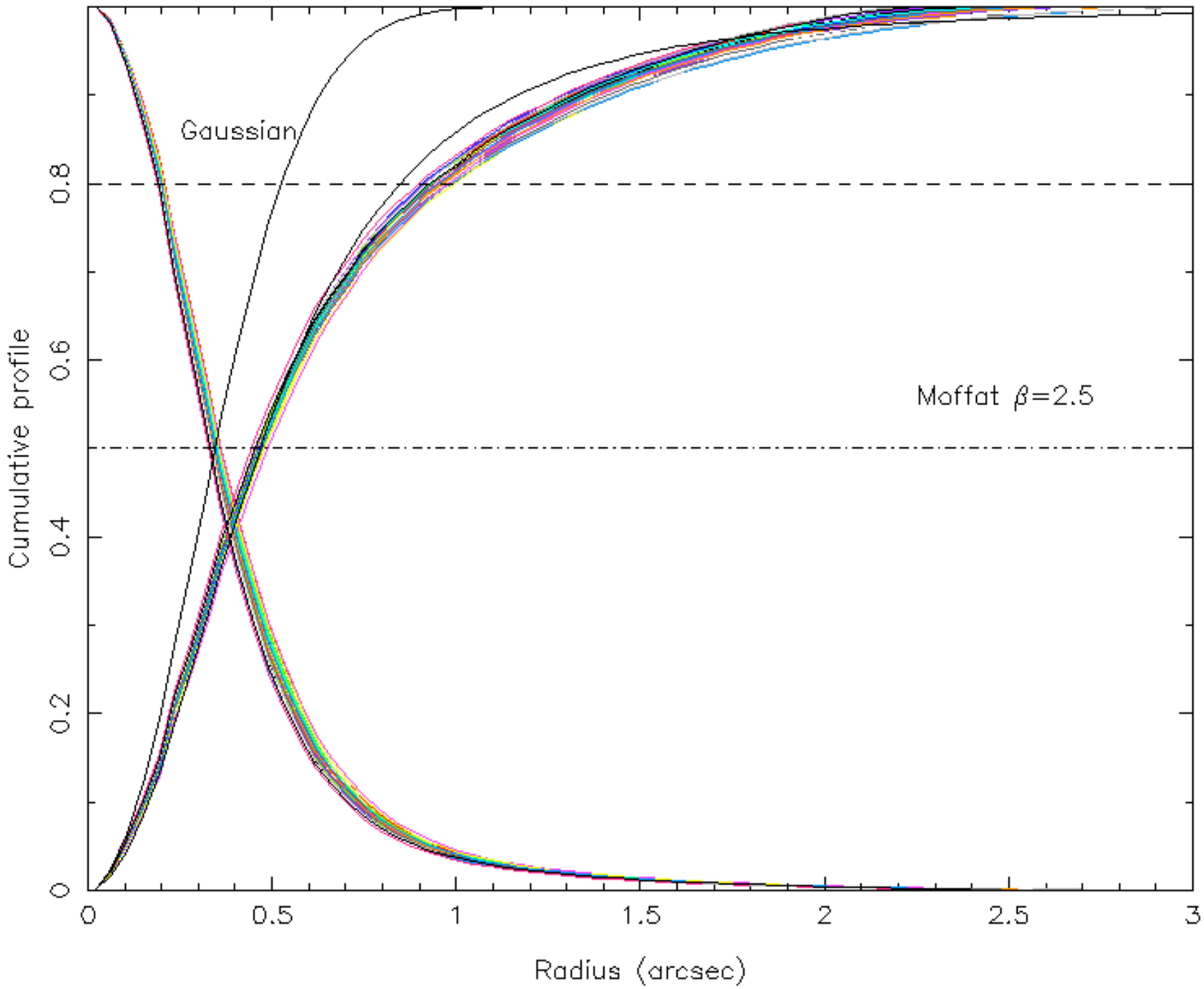


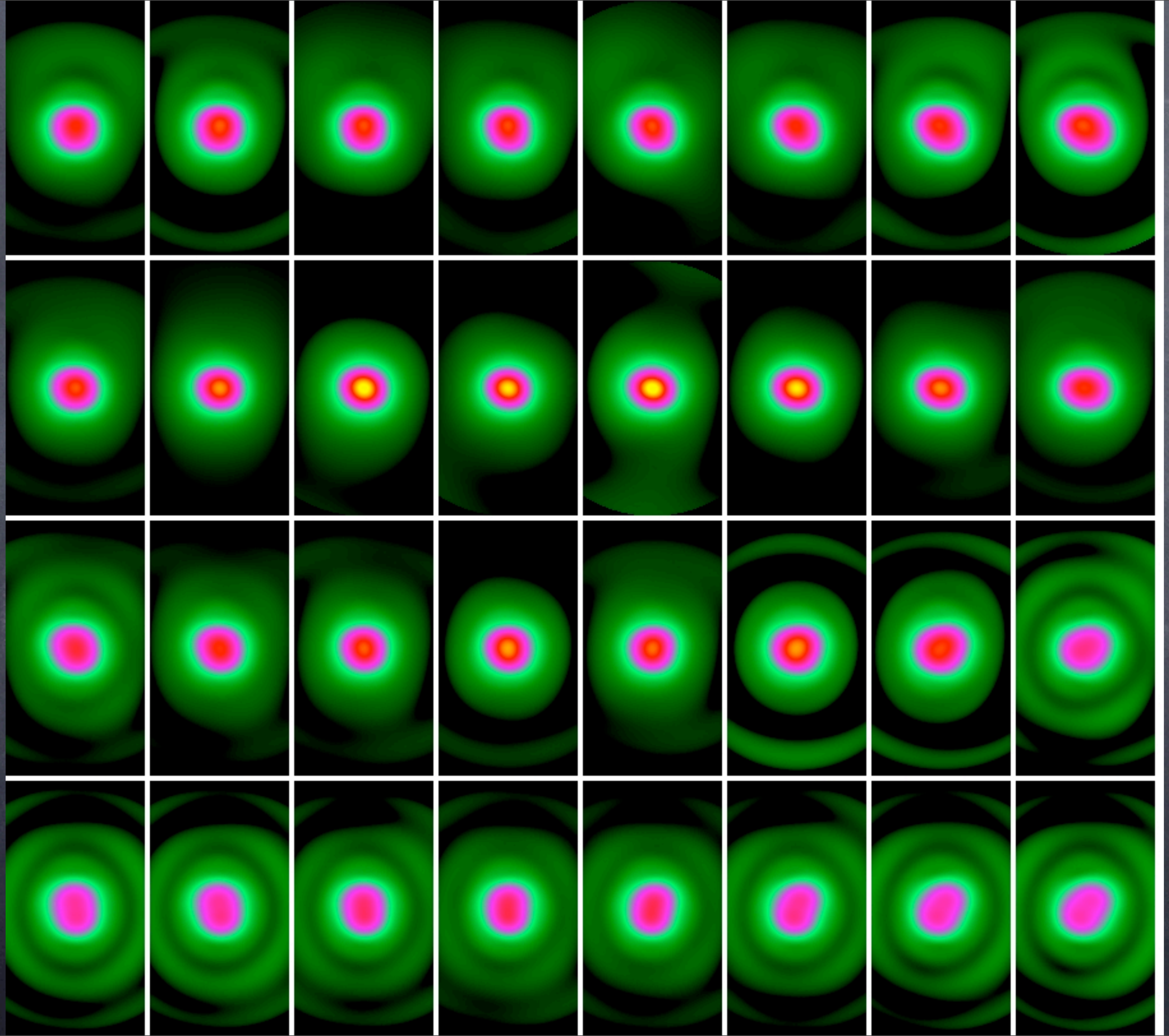
Issues/features

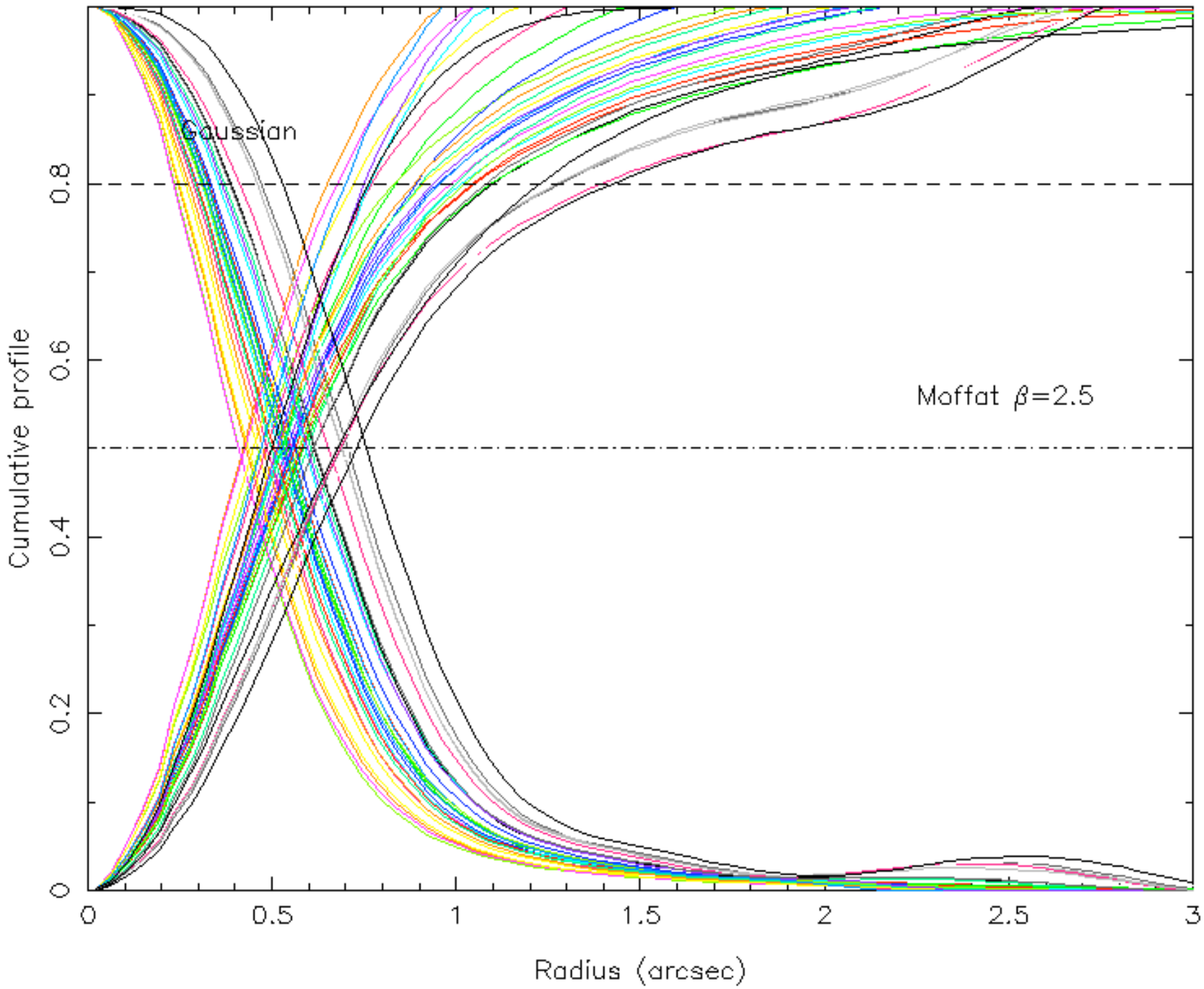
- efficiently acquiring raw VST data from ESO
- dealing with fringing in i,z bands
- crosstalk stability #93-96 [#29-32]
- scattered light problem -> illumination correction
  1 sq deg calibration regions ?
- uniform survey photometric calibration -> howto
- astrometric calibration -> TAN plane projection
- master calibration images - update frequency ->
  stability of "gains" of detectors
- stability of focus and hence PSF variations
- repeatability of filter positioning

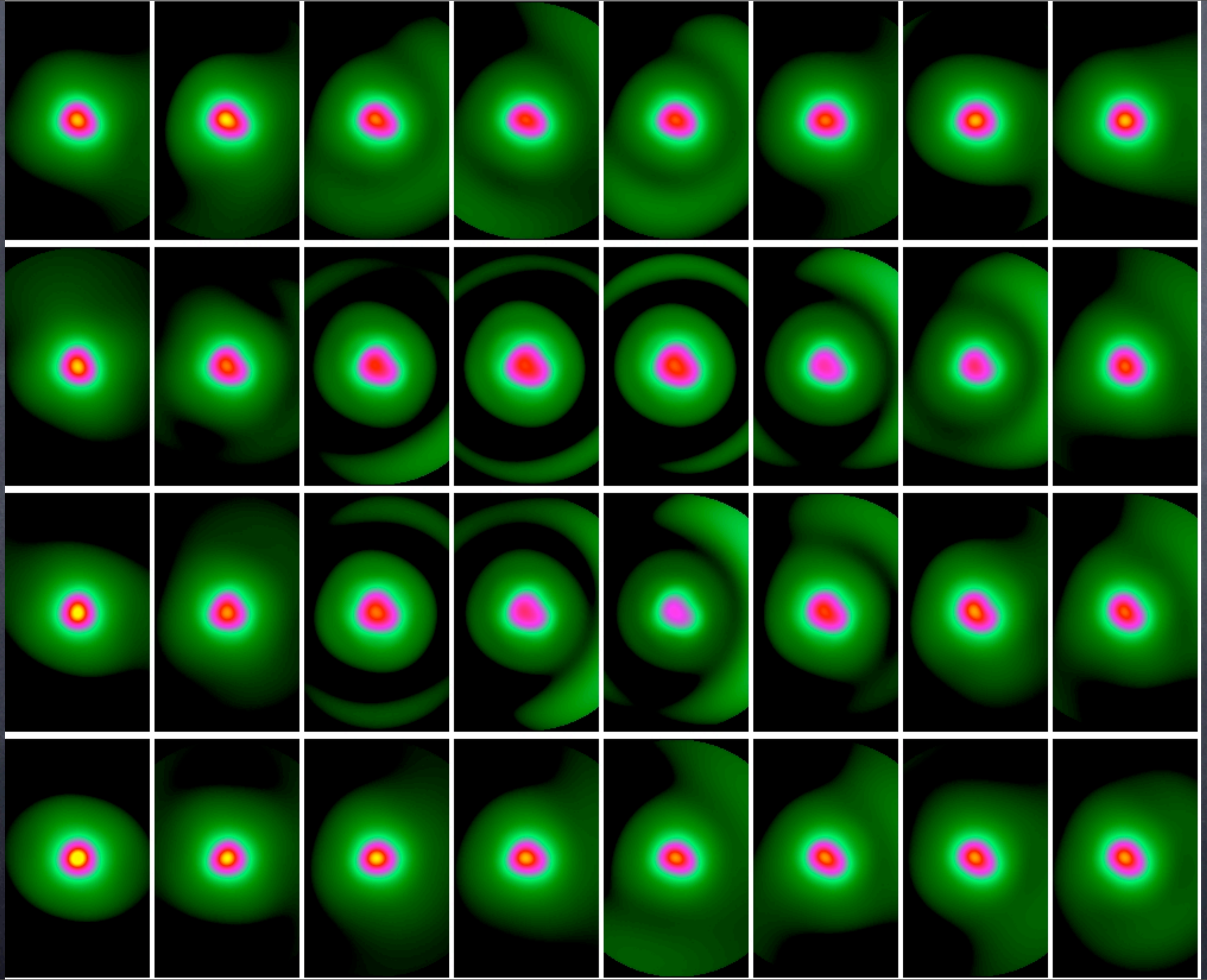
PSF variations




Gaussian
Moffat β=2.5
Cumulative profile
0
0.2
0.4
0.6
0.8
0
0.5
1
1.5
2
2.5
3
Radius (arcsec)




Gaussian
Moffat β=2.5
Cumulative profile
0
0.2
0.4
0.6
0.8
0
0.5
1
1.5
2
2.5
3
Radius (arcsec)



Astrometric and photometric calibration

Astrometric Calibration 2MASS - VST

WCS - TAN projection $\quad r' = tan(r)$

Linear solution
per detector

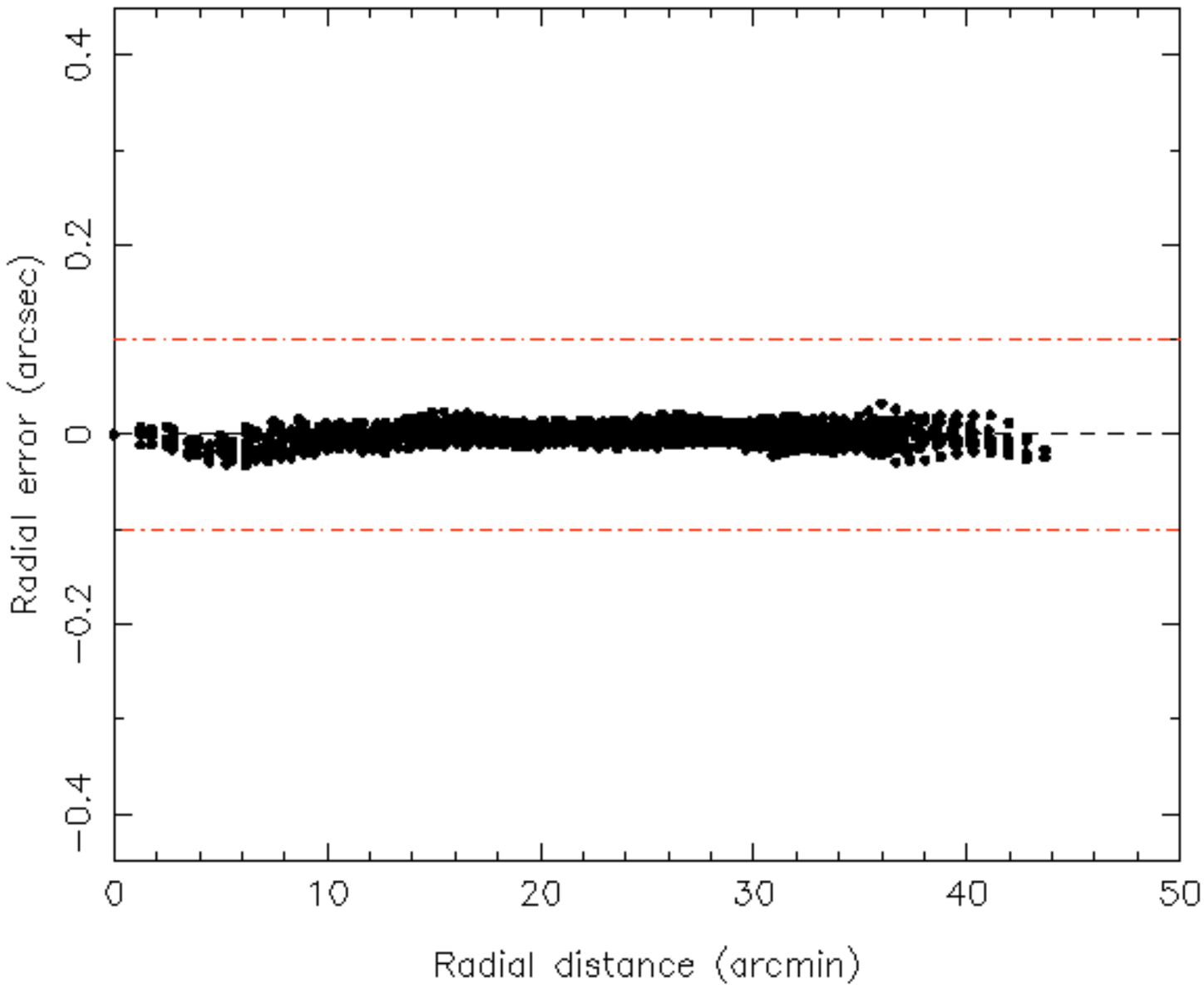
$$\xi' = ax' + by' + c$$

$$\eta' = dx' + ey' + f$$

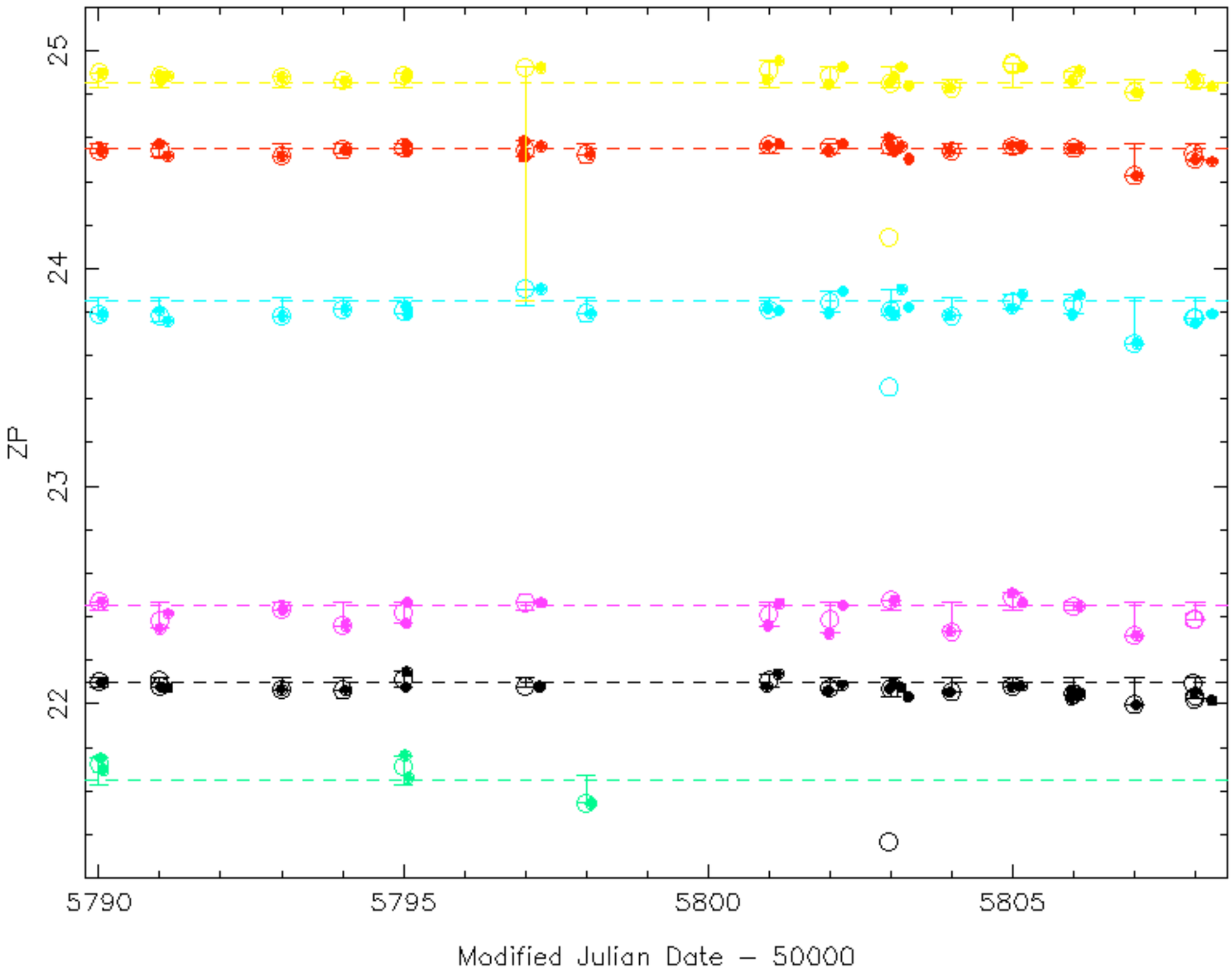
⟶ rms < 80 mas

Tabulated
systematics
from stacked
residuals

⟶ sys < 20 mas



Photometric Calibration



g

r

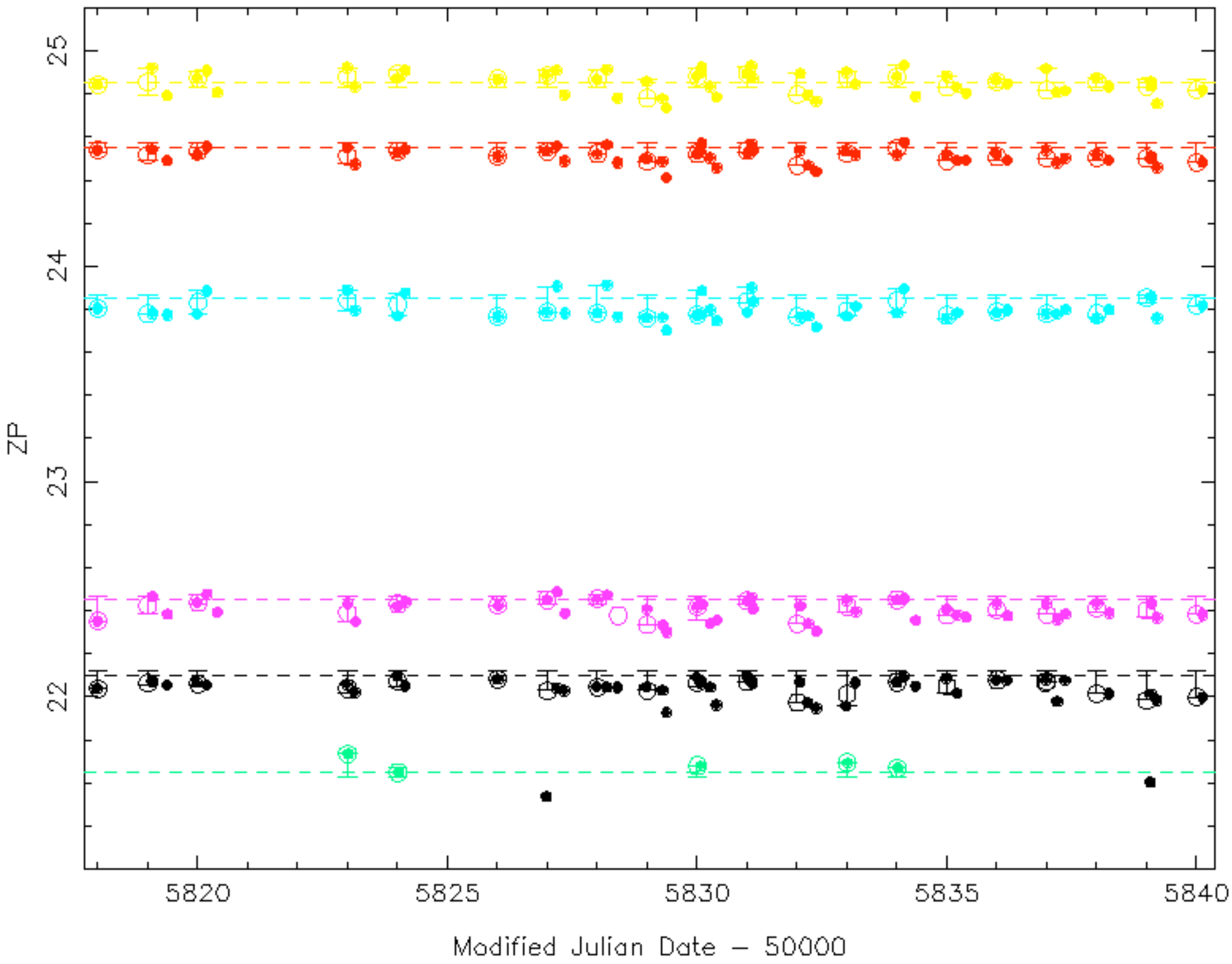
i

z

u

Ha

Photometric Calibration



g

r

i

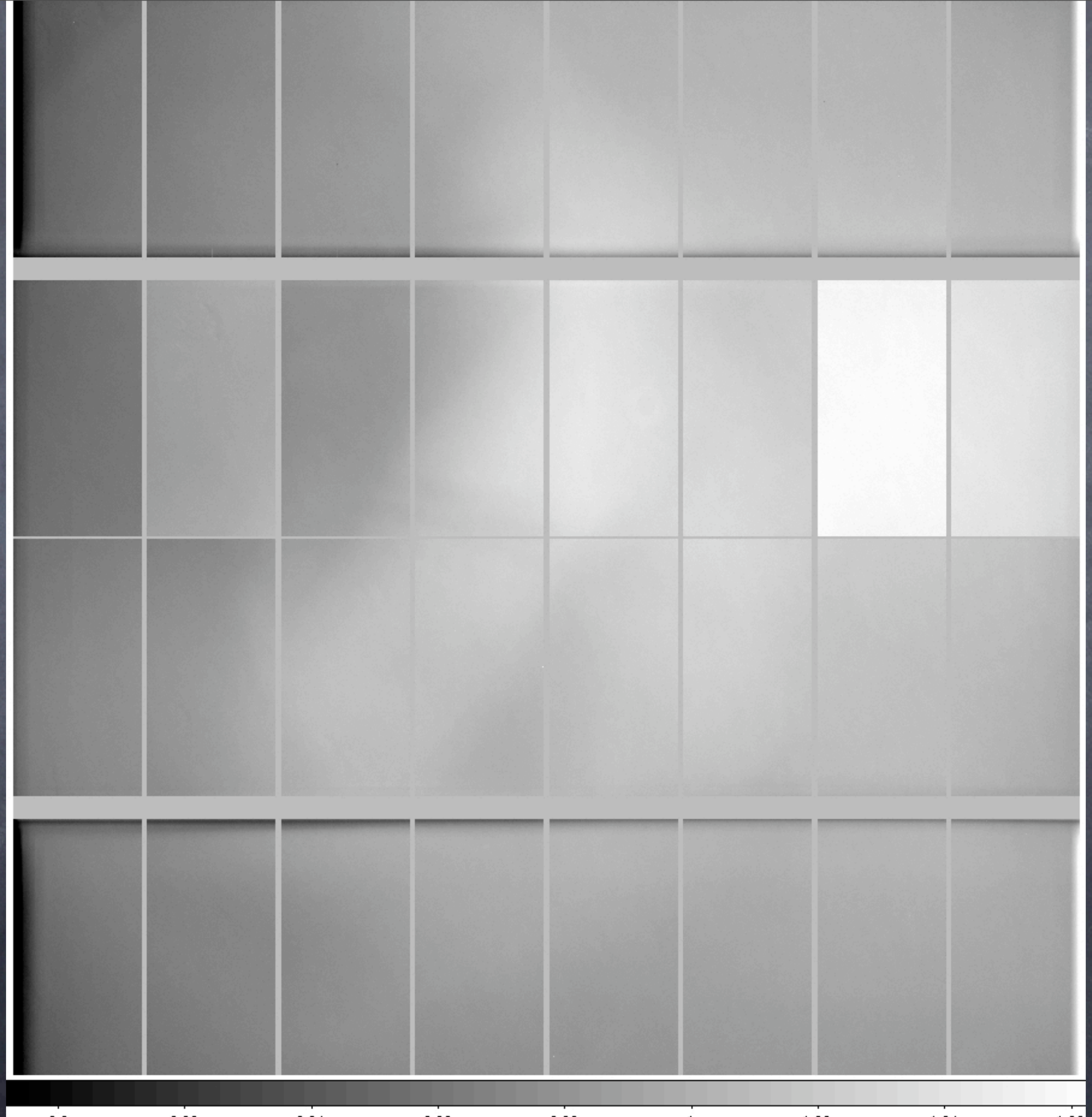
z

u

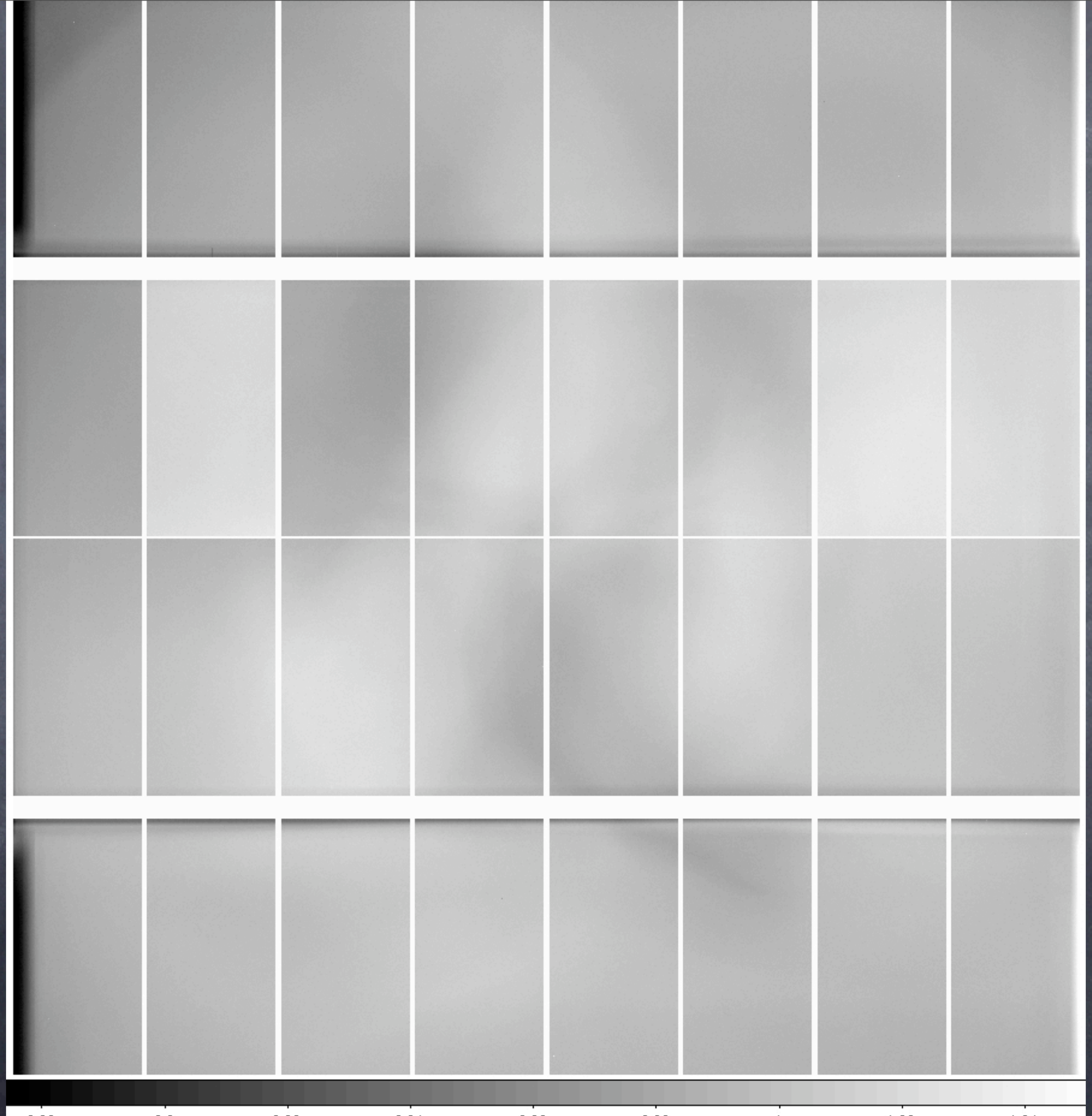
Ha

Filter positioning
detector "gain" variations
scattered light

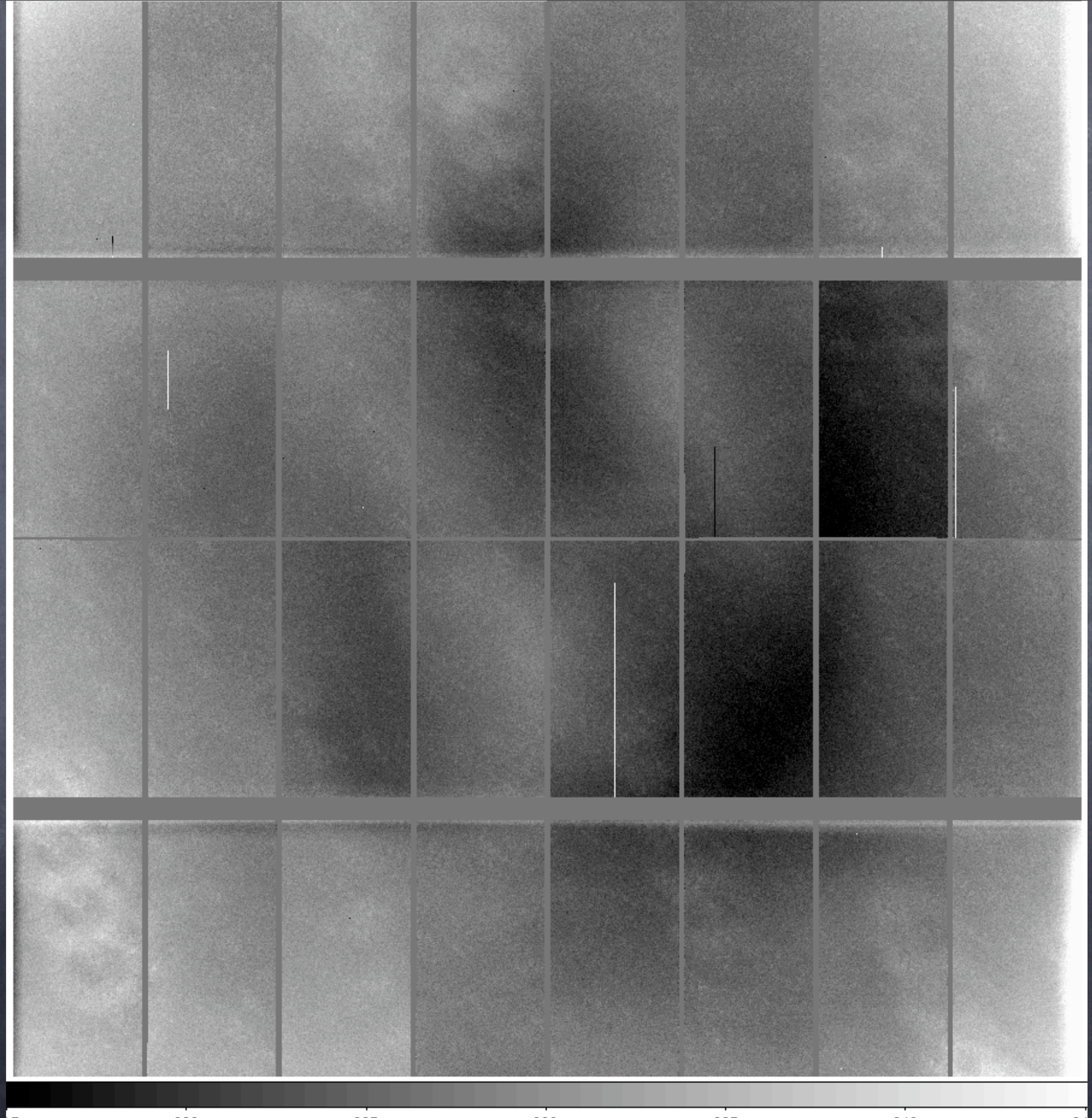
ratio monthly flats



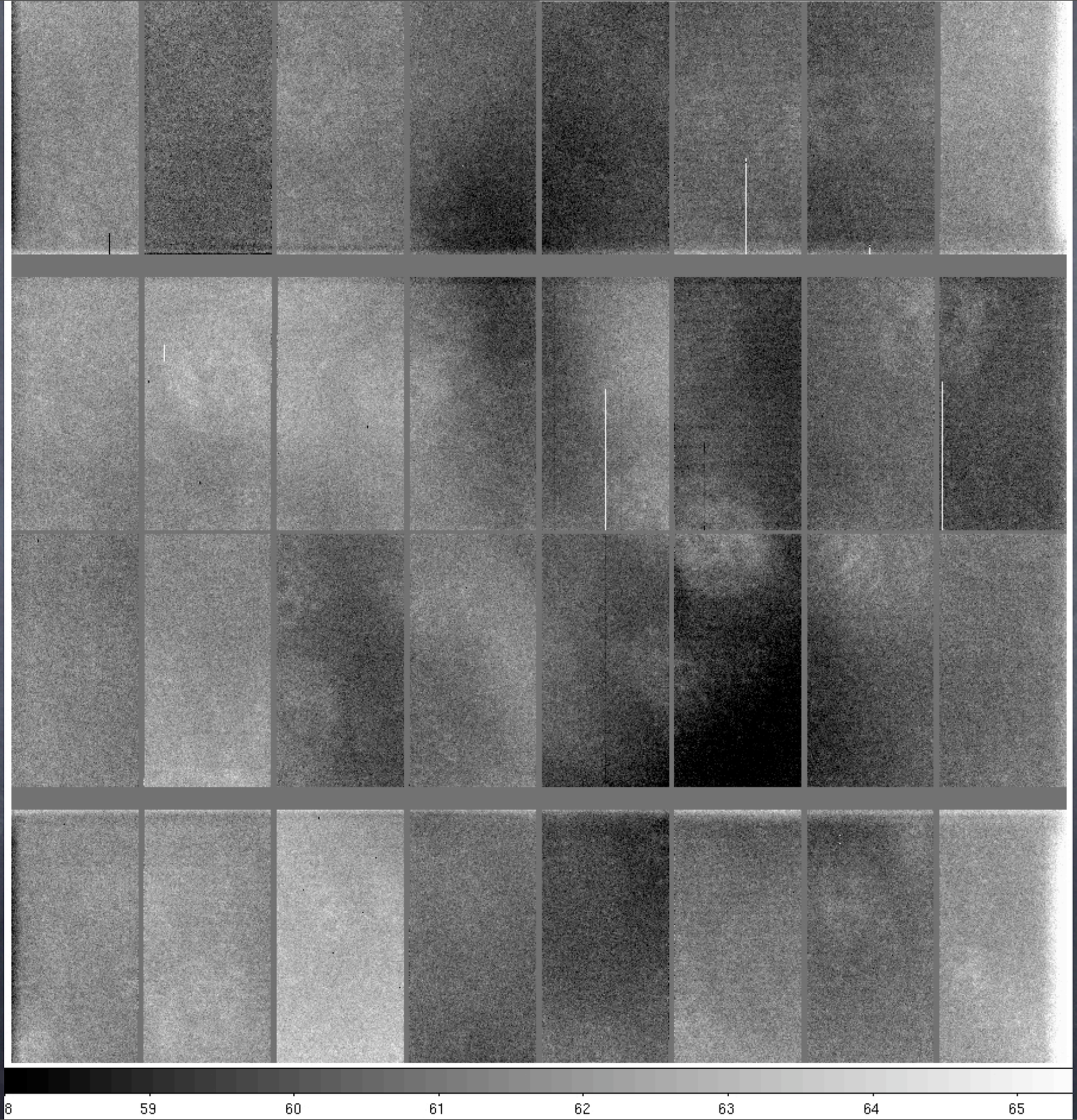
ratio
monthly
flats

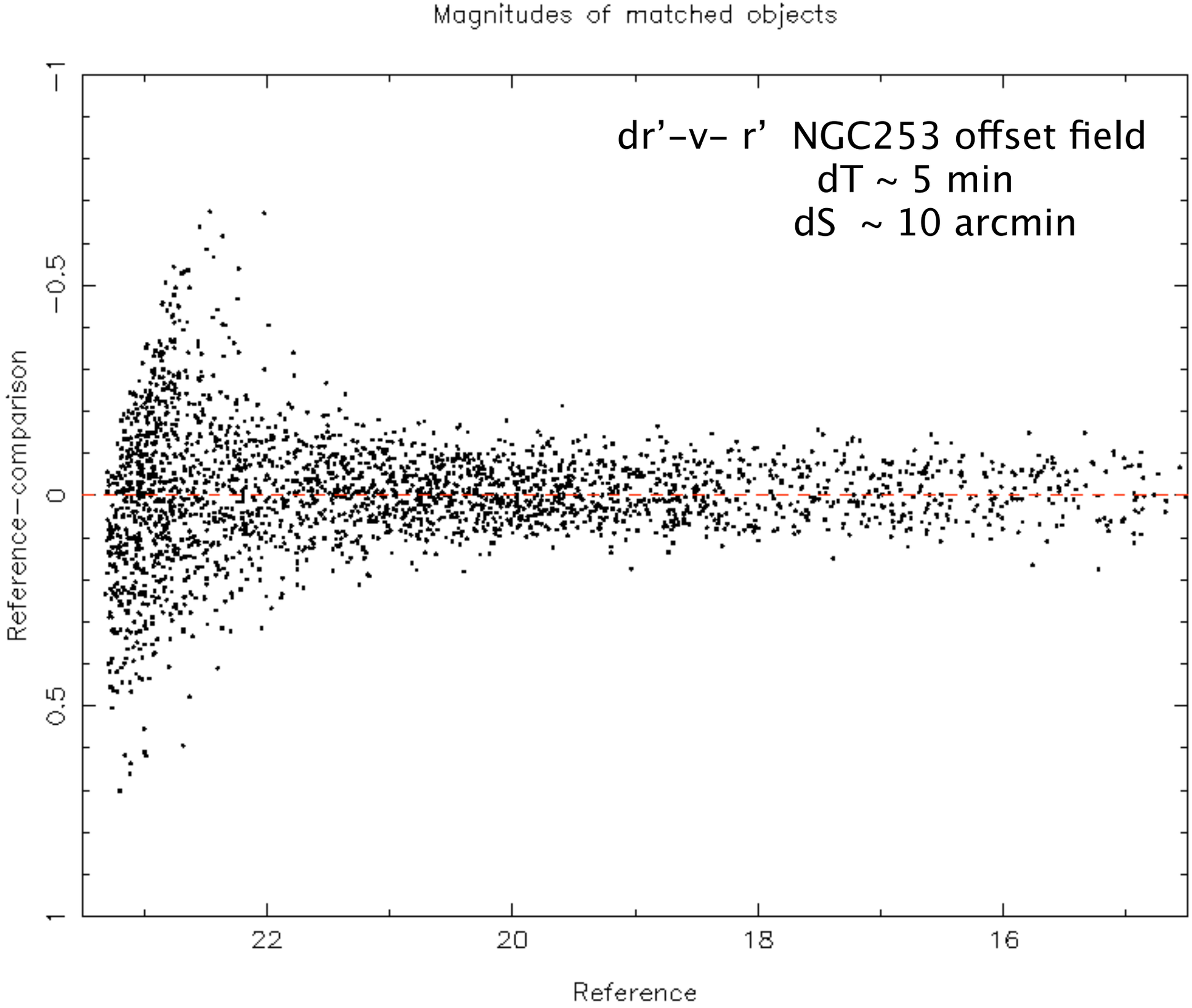


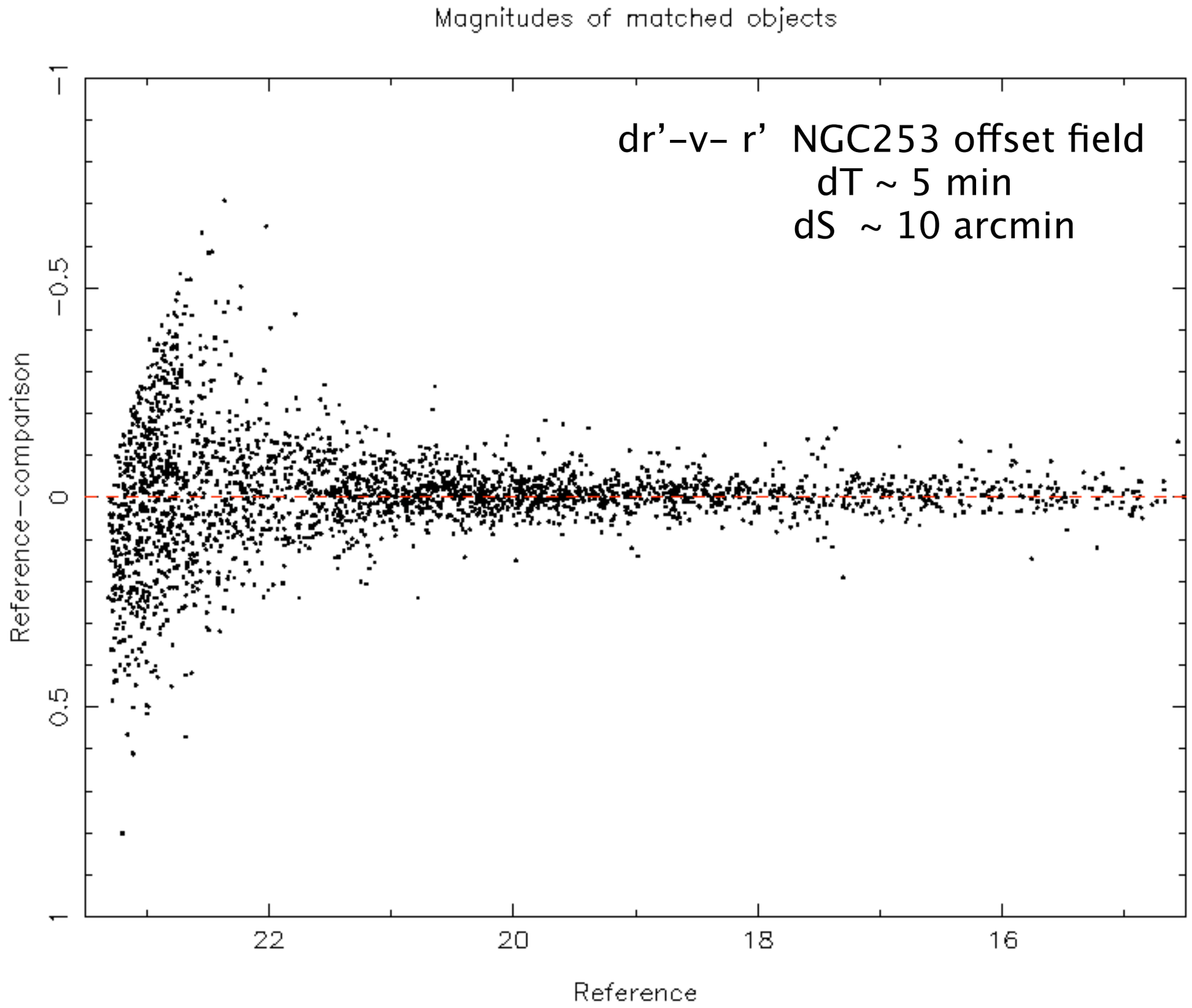
r_SDSS
darksky
stacks

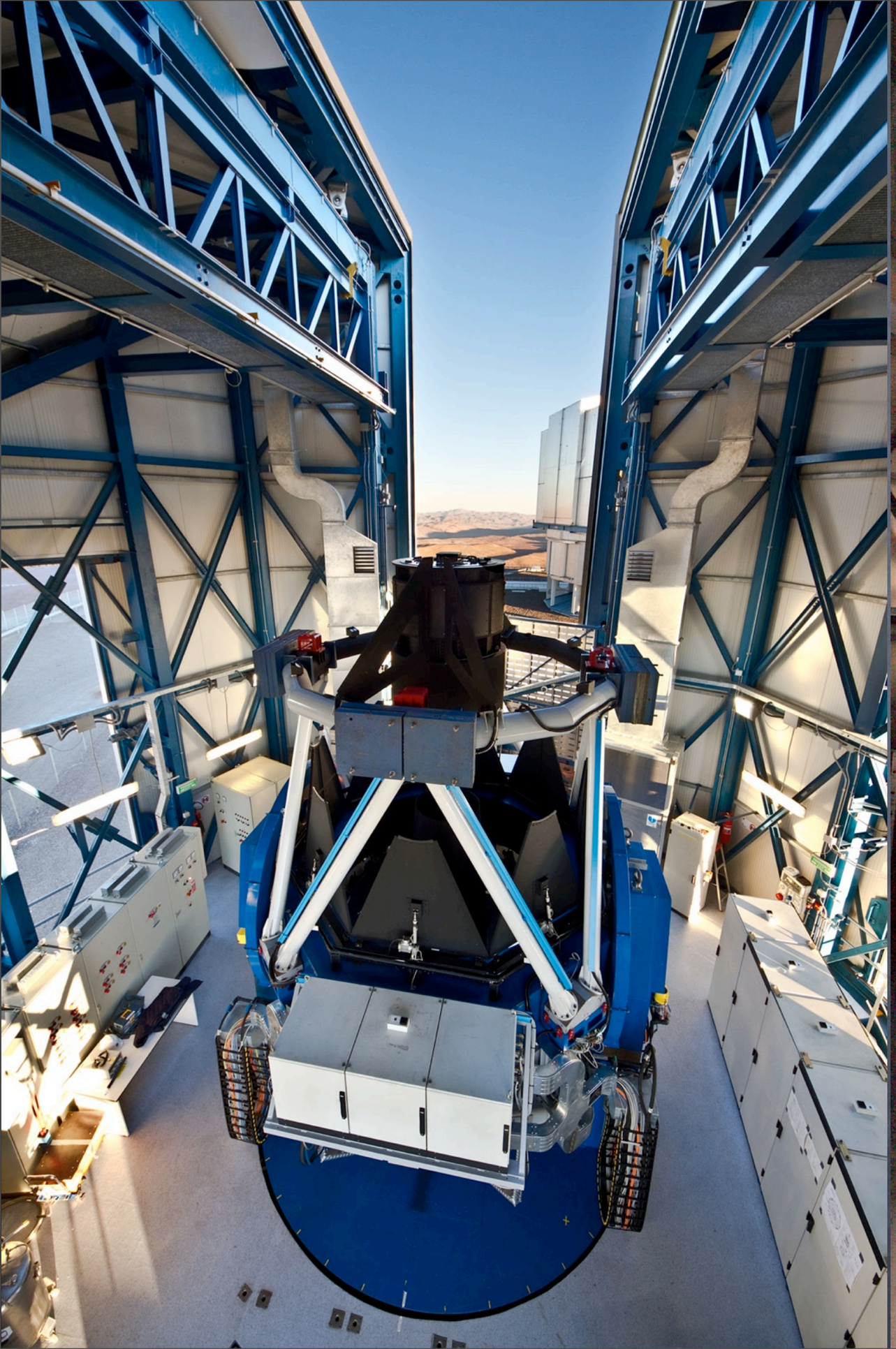


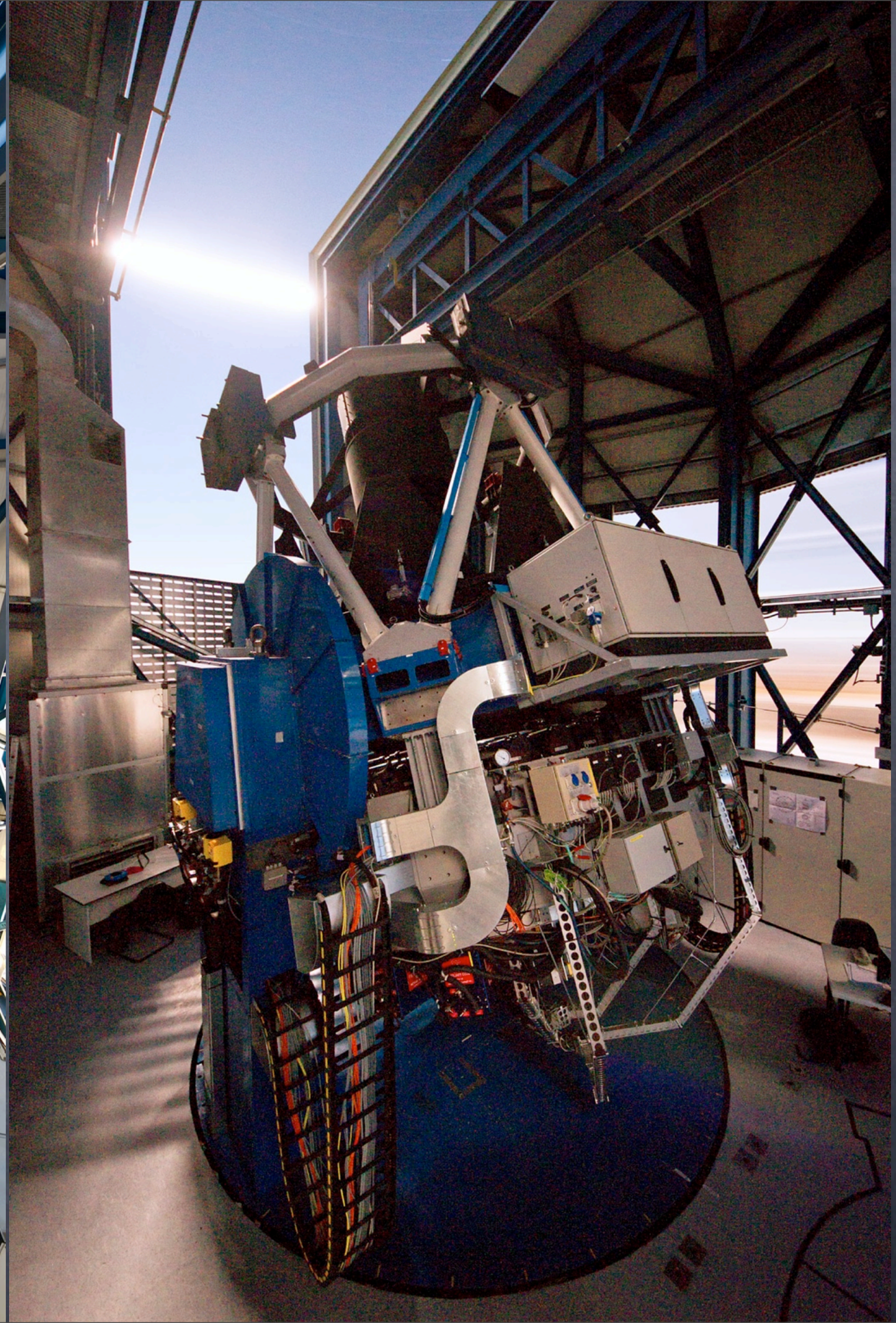
r_SDSS darksky stacks



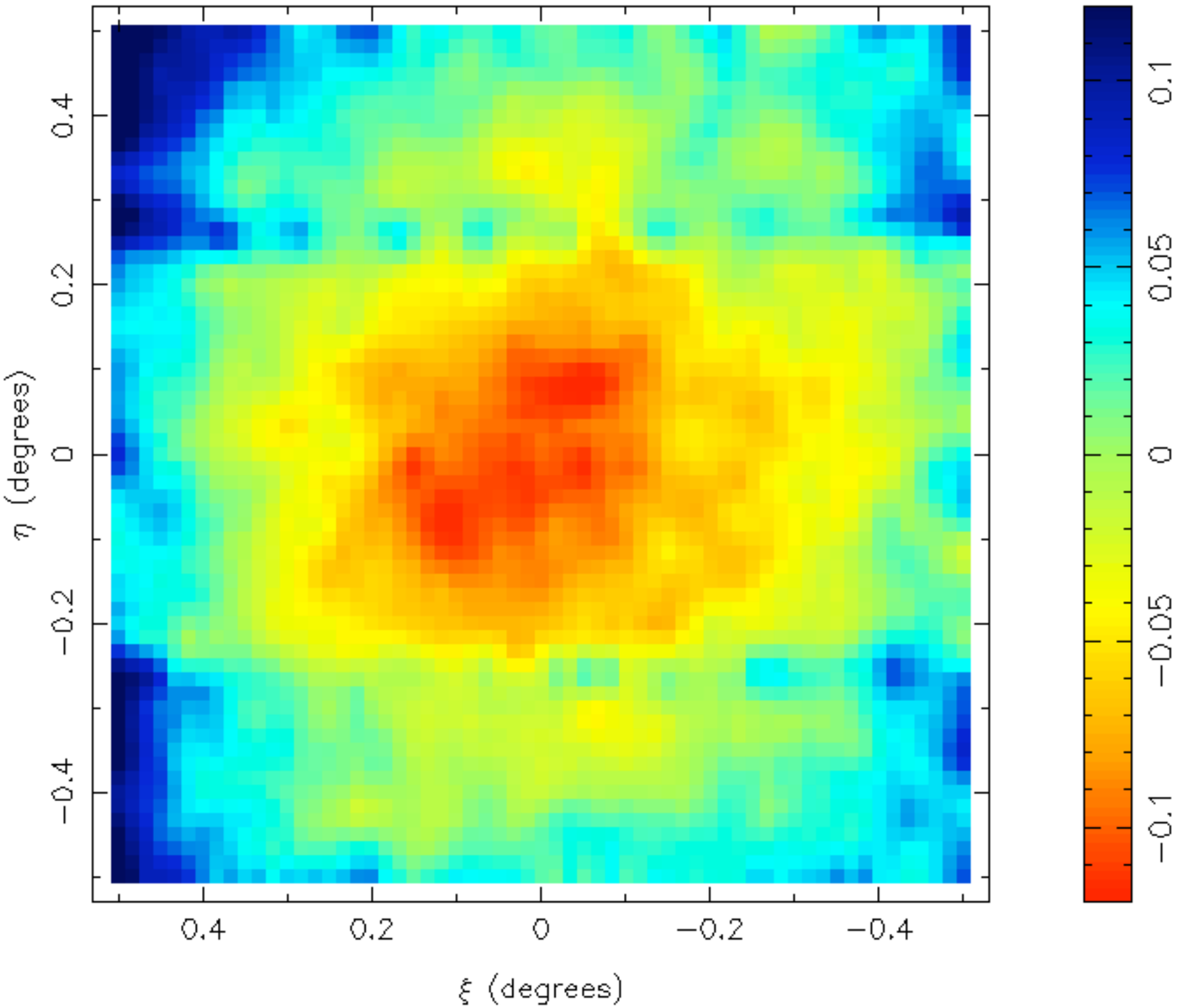

Magnitudes of matched objects
dr'-v- r' NGC253 offset field
dT ~ 5 min
dS ~ 10 arcmin
Reference-comparison
-1
-0.5
0
0.5
1
22
20
18
16
Reference


Magnitudes of matched objects
dr'-v- r' NGC253 offset field
dT ~ 5 min
dS ~ 10 arcmin
Reference-comparison
-1
-0.5
0
0.5
1
22
20
18
16
Reference

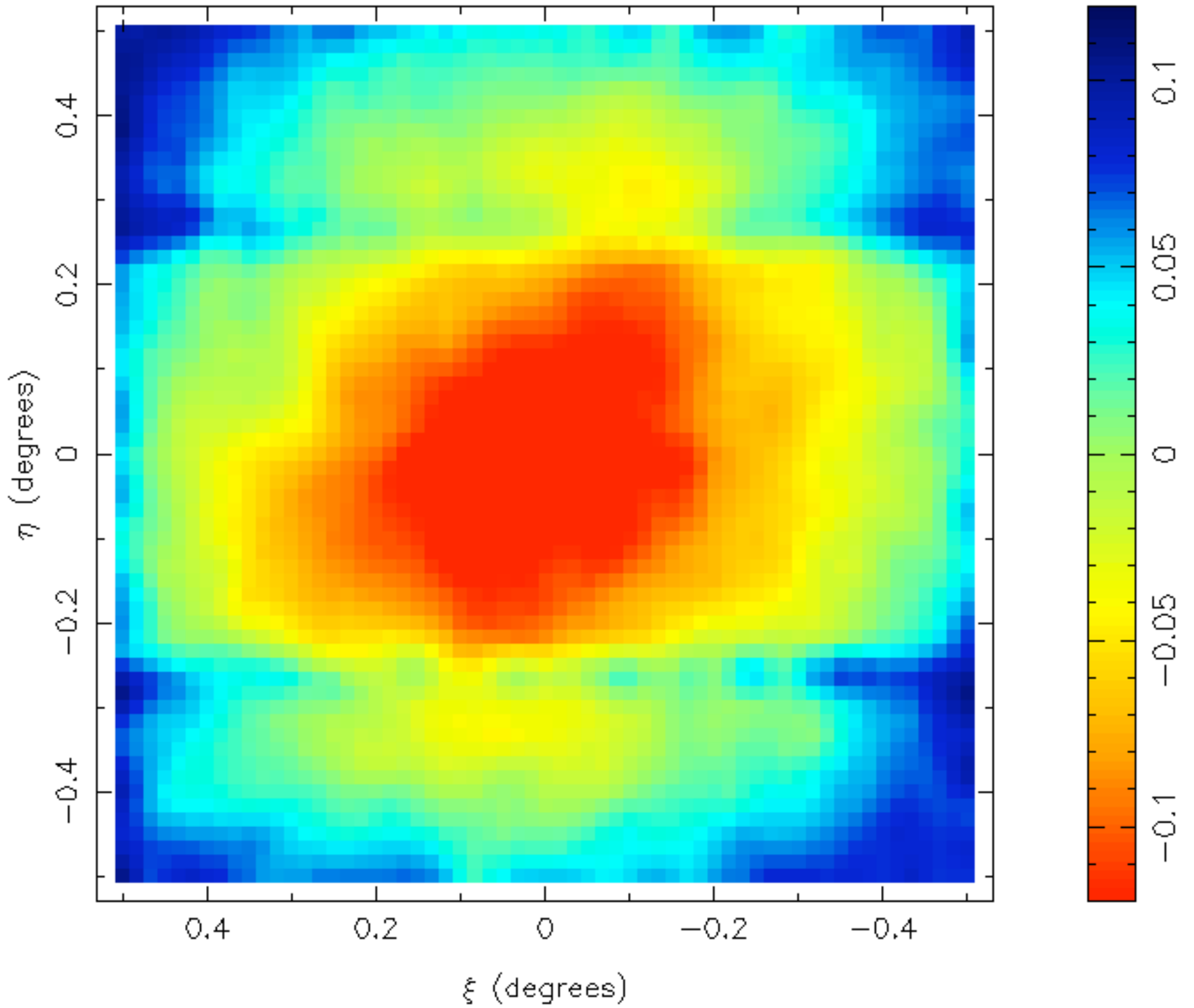




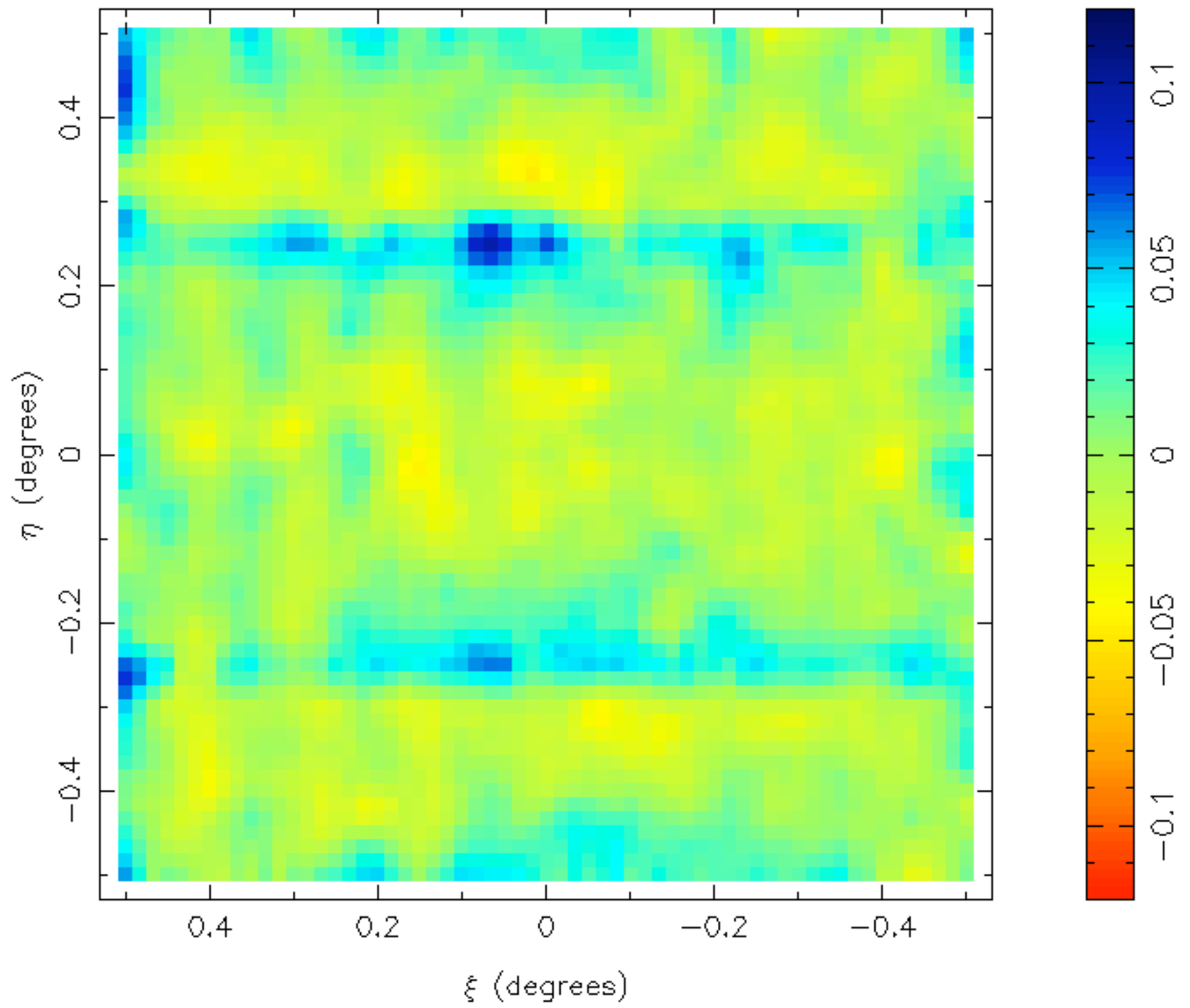
Illumination corrections i,z-band



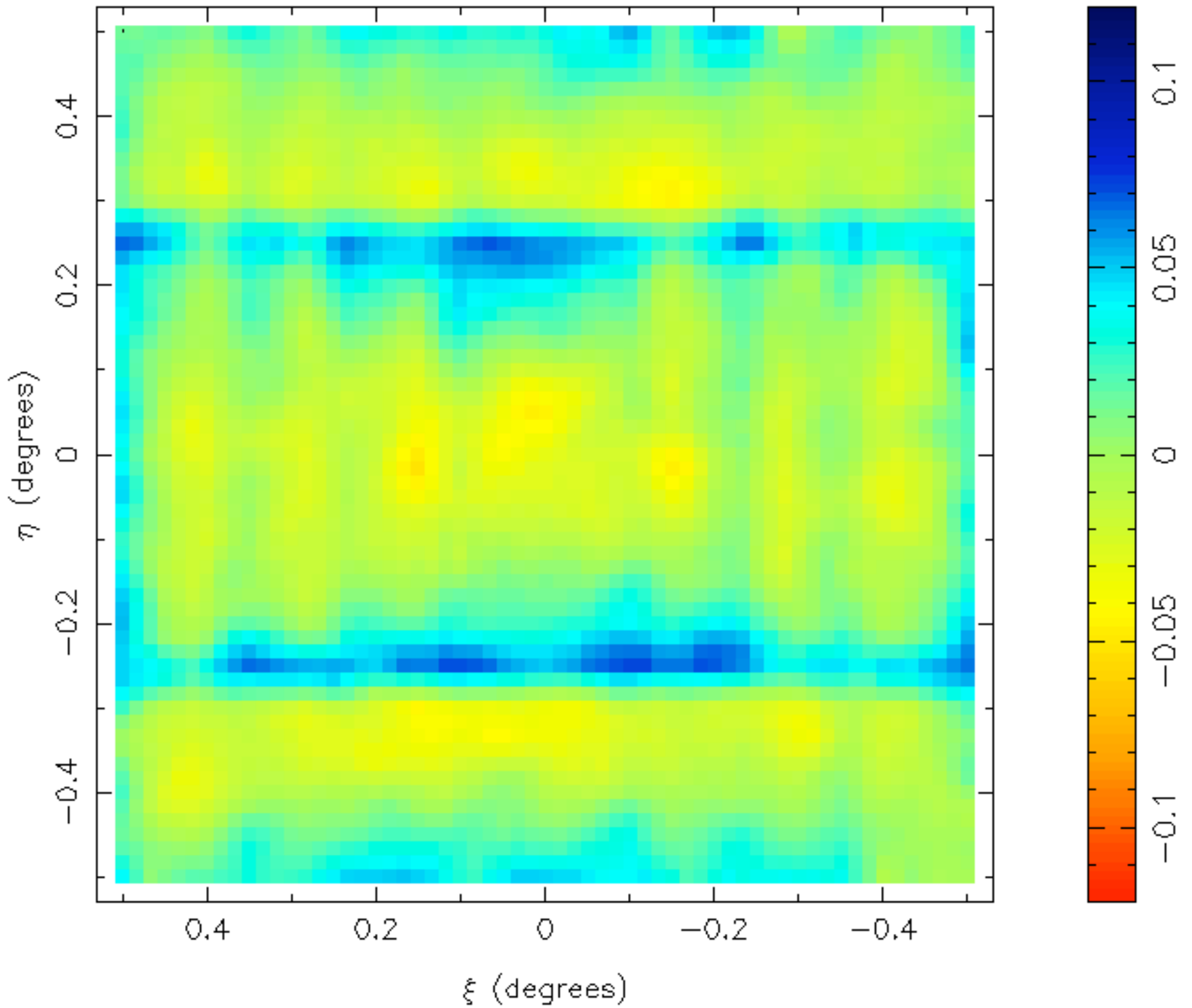
Illumination corrections i,z-band



Illumination corrections i,z-band (detector-level fix)



Illumination corrections i,z-band (detector-level fix)

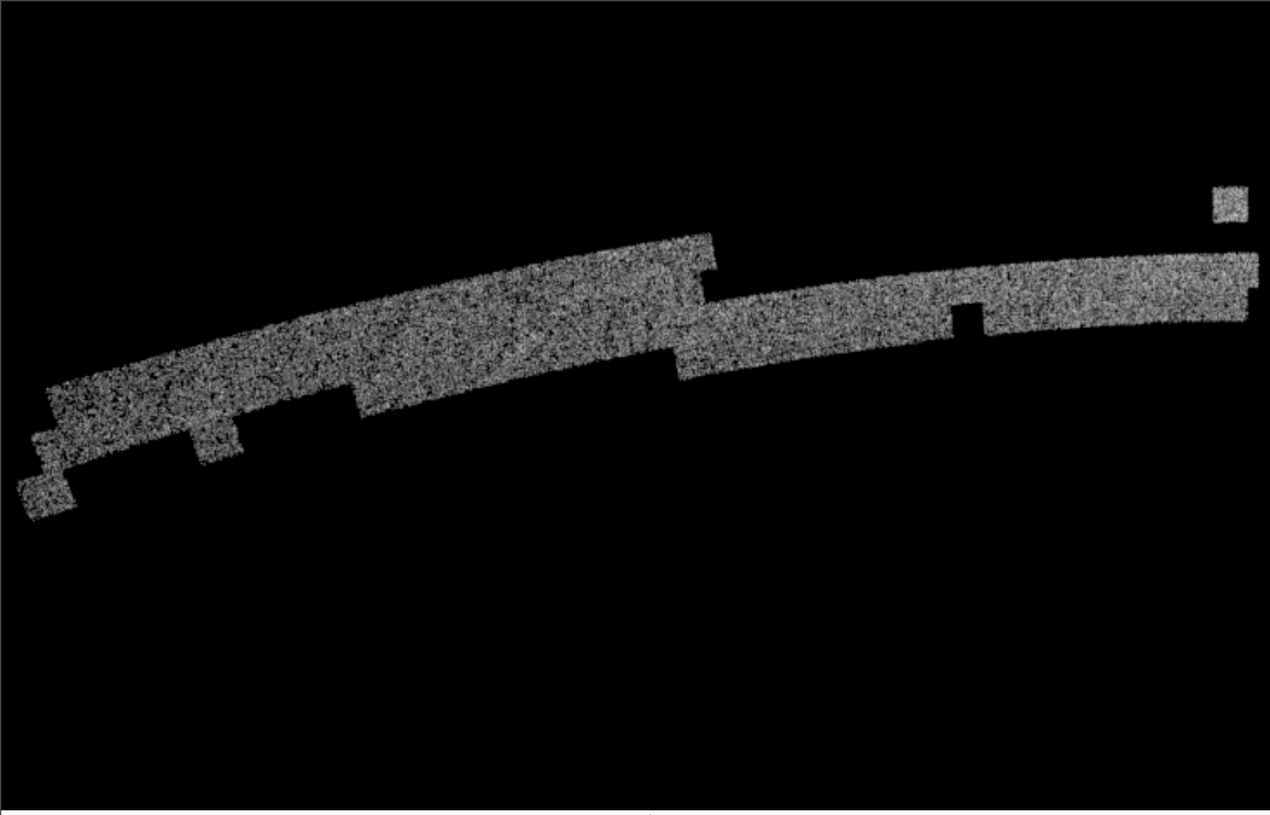


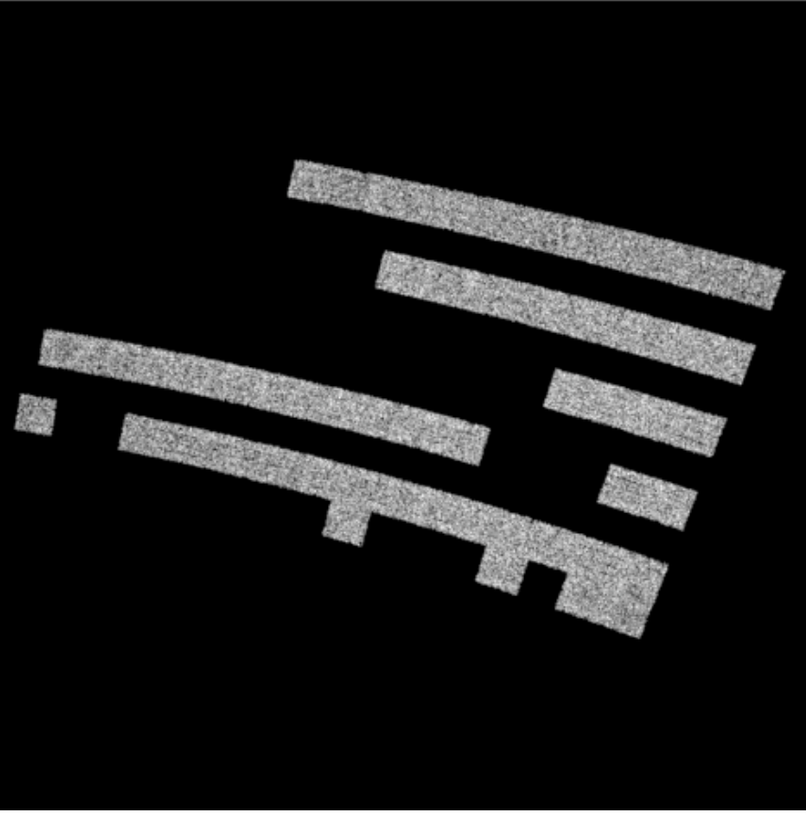
Photometric calibration

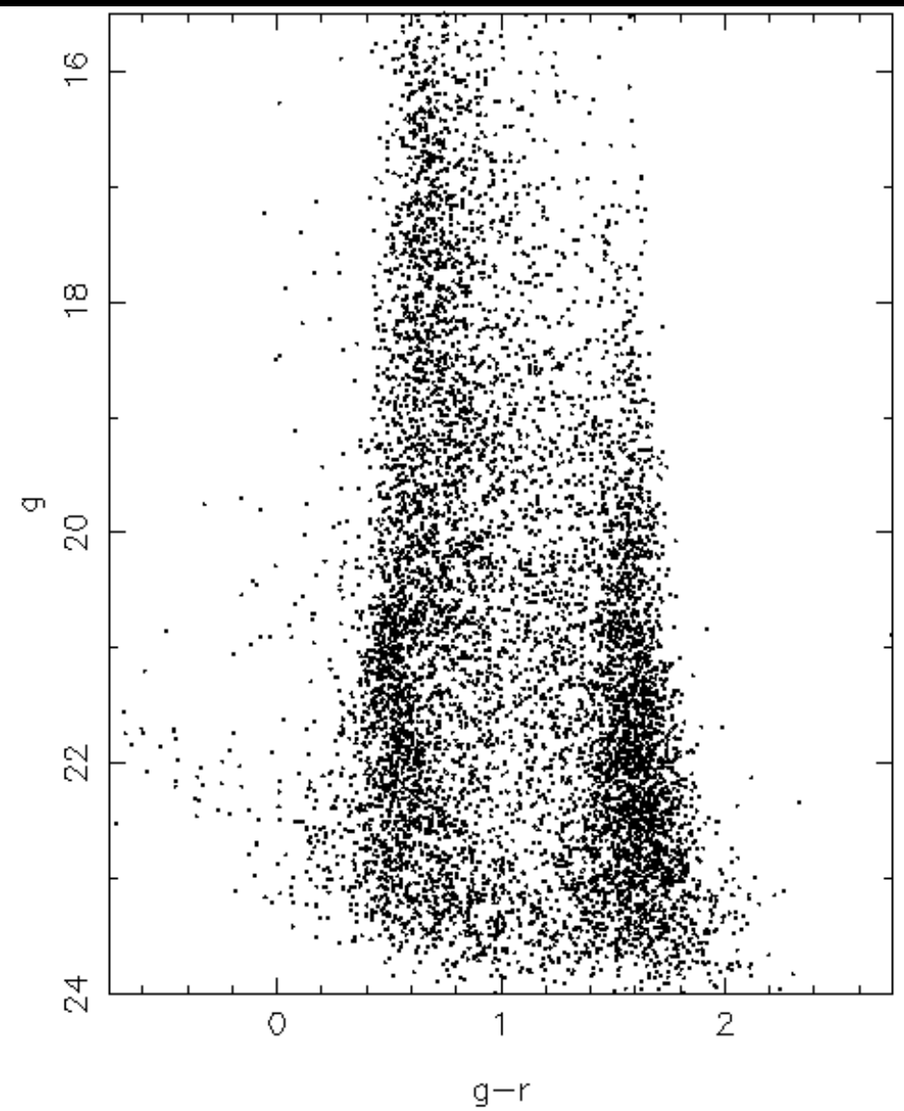
- internal gain calibration from twilight flats + dark skies
- STD field observations for 1st-pass calibration
  incl. celestial pole at -89deg for extinction measures ??
- 2MASS to measure i- and z-band, and possibly APASS ?
  to measure u- g- and r-band illumination corrections
- SDSS overlap (ATLAS) to independently monitor/
  measure illumination correction for u,g,r,i,z bands
- generate 1 sq deg SA calibration fields
- ce's variation with detector and/or radius
- overlap calibration from contiguous areas
- skymapper/APASS to provide uniform calibration
  eventually ?

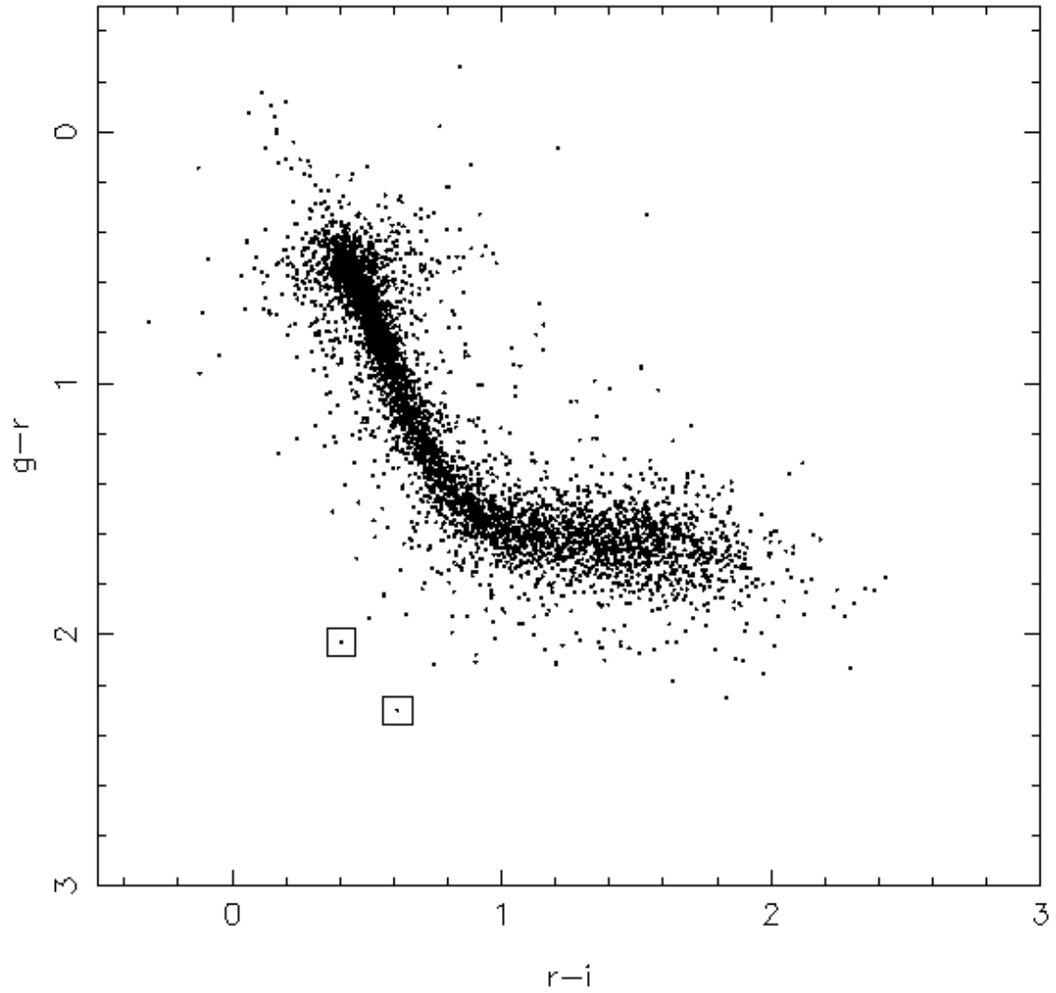
ATLAS data to 30th Sep

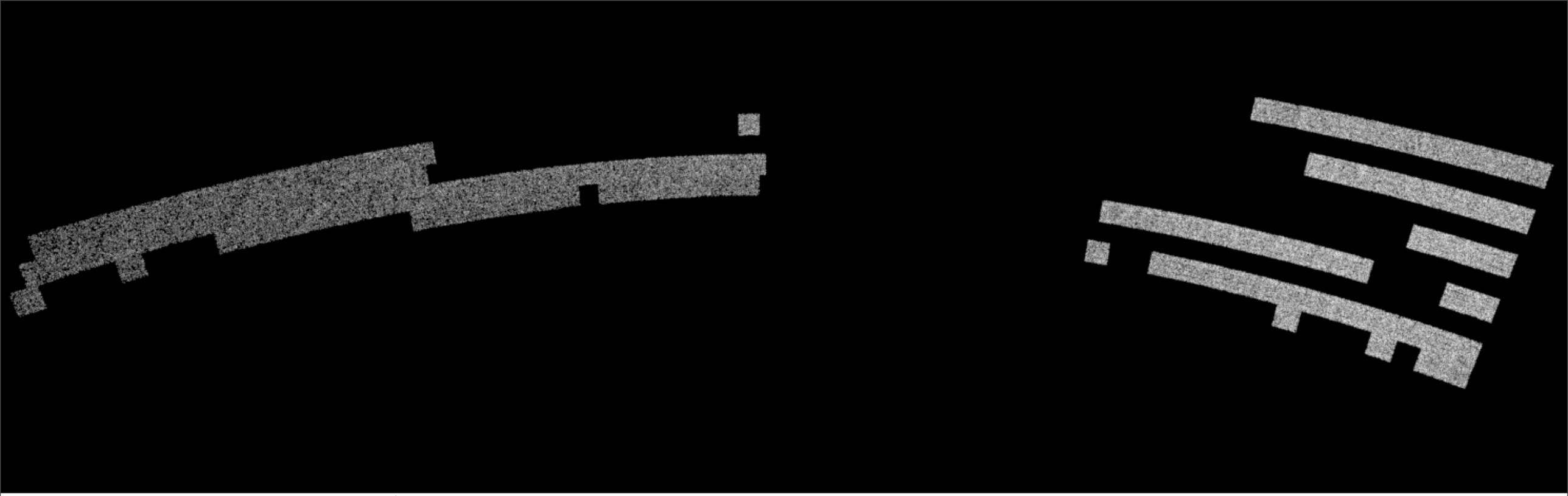
137 fields with ugriz

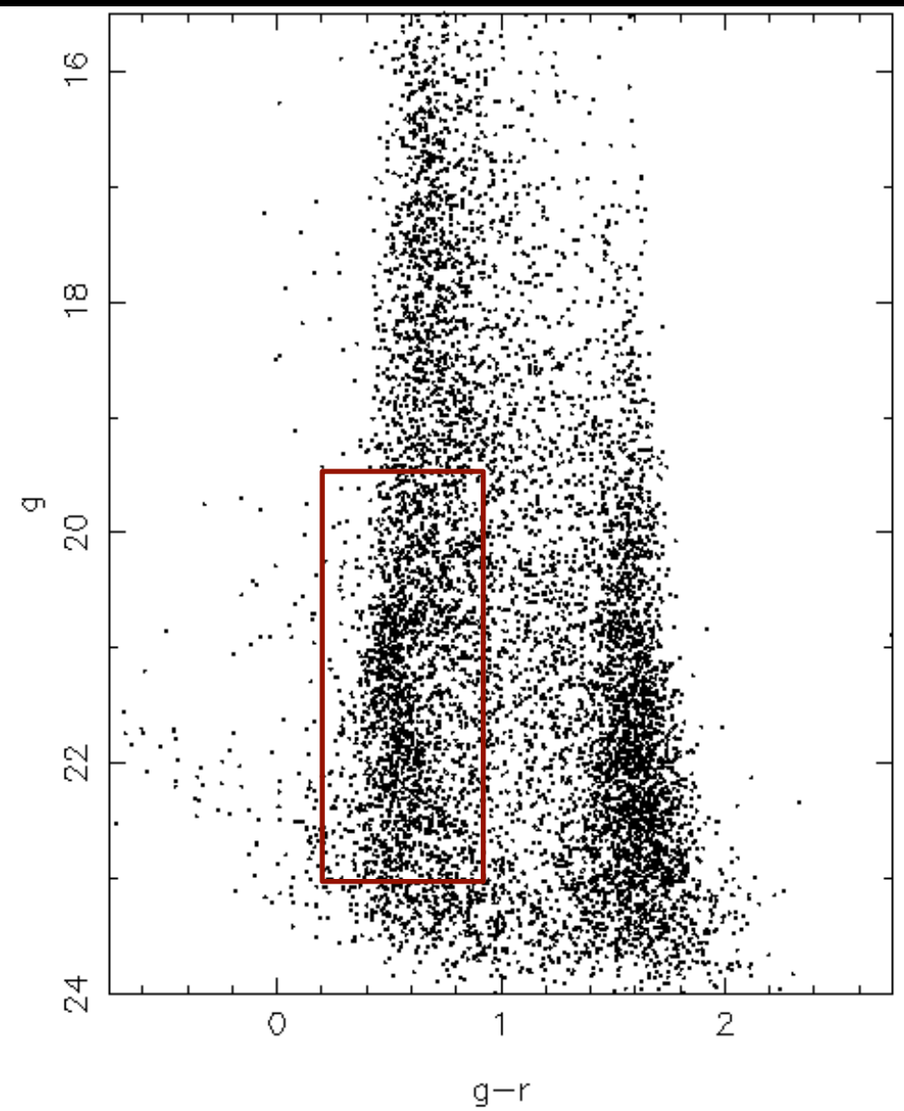


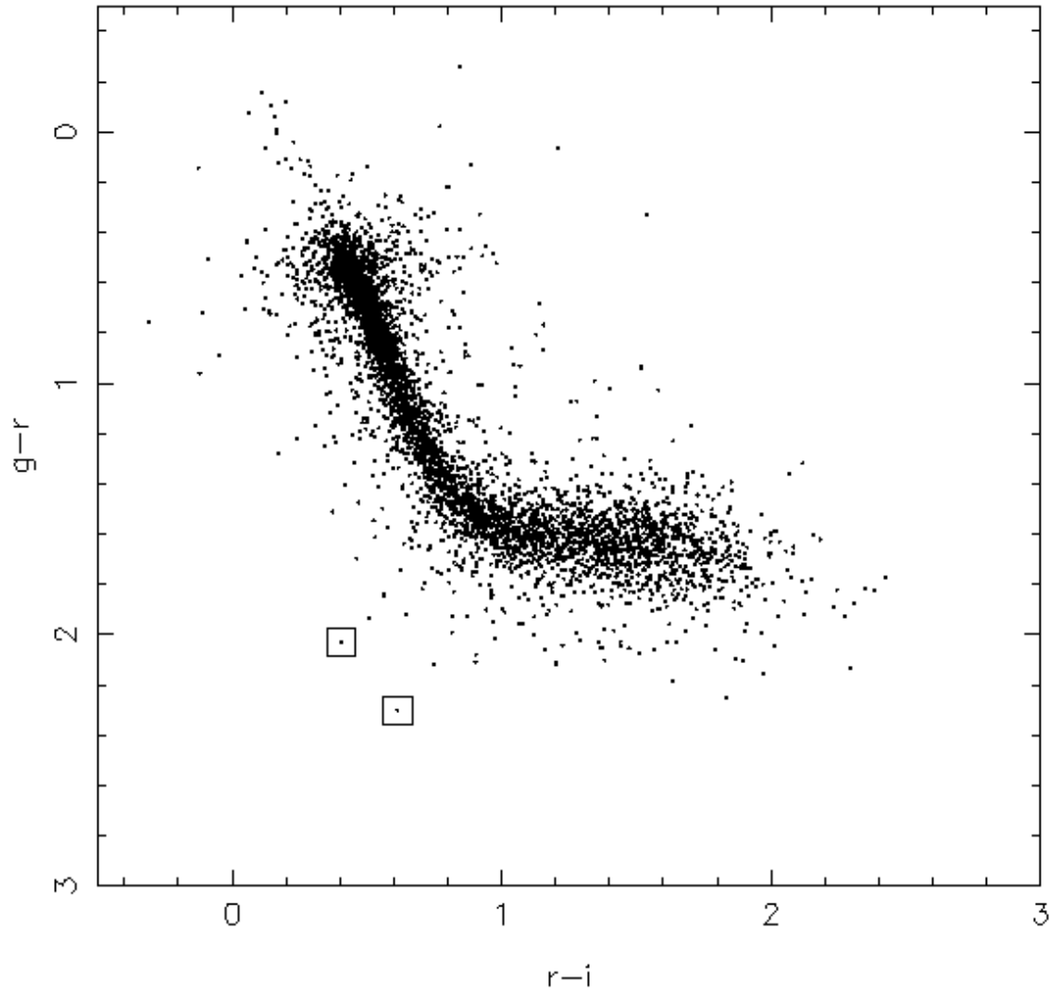



16
18
20
22
24
g
0
1
2
g−r


0
1
2
3
g−r
0
1
2
3
r−i




16
18
20
22
24
g
0
1
2
g−r


0
1
2
3
g−r
0
1
2
3
r−i