

Towards 1% Photometric Calibration of ESO's Public Kilo Degree Survey (KiDS)

Gijs A. Verdoes Kleijn
OmegaCEN / Target
Kapteyn Astronomical Institute

on behalf of KiDS production team



Public surveys Ω CAM-VST

KIDS-N (+VIKING @ VISTA)

KiDS, 1500 sq.deg. ugri

Main driver...

- Dark matter/energy: weak lensing tomography with phot-zs from KiDS+VIKING

...+ much more science:

Gal. evolution vs environment/activity, $z > 6.5$

QSOs, BDs, WDs, MW-streams and more.....

KIDS-S (+VIKING@VISTA)

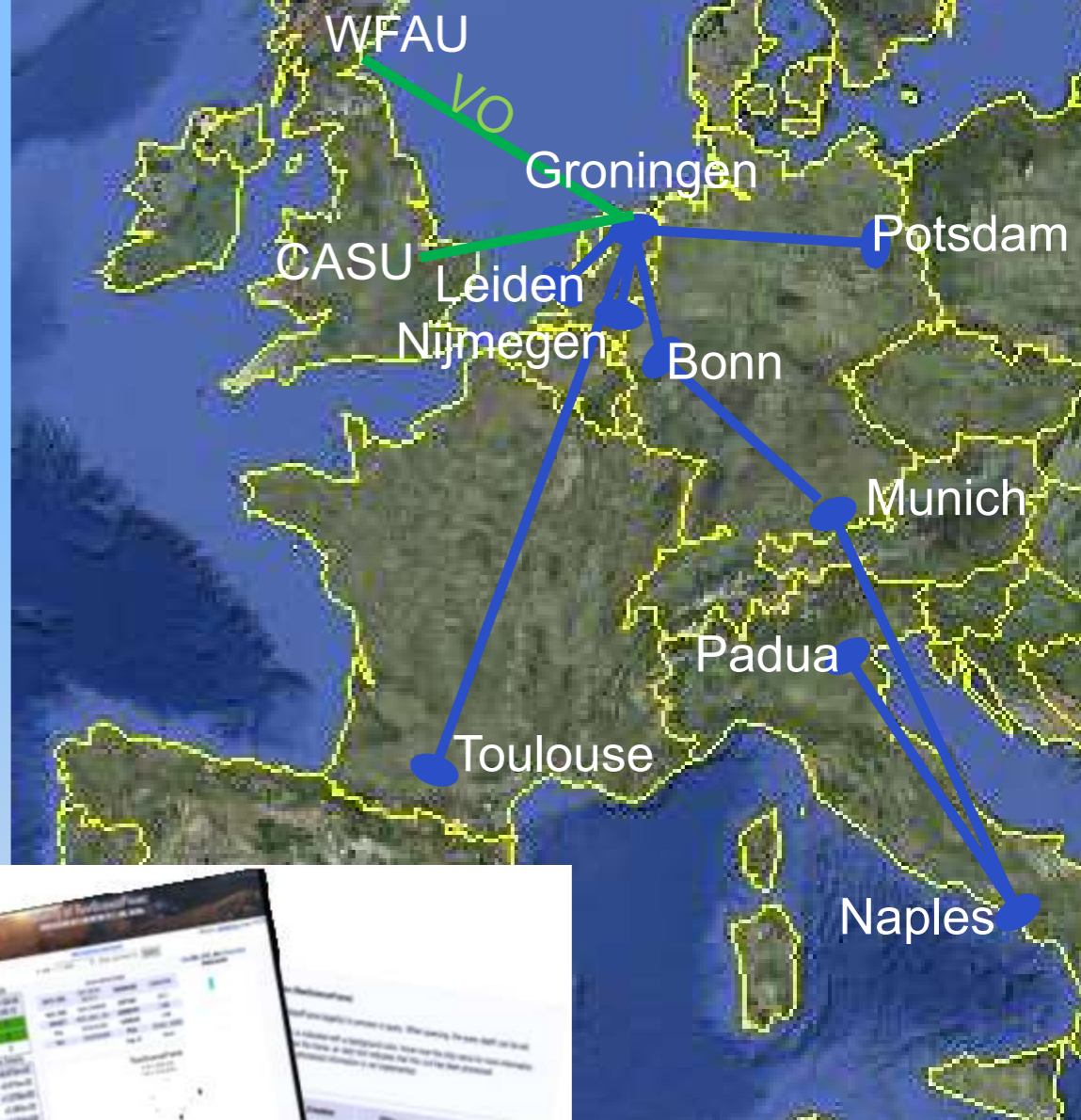
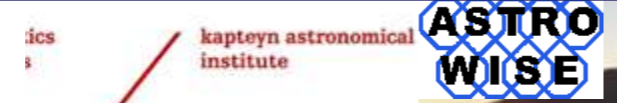


KiDS team

Kuijken (PI), 50+ team members total

DISTRIBUTED SURVEY HANDLING

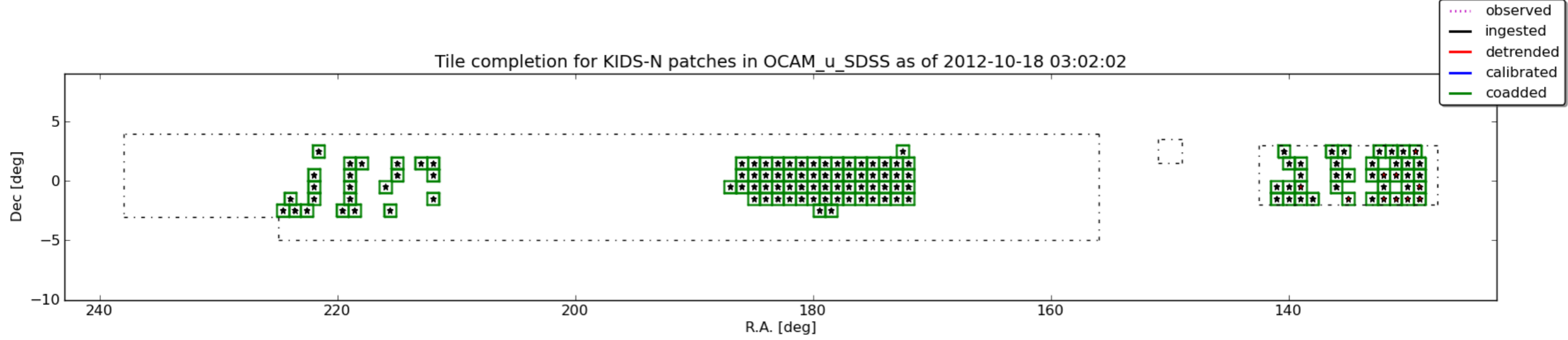
OmegaCEN LEAD CENTRE Valentijn	Verdoes Kleijn, Begeman, Boxhoorn, Buddelmeijer, Belikov, Bout, McFarland, Sikkema
Leiden Obs. Kuijken	de Jong, Helmich, Irisarri, Pila-Diez, van den Burg
OAC / Naples Univ Capaccioli	Grado, Getman, La Barbera, Napolitano, Rifatto, Dall’Ora, Puddu
Padua Obs.	Radovich
Rome Obs.	Huang
AlFA Bonn Schneider	Hildebrandt, Erben, Cordes, van Uitert
CASU, WFAU, Terapix	

KiDS

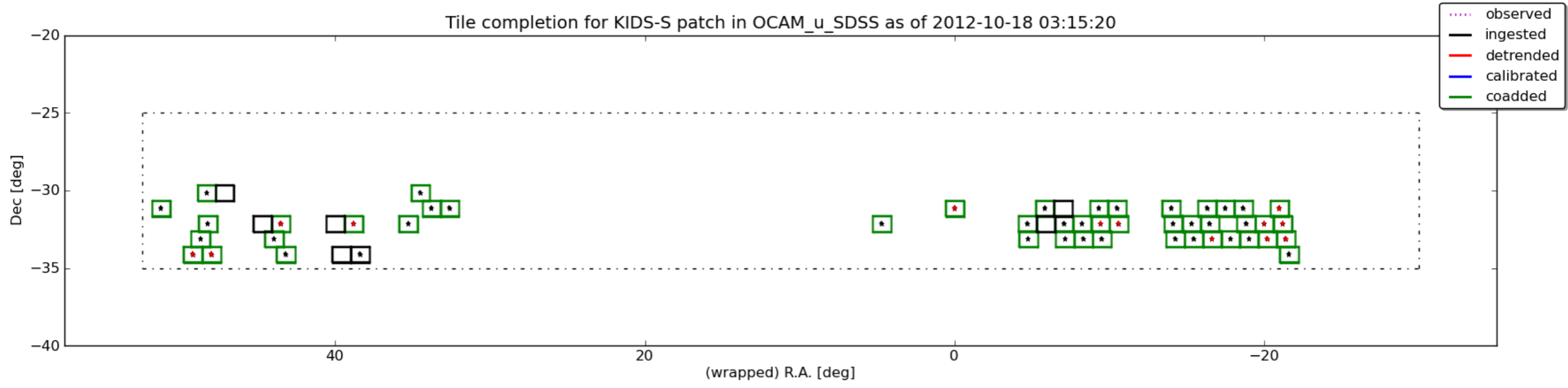


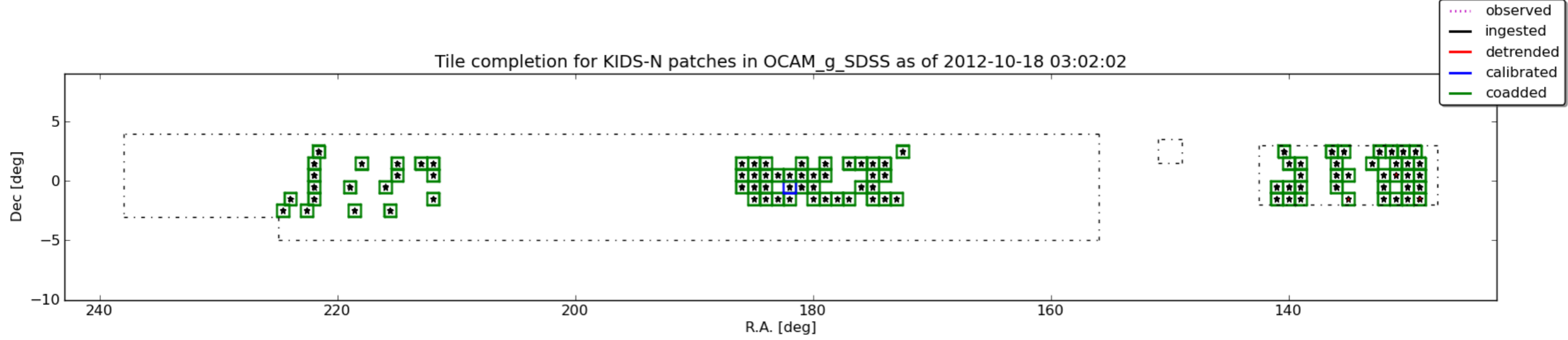
Tile completion for KIDS-N patches in OCAM_u_SDSS as of 2012-10-18 03:02:02



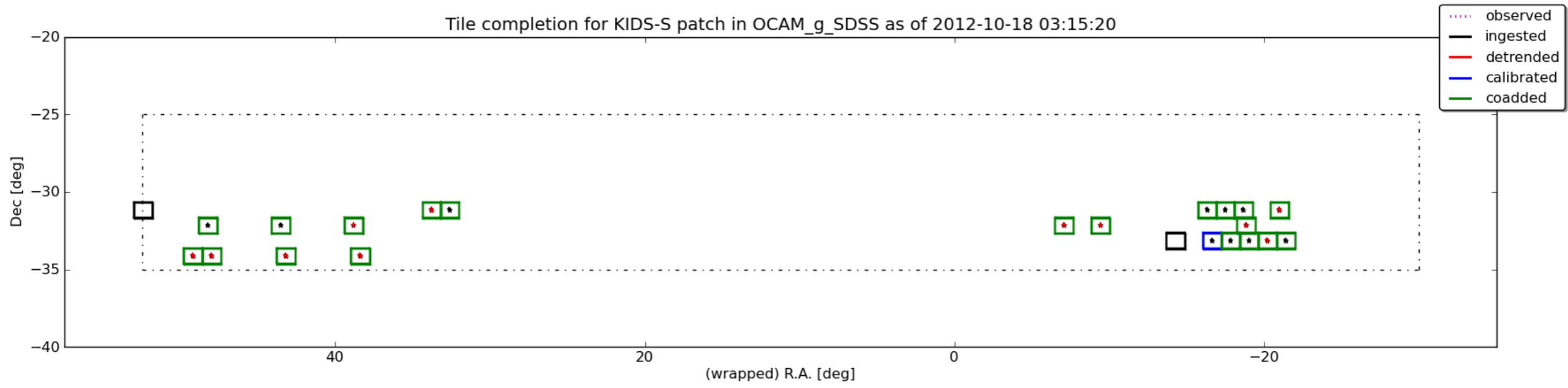
u

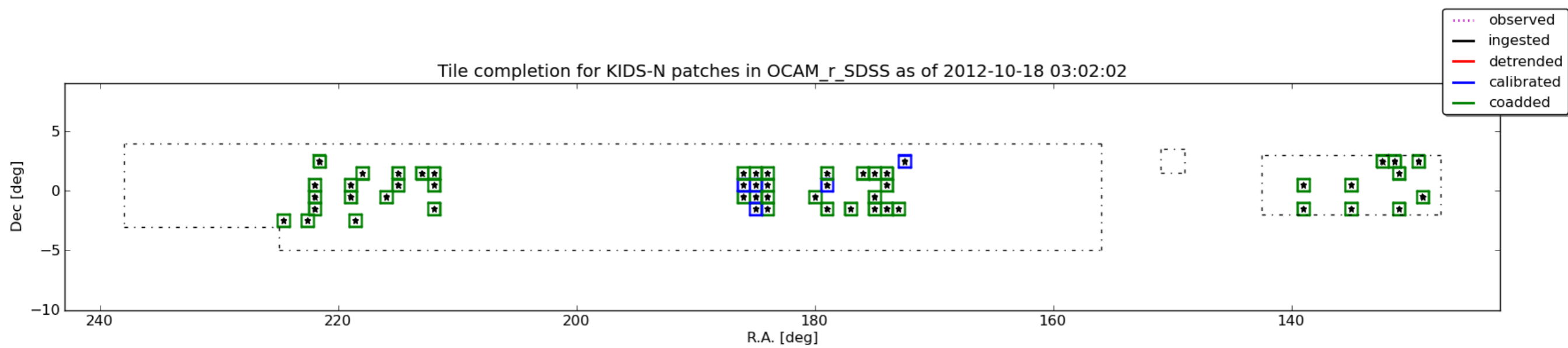
Tile completion for KIDS-S patch in OCAM_u_SDSS as of 2012-10-18 03:15:20



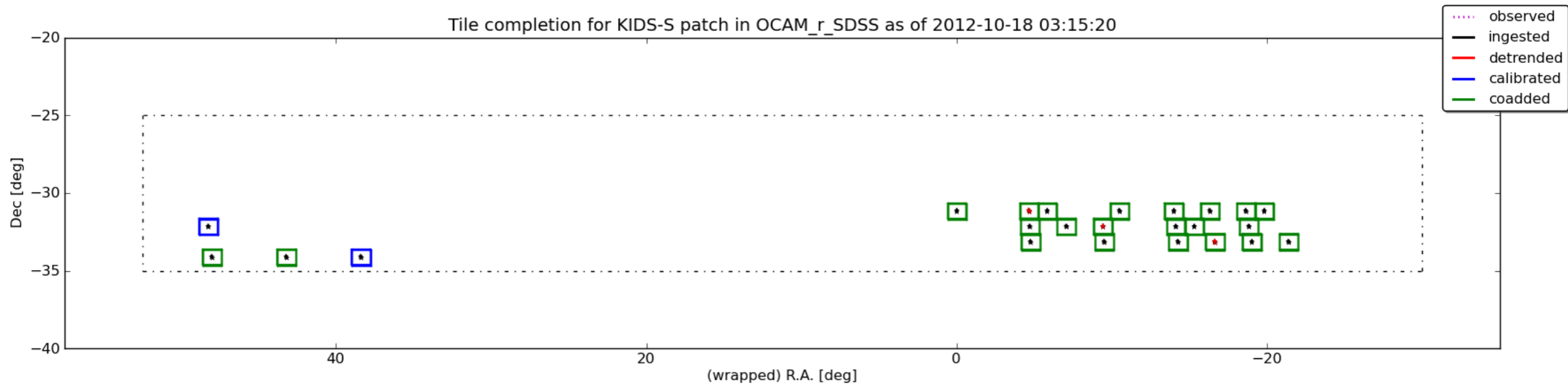


g

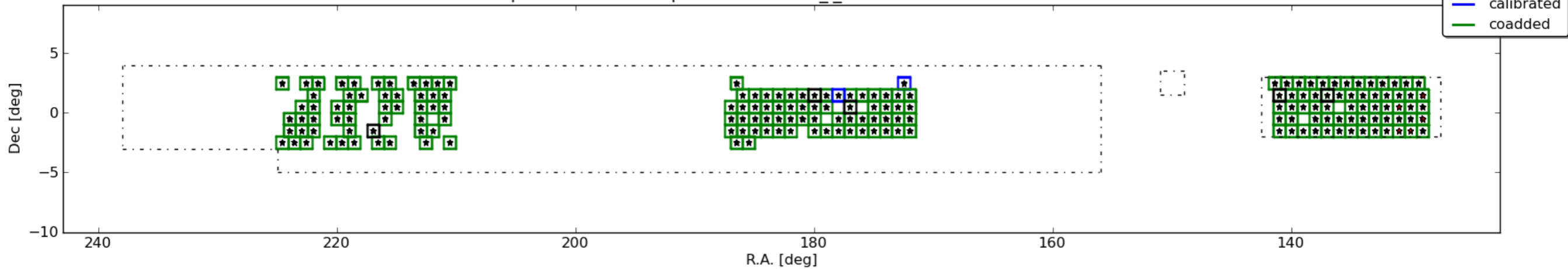




r

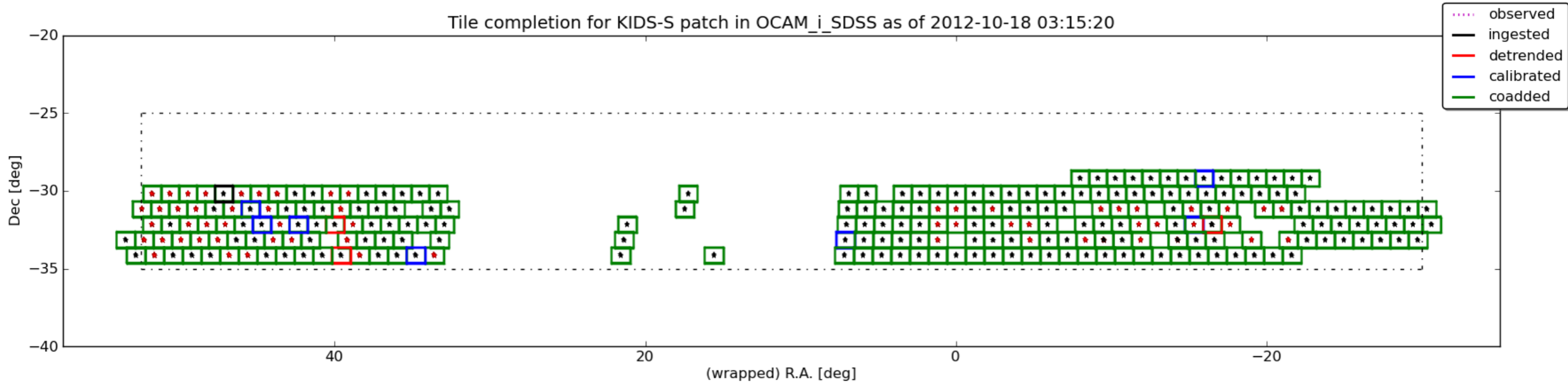


Tile completion for KIDS-N patches in OCAM_i_SDSS as of 2012-10-18 03:02:02



i

Tile completion for KIDS-S patch in OCAM_i_SDSS as of 2012-10-18 03:15:20



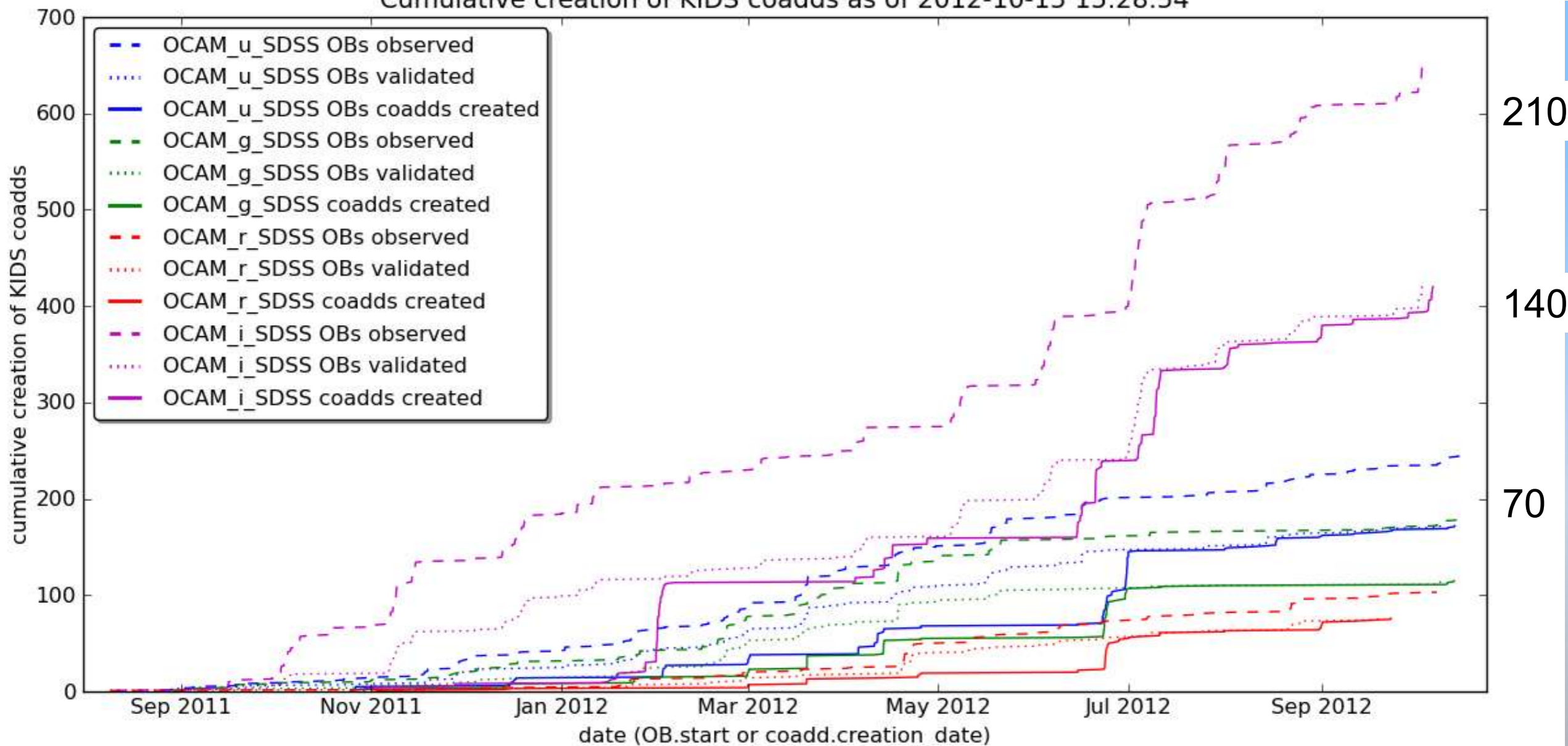
Query results for table CoaddedRegriddedFrame

Shown: 100 rows out of 1013 entries, from project 'KIDS'

SAMP: 1. [Test Java](#) 2. [Connect to the hub](#) 3. [Broadcast](#) : Aladin / Topcat

Gigapixels

Cumulative creation of KIDS coadds as of 2012-10-15 15:28:54



Square degrees



KiDS collaborative Quality Control

http://wiki.astro-wise.org/projects:kids:survey_progress:internaldelivery1.0

AstroWISE DBView CaITS Process [see 5 previous comments](#) DBname: [awgverdoes](#) project: KIDS

is_valid = 2: publishable +

Processing Details

creation_date	2012-03-16 19:39:50
is_valid	2
quality_flags	0
Privileges	2

Image Statistics Details

mean	+6.476e-12
median	+1.027e-13
stdev	+3.219e-10
min	-6.448e-09
max	+3.15e-08

Observational Details

DATE_OBS		OBSERVER	
MJD_OBS		EXPTIME	
OBJECT	KIDS_355.3_-31.2	AIRMSTRT	
R.A.	23:41:21.5534	AIRMEND	
Dec.	-31:09:33.6264	Filter	OCAM_r_SDSS
		mag_id	SloanR

Mosaic of Instrument OMEGACAM

CoaddedRegriddedFrame

18687 X 20023 pixel
62.29 X 66.74 arcmin

(pixel values are reversed)

WeightFrame

18687 X 20023 pixel
62.29 X 66.74 arcmin

Quick Views on Delivery 1.0

1. Photo Gallery (beta release):

- [Photo Gallery u.g.r.i](#)
- [Photo Gallery u](#)
- [Photo Gallery g](#)
- [Photo Gallery r](#)
- [Photo Gallery i](#)

KiDS internal release v1

Release Table

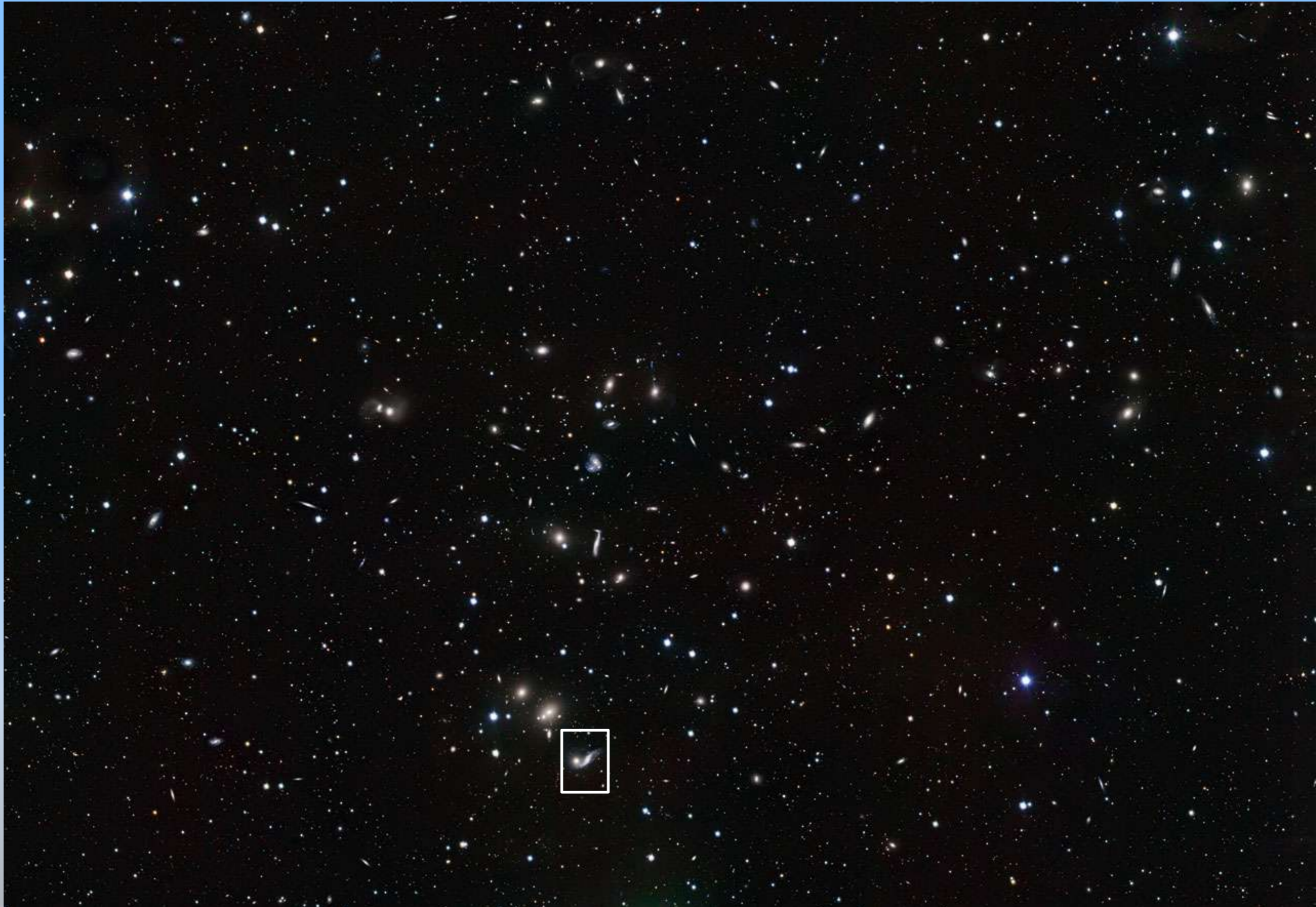
Column description

(3) OR_start: start time of the Observing Block

(4) KIDSMAGSDSS: median of magnitude residuals and median absolute deviation of magnitude residual. dr, drdec: mean positional residual in arcsec. This is topic in progress, see [http://www.astro-wise.org/projects:kids:survey_progress:internaldelivery1.0](#) for details.

(7) Comments: Coadd: mostly, eyeball comments given during visual inspection of coadds. Plus some bookkeeping and comments produced by automated quality control.

Objid	OR_start	OR_end	QualityWise	KIDSMAGSDSS	dr	drdec	Comments Coadd
KIDS_129_0_0.3_8	2012-01-02 02:13:10	02:13:10	@QualityWise	-0.052,0.033,0.033,0.043			KIDSIinternalDelivery-v1.0: gaps in the weight map. Problems with CCD2 in the reflection: Satellite tracks. Coadd QC passed!
KIDS_129_0_0.3_9	2011-12-05 07:42:03	07:42:03	@QualityWise	-0.020,0.028,0.016,0.029			KIDSIinternalDelivery-v1.0: gaps in the weight map. Problems with CCD2 in the reflection: Satellite tracks. Coadd QC passed!
KIDS_129_0_0.3_9	2012-01-02 02:13:10	02:13:10	@QualityWise	-0.052,0.033,0.033,0.043			KIDSIinternalDelivery-v1.0: gaps in the weight map. Problems with CCD2 in the reflection: Satellite tracks. Coadd QC passed!
KIDS_129_0_1_3_9	2012-01-02 02:13:10	02:13:10	@QualityWise	0.083,0.041,0.032,0.103			KIDSIinternalDelivery-v1.0: gaps in the weight map. Problems with CCD2 in the reflection: Satellite tracks. Coadd QC passed!



Evolution from clusters to outskirts in one shot

eso1211 — Photo Release SPACE SCOOP

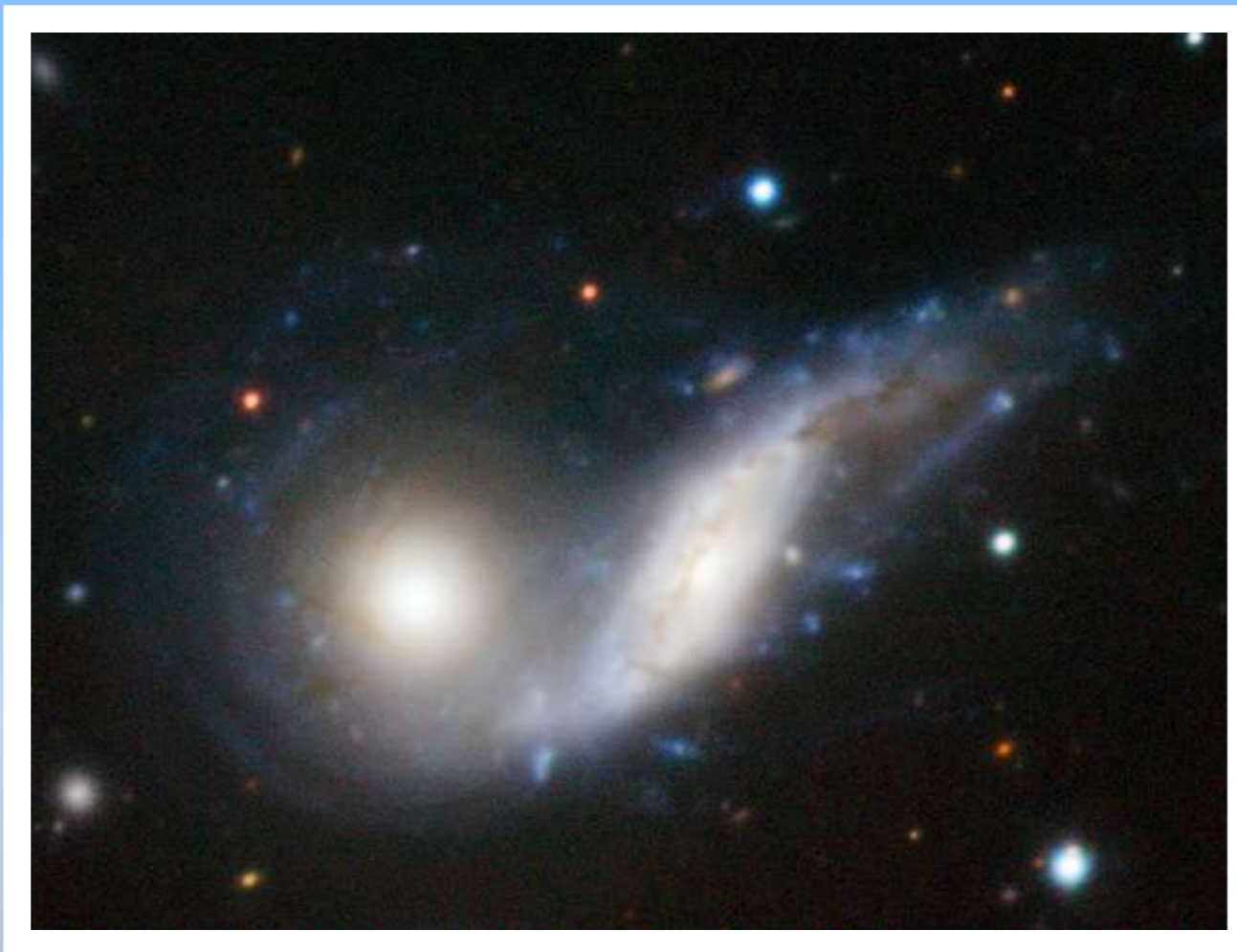
Choose your language:



Galaxies Get Up Close and Personal 

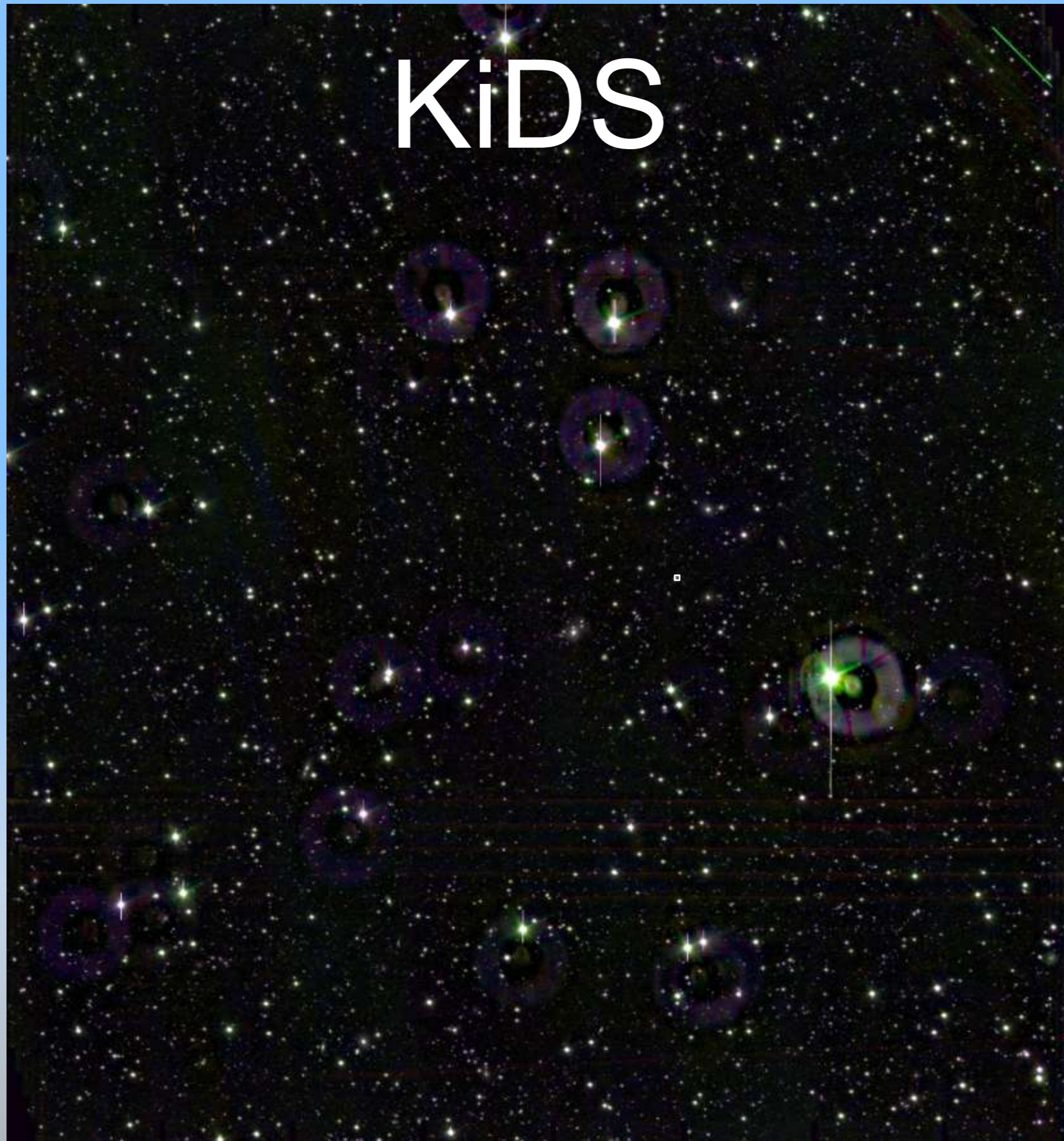
VST captures collisions in young galaxy cluster

7 March 2012



Galaxy transformations in Hercules Galaxy Cluster

KiDS



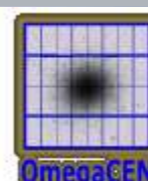
university of
 groningen

faculty of mathematics
 and natural sciences

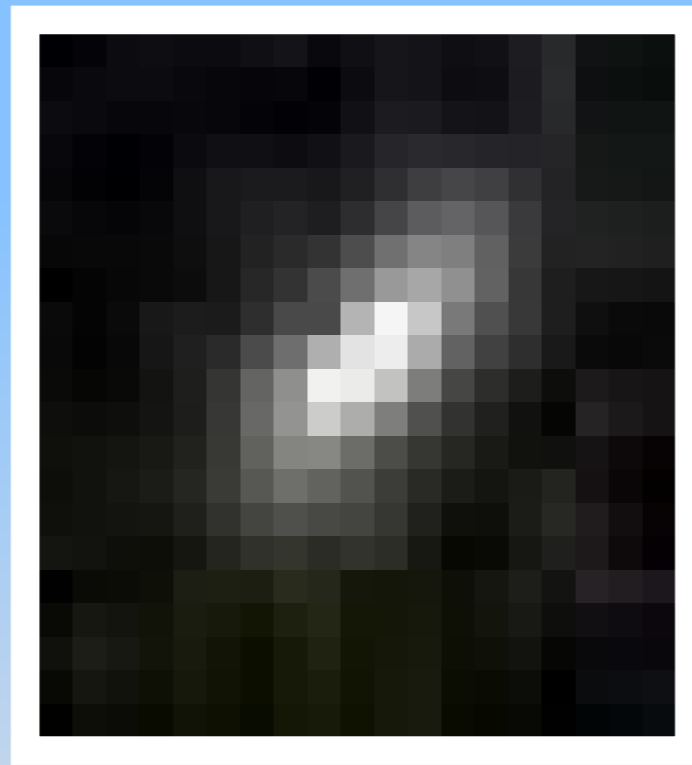
kapteyn astronomical
 institute



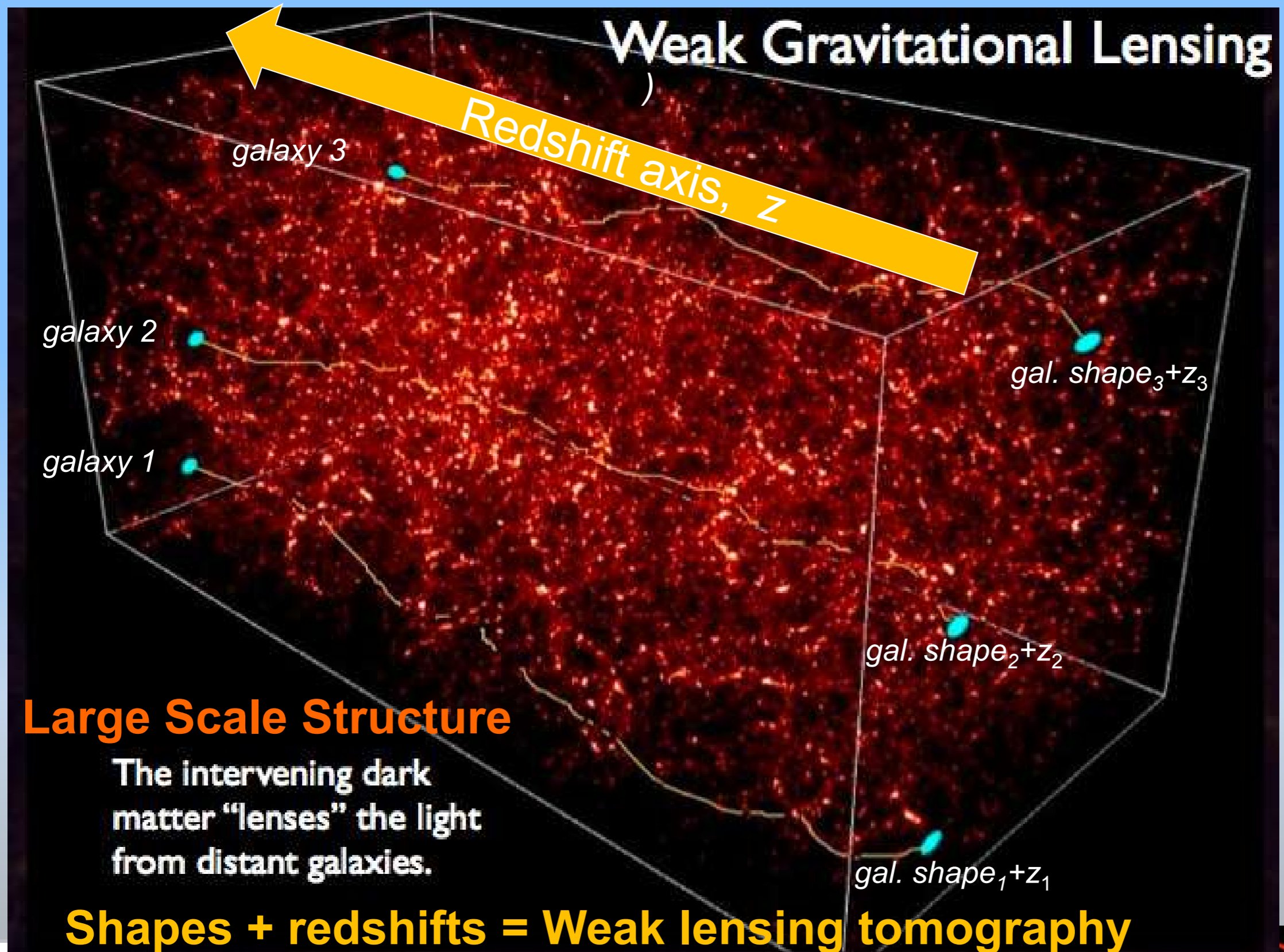
KiDS



Galaxy shapes



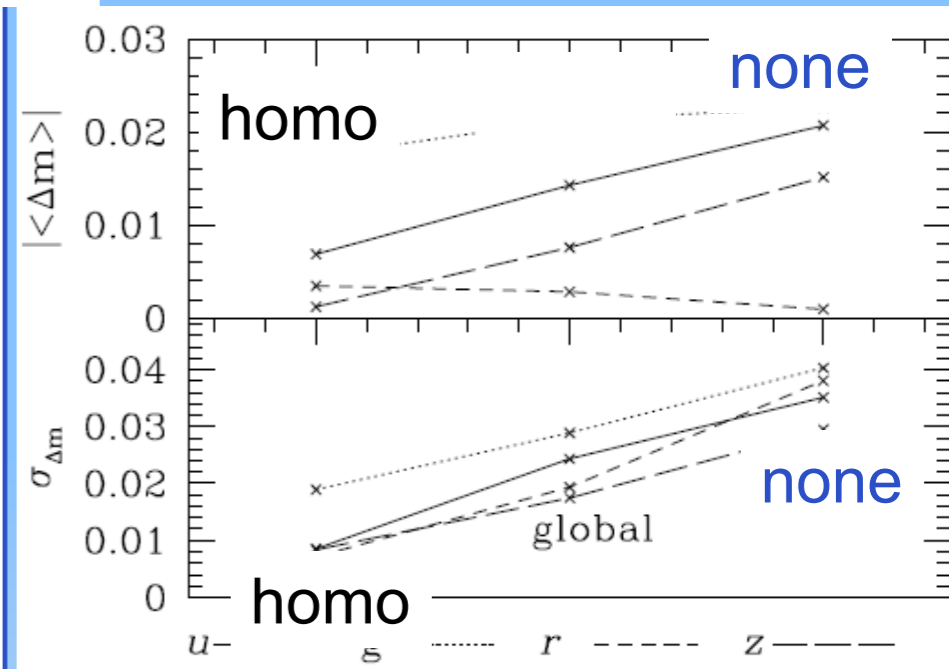
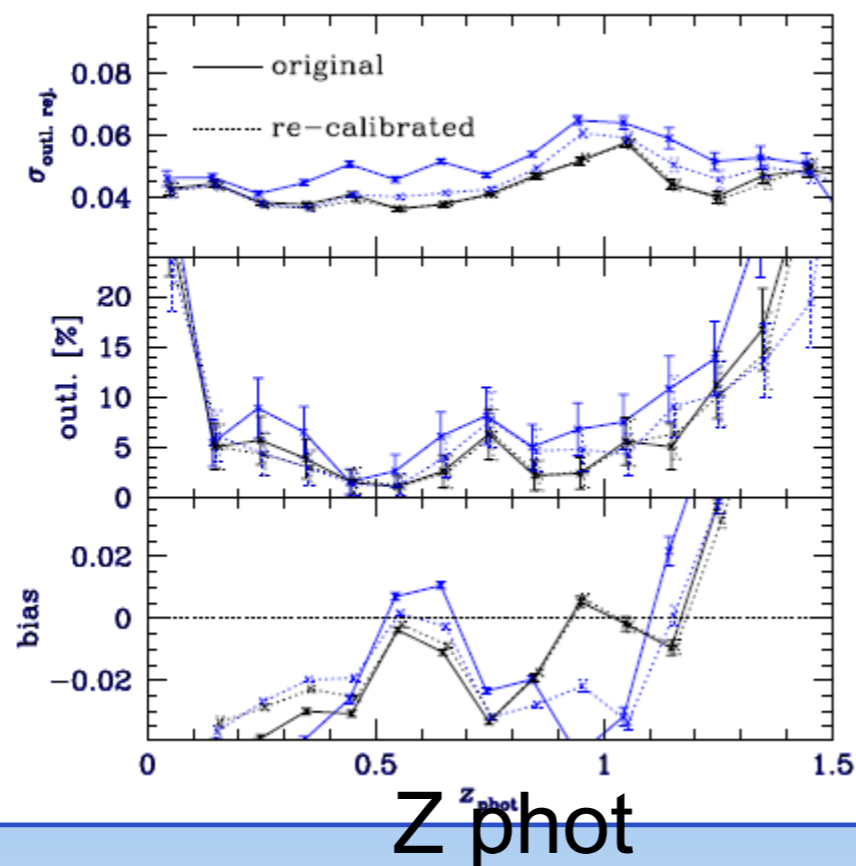
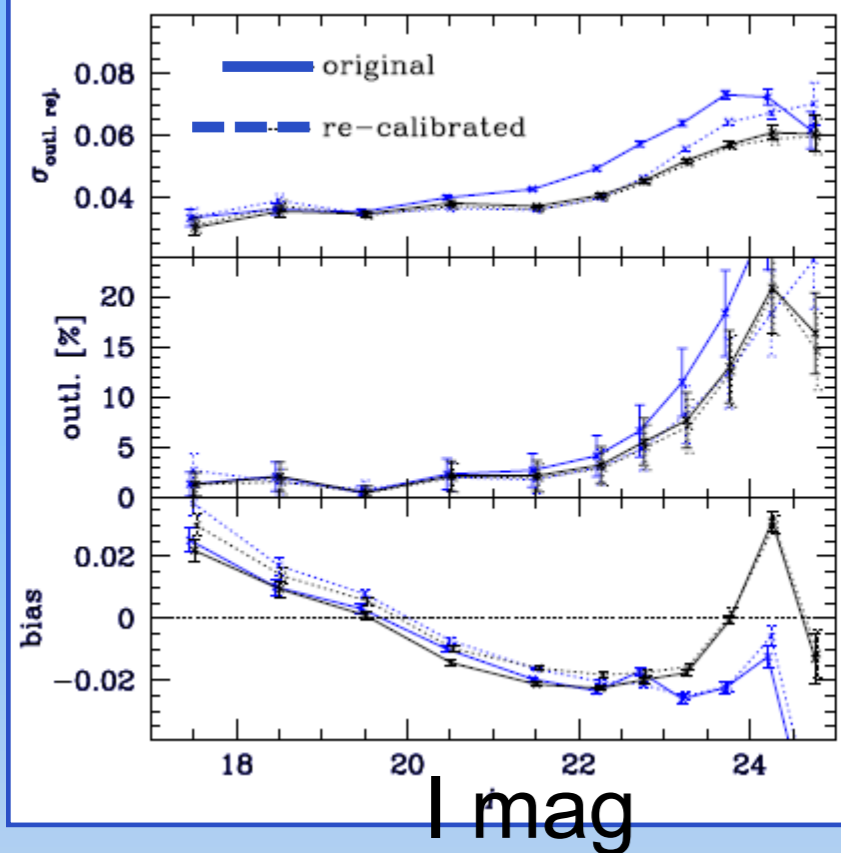
Dark Matter with KiDS in 3D



Why goal of 1%:

$\sigma(\text{phot. redshift}) - \sigma(\text{ZPT})$ “degeneracy”

---- = Homogenized image quality vs --- = none



Hildebrandt, Erben, Kuijken et al., 2012

Goal: 1% survey photometry



camera



telescope



atmosphere



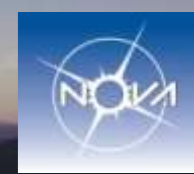
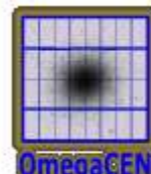
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faculty of mathematics
and natural sciences

kapteyn astronomical
institute

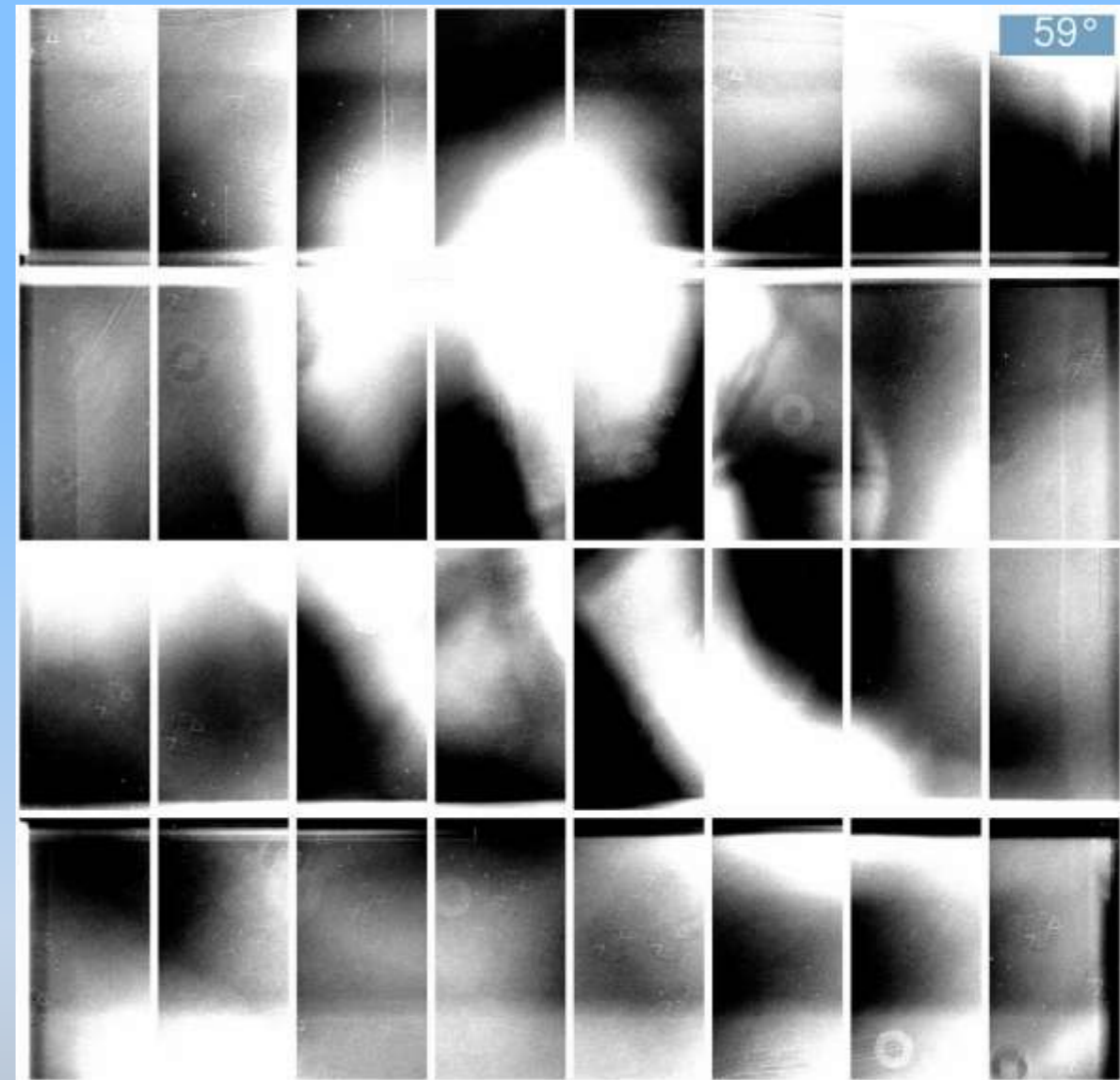


KIDS



Photometric homogenization single-coadd

- Stray light & vignetting
 - twilights
- CCD-to-CCD gain variations (vs time)

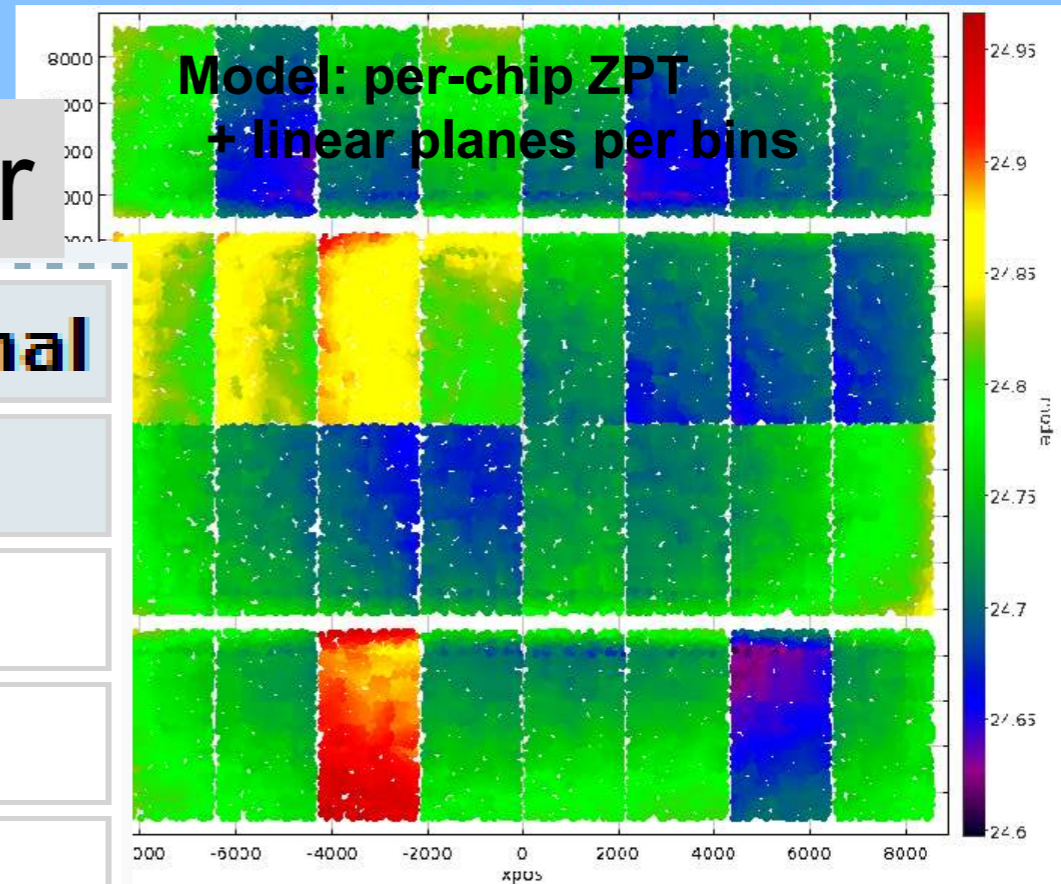


Twilight Sloan g vs rotator
angle camera-telescope

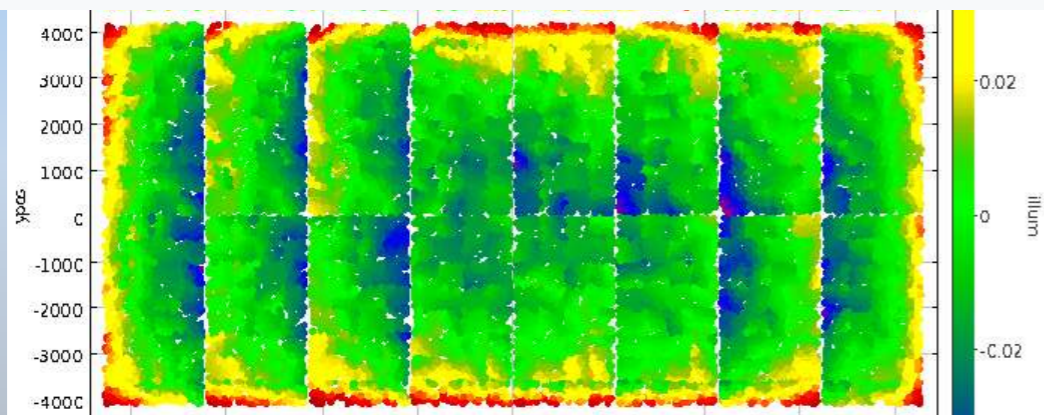
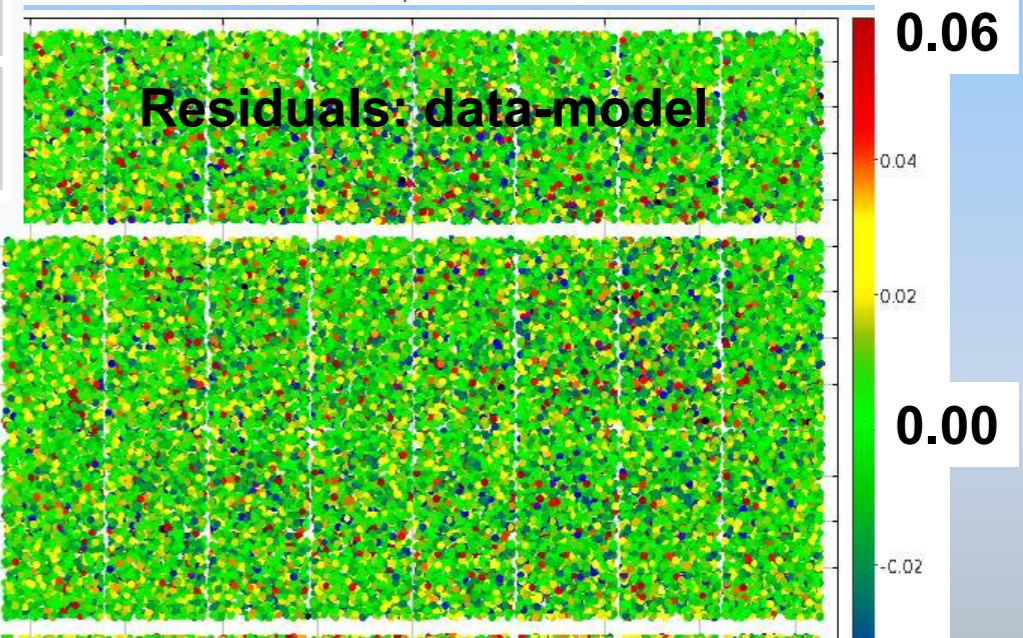
Coadd internal homogenization (r)



Residuals after illu-corr



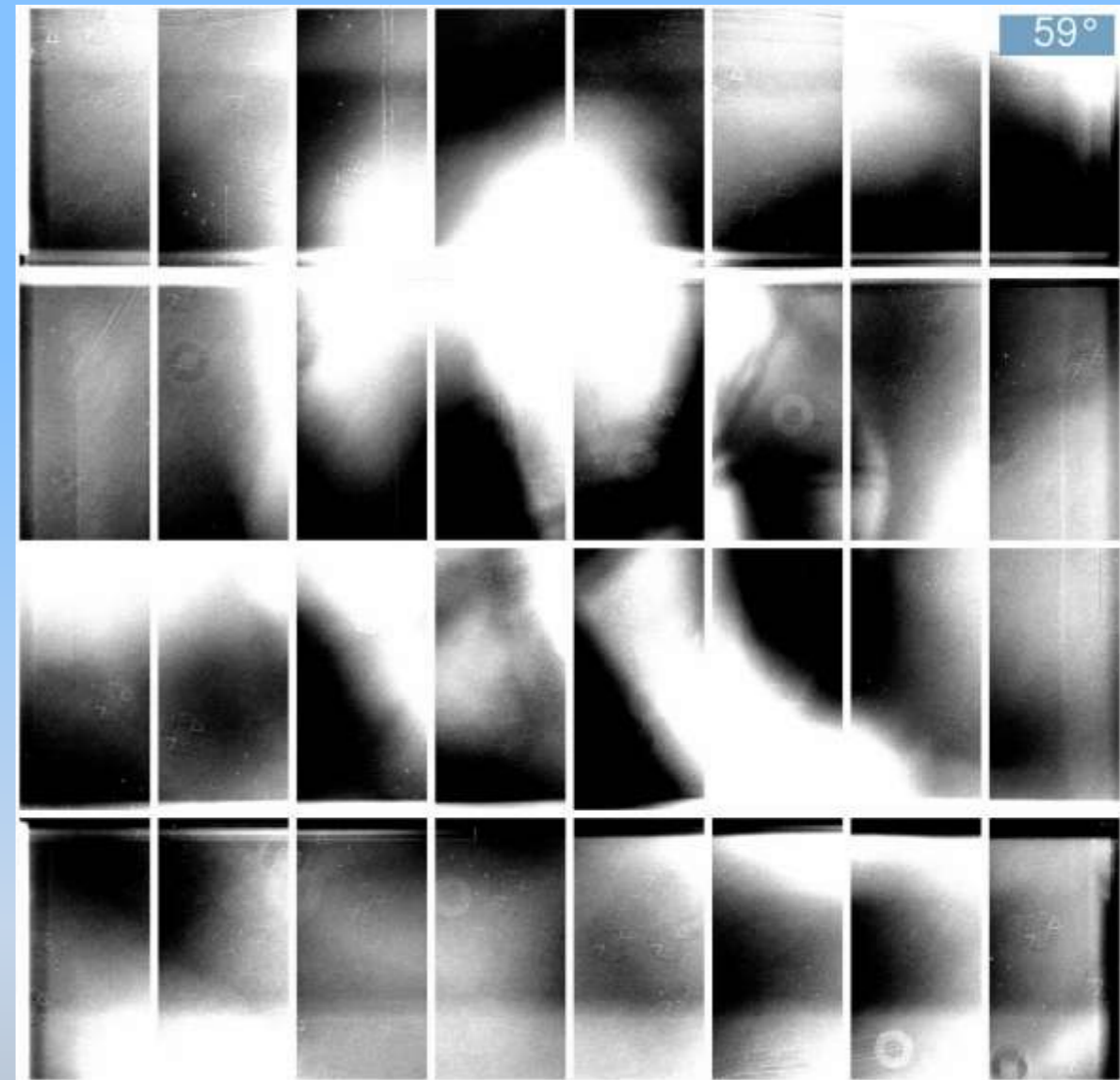
filter	rms internal (mag)	rms external (mag)
u	0.016	0.027
g	0.010	0.020
r	0.009	0.020
i	0.011	0.020



VST-TRE-OCM-23100-3608, also at wiki.astro-wise.org/projects/omegacam/portal/illuminationcorrection

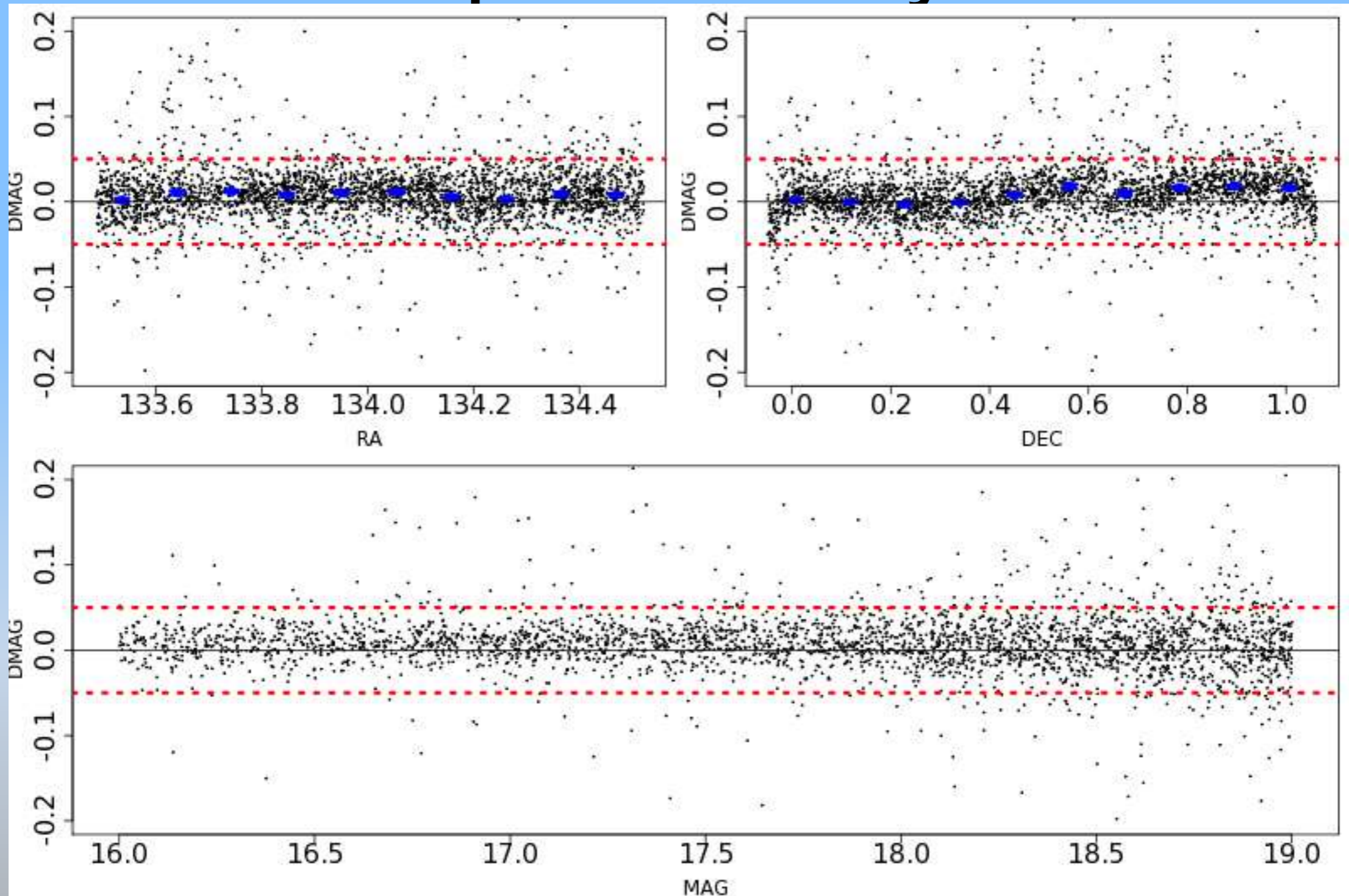
Photometric homogenization single-coadd

- Stray light & vignetting
 - Corrected flatfields to 1% (gri) and 1.5% (u) accuracy over full FoV



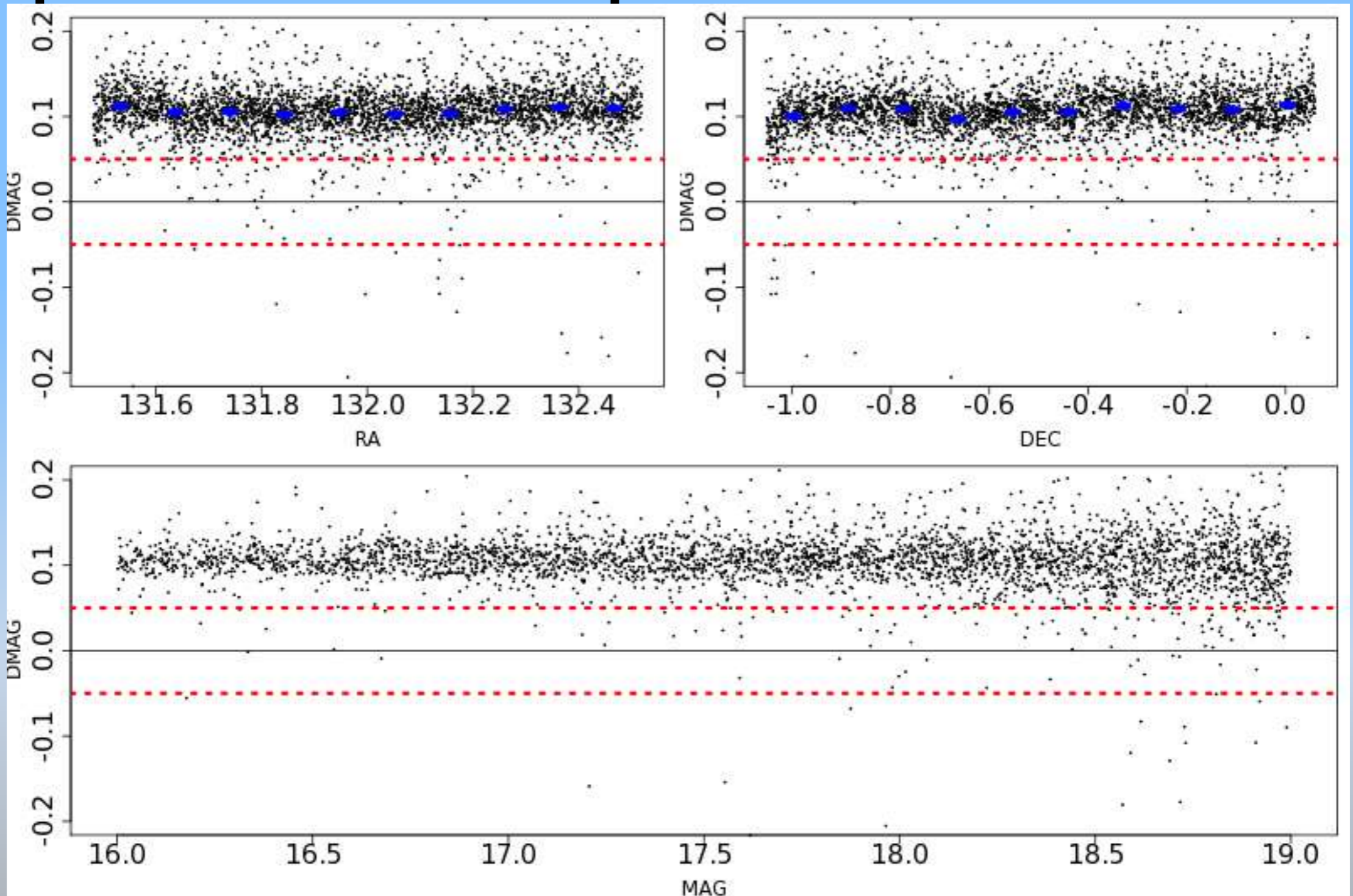
Twilight Sloan g vs rotator
angle camera-telescope

KIDS – SDSS DR8 single-coadd i-photometry

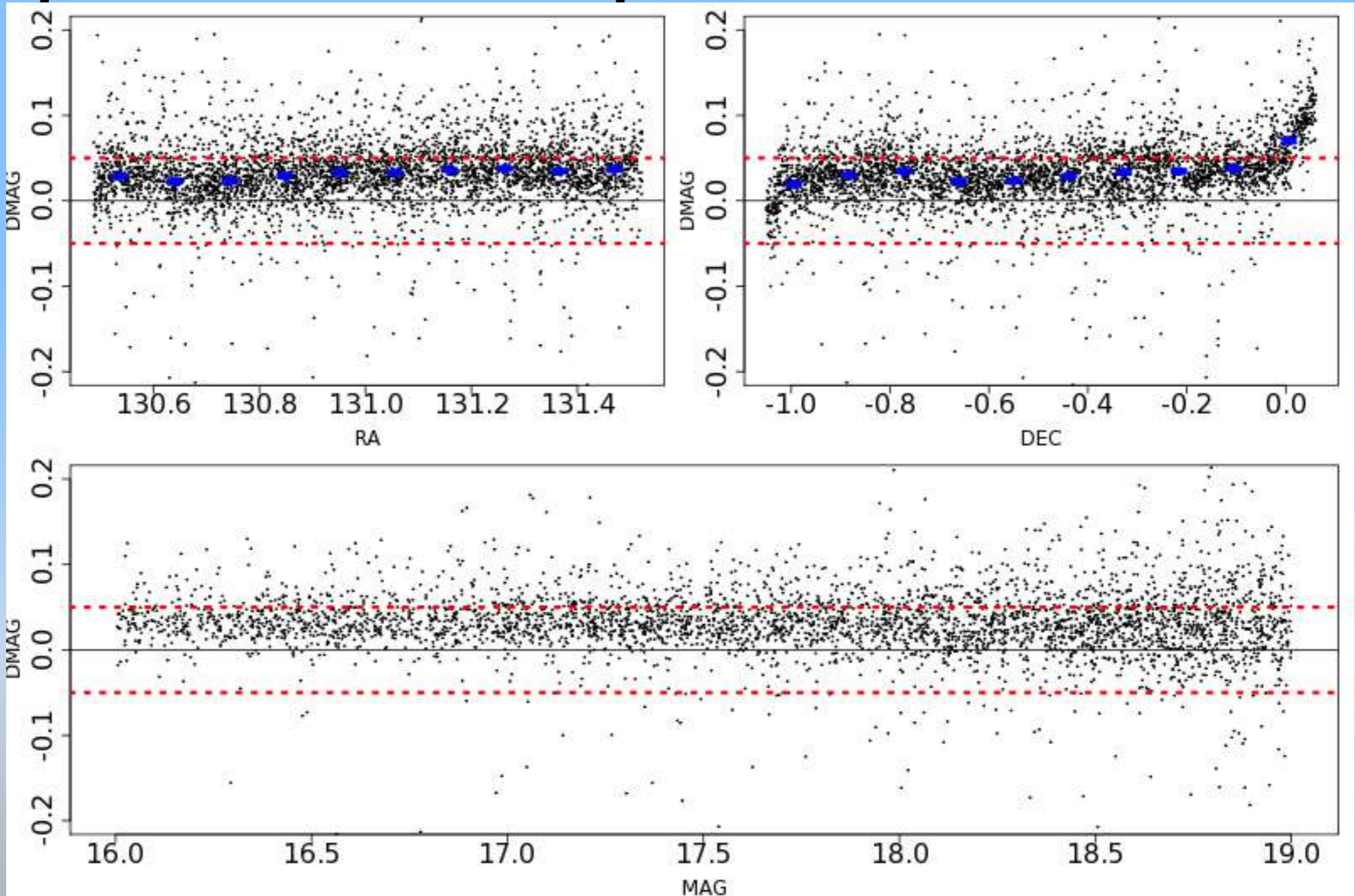


No SDSS-OCAM color terms applied yet

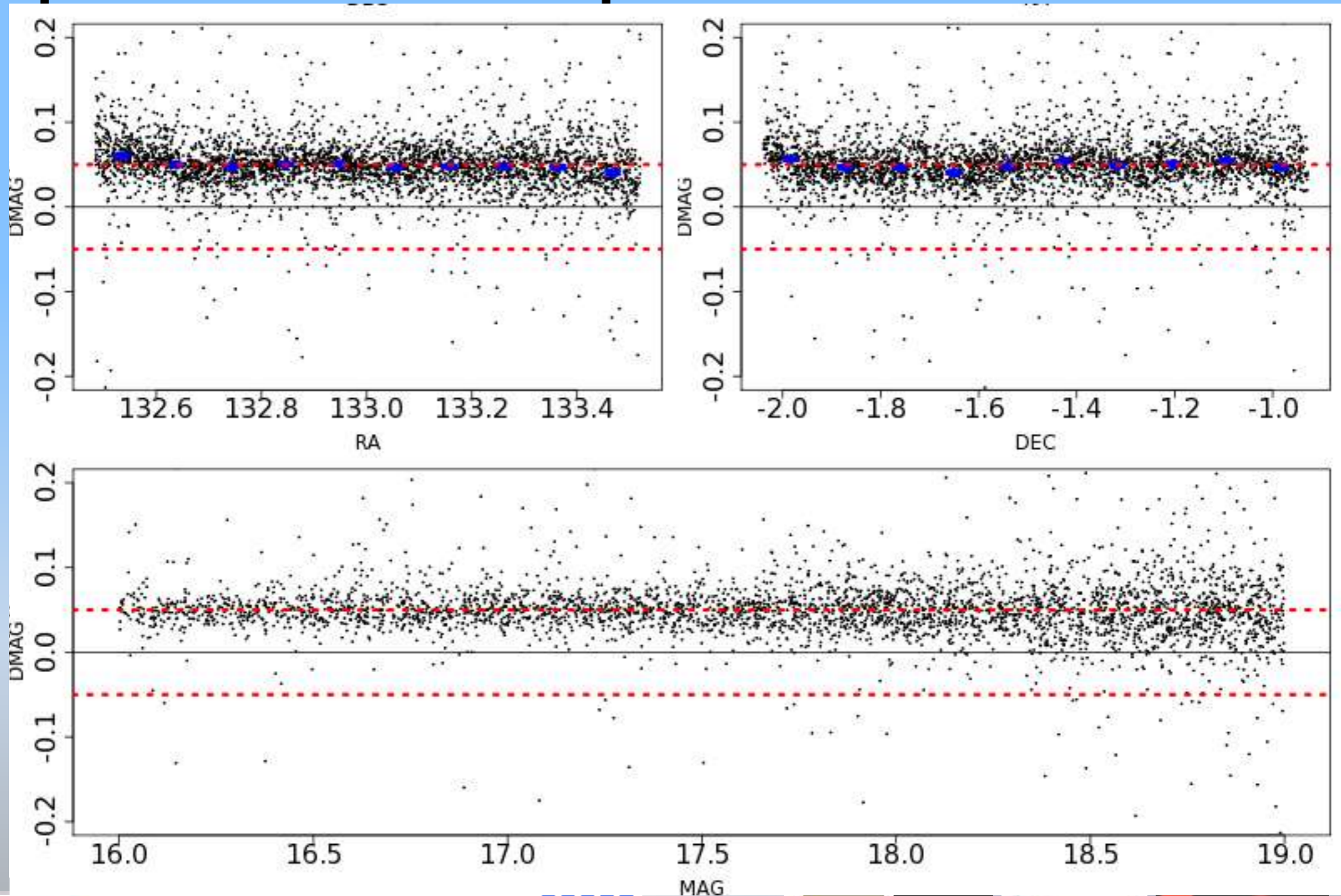
KiDS – SDSS DR8 single-coadd i-photom: non-photometric atmos



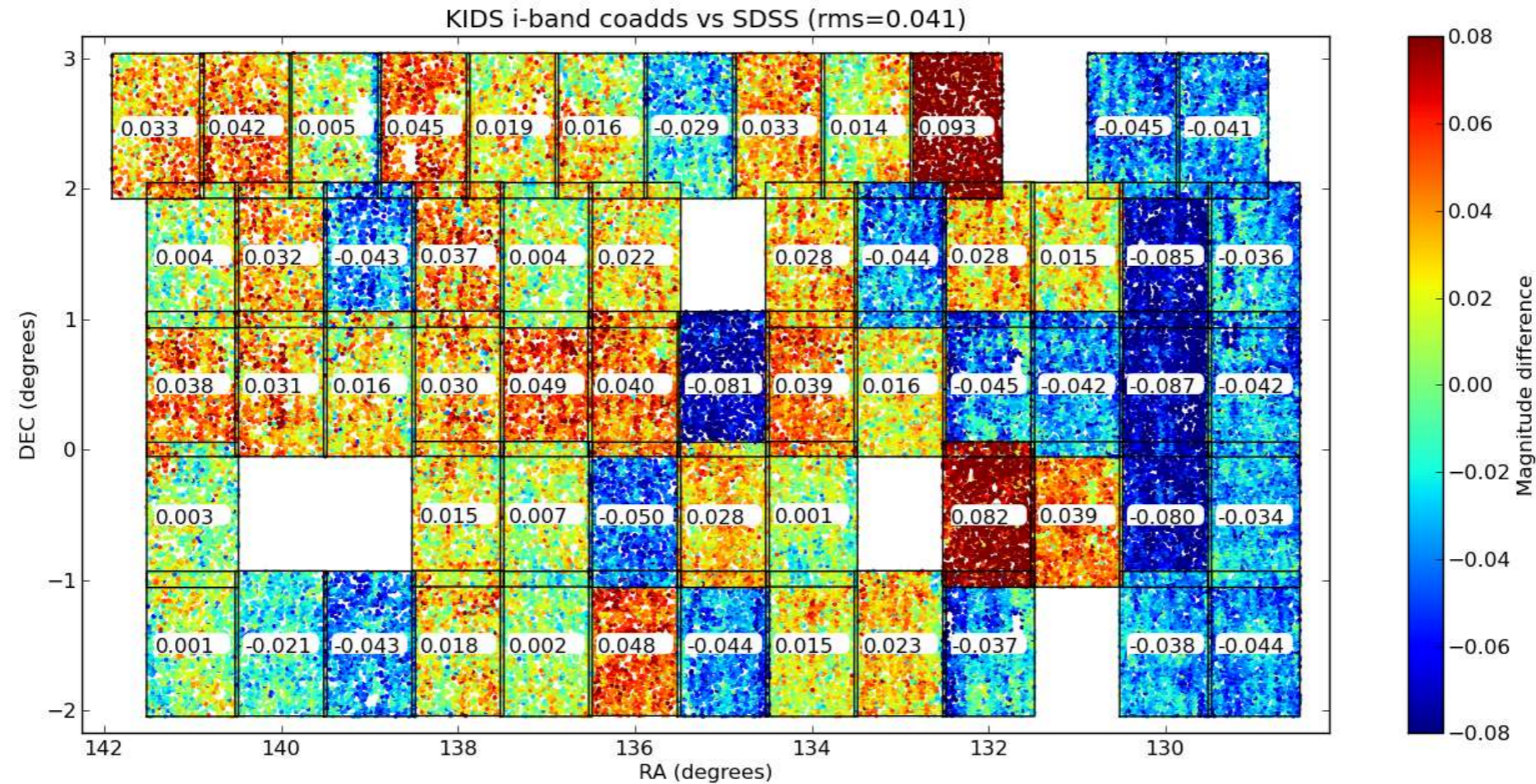
KIDS – SDSS DR8 single coadd i-photom: non-photometric atmos



KiDS – SDSS DR8 single-coadd i-photom: non-photometric atmos

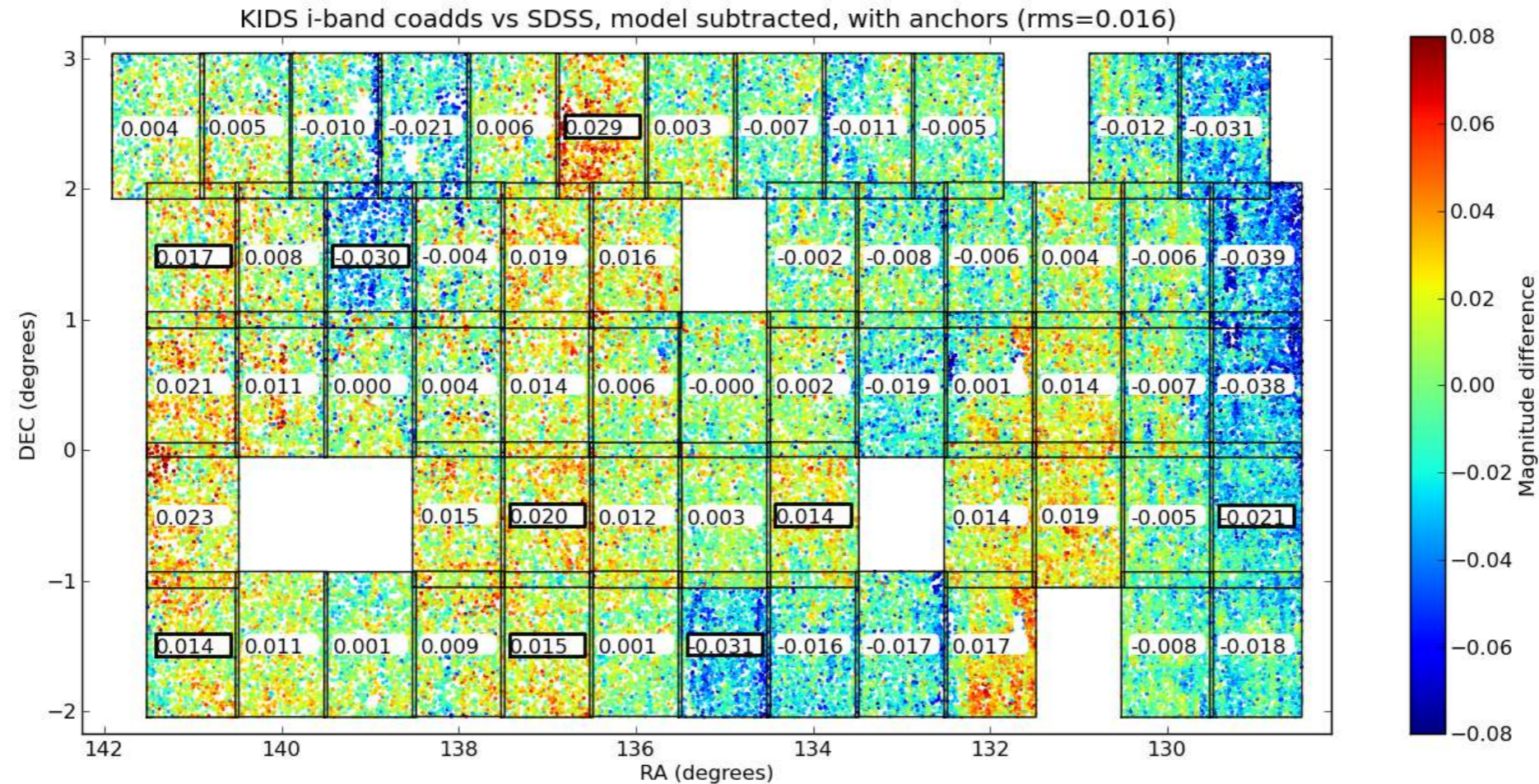


Survey photometric homogenization multiple coadds



Constraints	internal rms (mmag)	External (SDSS) std (mmag)
Nightly zeropoint-only	55	41

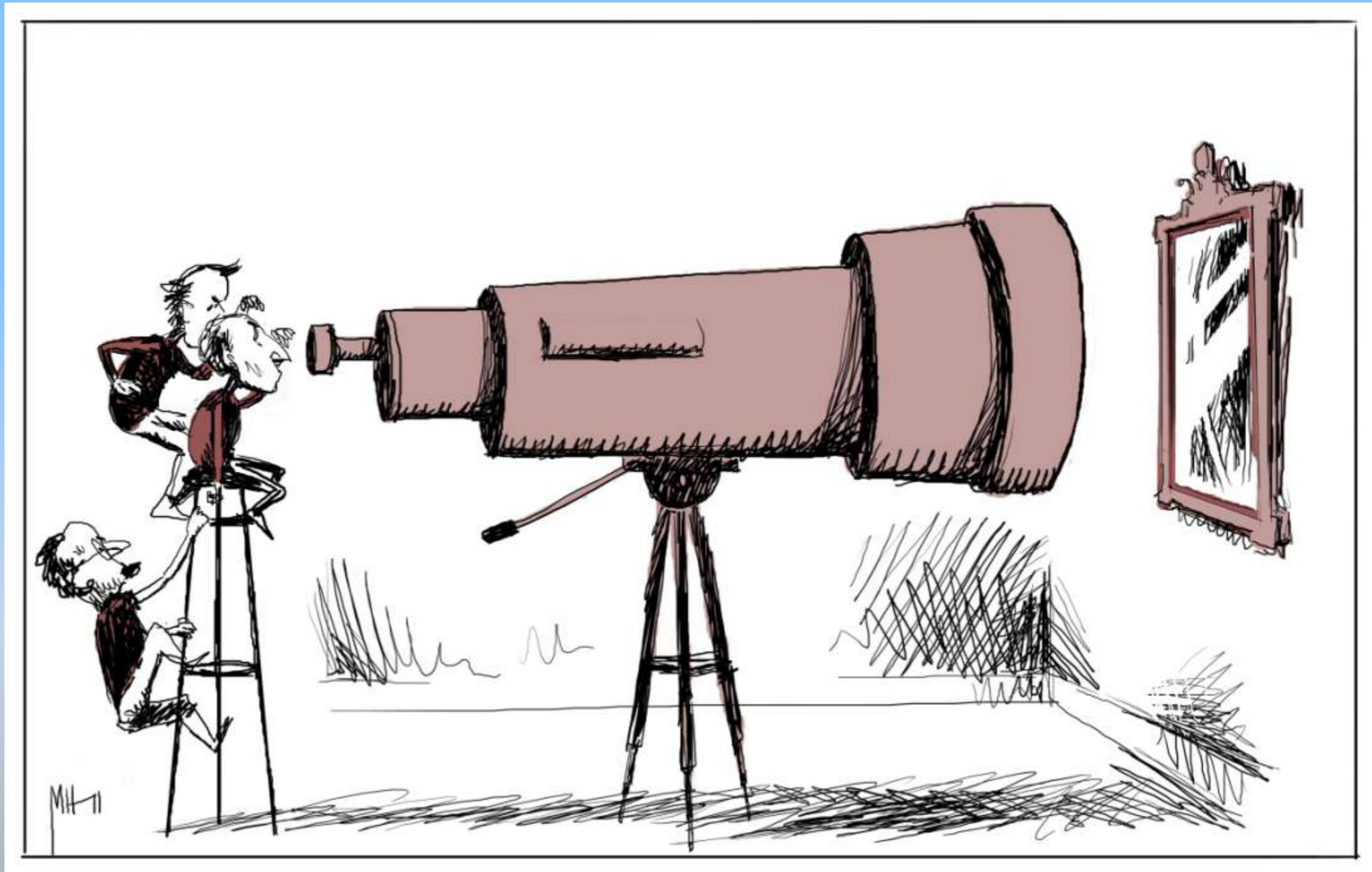
Survey photometric homogenization multiple coadds



Constraints	internal rms (mmag)	External (SDSS) std (mmag)
Nightly zeropoint-only	55	41
Overlaps + anchors	13	16

Internal calibration

Where next?



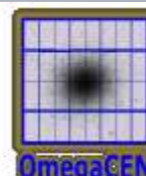
university of
 groningen

faculty of mathematics
 and natural sciences

kapteyn astronomical
 institute



KIDS



Exploit survey calibration plan!

Total objects 54770 (see in dbview)

Template - Filter > 01 Sep 2011 DataObs 14 Oct 2012 Total

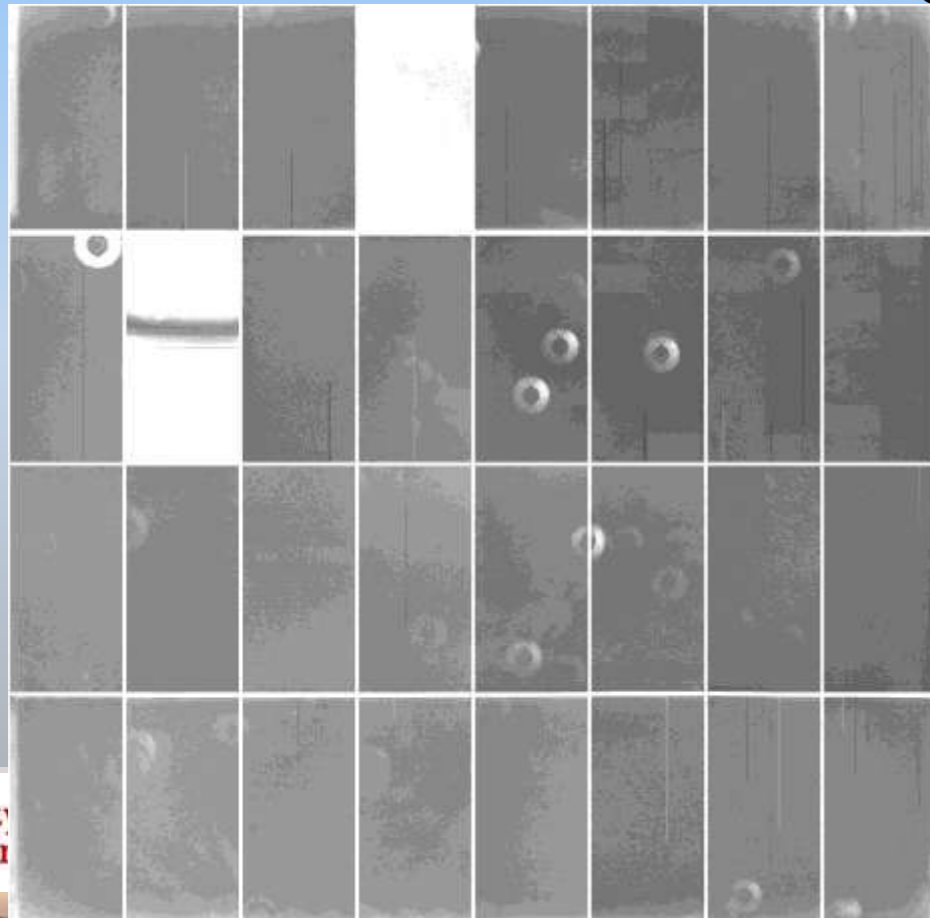
FLAT, DOME, SHUTTERTEST - OCA	4
FLAT, DOME, SHUTTERTEST - OCA	9
FLAT, SKY - OCAM B JOHN	167
FLAT, SKY - OCAM H ALPHA	43
FLAT, SKY - OCAM NB 659	184
FLAT, SKY - OCAM V JOHN	200
FLAT, SKY - OCAM g SDSS	467
FLAT, SKY - OCAM i SDSS	475
FLAT, SKY - OCAM r SDSS	456
FLAT, SKY - OCAM u SDSS	448
FLAT, SKY - OCAM u g r i SDSS	106
FLAT, SKY - OCAM v STRM	39
FLAT, SKY - OCAM z SDSS	515
OBJECT - OCAM B JOHN	307
OBJECT - OCAM NB 659	1701
OBJECT - OCAM V JOHN	2
OBJECT - OCAM g SDSS	4887
OBJECT - OCAM i SDSS	8982
OBJECT - OCAM r SDSS	6323
OBJECT - OCAM u SDSS	4299
OBJECT - OCAM u g r i SDSS	1
OBJECT - OCAM z SDSS	5474
OBJECT - opaque	1
STD, EXTINCTION - OCAM u g r	905
STD, ZEROPOINT - OCAM B JOHN	55
STD, ZEROPOINT - OCAM H ALPH	21
STD, ZEROPOINT - OCAM NB 659	123
STD, ZEROPOINT - OCAM V JOHN	51
STD, ZEROPOINT - OCAM g SDSS	710
STD, ZEROPOINT - OCAM i SDSS	672
STD, ZEROPOINT - OCAM r SDSS	721
STD, ZEROPOINT - OCAM u SDSS	729
STD, ZEROPOINT - OCAM u g r	49
STD, ZEROPOINT - OCAM v STRM	19
STD, ZEROPOINT - OCAM z SDSS	635

OCAM+VST monitoring: photom. calib unit 1 & 2

- 2 sets x 4 halogen
- Current stabilizer
- Fixed dome-screen near zenith

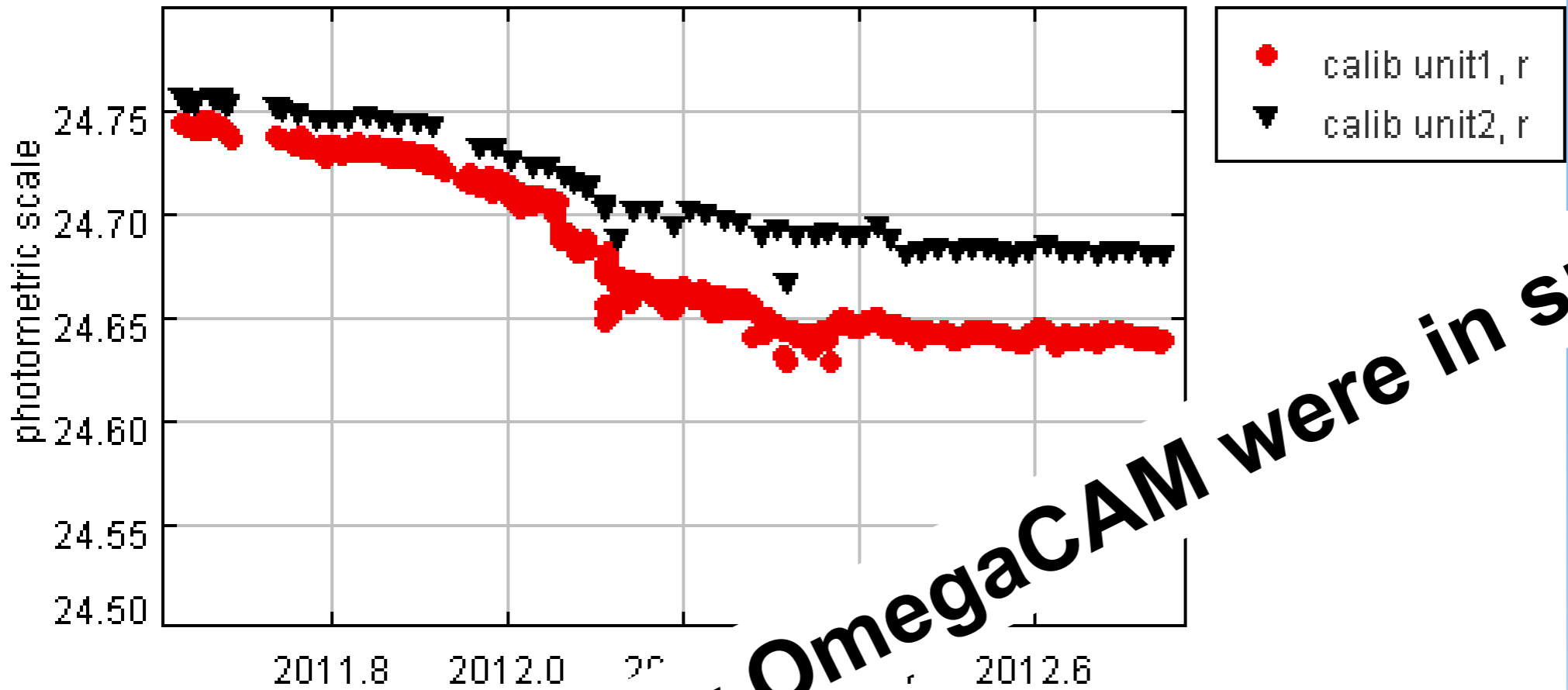
i' domeflats aug11 ->feb12
Stdev, i

Black->white= 1 -> 1.6mmag



Photom.scale: in-dome

Photometric monitoring

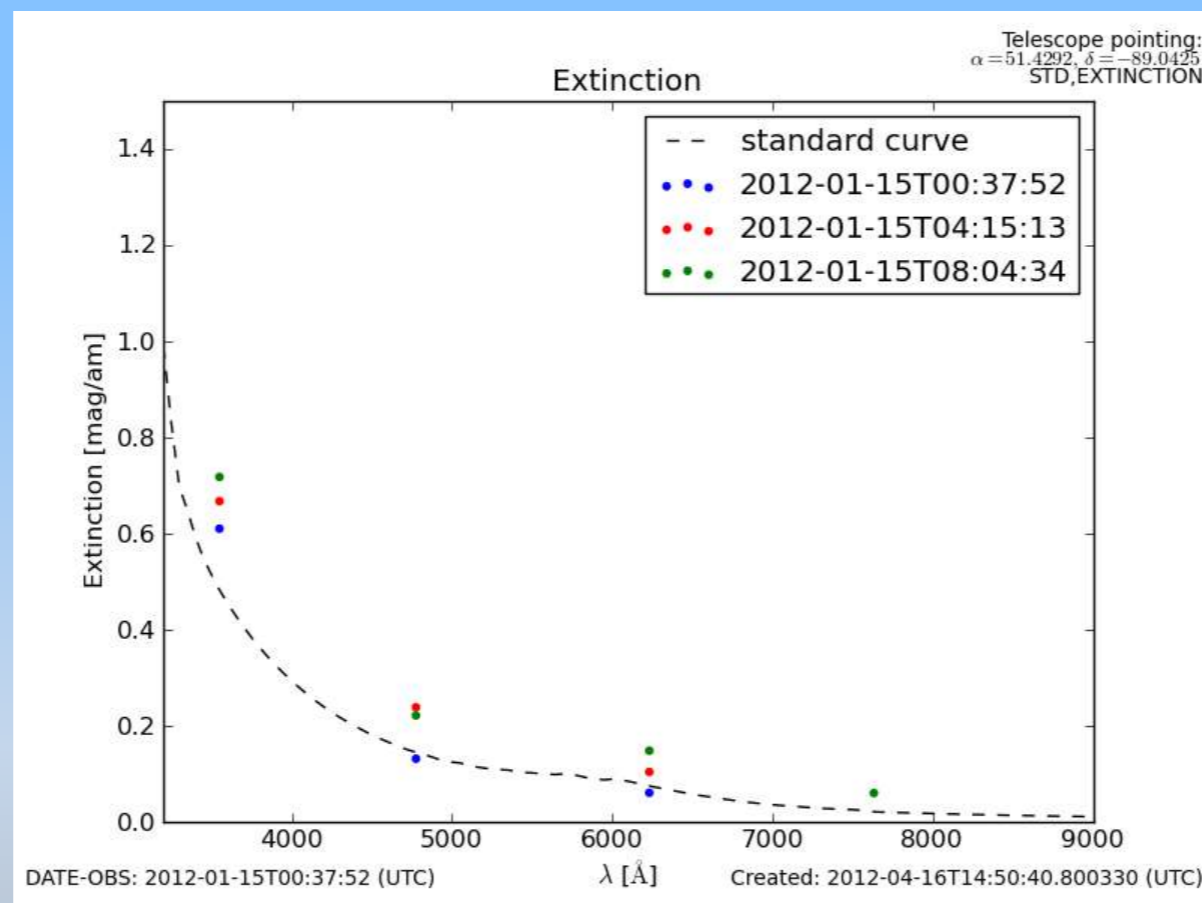


If only OmegaCAM were in space...

Observation target	Photometric measurement	Filter	Systematic std (mmag)	Measurement std (mmag)
Calib unit 1/2	OCAM+VST	r	(on trend) 1.8/1.3	<<1
Overlap	OCAM+VST+ATMOS	i	(total) 55.0	2

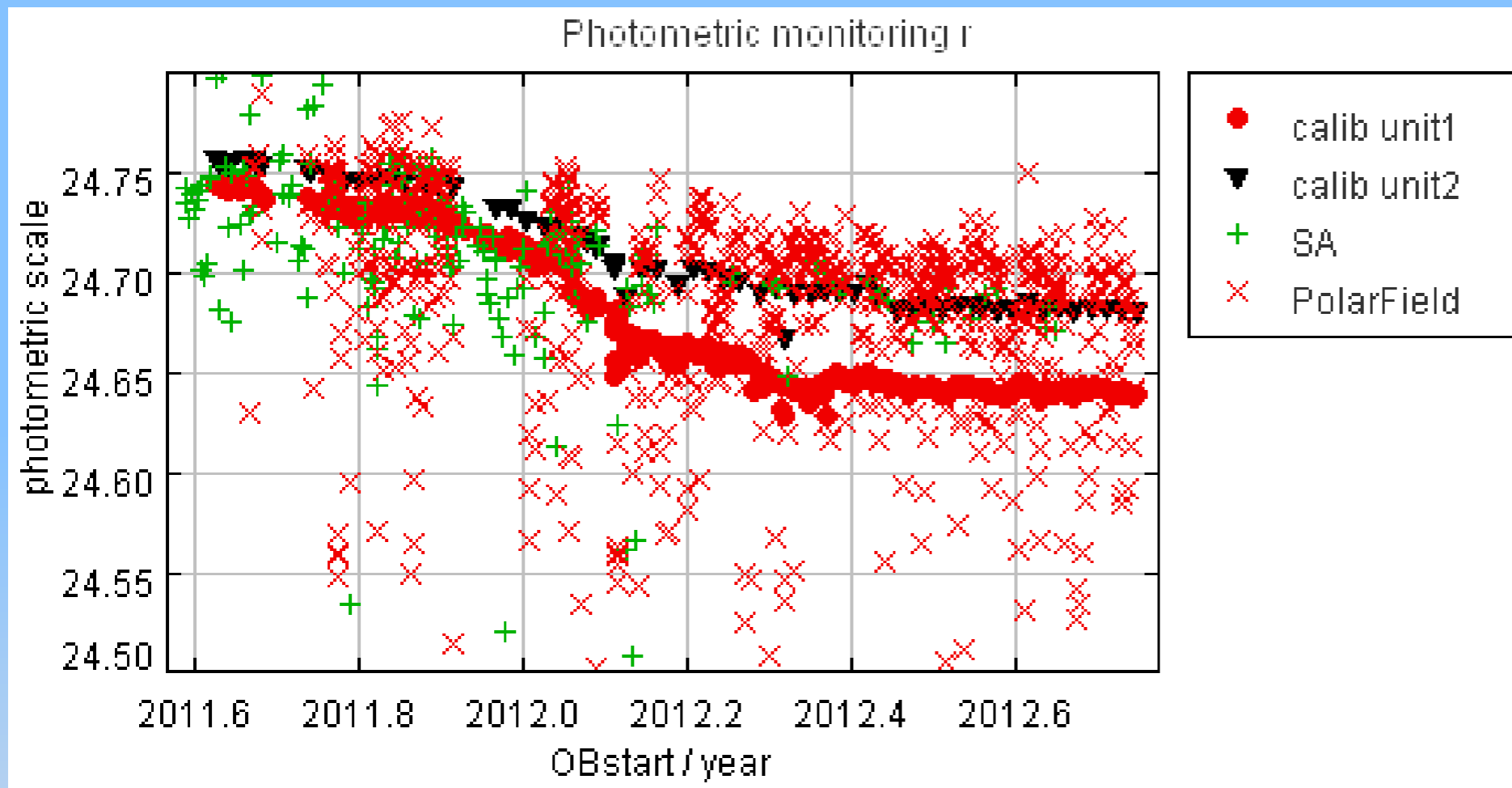
Extinction monitoring: polar field

Coordinates	$\alpha = 51.429167, \delta = -89.0425$ (J2000)
Filter	4 quadrant glass filter: <i>u, g, r</i> , and <i>i</i>
Exposure time	100s
Airmass	2.3-2.5
Magnitude limit	<i>u, g, r, i</i> , 17, 19, 19, 19



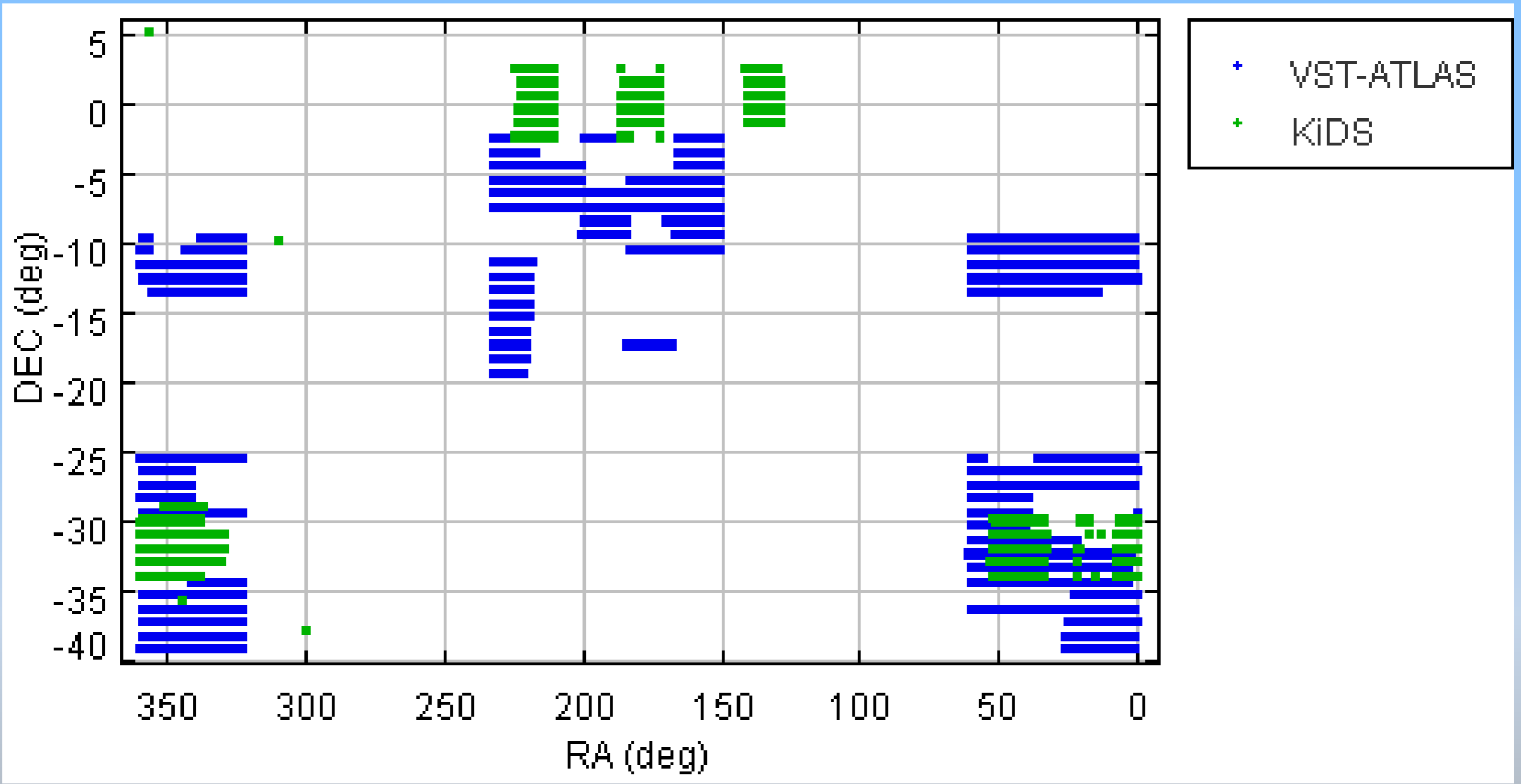
3x nightly observed:
connecting all nights photometrically

Photom.scale: in-dome + on-sky

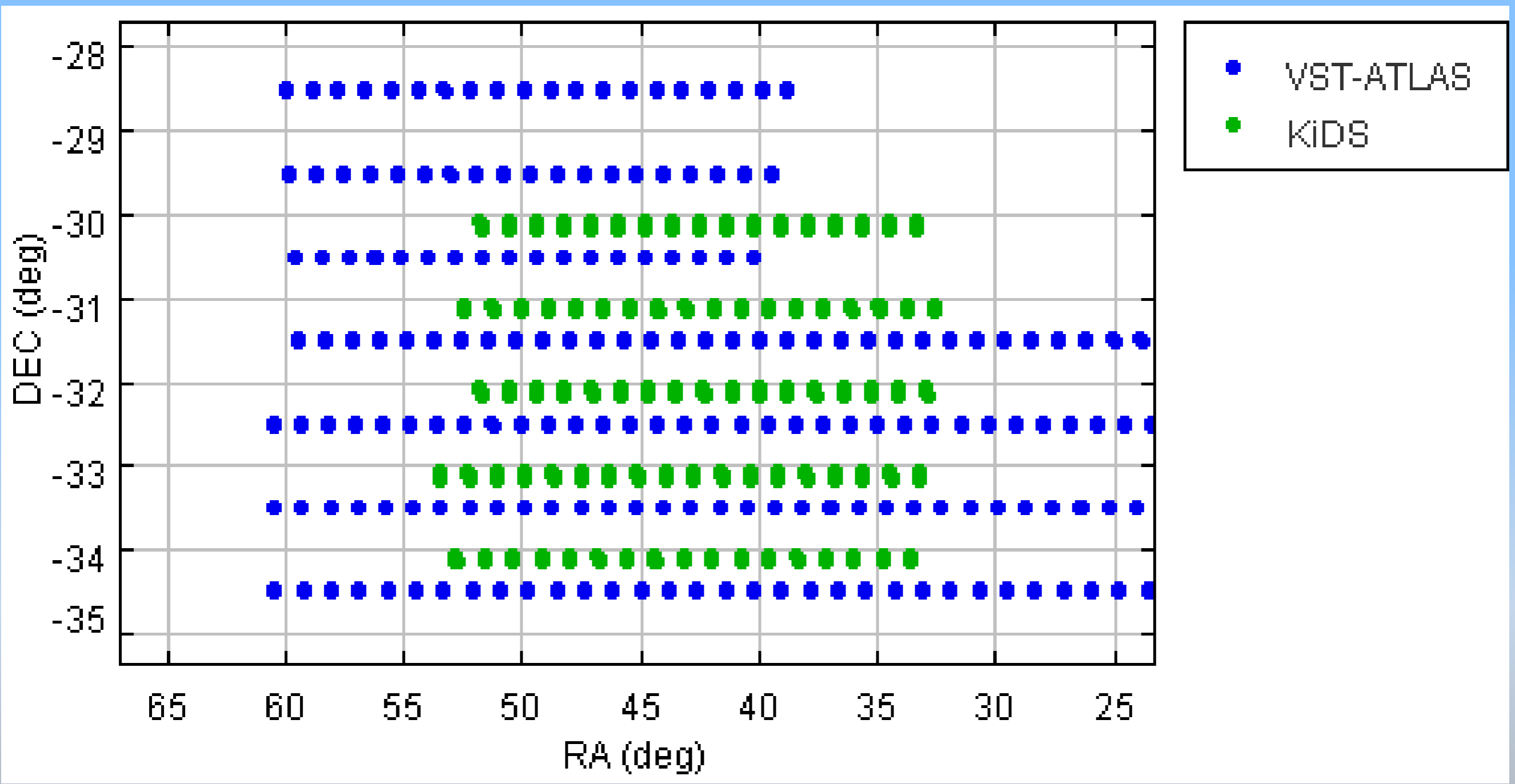


Observation target	Photom. measure	Filter	Systematic std (mmag)	Measurement std (mmag)
Calib unit 1/2	OCAM+VST	r	(on trend) 1.8/1.3	<<1
SA	OCAM+VST+ATMOS	r	(on trend) ~30.0	~5
Polar Field	OCAM+VST+ATMOS	r	(on trend) ~30.0	~4 (eventually)
Overlap	OCAM+VST+ATMOS	i	(total) 55.0	2

VST-ATLAS and KiDS, i



VST-ATLAS and KiDS, i



Conclusions

- KiDS: achieving unique combination of (image quality + depth + area)
 - Fierce competition: survey speed = crucial
- 1(gri)-1.5% (u) single coadd photometric homogeneity
- 2% survey photometry nightly SA + overlap-only: 2%
- On track for 1%
 - exploit OmegaCAM's survey Calib. Plan
 - VST-ATLAS overlap

KiDS Publications

Topic	Authors	Publication
 OmegaCAM imager	Kuijken etal.	2011, Messenger, Vol. 146
 Astro-WISE for KiDS production and QC	Verdoes Kleijn etal.	2011, astro-ph/1112.0886
 Astro-WISE Survey Pipeline	McFarland etal.	2011, astro-ph/1110.2509
 The Kilo-Degree Survey	de Jong etal.	2012, astro-ph/1206.1254
Monitoring OmegaCAM photometry with Astro-WISE	Verdoes Kleijn etal.	2012, submitted
First QSO with KiDS+VIKING	Mwebaze etal.	2012, in prep.

arXiv.org Search Results



Astro-WISE Topical issue

[Back to Search form](#)

The URL for this search is http://arxiv.org/find/all/1/OR+au:Astro_WISE+all:+EXACT+Astro_WISE/0/1/0/all/0/1

Showing results 1 through 17 (of 17 total) for **(au:Astro_WISE OR all:"Astro WISE")**

1. [arXiv:1208.6299](#) [pdf, other]

The Data Zoo in Astro-WISE

[Gijs A. Verdoes Kleijn](#), [Andrey N. Belikov](#), [John P. McFarland](#)

Comments: Accepted for publication in topical issue of Experimental Astronomy on Astro-WISE information system

Subjects: **Instrumentation and Methods for Astrophysics (astro-ph.IM)**

2. [arXiv:1208.0447](#) [pdf, ps, other]

The Astro-WISE datacentric information system

[K. Begeman](#), [A. N. Belikov](#), [D. R. Boxhoorn](#), [E. A. Valentijn](#)

Comments: 21 pages, 6 figures, accepted by Experimental Astronomy for topical issue on Astro-WISE

Subjects: **Instrumentation and Methods for Astrophysics (astro-ph.IM)**



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 and na



KiDS

