Focus on OU-MER

Mario Nonino, Marco Castellano,
Emiliano Merlin, Erik Romelli
On behalf of the OU-MER team

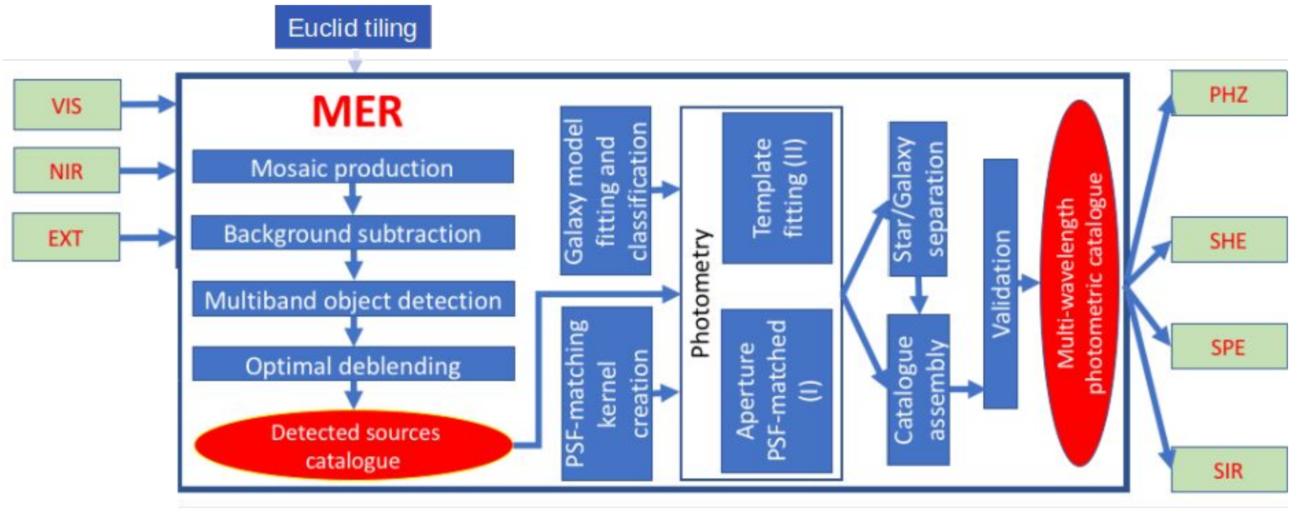
5° Meeting Nazionale Collaborazione Euclid
23-25 February 2022

OU-MER

*Euclid Organisation Unit which is in charge of the creation of the **official** source list:*

from images to catalogue

How is this accomplished? Quick visual summary (more details next talks):



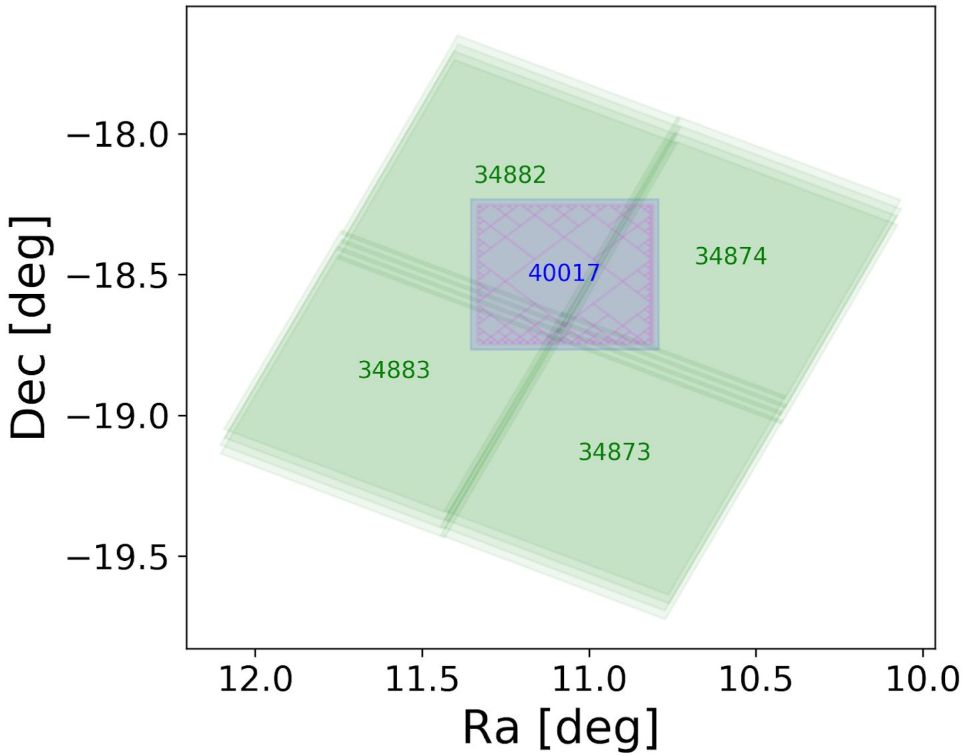
@ M. Castellano

Tiles are the basic blocks , both for Wide and Deep Surveys

* MER output (*including tiled input images)* is archived and delivered per tile.

* Downstream PF's (LE3, PHZ, SHE, SIR) get MER input per tile

Tile example



VIS (NIR) observations

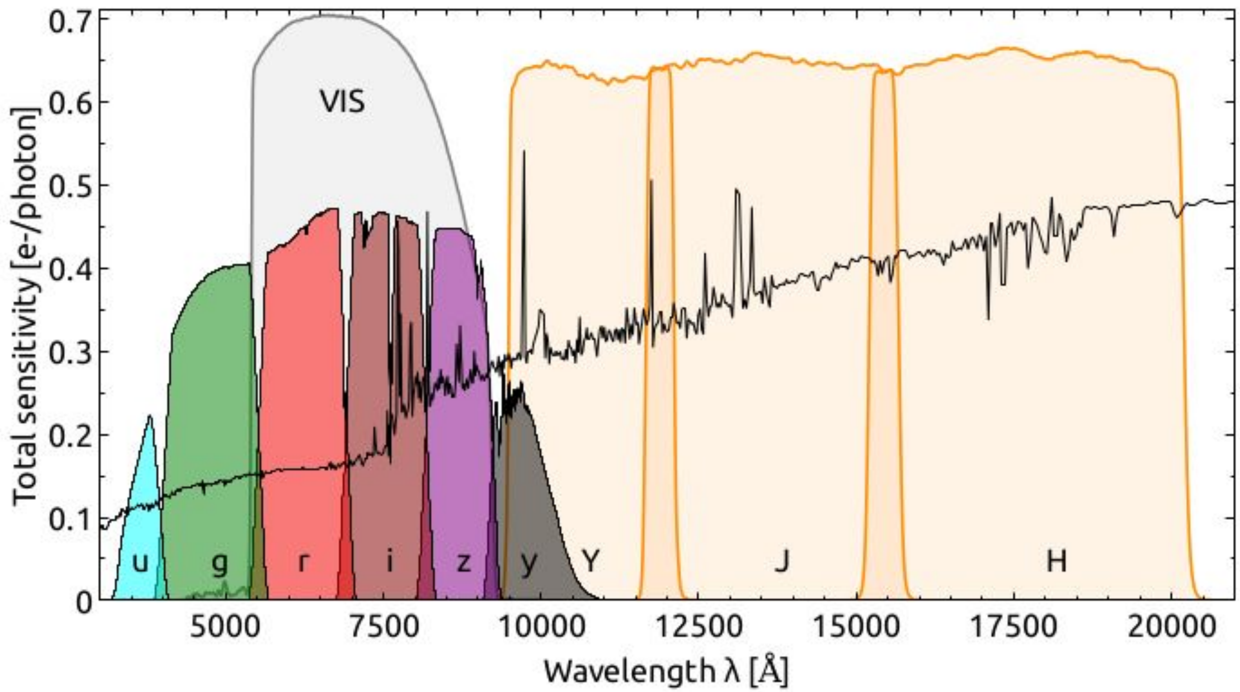
MER tile

Core area

Tiling schema: M.Kummel

Ext tiled on the very same footprint

.. from tile to catalogue



Estimate the fluxes (magnitudes) of all the detected objects in all bands.

OU-MER team and close collaborators

Mario Nonino, Hervé Dole, Martin Kuemmel, Mohammad Akhlaghi, Hubert Bretonniere, Remi Cabanac, Fernando Caro, Javier Gracia Carpio, Marco Castellano, Marc Dexet, Paola Dimauro, Yuedong Fang, Samuele Galeotta, Marc Huertas-Company, Loic Maurin, Emiliano Merlin, Erik Romelli, Elie Soubrié, Andrea Tramacere, Thomas Vassallo, Igor Zinchenko

.. OU-MER in depth

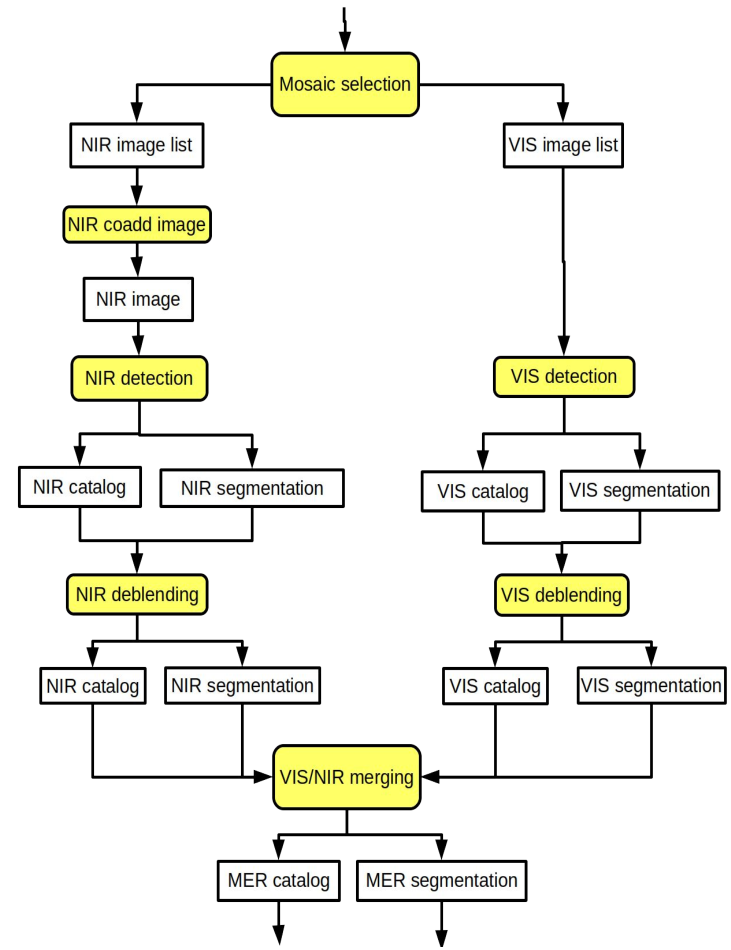
- *M. Castellano* => Detection & Deblending
- *E. Merlin* => Photometry
- *E. Romelli* => Catalogue

Q&A at the end of the 3 talks!

- Further informations on the MER PF and documentation:
- https://euclid.roe.ac.uk/projects/mer_pf/wiki/Wiki
- https://wiki.cosmos.esa.int/euclid/index.php/EC_SGS_OU_MER
- https://euclid.roe.ac.uk/projects/mer_pf/issues

Detection Requirements

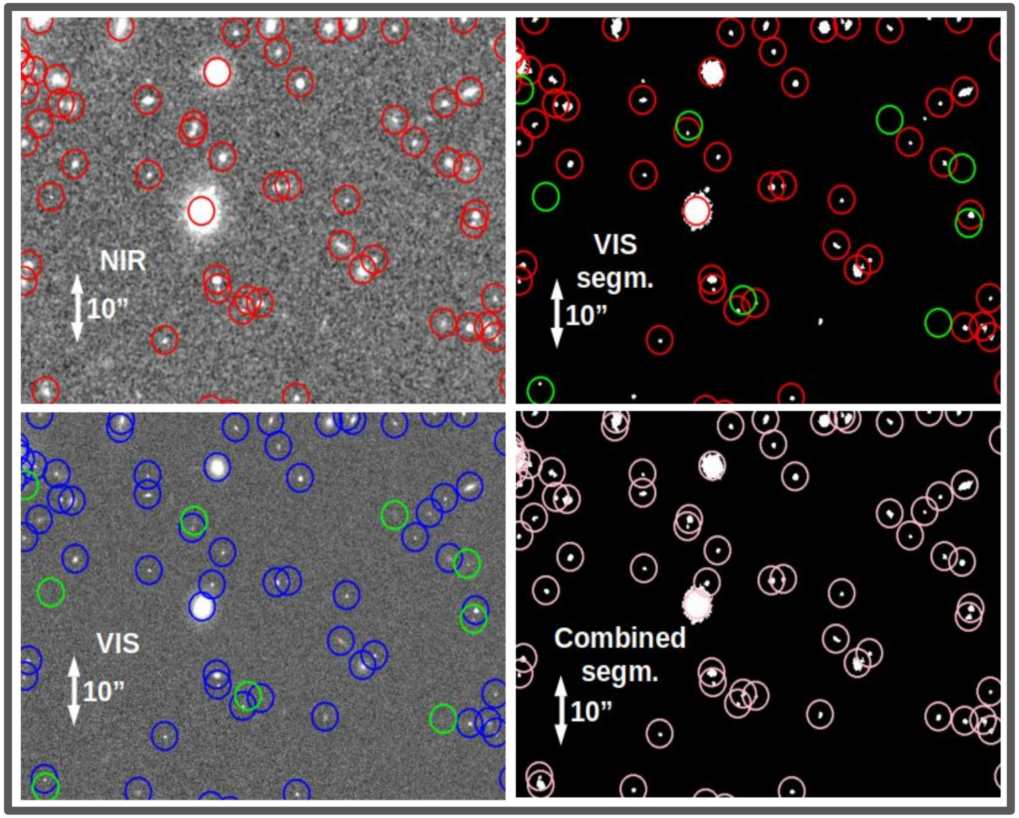
- Detection in VIS for shear measurement (SHE)
- SIR and PHZ need all objects -> need **all** N-IR objects
- Detection on one image (VIS + Y/J/H coadd or chi-square) excluded due to selection effects for weak lensing
- Solution:
  - Independent detection on VIS;
  - Independent detection on NIR (Y+J+H)
  - Merging VIS and NIR sources into single list



M. Kuemmel

Combining VIS and NIR sources

NIR detection image with NIR objects.



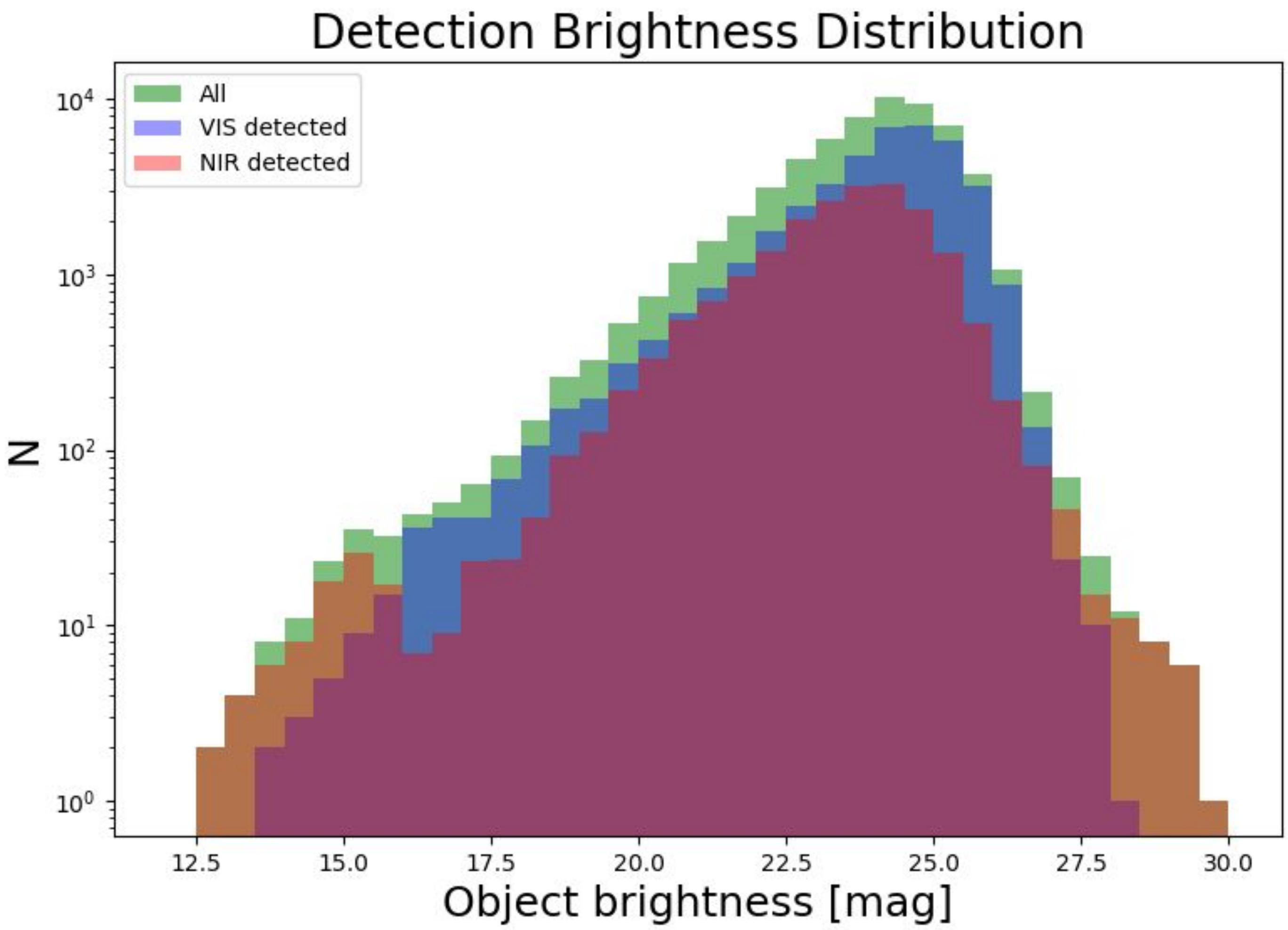
VIS segmentation image with the projected NIR object positions and the identified NIR-only objects

VIS image with the VIS detected objects and the NIR-only objects

Combined, final segmentation image with the combined objects

M. Kuemmel

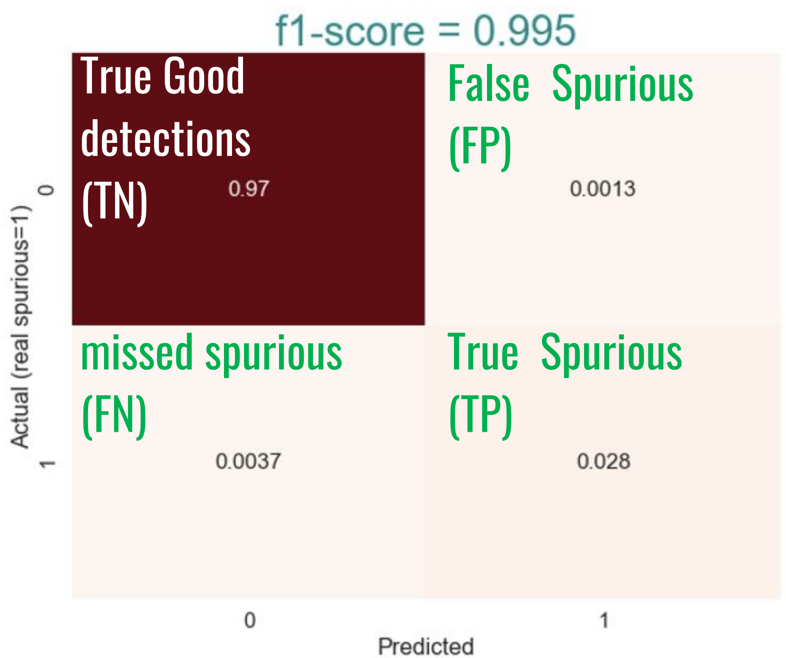
Combining VIS and NIR sources

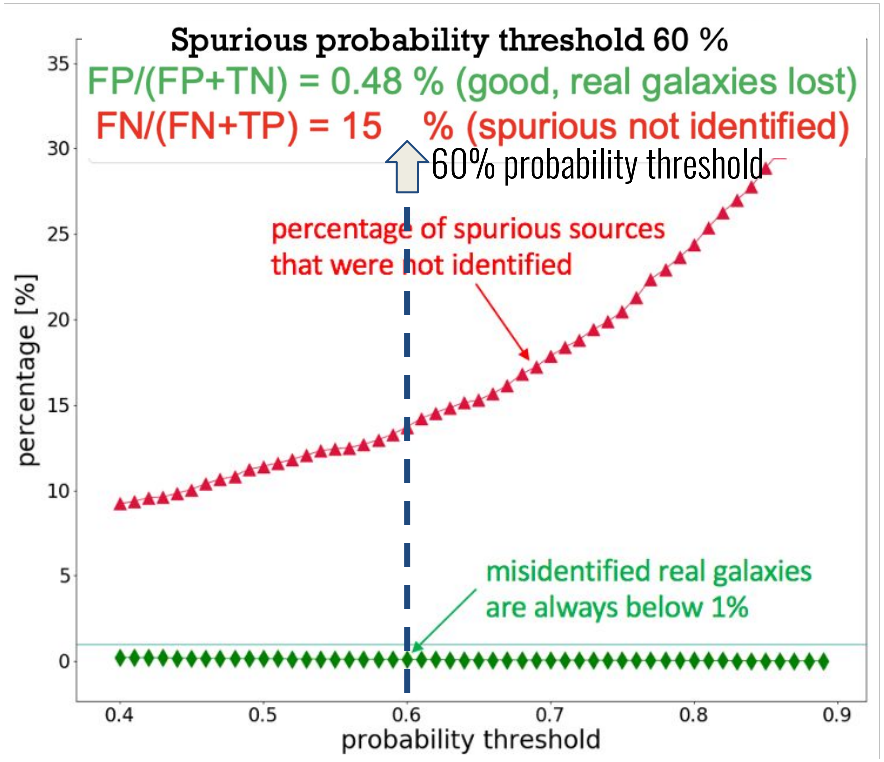


M. Kuemmel

Flagging spurious detections with AI

- ★ Random Forest Classifier : training with 500k objects from 8 SC8 tiles
- ★ using the OU-MER photometric catalog, a **spurious probability** is assigned to each detected source
- ★ 4% of detected sources are spurious (i.e., not real), of which up to 90% can be identified and removed
- ★ Spurious sources are faint isolated objects or fake detection associated with diffraction spikes of bright stars



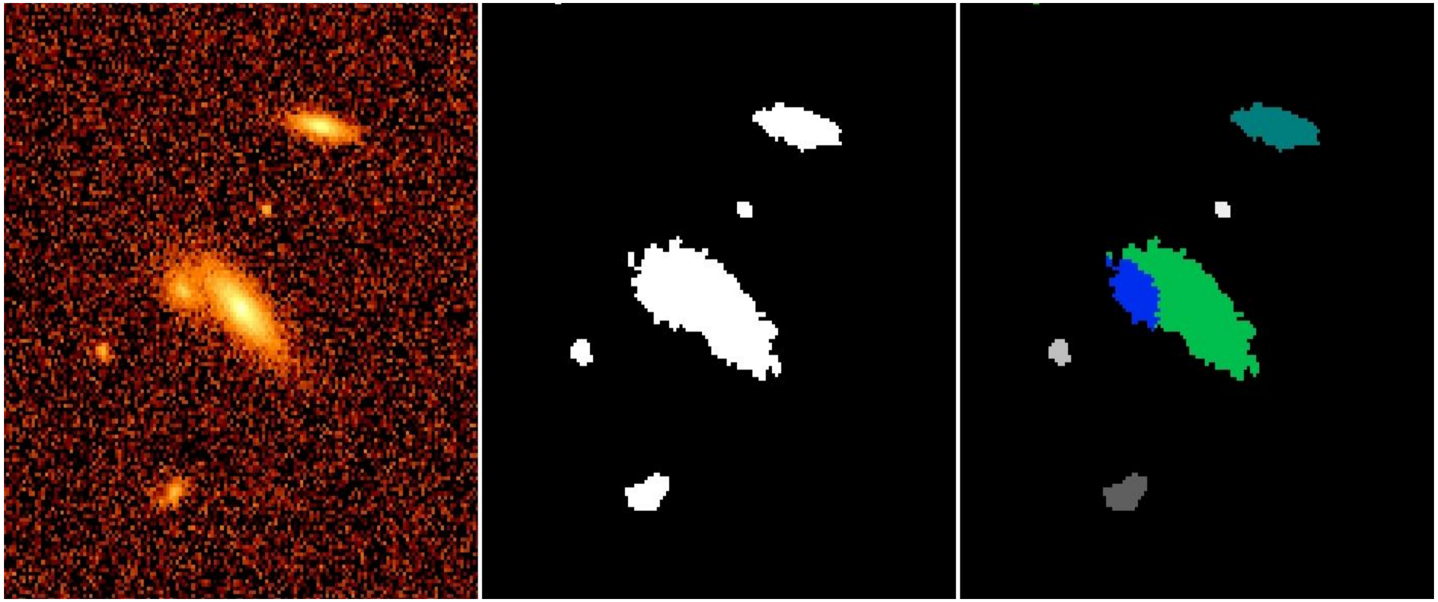


A.Calabrò, M.Castellano, E.Merlin

Detection and deblending

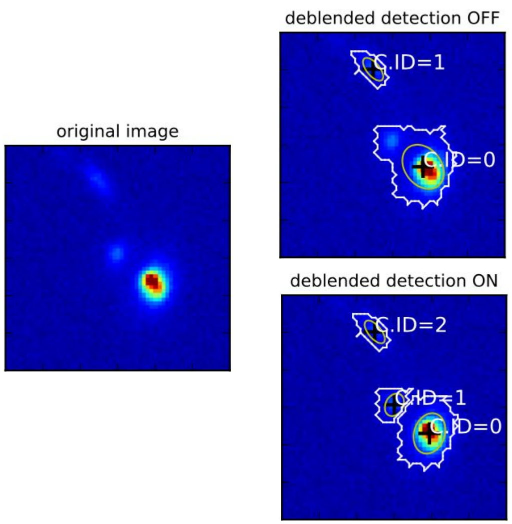
Deblending is the process of separating blended objects to recover the correct flux from each object

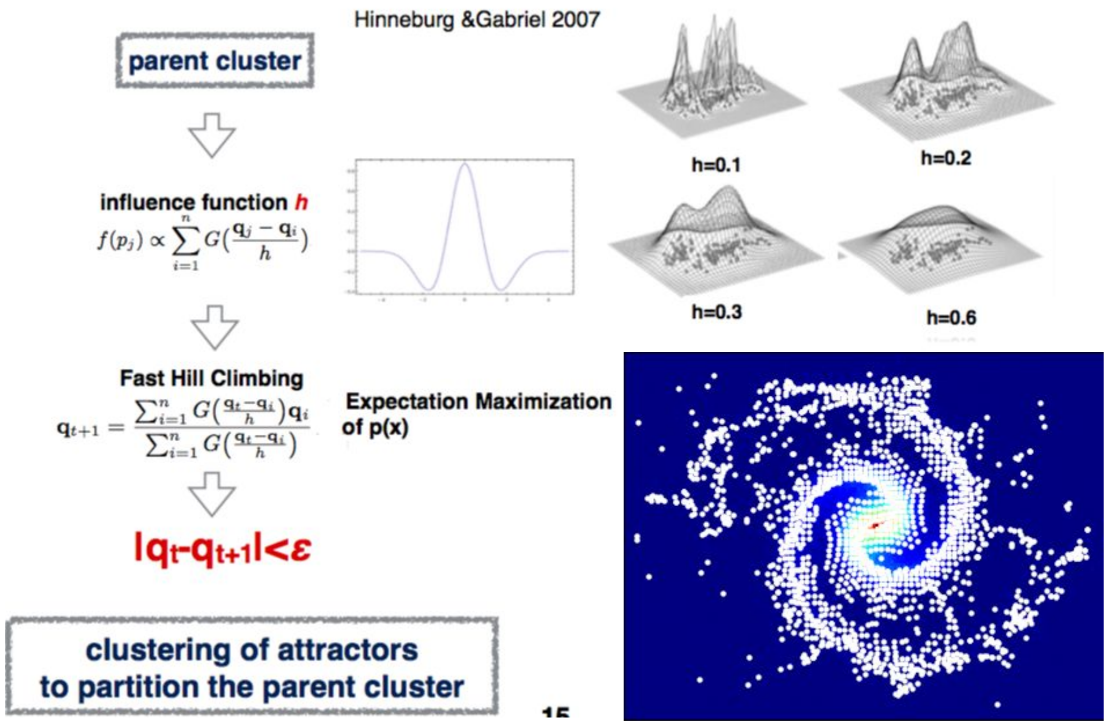
VIS image | Detection | Deblending



Deblending with ASTErIsM

ASTErIsM (Tramacere *et al.* 2016)



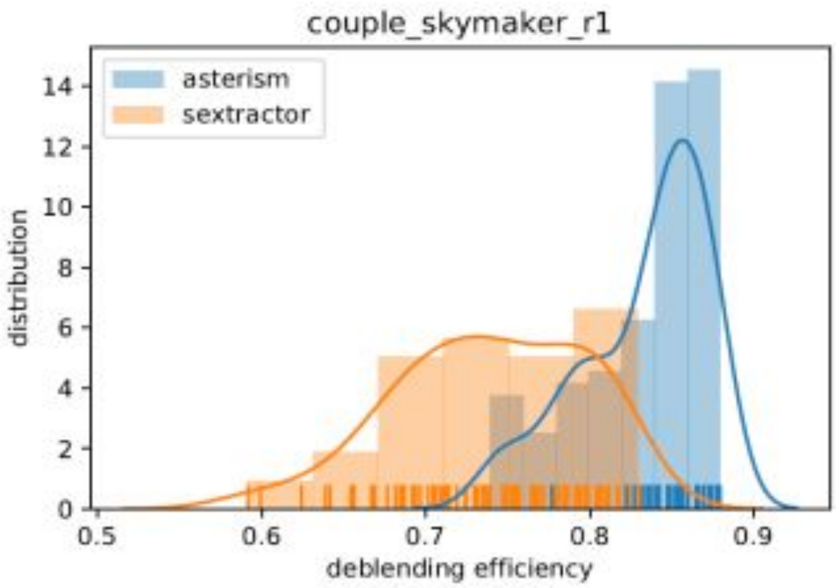


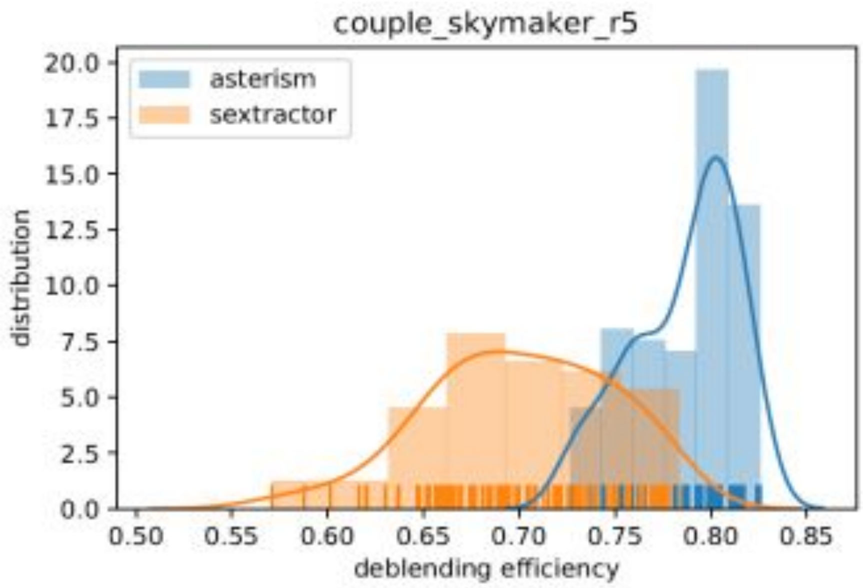
A. Tramacere, E.Romelli, V.Roscani,
M. Castellano

Deblending efficiency on internal simulations

ASTErIsM vs SExtractor

A. Tramacere, et al. in prep.

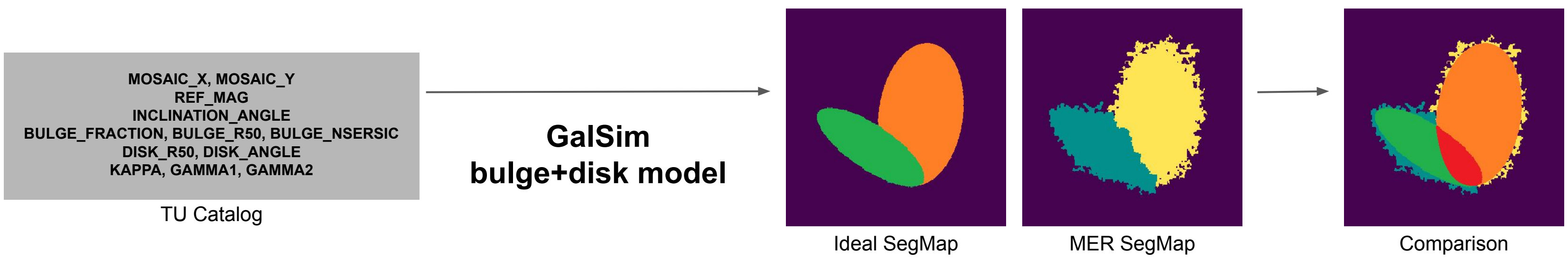




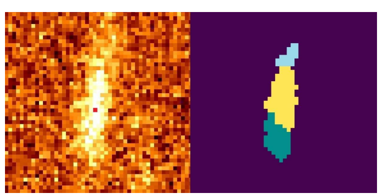
A. Tramacere, E.Romelli, V.Roscani,
M. Castellano

Deblending assessment tool

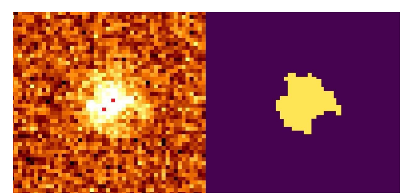
- ★ Comparison between the segmentation map produced by the MER pipeline and a ground-truth segmentation map generated from the TU catalogue
- ★ Identification of different cases (deblendings, over-deblendings and under-deblendings) to assess the performance of the deblending step in the MER pipeline
- ★ Computation of multiple diagnostics (% pix. covered, % pix. not-covered, % external pix, number of sources involved, etc) to provide a comprehensive characterization in every identified case



F. Caro, M. Castellano

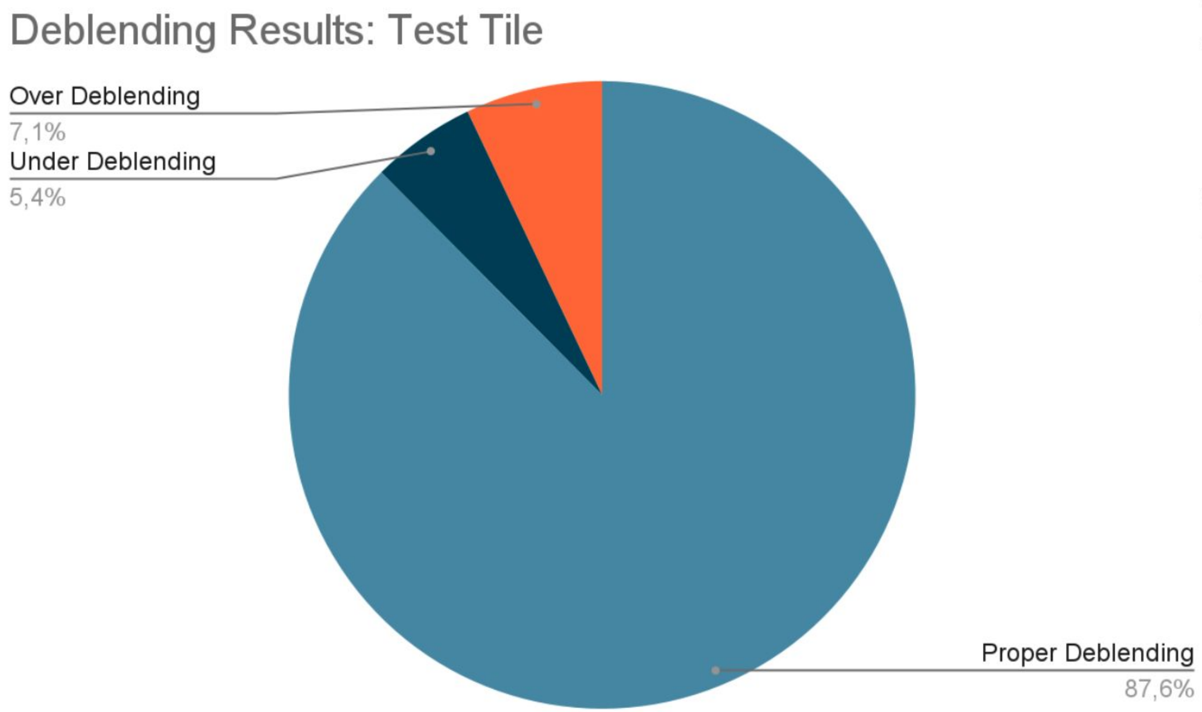


Over-Deblended



Under-Deblended

Deblending efficiency on official simulations

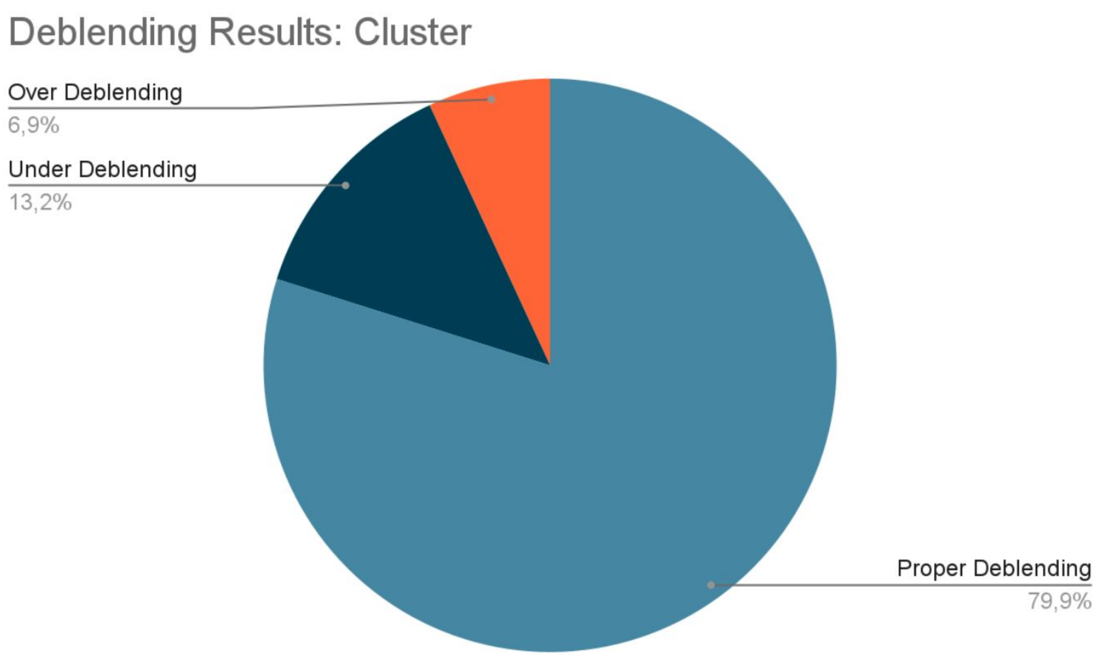


Under Deblending (5.4%)
4+ → 1: 1.55%
3 → 1: 15.02%
2 → 1: 83.43%

Over Deblending (7.1%)
1 → 2 : 93.74%
1 → 3 : 5.37%
1 → 4+: 0.89%

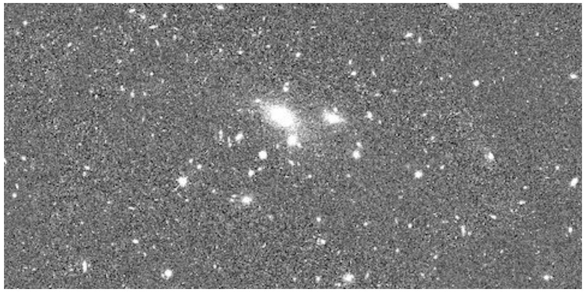
F. Caro, M. Castellano

Deblending efficiency with superimposed cluster



Under Deblending (13.2%)
4+ → 1: 13.24%
3 → 1: 22.19%
2 → 1: 64.57%

Over Deblending (6.9%)
1 → 2 : 67.93%
1 → 3 : 26.44%
1 → 4+: 5.63%



★ Superimposition of CLASH cluster images on Euclid tiles to analyze the deblending performance of the MER pipeline under more realistic and complex circumstances

★ TU and CLASH catalogues are used to establish the ground-truth in this alternative testing case

F. Caro, M. Castellano

OU-MER Photometry

Emiliano Merlin - OAR

Photometric techniques

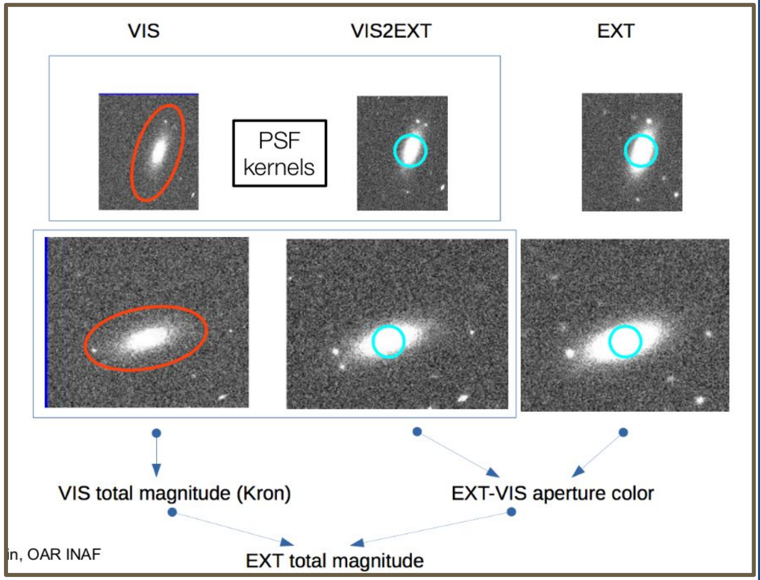
Forced photometry on positions of detected/deblended sources

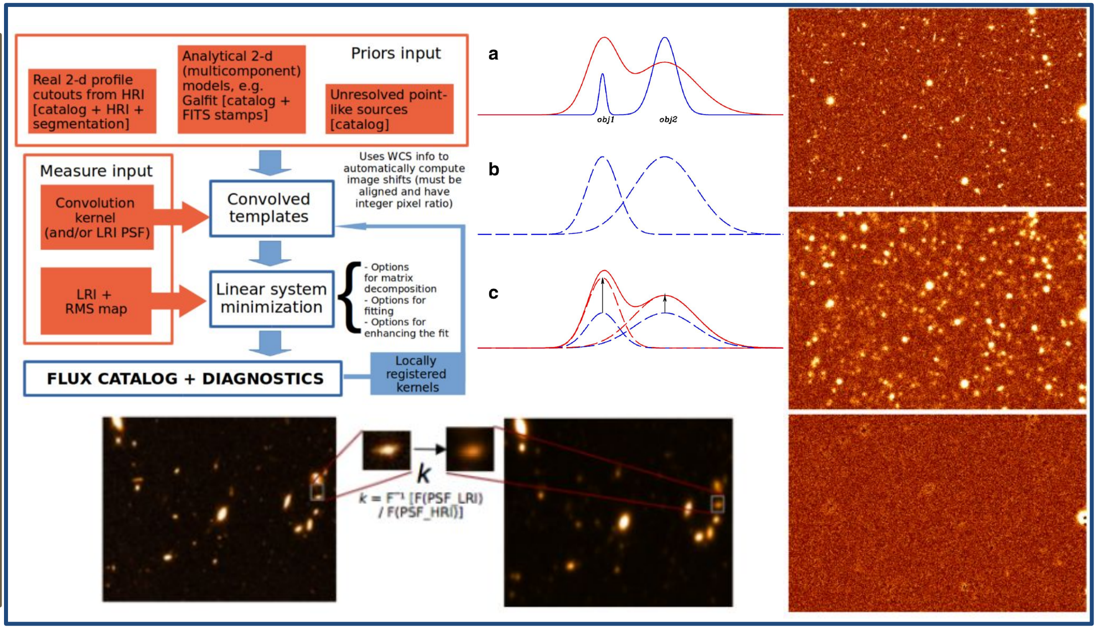
Detection (VIS FWHM=0.16”, m_{lim}=24.6, a few NIR): total flux from “extended” Kron elliptical apertures (*a-phot, Merlin+19*)

All other bands (NIR: FWHM=0.55”, m_{lim}=23.0, **EXT:** FWHM>1”, 23<m_{lim}<24.5**):**

- Fixed circular apertures in 2FWHM PSF-matched (*a-phot*) [**APER in catalog**; total flux is DET Kron + color(band-DET)]
- Template fitting (*t-phot, Merlin+2015,2016*) [**TOTAL in catalog]**

Both a-phot and t-phot widely tested/used (CANDELS, ASTRODEEP, Frontier Fields…); “euclidized” by SDC-IT (Galeotta, Maino, Romelli)





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- VIS PSF fitting (*t-phot* - only meaningful for stars!)
- Soon to include model fitting: **Euclid Morphology Challenge (EMC, see later slides)**

Euclid preparation: The Euclid Morphology Challenge - I. Model-fitting photometry for billions of galaxies

Emiliano Merlin[1]★, Marco Castellano[1], Marc Huertas-Company[2,3,4,5], Hubert Bretonnière[6,7], Diego Tuccillo[3], Fernando Buitrago[6], Ulrike Kuchner[8], John Peterson[9], Christopher Conselice[10], Boris Häußler[11], code developers / participants, and friends

[1] INAF-Osservatorio Astronomico di Roma, Via Frascati 33, I-00078 Monteporzio Catone, Italy
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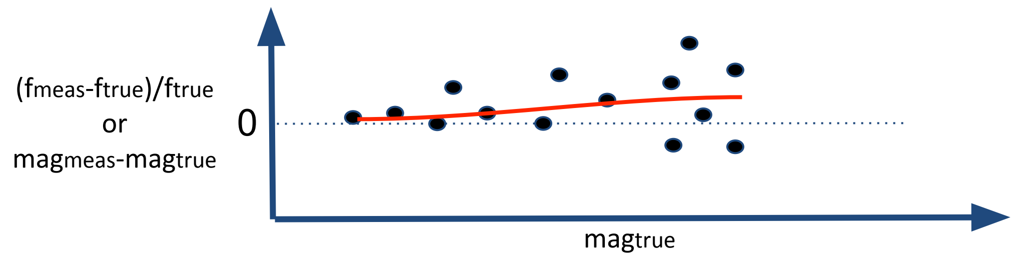
[8] University of Manchester, Manchester, United Kingdom
[9] Purdue University, West Lafayette, IN, USA
[10] European Southern Observatory, Alonso de Cordova 3107, Vitacura, Santiago, Chile

Photometric validation

Check measured fluxes/magnitudes against "True Universe" values from OU-SIM simulations in Scientific Challenges (Flagship Nbody DM simulation)

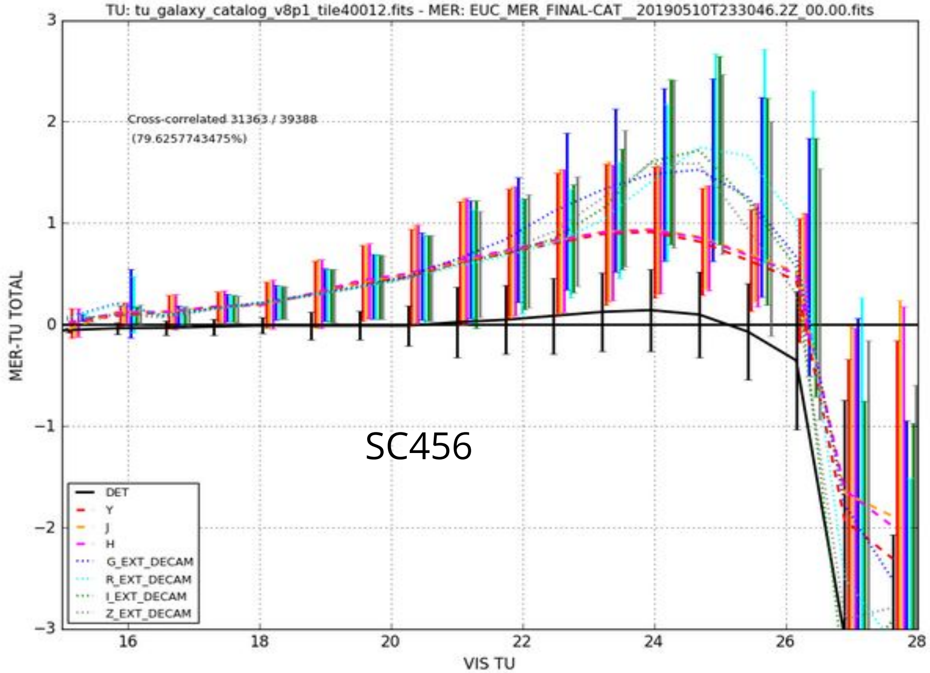


... **But:** long history of major issues and errors in simulations,
which caused delays and difficulties in assessing the accuracy of the OU-MER pipeline

(OU-MER required dedicated "featureless" simulations since... forever,
but we never got them)

→ Created and used internal simulations and tests
(that were used for the EMC and for validation with OU-PHZ)

Photometric validation



Each line is the median bias in a band (see legend)

Notes after discussing in SIM-CCB:

Cuts are not inclusive. Ideally we are only applying the target sources, that are VIS>24.5 in VIS and H>24.5 in NIR. However including those in VIS up to 26.5.

Therefore there will be sources in VIS that might not be included in NIR (unlikely to be viceversa, but possible). Adding an incl

Dear Emiliano,

I can confirm that the biases you see in the SC456 images very probably all come from the same source : the function that computed the size of the galaxy sta the differences in the detector specs) can easily explain the different level of bias between the channels.

I am running checks now to see how we can improve the simulations (by increasing the size of the stamps). In addition to the photometry biases (flux loss outs simulations runtime at a reasonnable level. This activity will require some days of work before I can come back to you with a proposition and some more time if

Anyway, the bottom line is that the problem you identified is real and comes from the simulations and we are working on it.

Thank you for your very helpful feedback.

Photometric validation

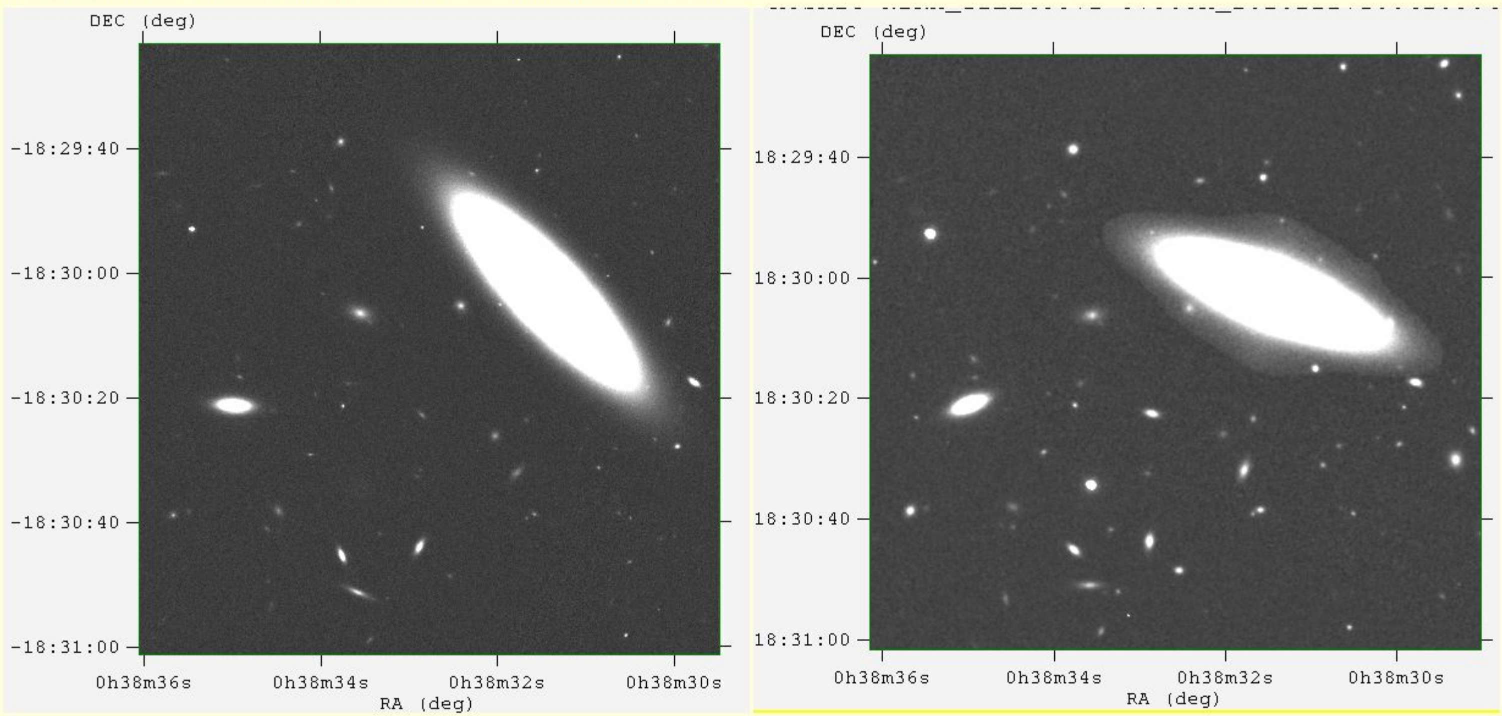
VIS and NIR simulated galaxies have different orientations

Added by Javier Graciá Carpio about 1 year ago. Updated about 1 year ago.

Status:	Closed	**Start date:**	2020-12-02
Priority:	Normal	**Due date:**	
Assignee:	Santiago Serrano	**% Done:**	100%
Category:	-	**Estimated time:**	
Target version:	-		
Buddy:			

Description

We have found that at least some galaxies in the VIS and NIR MER mosaics have clearly different orientations.



The orientation on the EXT mosaics is consistent with NIR.

Photometric validation

EXT Photometry provided to PHZ are shallower than expected

Added by Florian Dubath 4 months ago. Updated 13 days ago.

Status:	New	**Start date:**	2021-10-11
Priority:	Normal	**Due date:**	
Assignee:	Aku Venhola	**% Done:**	0%
Category:	-	**Estimated time:**	
Target version:	-		
Buddy:			

Description

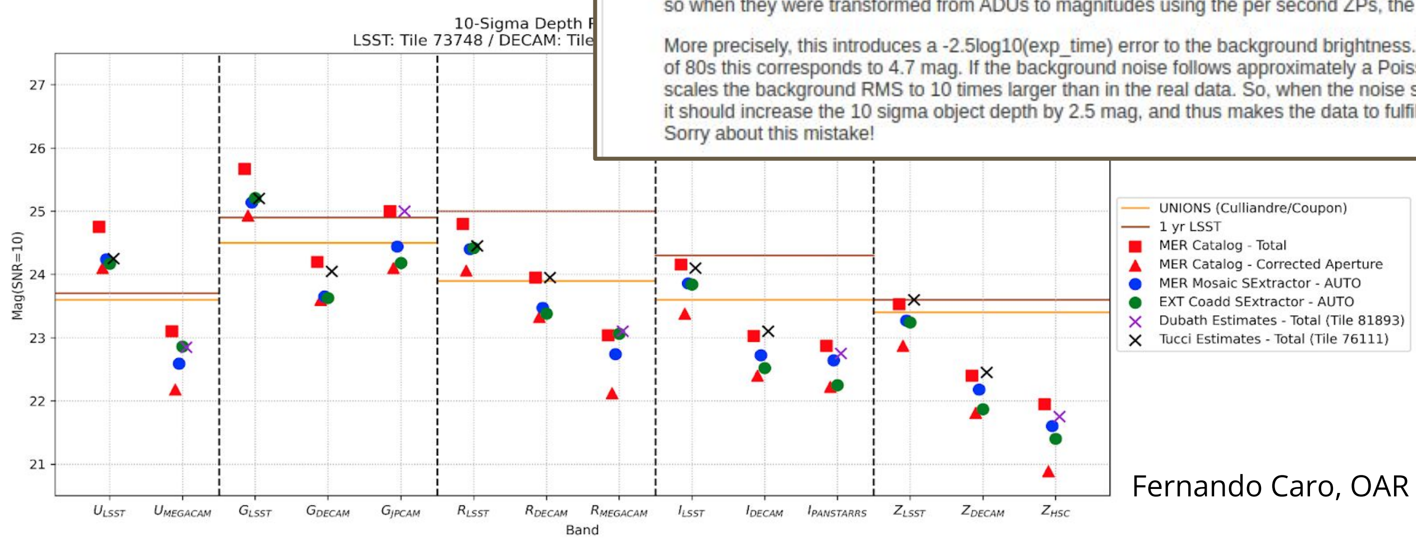
Checking the data received during SC8 we observe that most of the ext data are shallower than the requirement (see attached plots). The quality of the input has an impact on PHZ-PF performance.

Files

SN_Mag_MER_TOTAL_T81893.pdf (2.16 MB)

Hi, I did some analysis on this and the problem seems to be in the sky values that I filled into the survey file.
I got the background levels, exposure times and zeropoints from the CFIS team and used those to generate the survey files.
The background values that I got were in ADUs/exposure and so were the ZPs as well. I scaled the ZPs with exposure time,
in order to get them into the right units for OU-SIM. However, I did not scale the background values with the exposure time,
so when they were transformed from ADUs to magnitudes using the per second ZPs, the background values get way too bright.

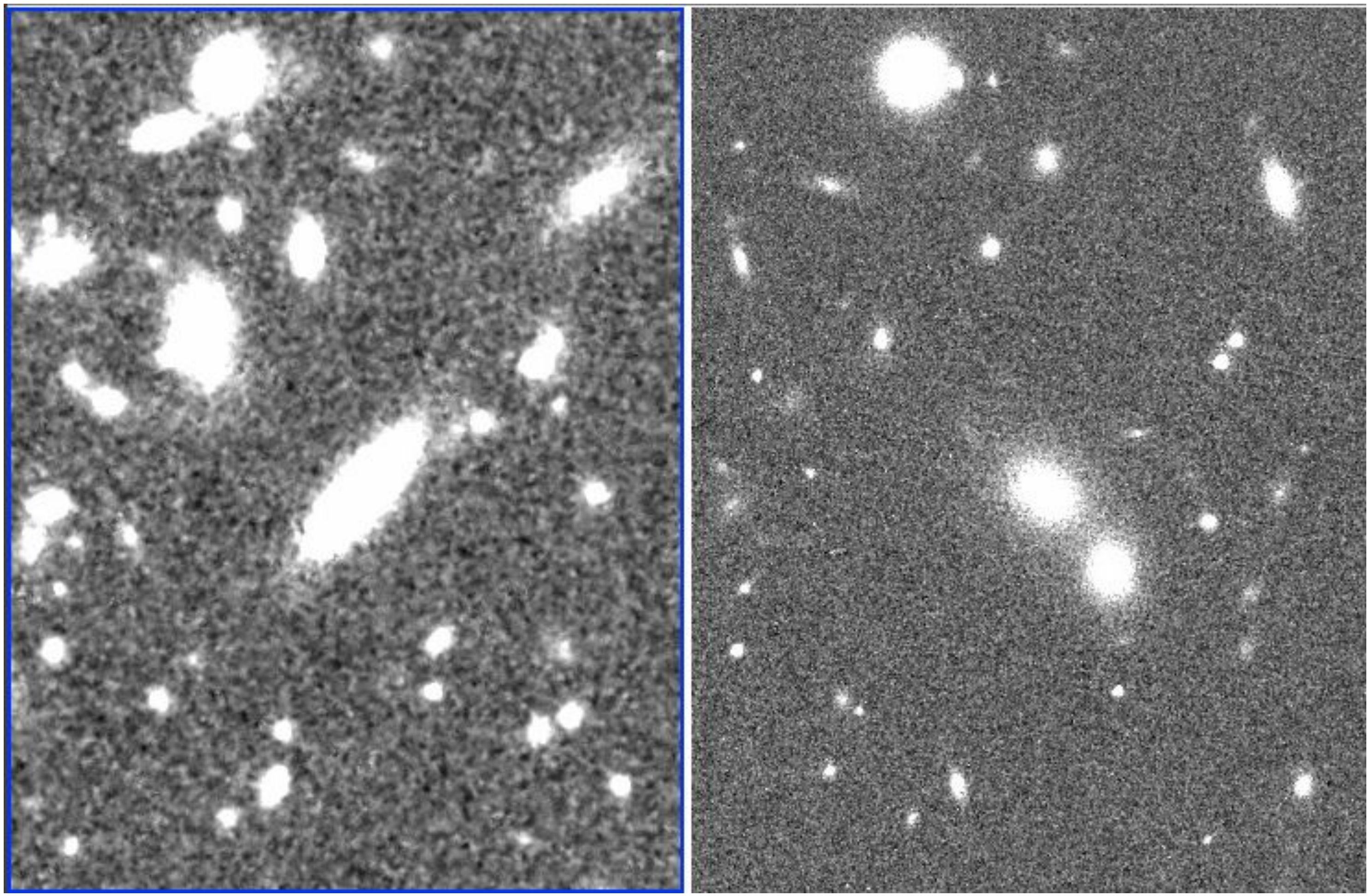
More precisely, this introduces a -2.5log10(exp_time) error to the background brightness. With typical CFIS r-band exposure time of 80s this corresponds to 4.7 mag. If the background noise follows approximately a Poisson distribution, this mistake scales the background RMS to 10 times larger than in the real data. So, when the noise scales down to 10% from the current one, it should increase the 10 sigma object depth by 2.5 mag, and thus makes the data to fulfill the quality requirements.
Sorry about this mistake!



Fernando Caro, OAR

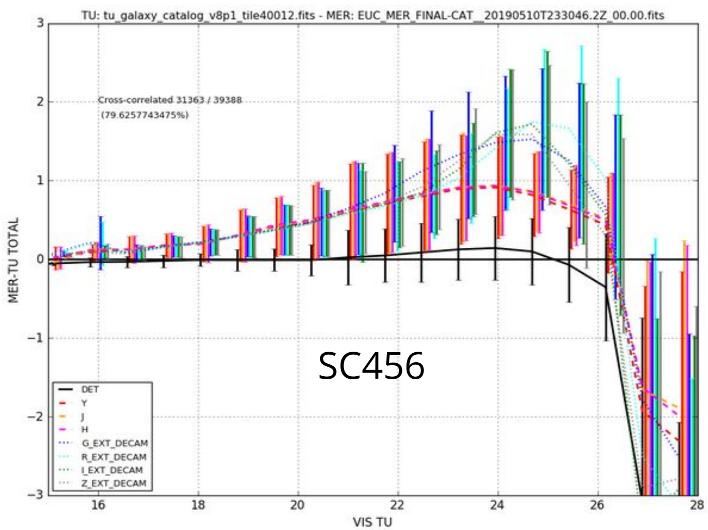
Photometric validation

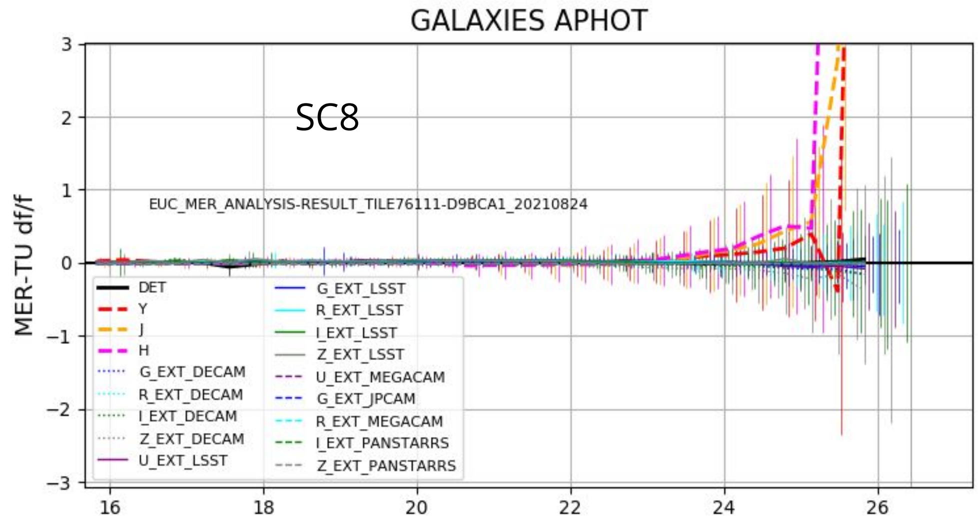
Cycle 12 simulations (Feb. 20, 2022) NIR and VIS mosaic (same region):

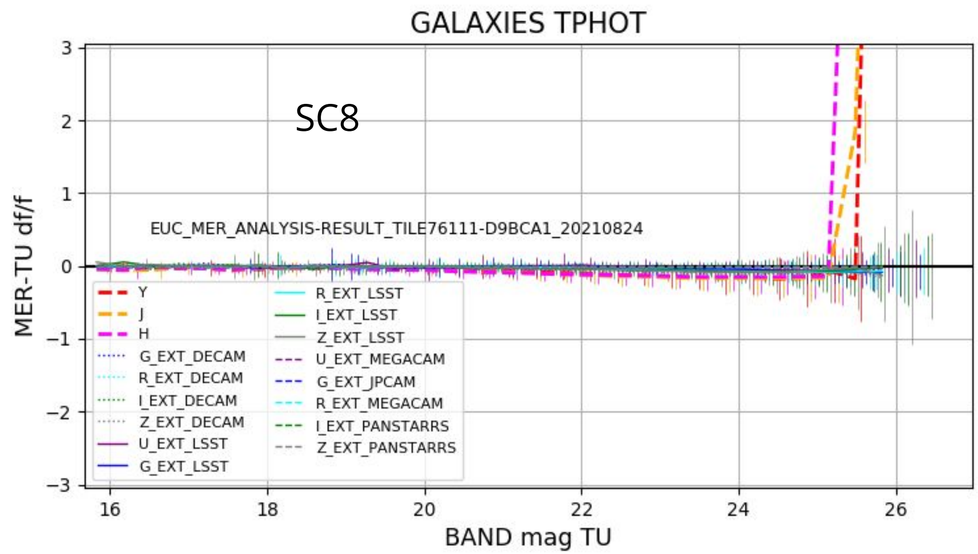


Photometric validation

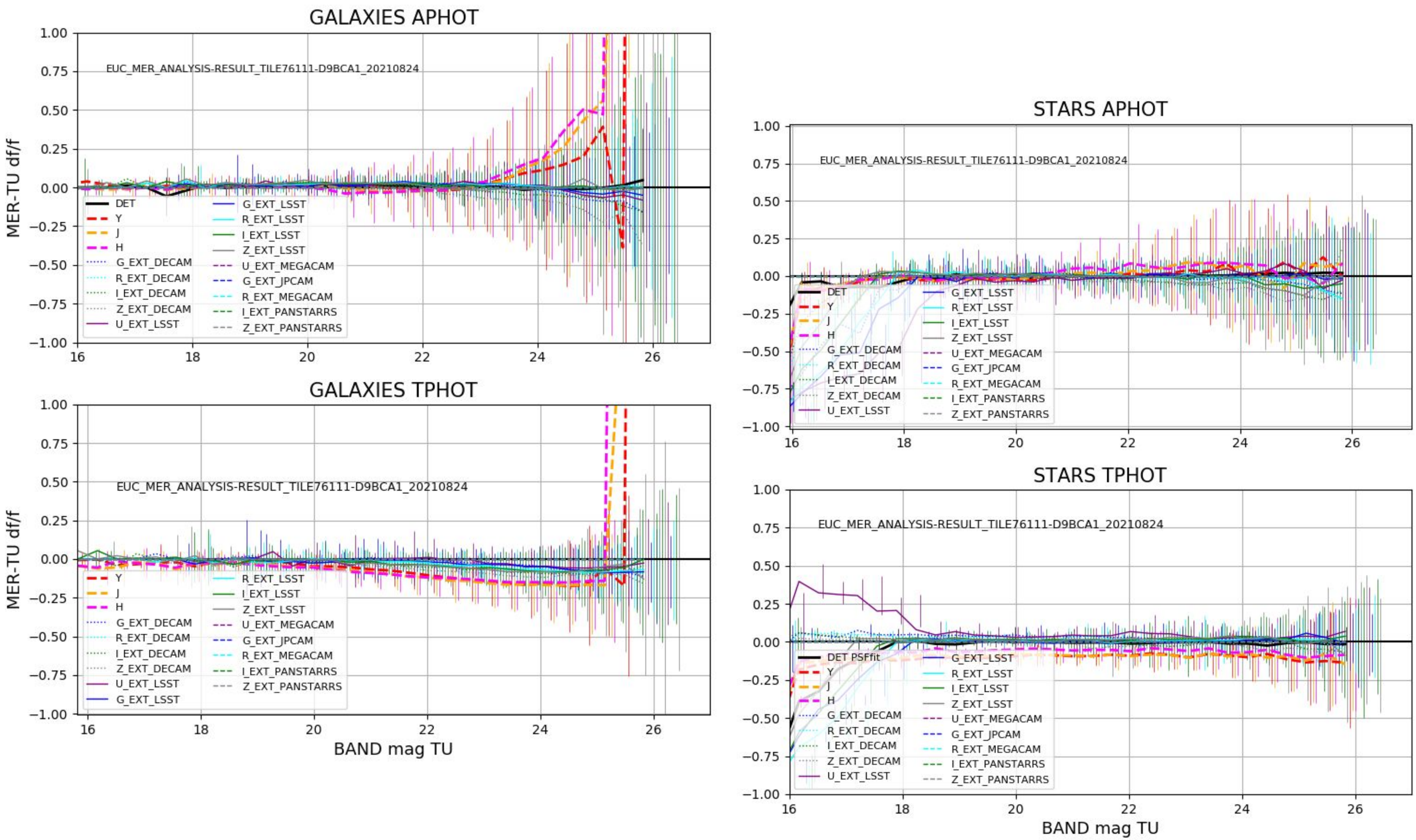
(Could have been like this some years ago...)



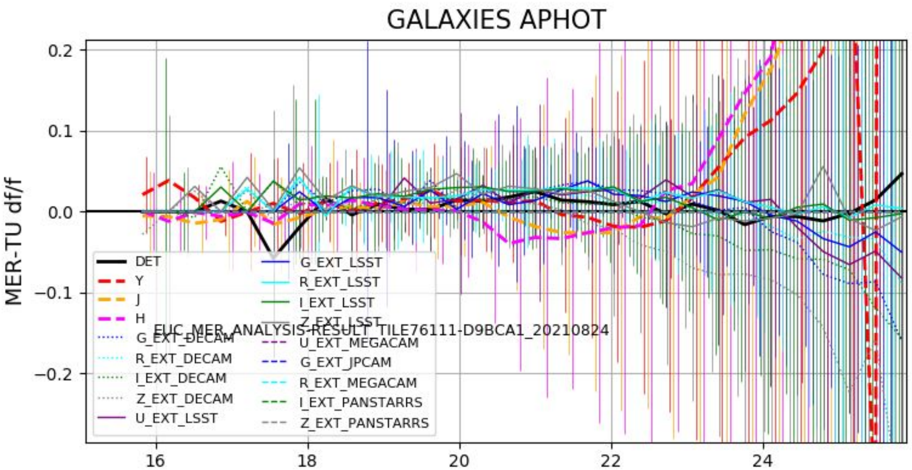


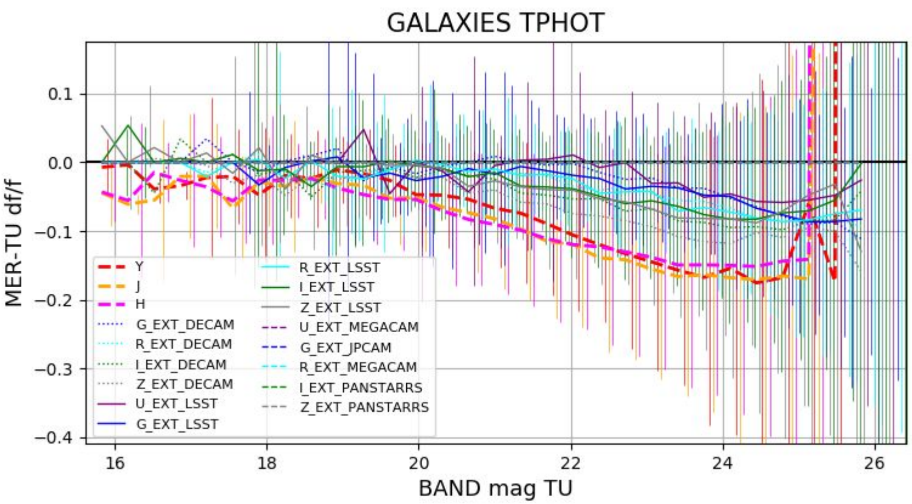


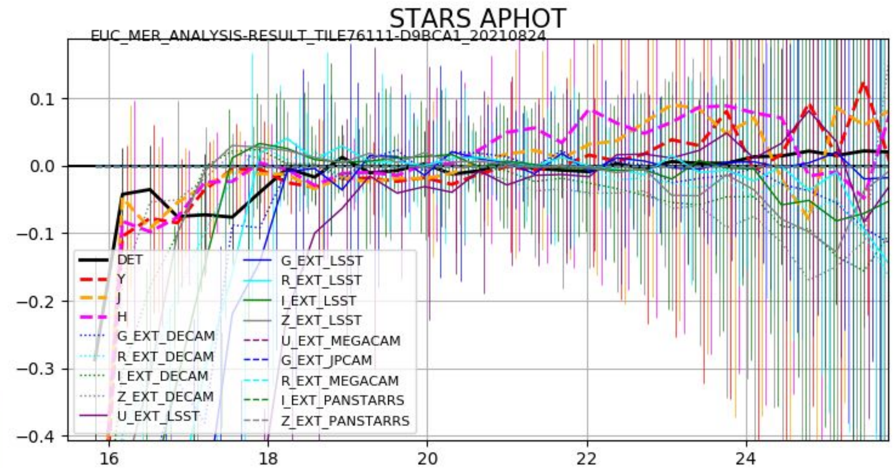
Photometric validation

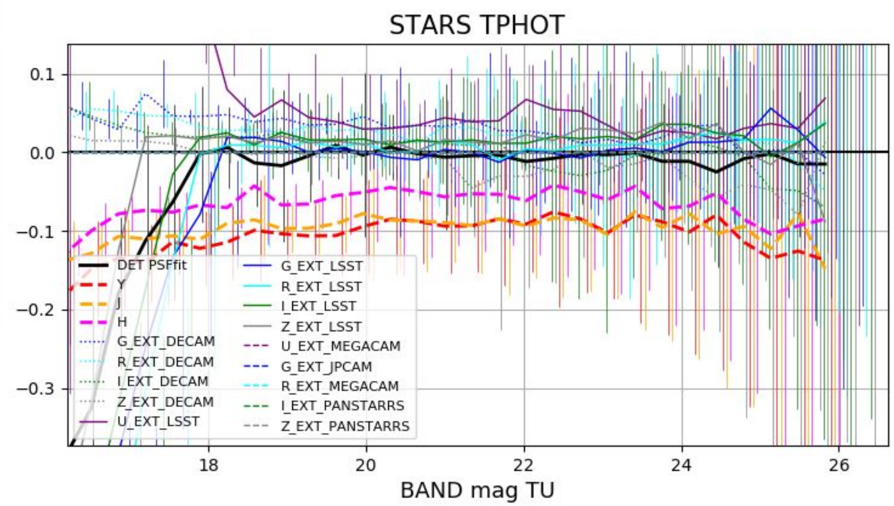


Photometric validation

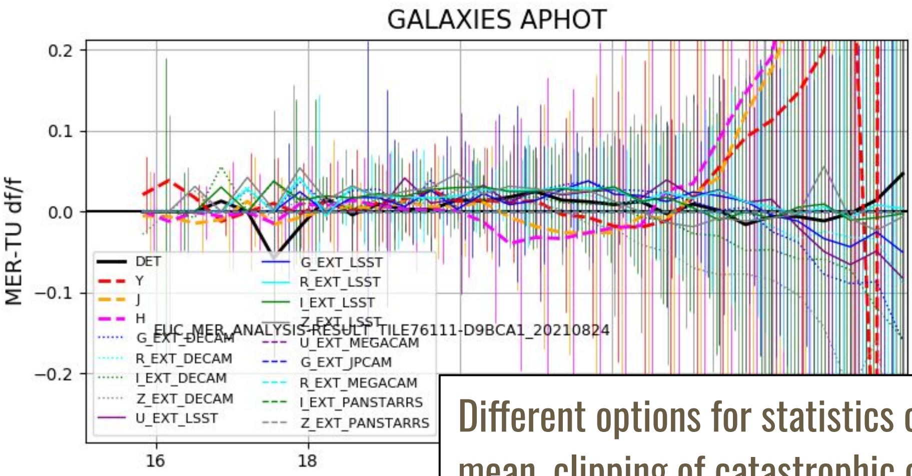


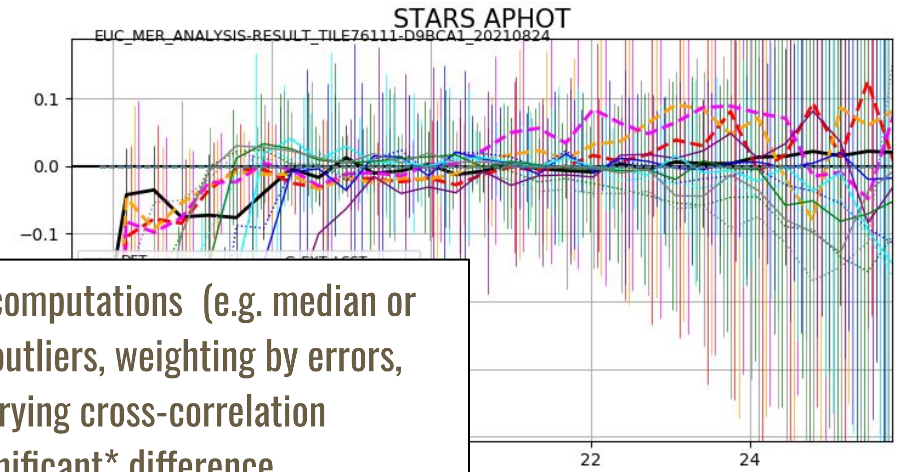


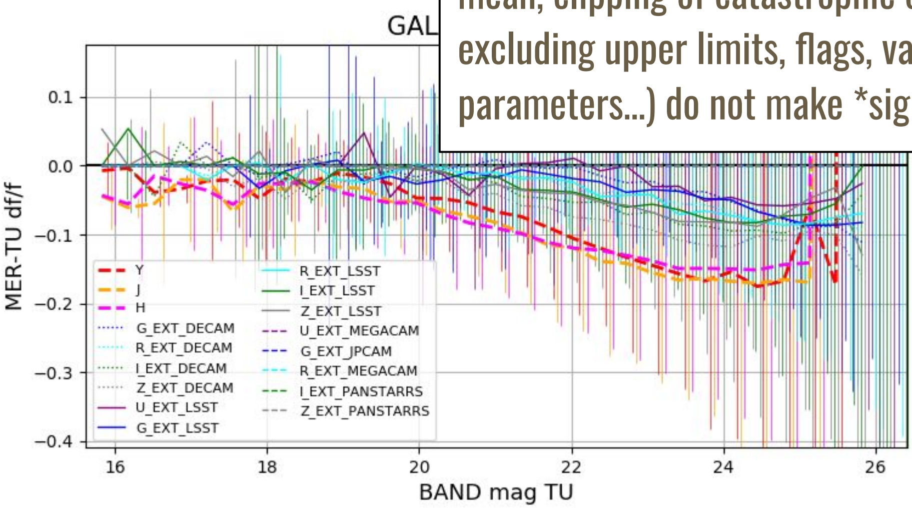


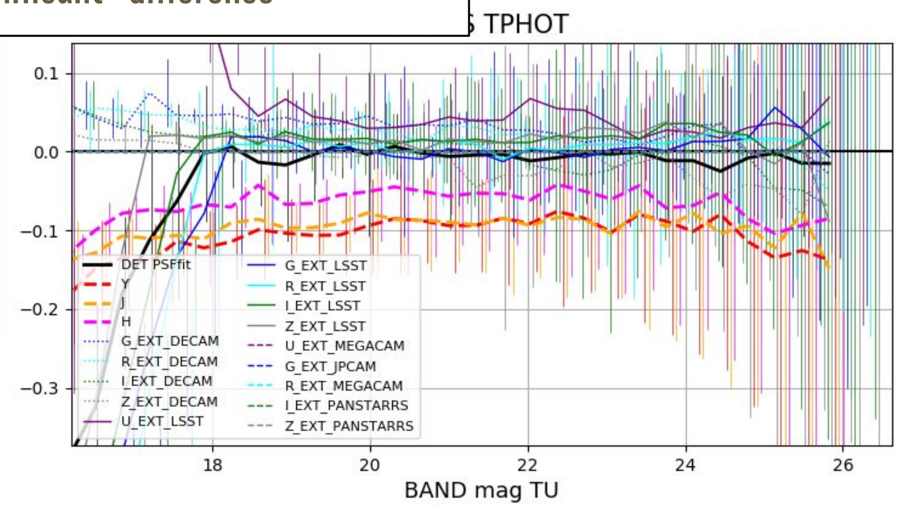


Photometric validation





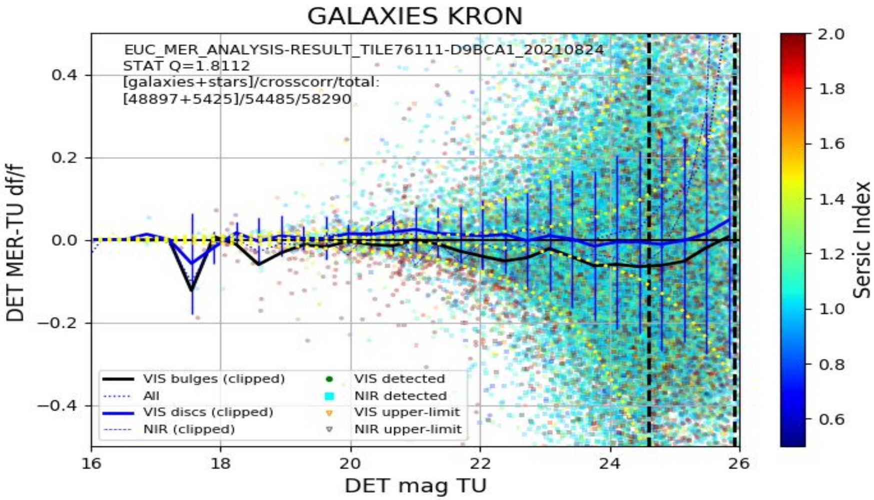


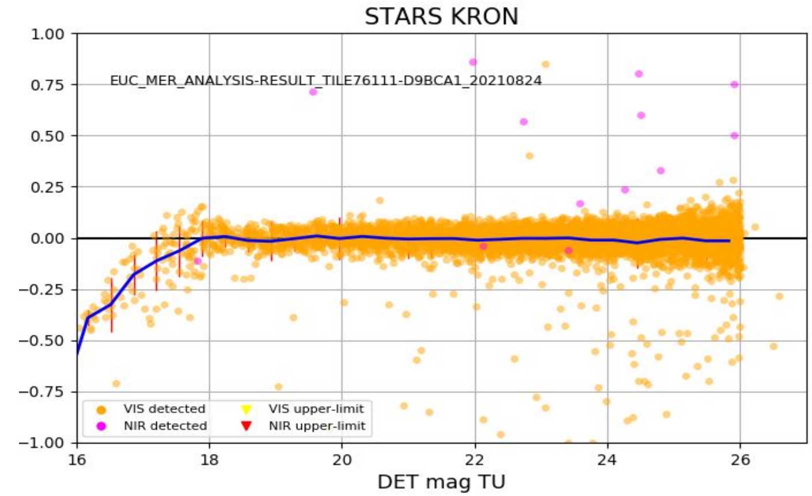


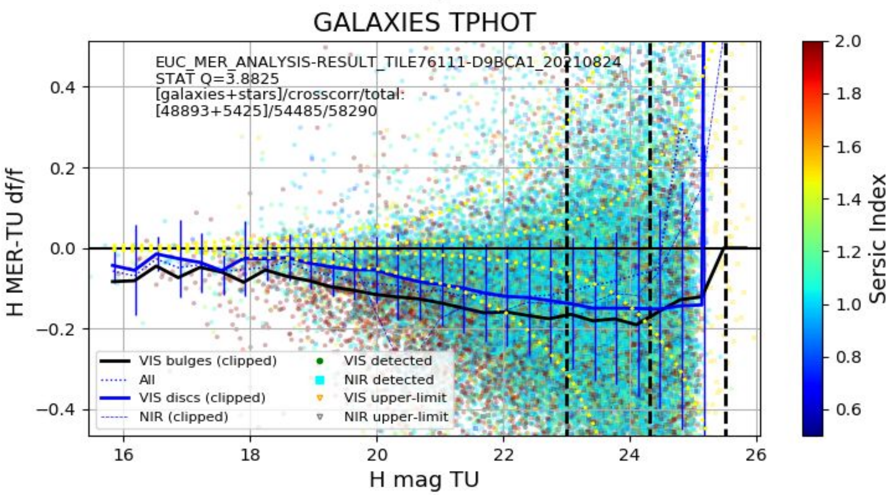
Different options for statistics computations (e.g. median or mean, clipping of catastrophic outliers, weighting by errors, excluding upper limits, flags, varying cross-correlation parameters...) do not make *significant* difference

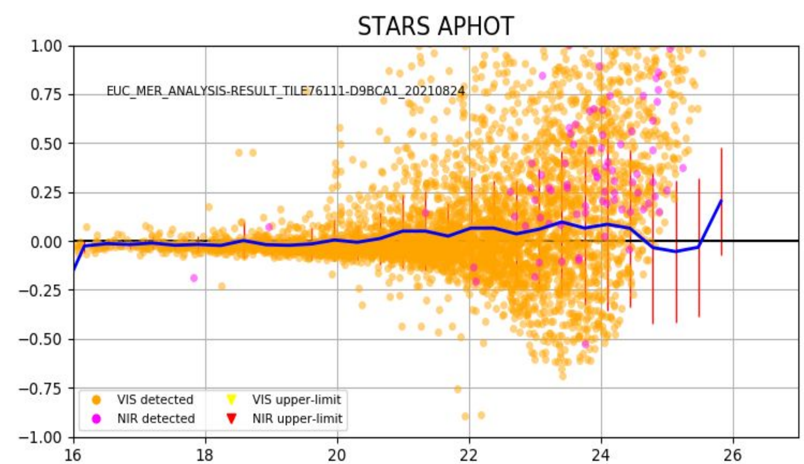
Photometric validation

Each band is also checked in details - some examples:



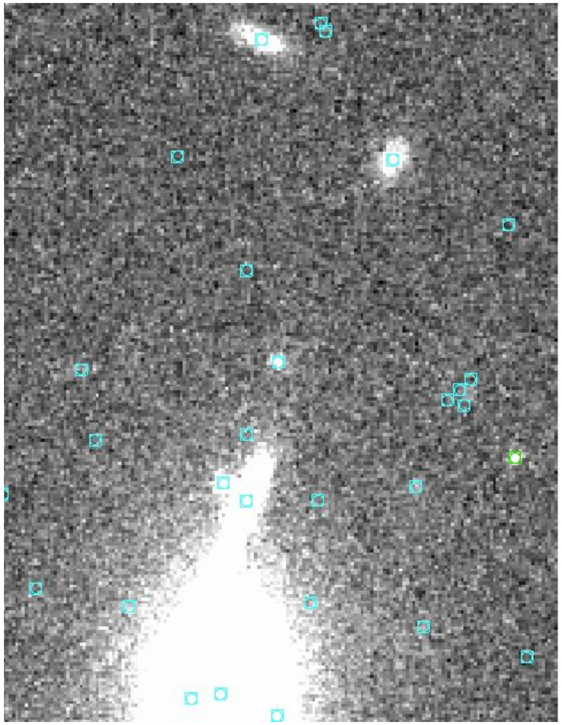


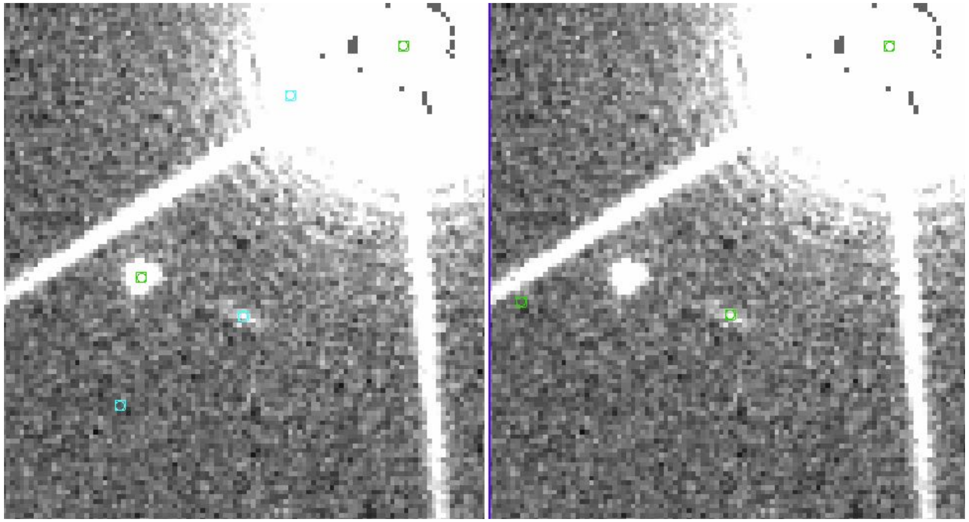


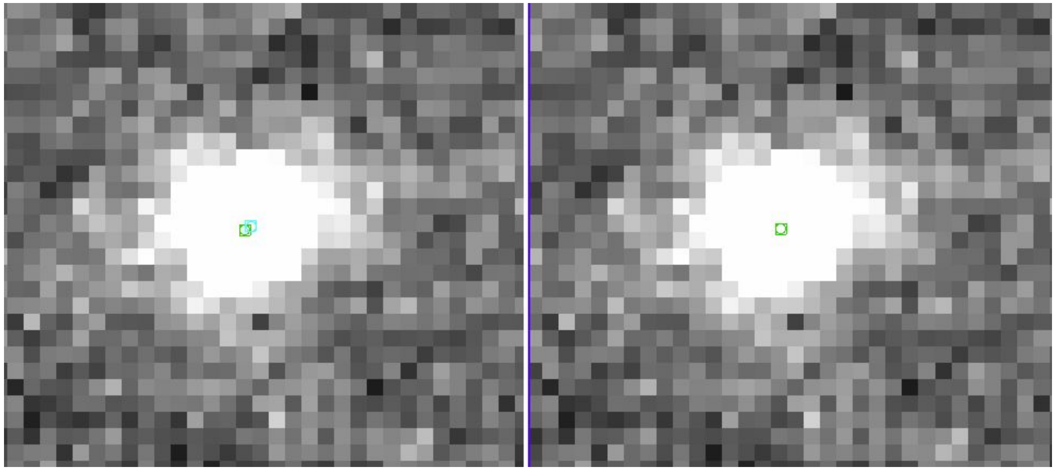


Photometric validation

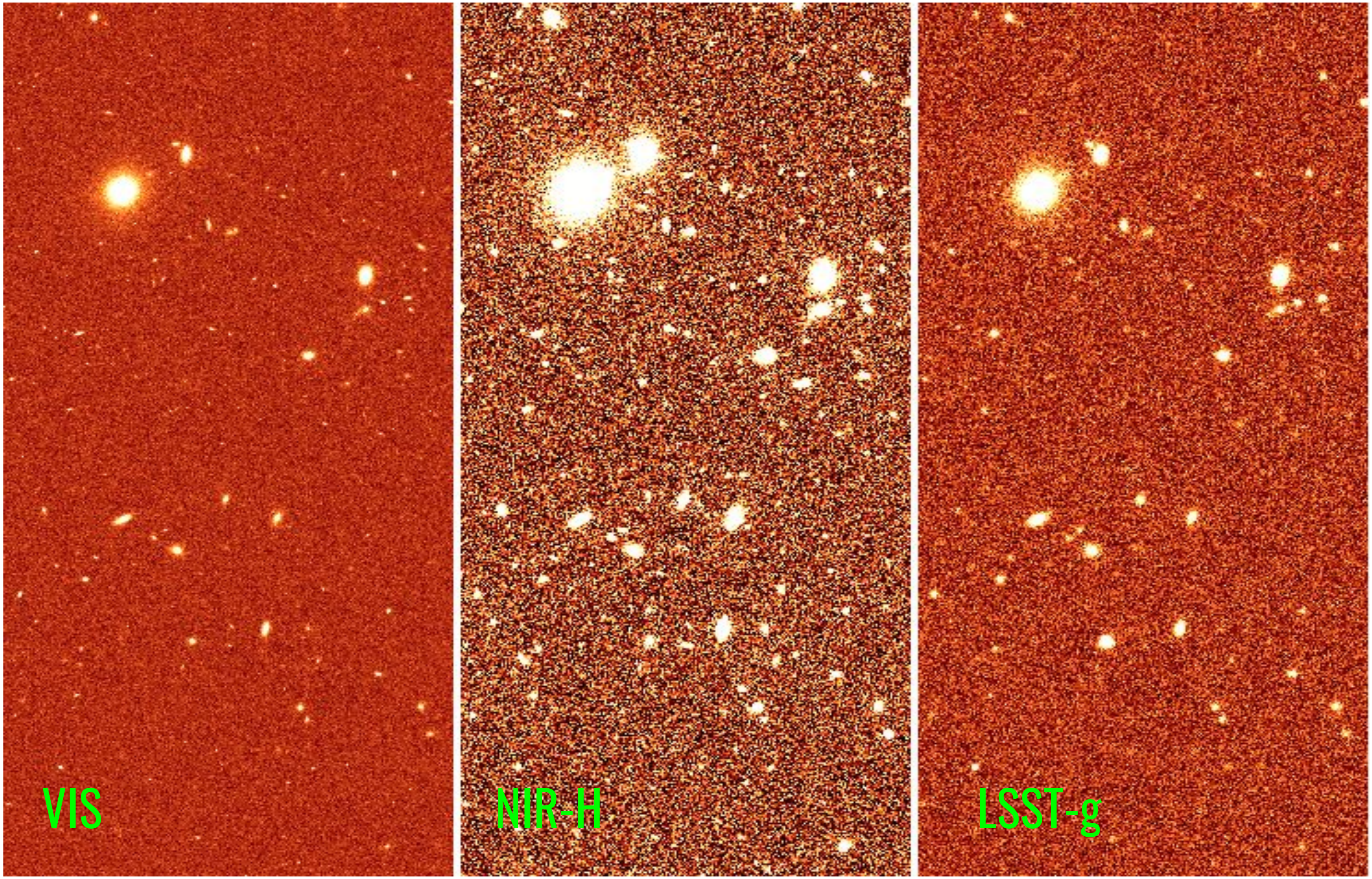
Examples of outliers







Euclid Morphology Challenge



Euclid Morphology Challenge

Official Euclid consortium initiative

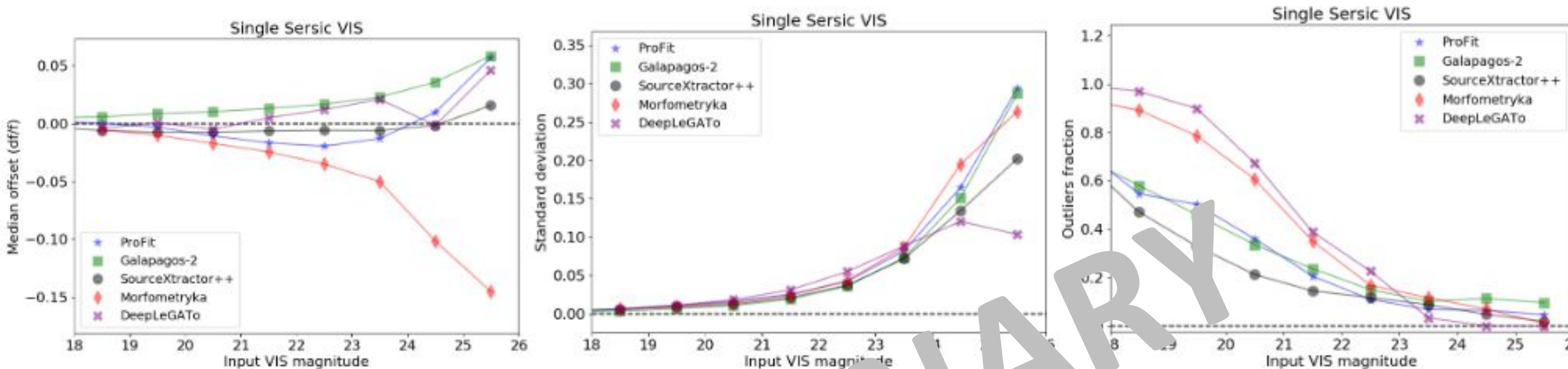
EM, M. Castellano, M. Huertas-Company (MWG, IAC/UniParis)
+ H. Bretonniere, D. Tuccillo, U. Kuchner, C. Conselice, F. Buitrago

—

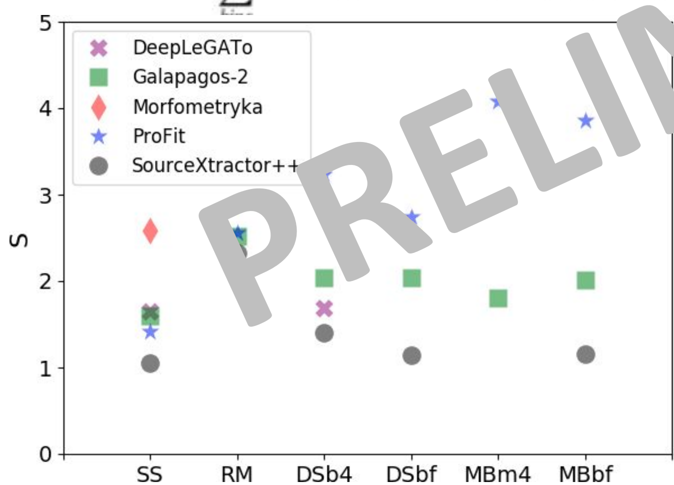
- EGG (Schreiber+2017) + GalSim (Rowe+2015) + many Python scripts
- RedBook + J.C.Cuillandre estimated depths, MDB PSFs
- 5x 0.5 sq.deg. FoVs simulated in VIS, and in NIR + EXT (LSST) for one case (rebinned)
- 1.2 million galaxies, 350k with SNR>5 in VIS
- 3 realizations: double Sersic, single Sersic, “realistic” (ML)
- Produced and distributed images, RMS maps, list of input positions, PSF models
- 8 code developers invited, 5 accepted:
  DeepLeGATo, Galapagos-2, Morfometryka, ProFit, SourceXtractor++
- Required to provide photometry and morphology estimates for 5sigma sources
- Started in 2020, finishing now...

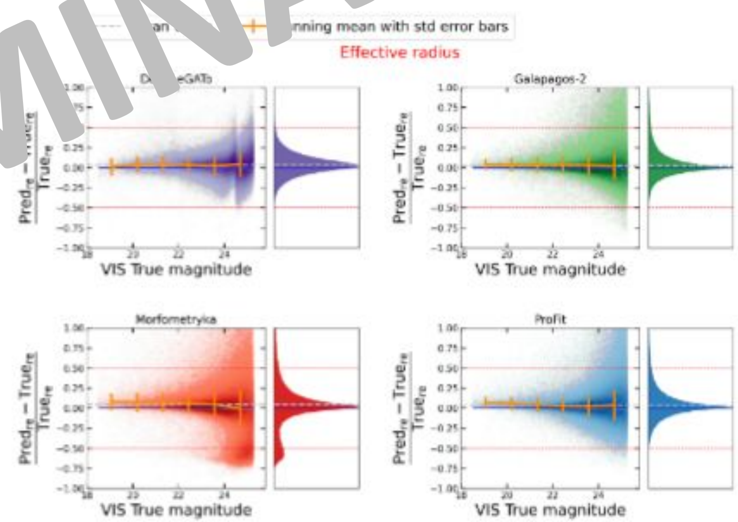
Euclid Morphology Challenge

Currently finalizing drafts of two papers (Merlin+2022, MER Pre-Launch Key Paper, about photometry; Bretonniere+2022, GAEV Pre-Launch Key Paper, about morphology)



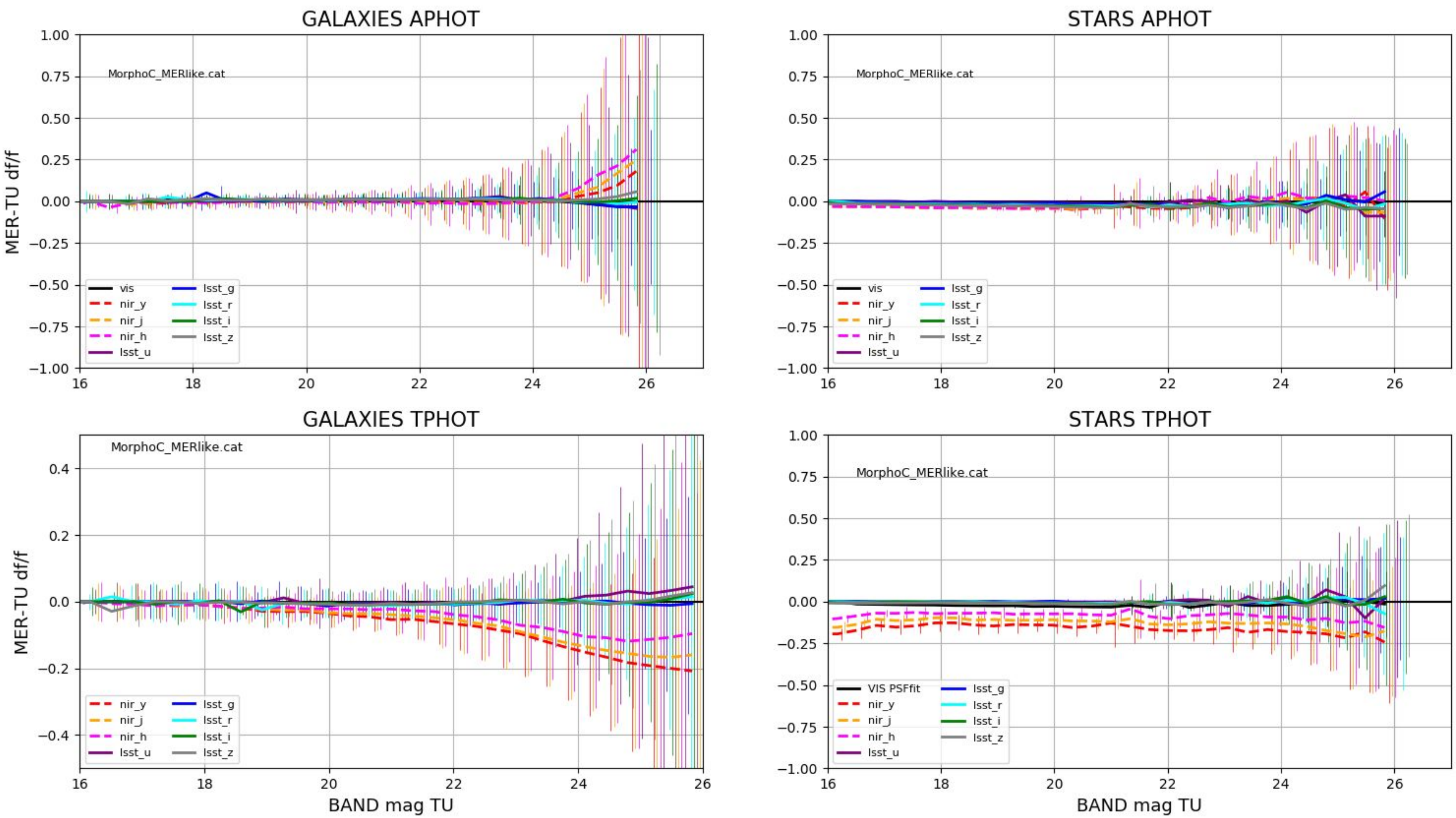
$$S = (1 - C) + \sum_{bins} w_{bin} \{k_{\mathcal{B}} \mathcal{B}_{bin} + k_{\mathcal{D}}(\mathcal{D}_{bin} - 1) + k_{O} O_{bin}\}$$





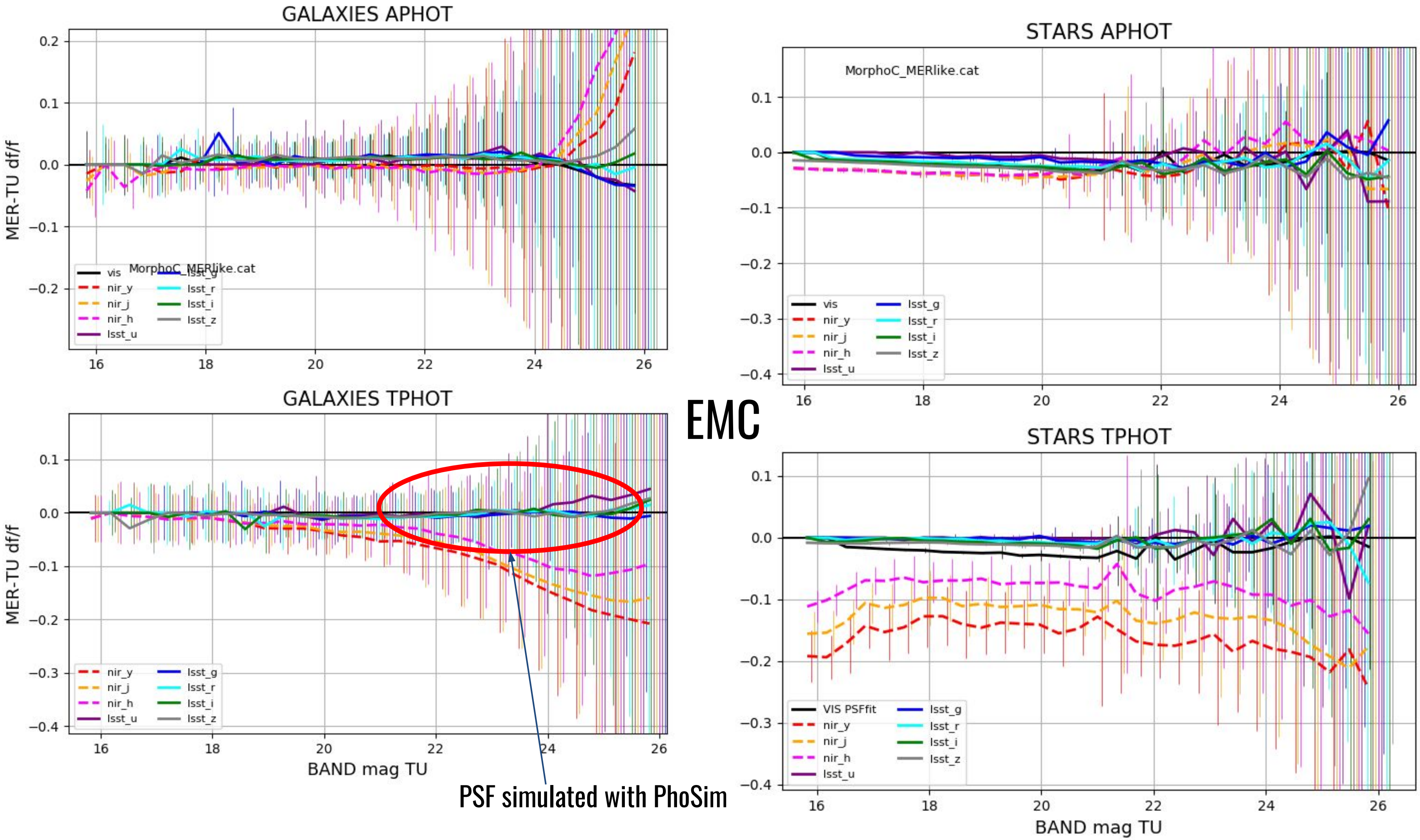
Euclid Morphology Challenge

Also, checked OU-MER photometry on EMC images



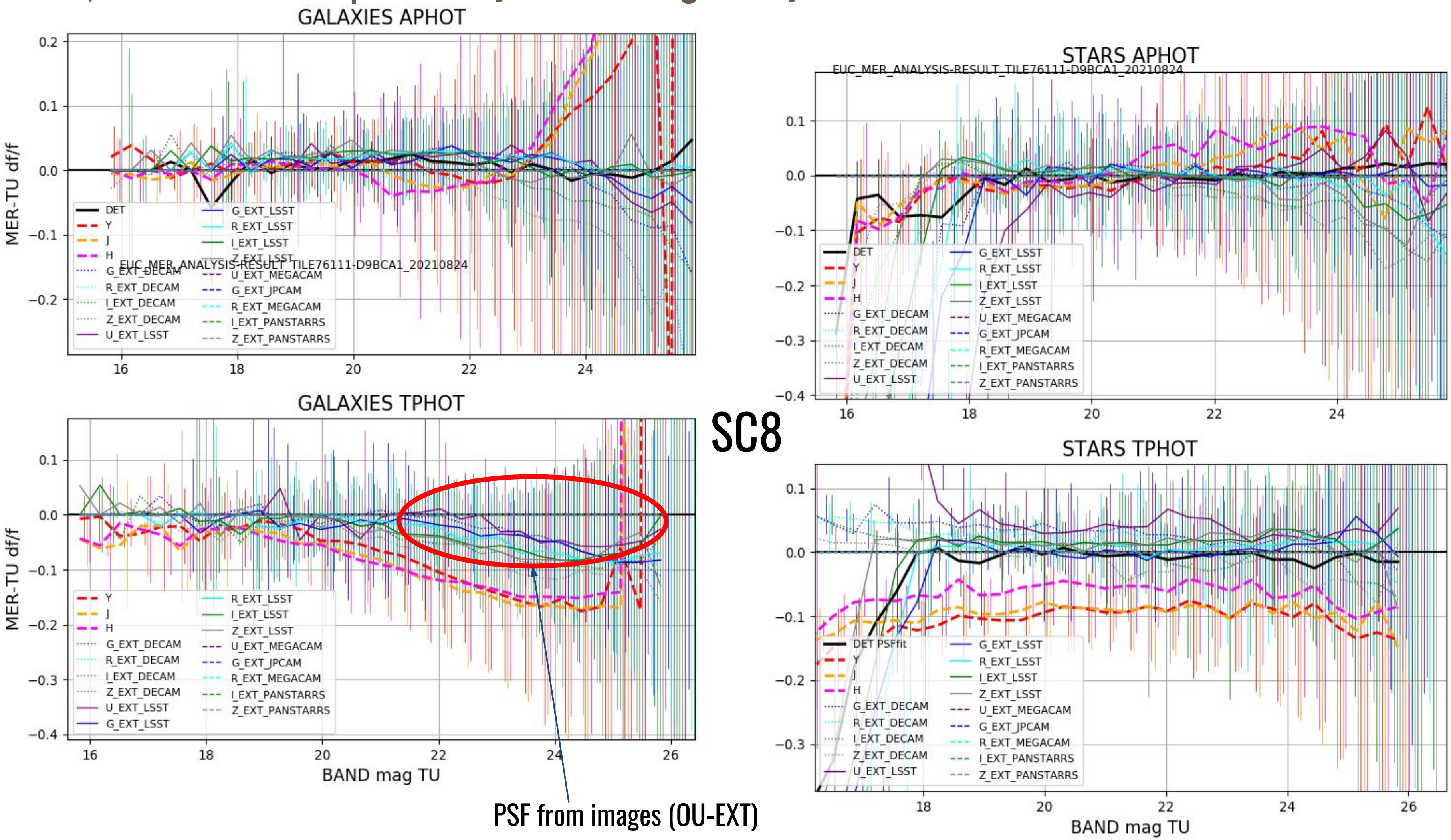
Euclid Morphology Challenge

Also, checked OU-MER photometry on EMC images: very similar to SC8!



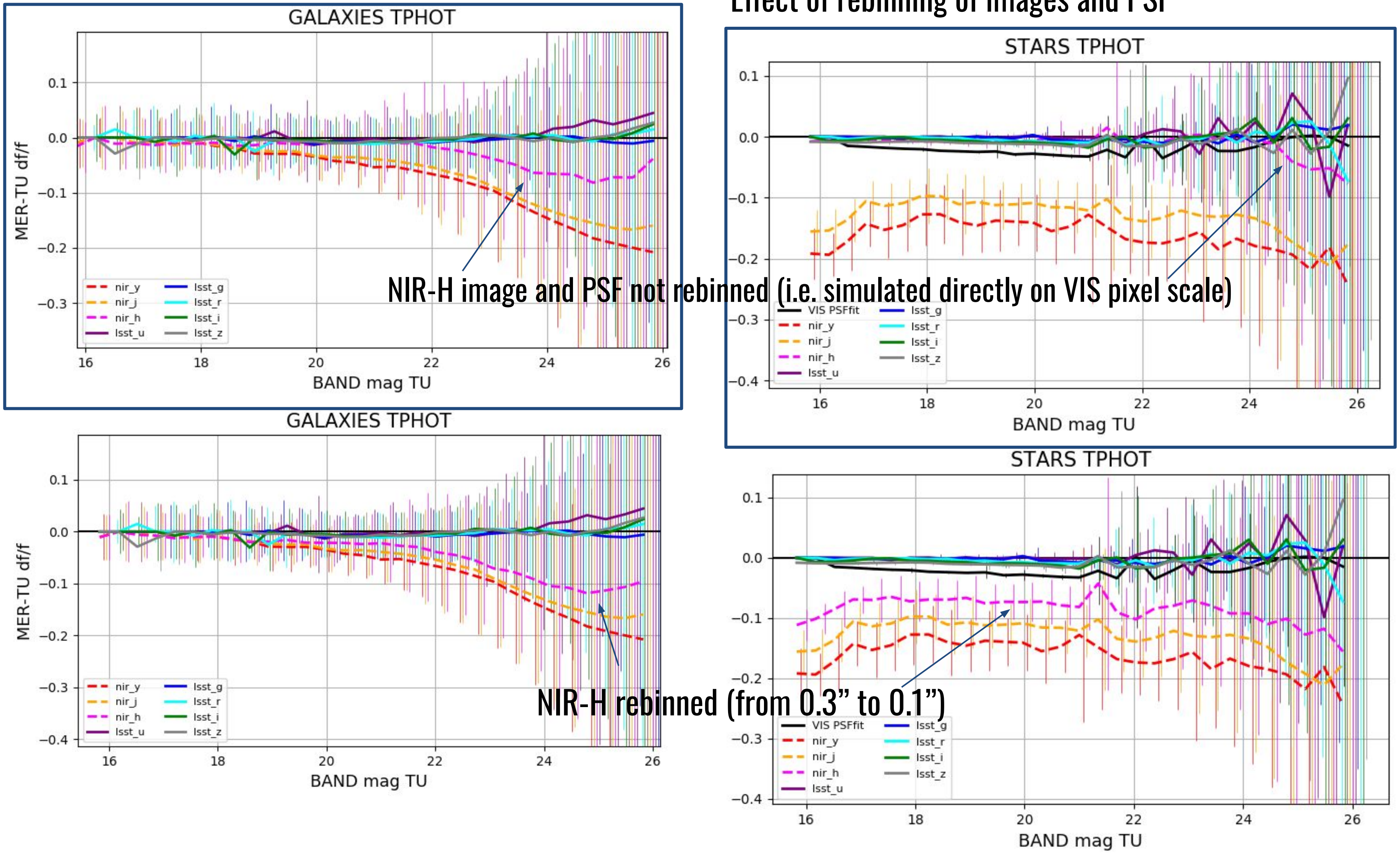
Photometric validation

Also, checked OU-MER photometry on EMC images: very similar to SC8!

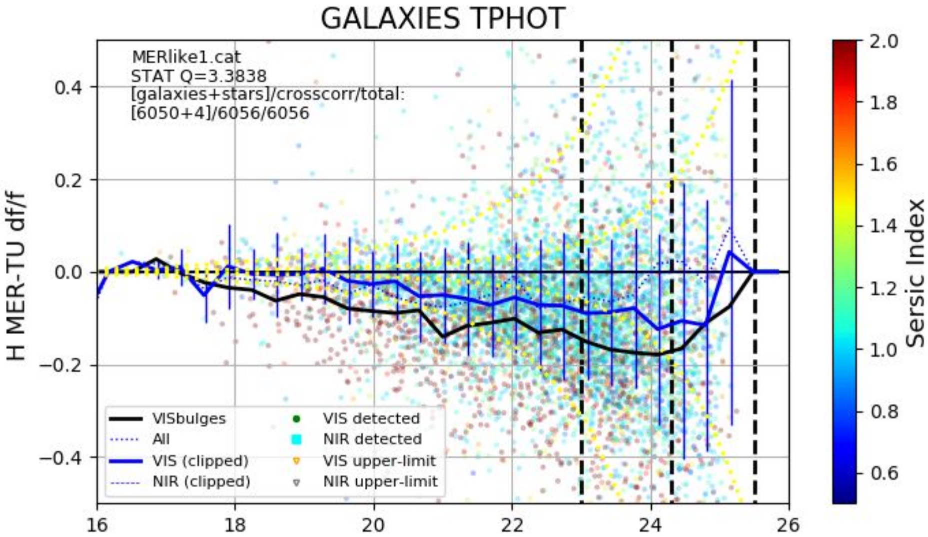


Euclid Morphology Challenge

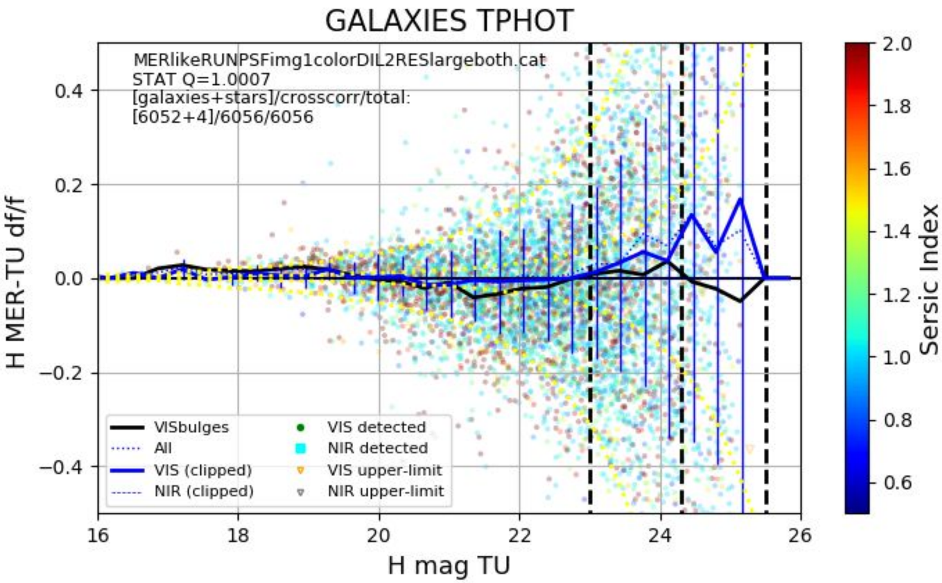
Effect of rebinning of images and PSF

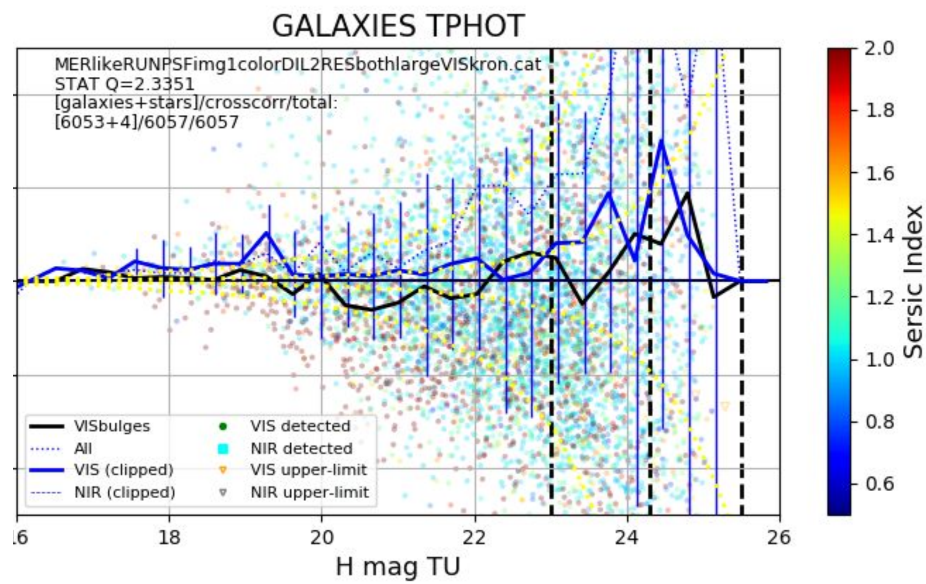


Photometric validation



t-phot on NIR-H: probably a PSF related issue, but also testing new configurations to improve accuracy

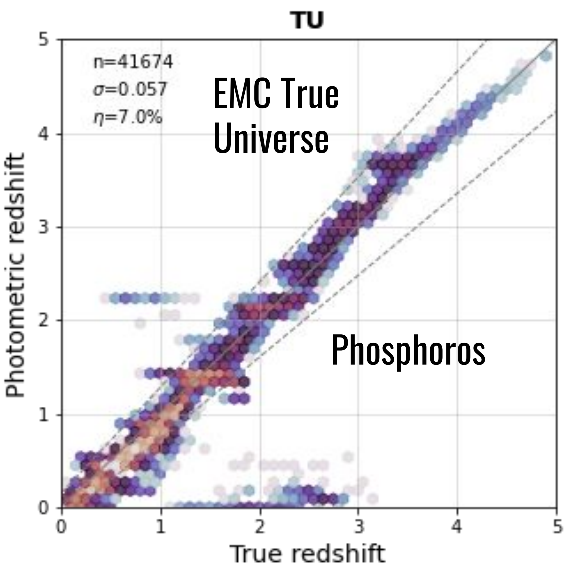


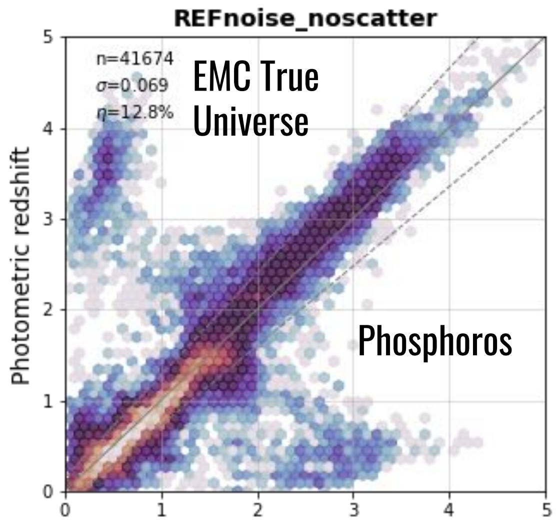


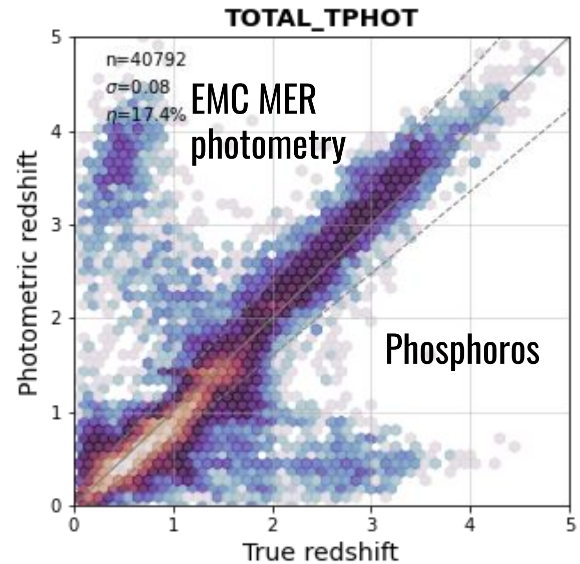
EMC OU-PHZ check

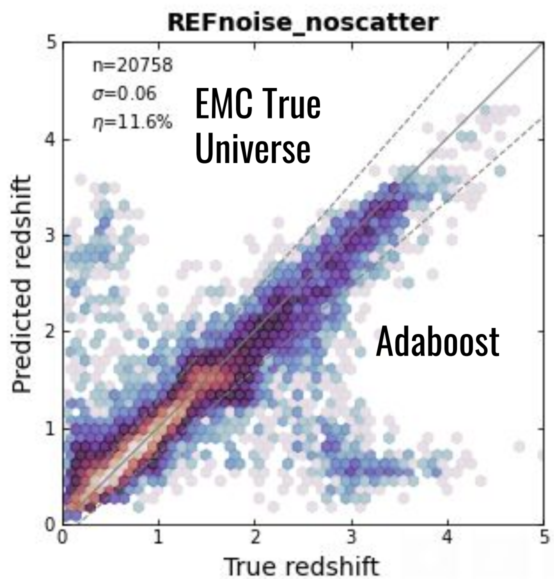
G. Desprez (OU-PHZ) used photometry on EMC images to test photo-z accuracy

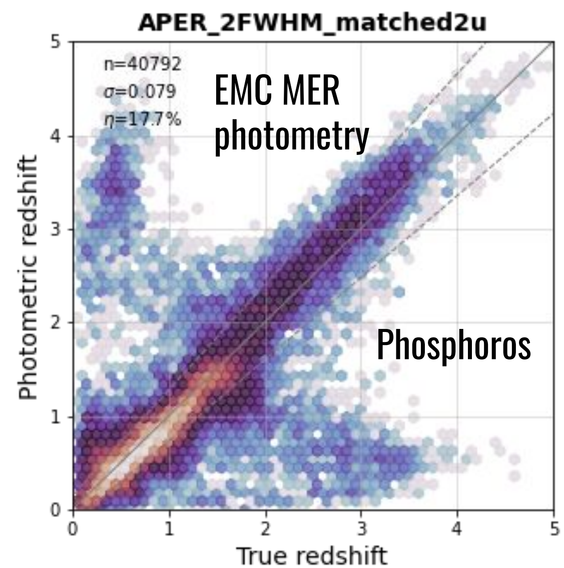
(PhD Thesis)





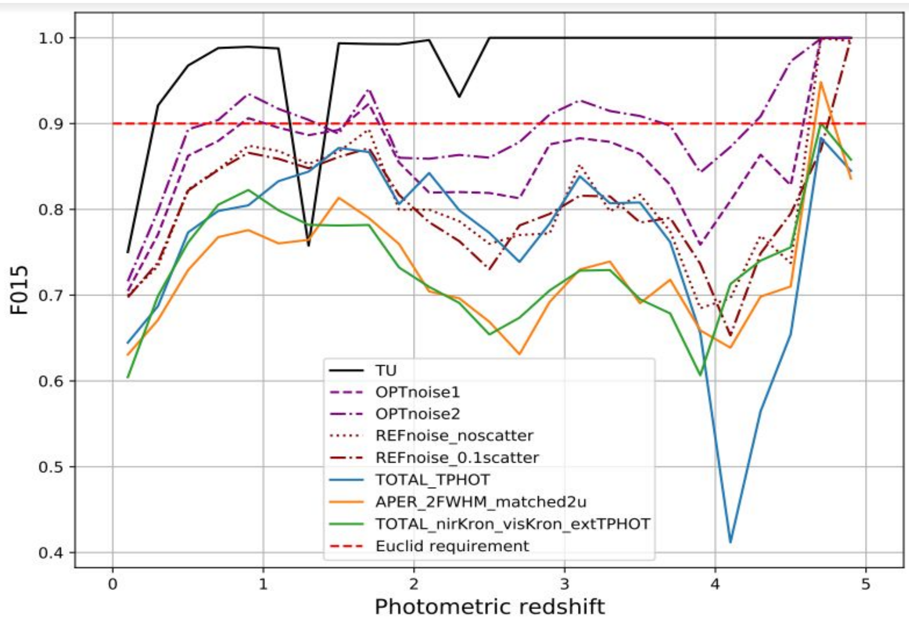


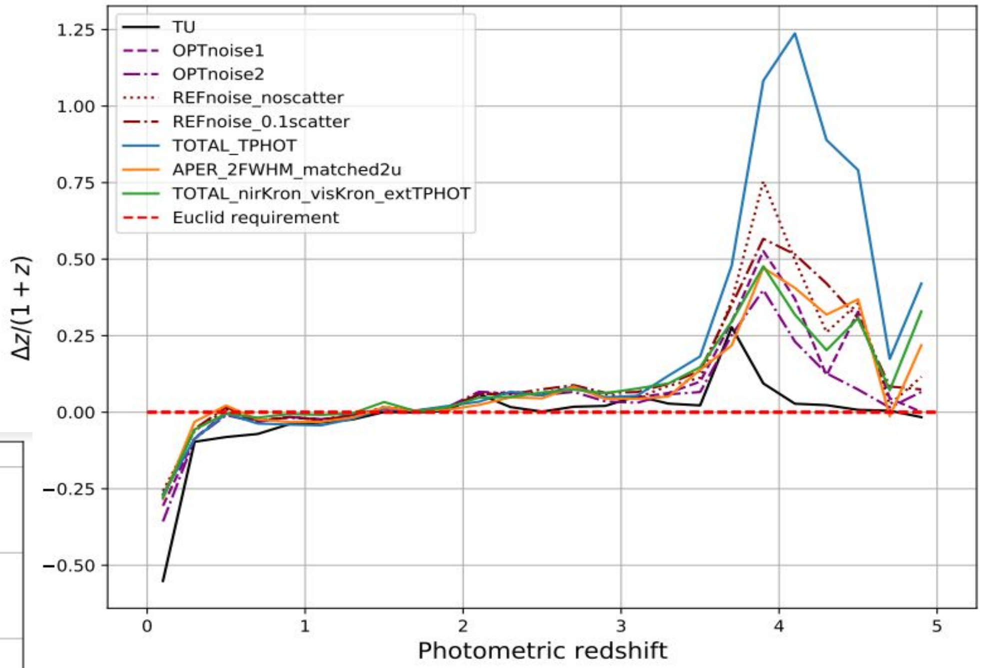




EMC OU-PHZ check

MER Photometry from does not *significantly* impact the performance of PHZ estimates w.r.t. “noisy” True Universe





OU-MER photometry: conclusions

- Long history of problems in OU-SIM simulations caused delays in quality checks. Often had to use home-made simulations
- Now, acceptable-to-good results; still finding some issues; working on them (new methods, checks on PSFs, OU-SIM ad hoc simulations with objects replicated on a regular grid of positions to factorize contamination out)
- Also checking nominal error budget consistency (F. Caro)
- Euclid Morphology Challenge: 5 model-fitting codes compared on simulations, 2 key-project papers being finalized, also used to check MER photometry, results similar to SC8
- Checks with OU-PHZ on EMC data (results similar to SC8): current photometry issues do not significantly impact the quality of photo-z

OU-MER
Catalog and output description

Erik Romelli
On behalf of the OU-MER team

5° Meeting Nazionale Collaborazione Euclid

OU-MER Deliverable

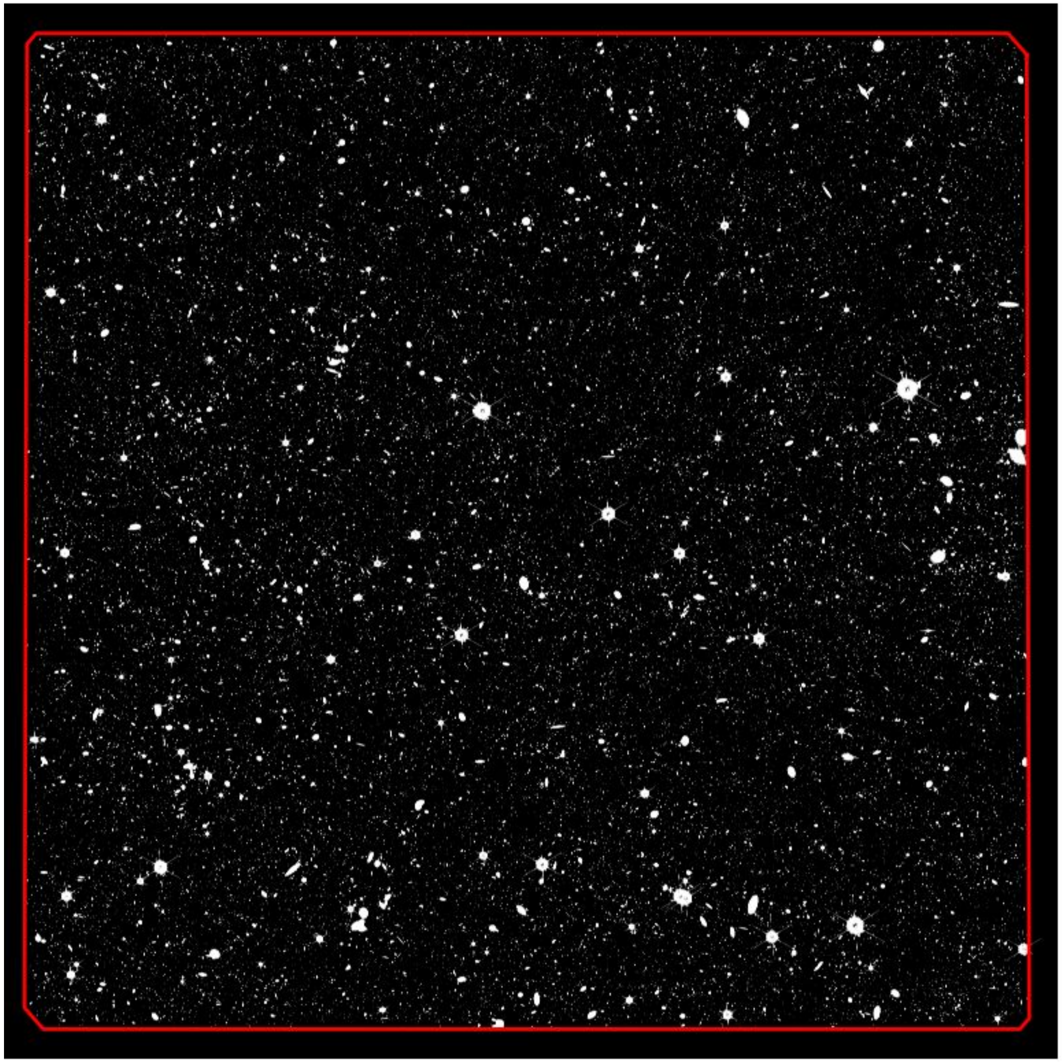
- DpdMerBksMosaic
  - Background-subtracted mosaic
- DpdMerDetectionMosaic
  - Mosaic used to perform the object detection, it could be a combination of the VIS and NIR background subtracted mosaics.
- DpdMerSegmentationMap
  - Map showing the connected pixels of the objects detected on the corresponding detection mosaic
- DpdMerFinalCatalog
  - Final merged catalog with photometric and morphological information

https://euclid.roe.ac.uk/projects/mer_pf/wiki/DataModel

MER mosaics and segmap

Outer Tile -> Mosaic

MER mosaics and segmap



Outer Tile -> Mosaic

Inner Tile -> Segmentation Map

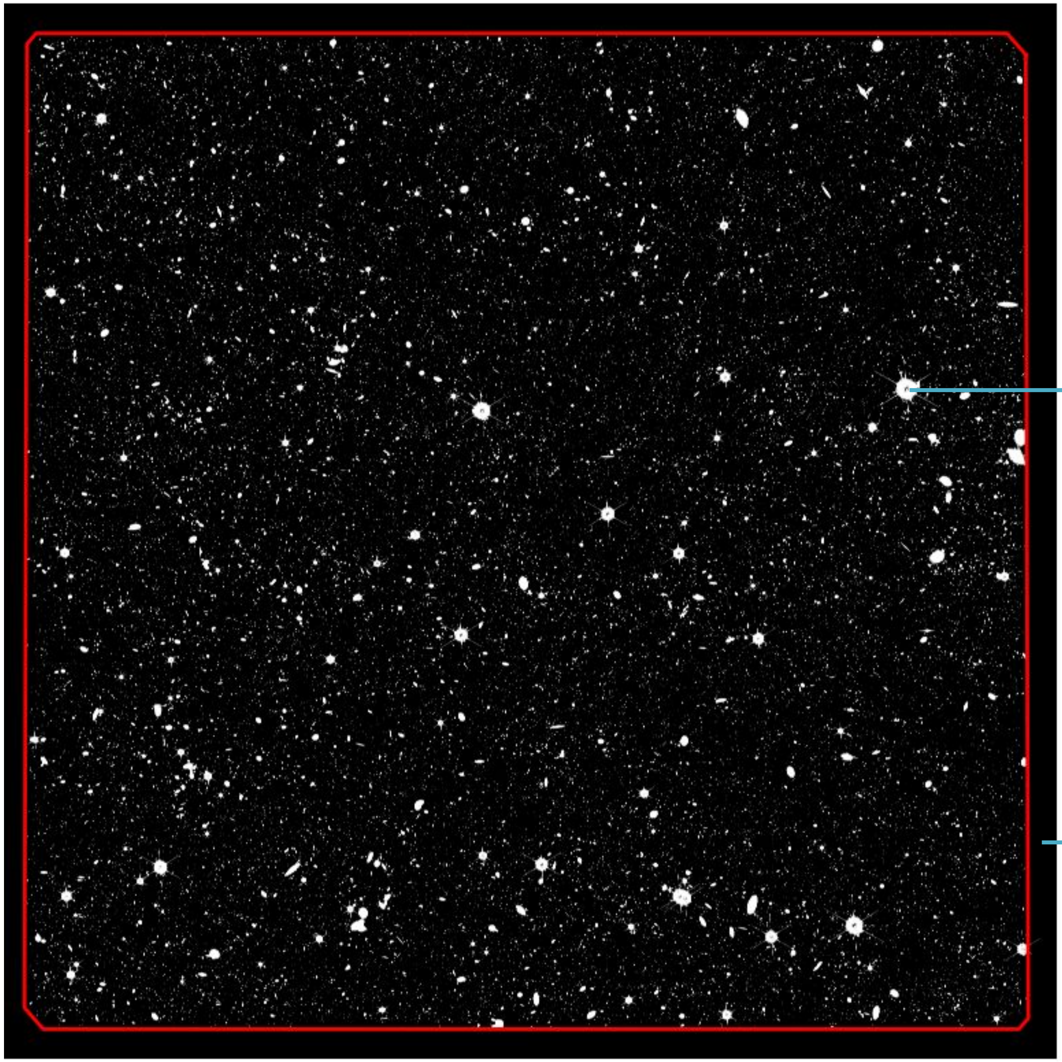
-> Catalogued sources

No overlap

=

No duplicates

MER segmentation map



SEGMENTATION_MAP_ID

TileID*10^6 + SourceID = 82215001301

SEGMENTATION_MAP_ID = -1 [NOT CATALOGUED]

OU-MER catalog

OBJECT_ID	FLUX_VIS_PSF	DEBLENDED_FLAG	SPURIOUS_FLAG	SEGMENTATION_AREA	A_IMAGE_ERR
RIGHT_ASCENSION	FLUXERR_VIS_PSF	PARENT_ID	SPURIOUS_PROB	A_IMAGE	POSITION_ANGLE_ERR
DECLINATION	FLUX_SEGMENTATION	BLENDED_PROB	MAG_STARGAL_SEP	POSITION_ANGLE	ELLIPTICITY_ERR
SEGMENTATION_MAP_ID	FLUXERR_SEGMENTATION	SHE_FLAG	DET_QUALITY_FLAG	ELLIPTICITY	CONCENTRATION_ERR
VIS_DET	FLUX_DETECTION_TOTAL	VARIABLE_FLAG	MU_MAX	CONCENTRATION	ASYMMETRY_ERR
	FLUXERR_DETECTION_TOTAL	BINARY_FLAG	MUMAX_MINUS_MAG	ASYMMETRY	SMOOTHNESS_ERR
FLUX_[band]_APER	FLAG_[band]	POINT_LIKE_FLAG		SMOOTHNESS	GINI_ERR
FLUXERR_[band]_APER	FLAG_NIR_STACK	POINT_LIKE_PROB		GINI	MOMENT_20_ERR
FLUX_NIR_STACK_APER		EXTENDED_FLAG		MOMENT_20	
FLUXERR_NIR_STACK_APER	AVG_TRANS_WAVE_[band]	EXTENDED_PROB			GAL_EBV
FLUX_[band]_TOTAL					GAL_EBV_ERR
FLUXERR_[band]_TOTAL					

OU-MER catalog

OBJECT_ID
RIGHT_ASCENSION
DECLINATION
SEGMENTATION_MAP_ID
VIS_DET

FLUX_[band]_APER
FLUXERR_[band]_APER
FLUX_NIR_STACK_APER
FLUXERR_NIR_STACK_APER
FLUX_[band]_TOTAL
FLUXERR_[band]_TOTAL

FLUX_VIS_PSF
FLUXERR_VIS_PSF
FLUX_SEGMENTATION
FLUXERR_SEGMENTATION
FLUX_DETECTION_TOTAL
FLUXERR_DETECTION_TOTAL
FLAG_[band]
FLAG_NIR_STACK

AVG_TRANS_WAVE_[band]

DEBLENDED_FLAG
PARENT_ID
BLENDED_PROB
SHE_FLAG
VARIABLE_FLAG
BINARY_FLAG
POINT_LIKE_FLAG
POINT_LIKE_PROB
EXTENDED_FLAG
EXTENDED_PROB

SPURIOUS_FLAG
SPURIOUS_PROB
MAG_STARGAL_SEP
DET_QUALITY_FLAG
MU_MAX
MUMAX_MINUS_MAG

SEGMENTATION_AREA
A_IMAGE
POSITION_ANGLE
ELLIPTICITY
CONCENTRATION
ASYMMETRY
SMOOTHNESS
GINI
MOMENT_20

A_IMAGE_ERR
POSITION_ANGLE_ERR
ELLIPTICITY_ERR
CONCENTRATION_ERR
ASYMMETRY_ERR
SMOOTHNESS_ERR
GINI_ERR
MOMENT_20_ERR

GAL_EBV
GAL_EBV_ERR

OU-MER catalog

OBJECT_ID	FLUX_VIS_PSF	DEBLENDED_FLAG	SPURIOUS_FLAG	SEGMENTATION_AREA	A_IMAGE_ERR
RIGHT_ASCENSION	FLUXERR_VIS_PSF	PARENT_ID	SPURIOUS_PROB	A_IMAGE	POSITION_ANGLE_ERR
DECLINATION	FLUX_SEGMENTATION	BLENDED_PROB	MAG_STARGAL_SEP	POSITION_ANGLE	ELLIPTICITY_ERR
SEGMENTATION_MAP_ID	FLUXERR_SEGMENTATION	SHE_FLAG	DET_QUALITY_FLAG	ELLIPTICITY	CONCENTRATION_ERR
VIS_DET	FLUX_DETECTION_TOTAL	VARIABLE_FLAG	MU_MAX	CONCENTRATION	ASYMMETRY_ERR
	FLUXERR_DETECTION_TOTAL	BINARY_FLAG	MUMAX_MINUS_MAG	ASYMMETRY	SMOOTHNESS_ERR
FLUX_[band]_APER	FLAG_[band]	POINT_LIKE_FLAG		SMOOTHNESS	GINI_ERR
FLUXERR_[band]_APER	FLAG_NIR_STACK	POINT_LIKE_PROB		GINI	MOMENT_20_ERR
FLUX_NIR_STACK_APER		EXTENDED_FLAG		MOMENT_20	
FLUXERR_NIR_STACK_APER	AVG_TRANS_WAVE_[band]	EXTENDED_PROB			GAL_EBV
FLUX_[band]_TOTAL					GAL_EBV_ERR
FLUXERR_[band]_TOTAL					

Available bands

VIS	H	DECam g	OmegaCAM g	Rubin/LSST g	MegaCam u	JPCam g	Pan-STARRS i	HSC z
	J	DECam i	OmegaCAM i	Rubin/LSST i	MegaCam r		Pan-STARRS z	
	Y	DECam r	OmegaCAM r	Rubin/LSST r				
		DECam z	OmegaCAM u	Rubin/LSST u				
				Rubin/LSST z				

OU-MER catalog

OBJECT_ID
RIGHT_ASCENSION
DECLINATION
SEGMENTATION_MAP_ID
VIS_DET

FLUX_[band]_APER
FLUXERR_[band]_APER
FLUX_NIR_STACK_APER
FLUXERR_NIR_STACK_APER
FLUX_[band]_TOTAL
FLUXERR_[band]_TOTAL

FLUX_VIS_PSF
FLUXERR_VIS_PSF
FLUX_SEGMENTATION
FLUXERR_SEGMENTATION
FLUX_DETECTION_TOTAL
FLUXERR_DETECTION_TOTAL
FLAG_[band]
FLAG_NIR_STACK

AVG_TRANS_WAVE_[band]

DEBLENDED_FLAG
PARENT_ID
BLENDED_PROB
SHE_FLAG
VARIABLE_FLAG
BINARY_FLAG
POINT_LIKE_FLAG
POINT_LIKE_PROB
EXTENDED_FLAG
EXTENDED_PROB

SPURIOUS_FLAG
SPURIOUS_PROB
MAG_STARGAL_SEP
DET_QUALITY_FLAG
MU_MAX
MUMAX_MINUS_MAG

SEGMENTATION_AREA
A_IMAGE
POSITION_ANGLE
ELLIPTICITY
CONCENTRATION
ASYMMETRY
SMOOTHNESS
GINI
MOMENT_20

A_IMAGE_ERR
POSITION_ANGLE_ERR
ELLIPTICITY_ERR
CONCENTRATION_ERR
ASYMMETRY_ERR
SMOOTHNESS_ERR
GINI_ERR
MOMENT_20_ERR

GAL_EBV
GAL_EBV_ERR

Available bands

VIS	H	DECam g	OmegaCAM g	Rubin/LSST g	MegaCam u	JPCam g	Pan-STARRS i	HSC z
	J	DECam i	OmegaCAM i	Rubin/LSST i	MegaCam r		Pan-STARRS z	
	Y	DECam r	OmegaCAM r	Rubin/LSST r				
		DECam z	OmegaCAM u	Rubin/LSST u				
				Rubin/LSST z				

OU-MER catalog

OBJECT_ID
RIGHT_ASCENSION
DECLINATION
SEGMENTATION_MAP_ID
VIS_DET

FLUX_[band]_APER
FLUXERR_[band]_APER
FLUX_NIR_STACK_APER
FLUXERR_NIR_STACK_APER
FLUX_[band]_TOTAL
FLUXERR_[band]_TOTAL

FLUX_VIS_PSF
FLUXERR_VIS_PSF
FLUX_SEGMENTATION
FLUXERR_SEGMENTATION
FLUX_DETECTION_TOTAL
FLUXERR_DETECTION_TOTAL
FLAG_[band]
FLAG_NIR_STACK

AVG_TRANS_WAVE_[band]

DEBLENDED_FLAG
PARENT_ID
BLENDED_PROB
SHE_FLAG
VARIABLE_FLAG
BINARY_FLAG
POINT_LIKE_FLAG
POINT_LIKE_PROB
EXTENDED_FLAG
EXTENDED_PROB

SPURIOUS_FLAG
SPURIOUS_PROB
MAG_STARGAL_SEP
DET_QUALITY_FLAG
MU_MAX
MUMAX_MINUS_MAG

SEGMENTATION_AREA
A_IMAGE
POSITION_ANGLE
ELLIPTICITY
CONCENTRATION
ASYMMETRY
SMOOTHNESS
GINI
MOMENT_20

A_IMAGE_ERR
POSITION_ANGLE_ERR
ELLIPTICITY_ERR
CONCENTRATION_ERR
ASYMMETRY_ERR
SMOOTHNESS_ERR
GINI_ERR
MOMENT_20_ERR

GAL_EBV
GAL_EBV_ERR

Available bands

VIS	H	DECam g	OmegaCAM g	Rubin/LSST g	MegaCam u	JPCam g	Pan-STARRS i	HSC z
	J	DECam i	OmegaCAM i	Rubin/LSST i	MegaCam r		Pan-STARRS z	
	Y	DECam r	OmegaCAM r	Rubin/LSST r				
		DECam z	OmegaCAM u	Rubin/LSST u				
				Rubin/LSST z				

OU-MER catalog

OBJECT_ID
RIGHT_ASCENSION
DECLINATION
SEGMENTATION_MAP_ID
VIS_DET

FLUX_[band]_APER
FLUXERR_[band]_APER
FLUX_NIR_STACK_APER
FLUXERR_NIR_STACK_APER
FLUX_[band]_TOTAL
FLUXERR_[band]_TOTAL

FLUX_VIS_PSF
FLUXERR_VIS_PSF
FLUX_SEGMENTATION
FLUXERR_SEGMENTATION
FLUX_DETECTION_TOTAL
FLUXERR_DETECTION_TOTAL
FLAG_[band]
FLAG_NIR_STACK

AVG_TRANS_WAVE_[band]

DEBLENDED_FLAG
PARENT_ID
BLENDED_PROB
SHE_FLAG
VARIABLE_FLAG
BINARY_FLAG
POINT_LIKE_FLAG
POINT_LIKE_PROB
EXTENDED_FLAG
EXTENDED_PROB

SPURIOUS_FLAG
SPURIOUS_PROB
MAG_STARGAL_SEP
DET_QUALITY_FLAG
MU_MAX
MUMAX_MINUS_MAG

SEGMENTATION_AREA
A_IMAGE
POSITION_ANGLE
ELLIPTICITY
CONCENTRATION
ASYMMETRY
SMOOTHNESS
GINI
MOMENT_20

A_IMAGE_ERR
POSITION_ANGLE_ERR
ELLIPTICITY_ERR
CONCENTRATION_ERR
ASYMMETRY_ERR
SMOOTHNESS_ERR
GINI_ERR
MOMENT_20_ERR

GAL_EBV
GAL_EBV_ERR

Available bands

VIS	H	DECam g	OmegaCAM g	Rubin/LSST g	MegaCam u	JPCam g	Pan-STARRS i	HSC z
	J	DECam i	OmegaCAM i	Rubin/LSST i	MegaCam r		Pan-STARRS z	
	Y	DECam r	OmegaCAM r	Rubin/LSST r				
		DECam z	OmegaCAM u	Rubin/LSST u				
				Rubin/LSST z				

MER source classification

VIS_DET

No VIS-only detection

1: detected by VIS
0: NIR-only detection

MER source classification

VIS_DET

No VIS-only detection

1: detected by VIS
0: NIR-only detection

DET_QUALITY_FLAG

0: regular
1: contaminated
2: originally blended
4: saturated pixels
8: edge of the field

MER source classification

VIS_DET

No VIS-only detection

1: detected by VIS
0: NIR-only detection

DET_QUALITY_FLAG

0: regular
1: contaminated
2: originally blended
4: saturated pixels
8: edge of the field

POINT_LIKE_FLAG

VIS_DET = 1
DET_QUALITY_FLAG = 0
POINT_LIKE_PROBA > threshold (MDB)

0: extended source
1: point-like source

MER source classification

VIS_DET

No VIS-only detection

1: detected by VIS
0: NIR-only detection

SPURIOUS_PROBA

SPURIOUS_FLAG: work in progress...

DET_QUALITY_FLAG

0: regular
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MER source classification

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DET_QUALITY_FLAG = 0
POINT_LIKE_PROBA > threshold (MDB)

0: extended source
1: point-like source

SPURIOUS_PROBA

SPURIOUS_FLAG: work in progress...

DEBLENDED_FLAG

0: not originally blended
1: originally blended

MER source classification

VIS_DET

No VIS-only detection

1: detected by VIS
0: NIR-only detection

DET_QUALITY_FLAG

0: regular
1: contaminated
2: originally blended
4: saturated pixels
8: edge of the field

POINT_LIKE_FLAG

VIS_DET = 1
DET_QUALITY_FLAG = 0
POINT_LIKE_PROBA > threshold (MDB)

0: extended source
1: point-like source

SPURIOUS_PROBA

SPURIOUS_FLAG: work in progress...

DEBLENDED_FLAG

0: not originally blended
1: originally blended

PARENT_ID*

Same PARENT_ID -> deblended from same parent

-1: not originally blended
: parent source ID

* New in DM 9

Something more about MER catalogs

The OU-MER catalog uses the common definitions for NULL values

(EL_NullValue · develop · EuclidLibs / EL_Utils · GitLab (euclid-sgs.uk))

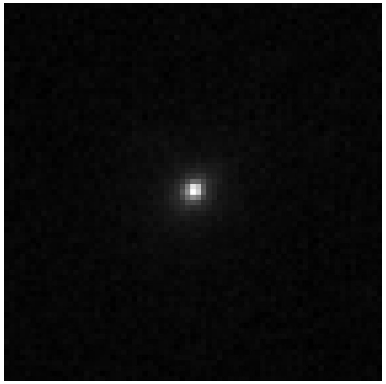
```python
class NullValueDefinition(object):
    SHORT = 32767
    UNSIGNED_SHORT = 65535
    INT = 2147483647
    UNSIGNED_INT = 4294967295
    LONG = 0 + INT
    UNSIGNED_LONG = 0 + UNSIGNED_INT
    LONG_LONG = 9223372036854775807
    UNSIGNED_LONG_LONG = 18446744073709551615
    FLOAT = (
        -9.1191198405961529780329707018610306211666548598348835886874346433328408778606899431906640529632568359375e-36
    )
    DOUBLE = (
        -9.11912913914910037028874457372284655860629798950284537967455254278597872115555125171841159862837211669273074221564456820487976074 21875e-36
    )
    BOOL = 0
    STRING = ""
    COMPLEX_FLOAT = complex(FLOAT, 0)
    COMPLEX_DOUBLE = complex(DOUBLE, 0)
```

Something more about MER catalogs

Delivered within DpdMerFinalCatalog:

MER CUTOUT CATALOG

OBJECT_ID	CORNER_0_RA	CORNER_1_RA	CORNER_2_RA	CORNER_3_RA	SEMIMAJOR_AXIS
RIGHT_ASCENSION	CORNER_0_DEC	CORNER_1_DEC	CORNER_2_DEC	CORNER_3_DEC	SEMIMINOR-AXIS
DECLINATION					POSITION_ANGLE
					PARENT_ID
					FLUX_DETECTION_TOAL




Q&A
You have
Questions
We have
Answers