Cluster data analysis with the DM stack

LSST-France – June 8th - 9th

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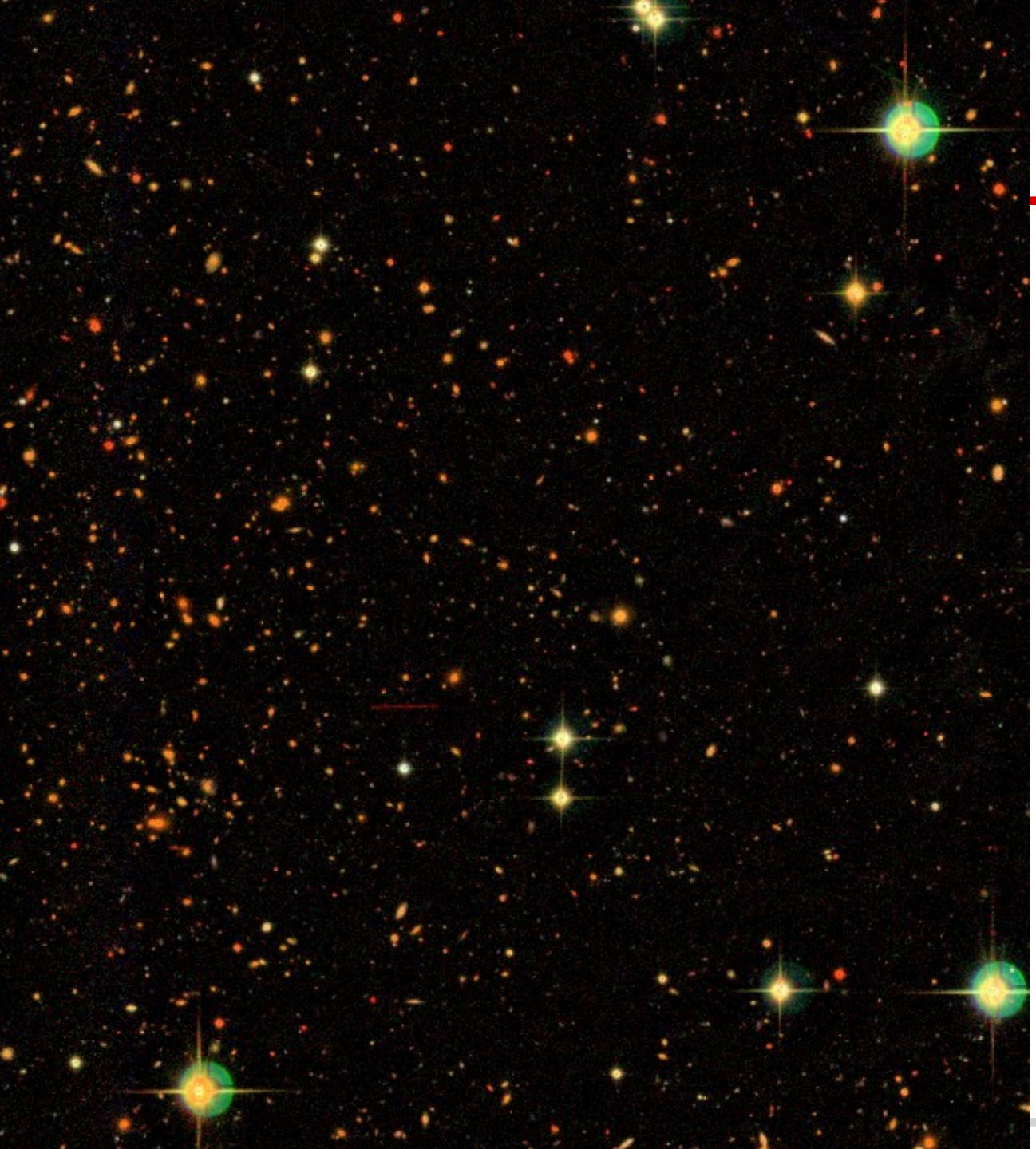
- Work started in the framework of the DESC reprocessing task force
- See step / step documentation in https://github.com/DarkEnergyScienceCollaboration/ReprocessingTaskForce/wiki
- Goal is to develop a complete pipeline for cluster analysis in the stack framework
- Try to reproduce the results from the Weighting The Giants collaboration

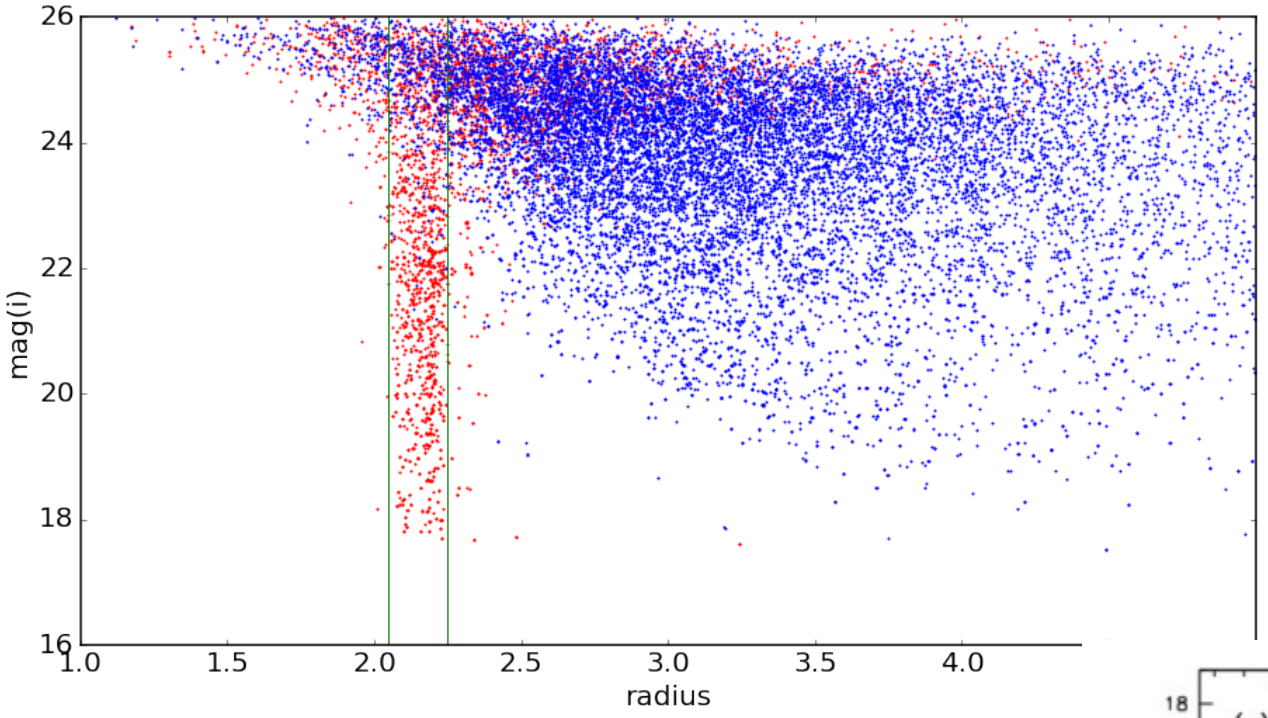
MACSJ2243.3-0935 (z=0.447)

- In the SDSS foot print – CFHT images in all bands
  - u(5), g(6), r(9), i(12), z(10)
- Processing is ~complete
  - processCcd
  - coadd
  - Multiband processing (deblend and measure in every band coherently)
  - Photometry with CModel (fit galaxies with exponential + dVC)
  - ShapeHSM (interface with GalSim)
- Forced photometry is broken (but I haven't spent too much time on it)
- Catalogs are available at CC-IN2P3
  - Easy procedure to access the data through python notebooks without having to worry about the LSST stack



Color coding :

R = i
G = r
B = g



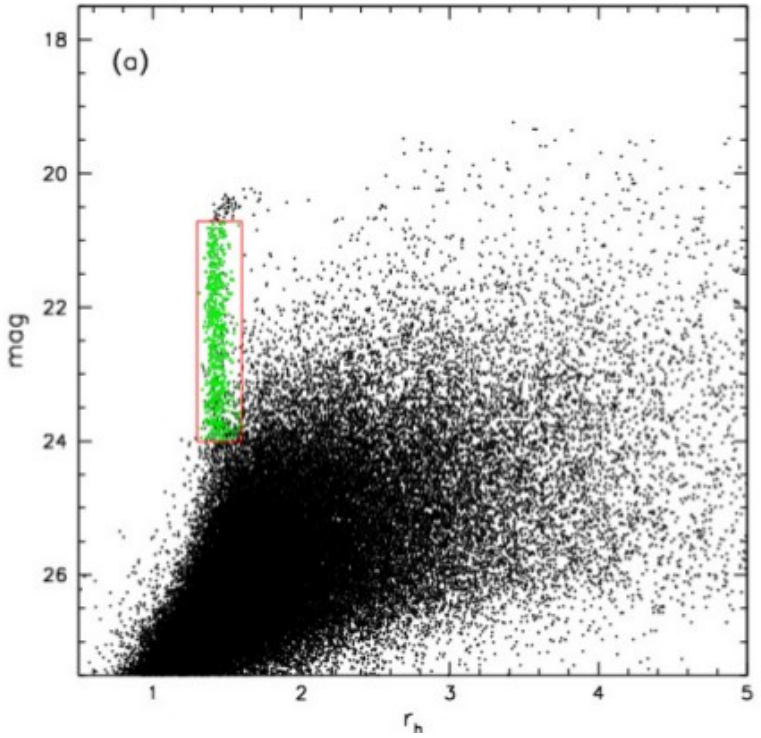
Star / galaxy separation

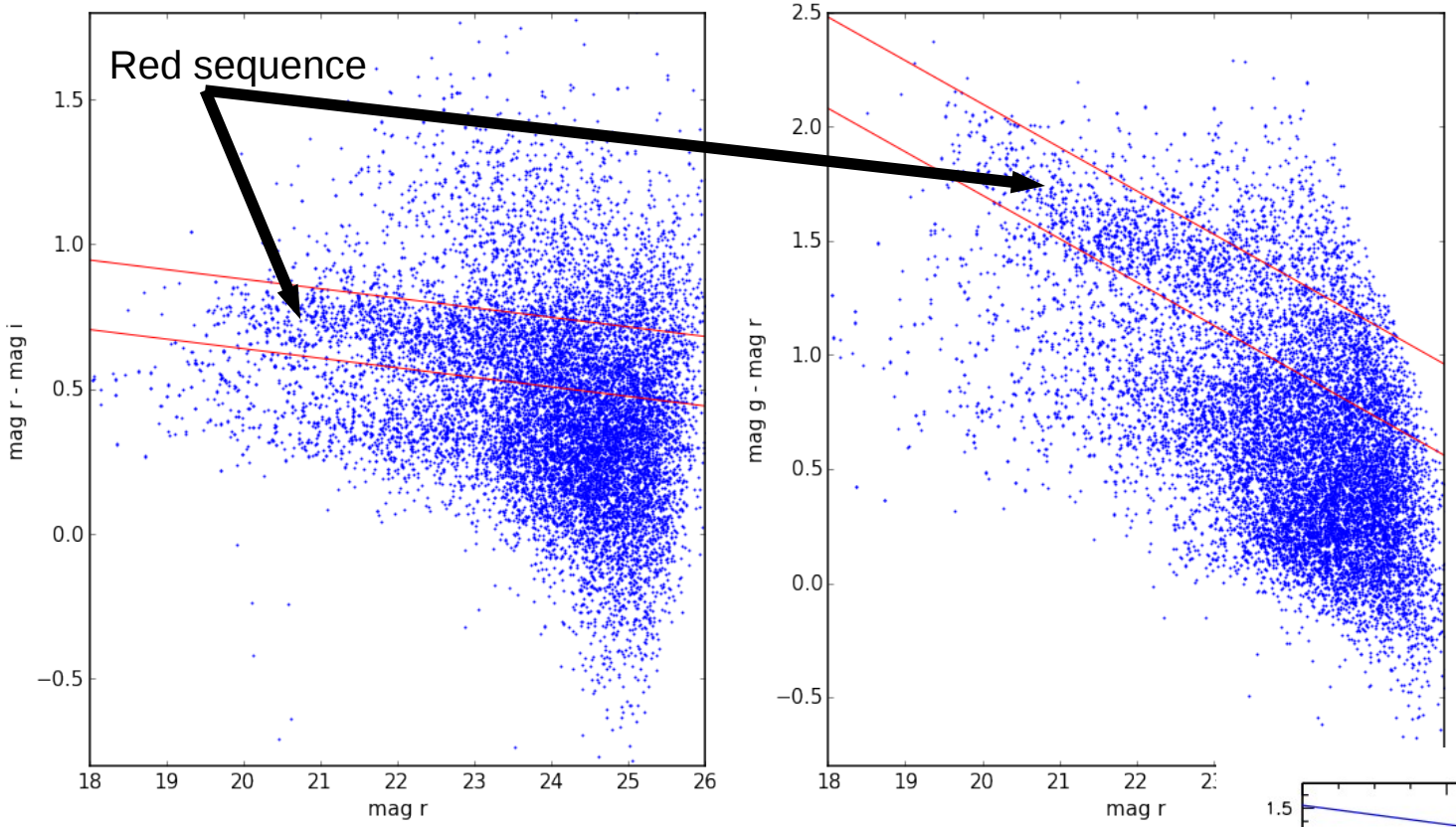
Source extendedness :

- blue : galaxies
- red : stars

Source radius computed from the second moments

To be compared to:
A. vd Linden et al. 2014 – WtG I.

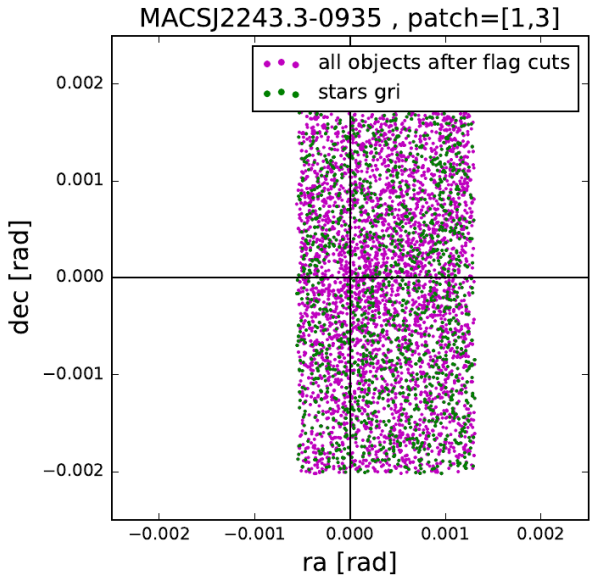


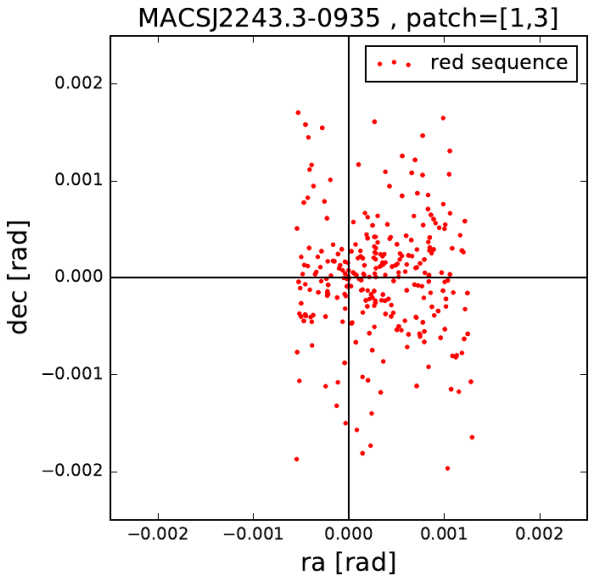


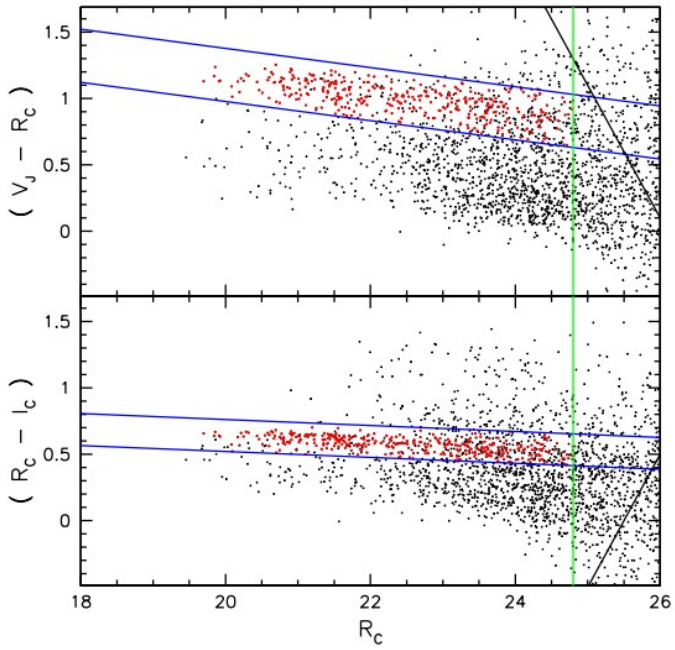
Color plots

Fluxes from Cmodel in multiband

To be compared to: Aplegate et al. 2014 – WtG III.





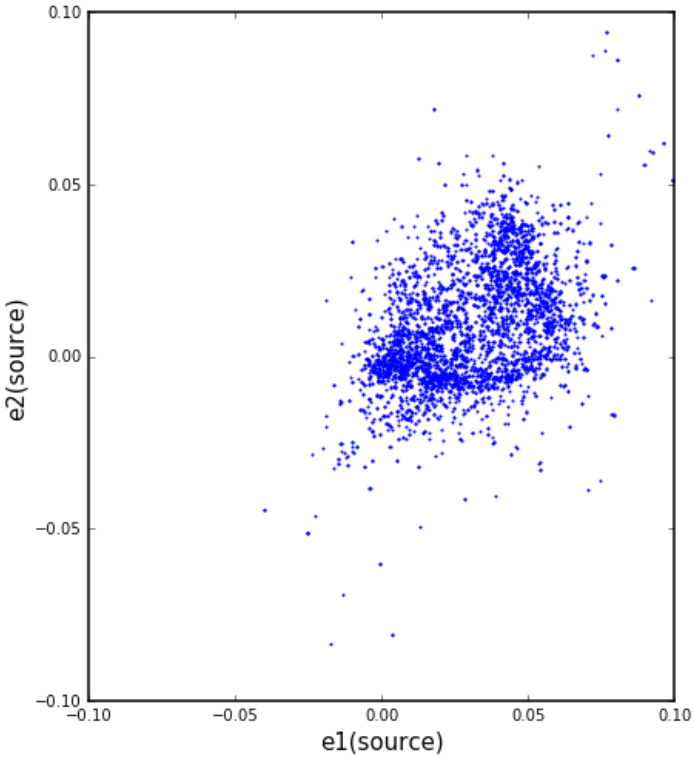


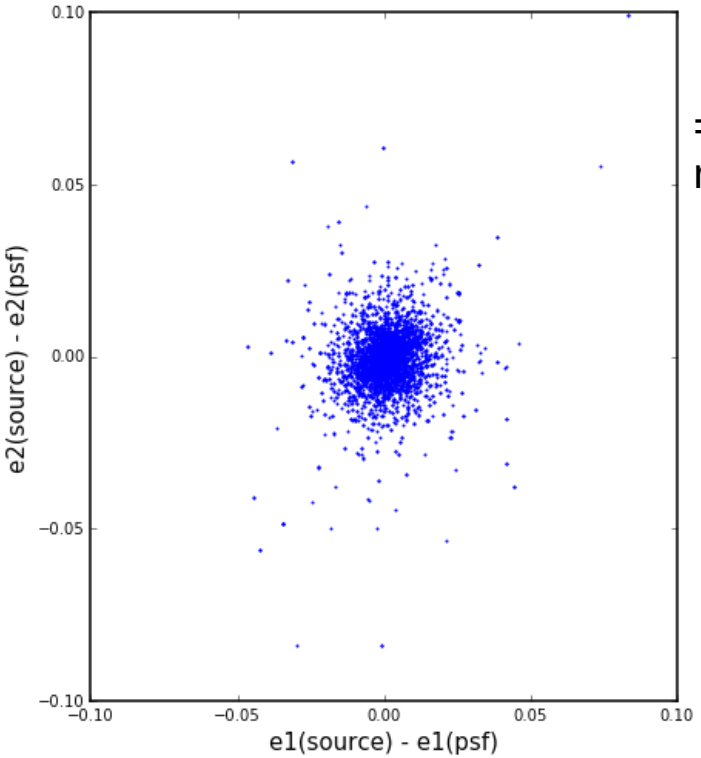
First look at ellipticities

Compute ellipticities for stars from shapeHSM second moments

- For sources
- For psf

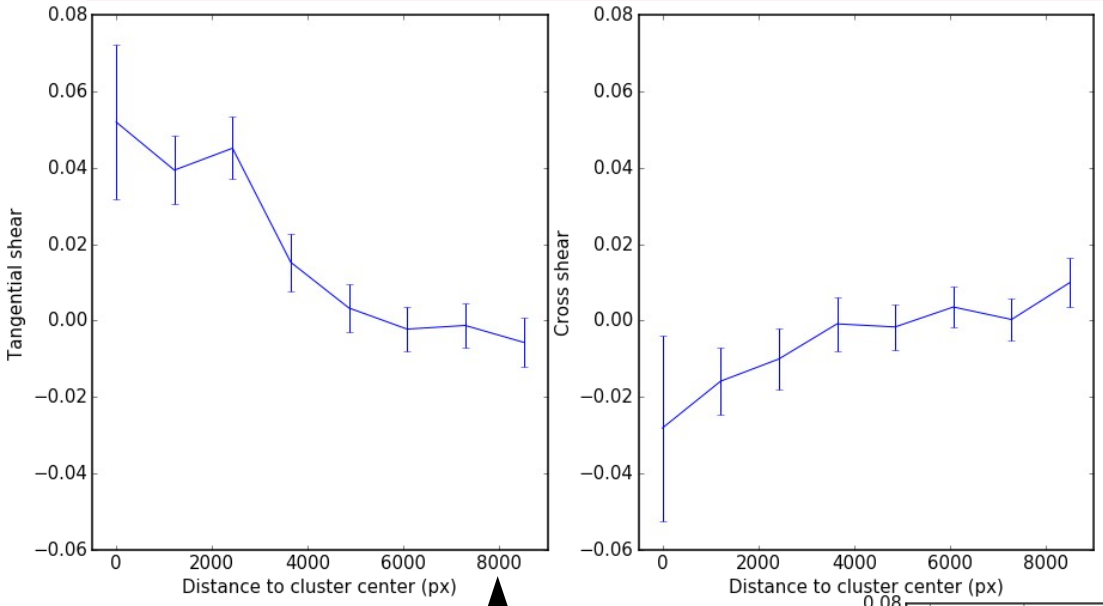
$$e = \frac{Q_{11} - Q_{22} + 2iQ_{12}}{Q_{11} + Q_{22} + 2(Q_{11}Q_{22} - Q_{12}^2)^{1/2}} = e_1 + ie_2$$





==> PSF model seems reasonable

… and shear



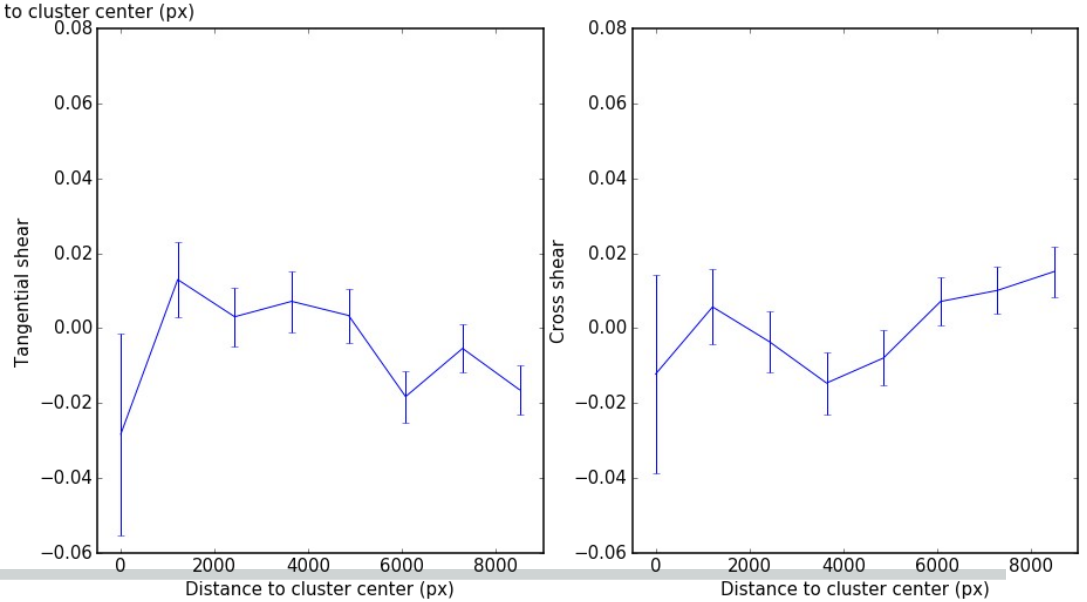
24 arcmin

Ellipticities from shapeHSM in I band

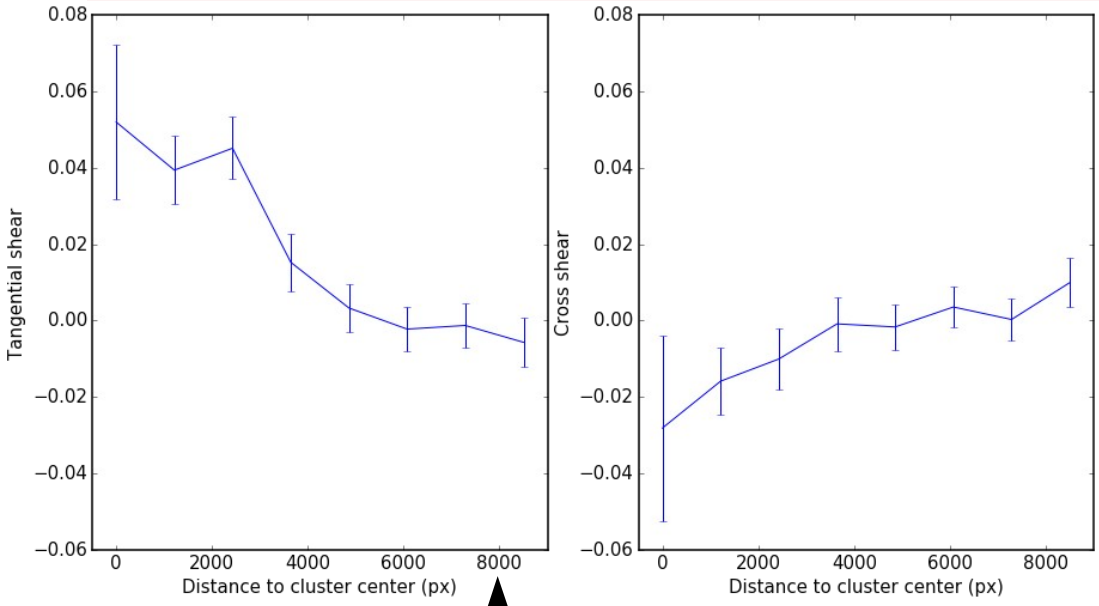
Quality cut : ellipticities should be roughly compatible in r and I

$|\Delta e_{1,2}| < 0.5$

Null test : move reference point by 18 arcmin in ra and dec

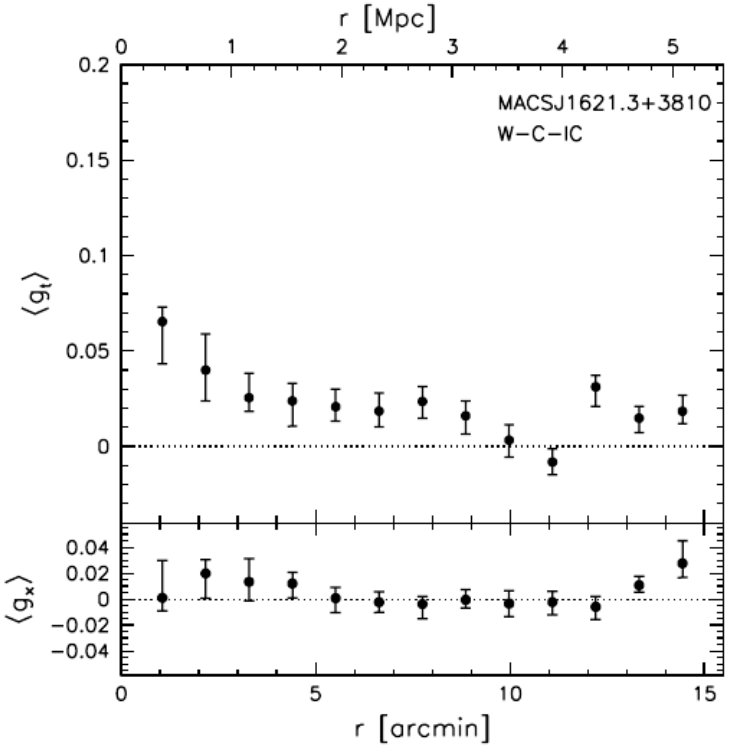


… and shear

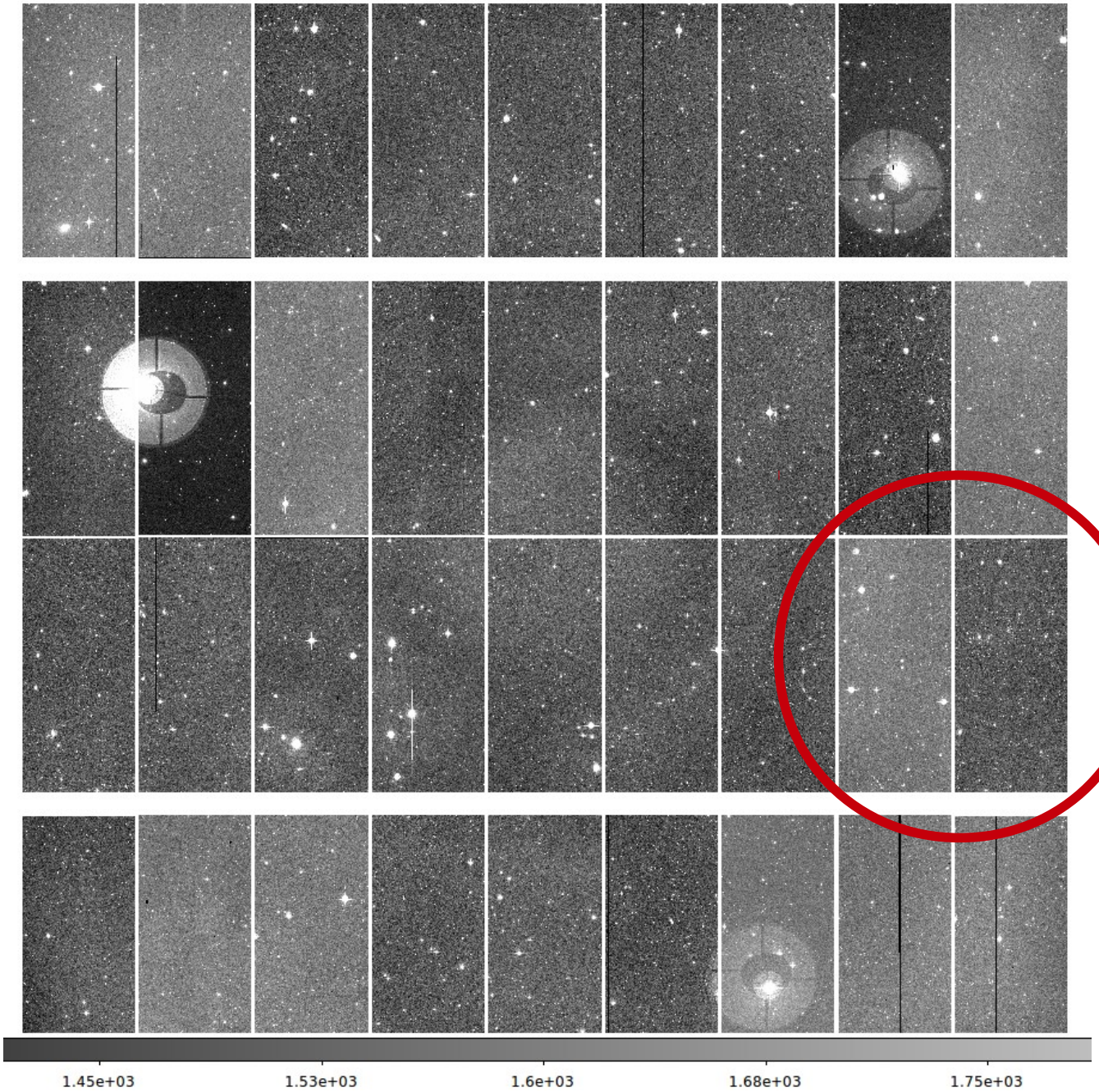


25 arcmin

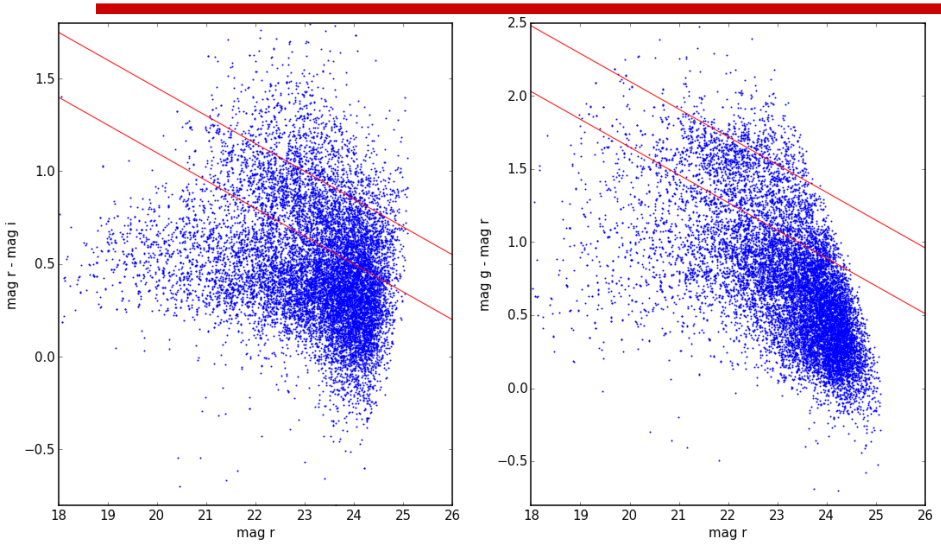
This study
MACSJ2243.3-0935
(z=0.447)

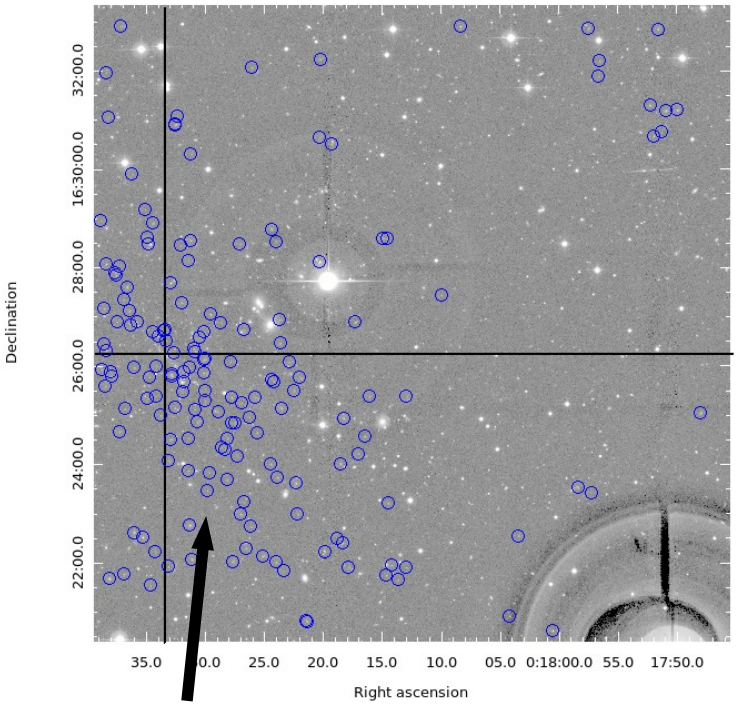


WtG I – MACSJ1621.3+3810
(z=0.463)

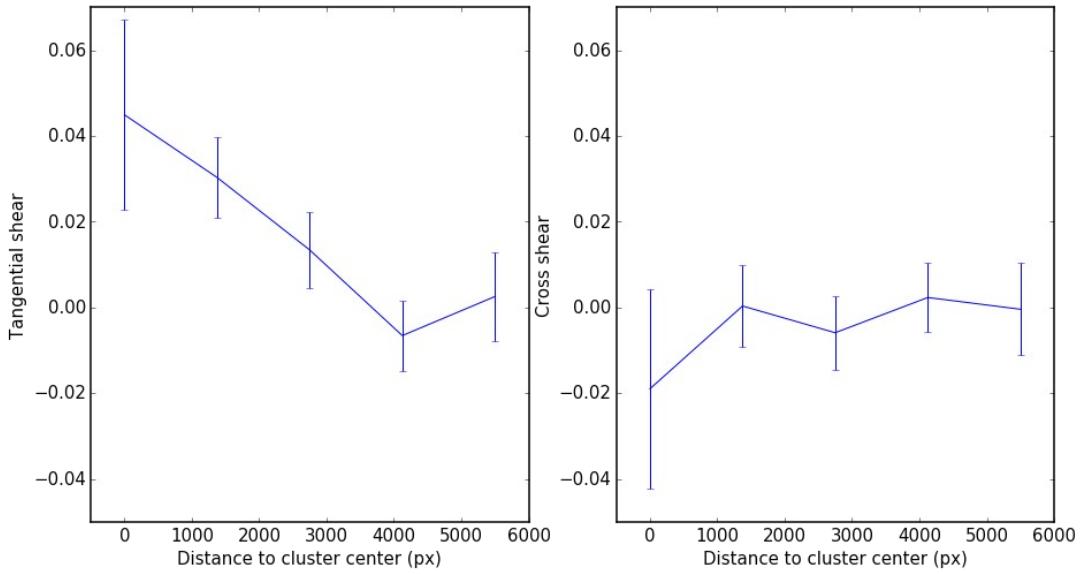

MACSJ2243
1.45e+03
1.53e+03
1.6e+03
1.68e+03
1.75e+03

CL0016+16 (z=0.547)

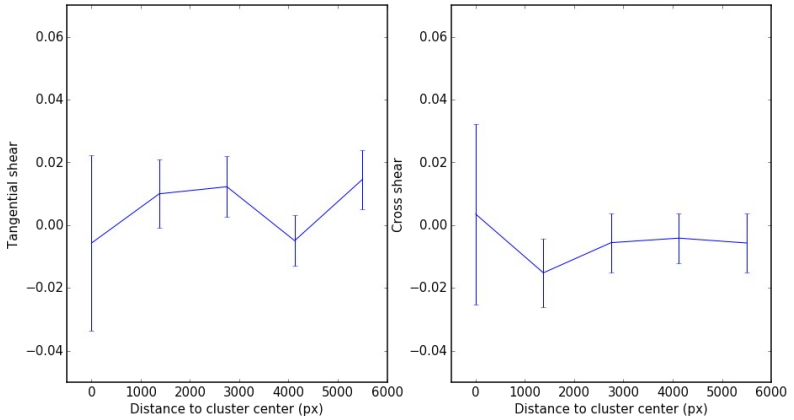




Galaxies identified as red sequence



Null test



Next steps

- Continue to debug
- Try to reproduce WtG I and III step by step
- Fix forced photometry

- Work with Jean-Stéphane to plug Photo-z in order to improve foreground galaxy removal

- New clusters
  - Zw2089 from recent CFHT campaign (already have i, r and z band)
  - 3C295 – check what we can do with it

- With Nicolas joining the effort we hope to make fast progress