Still Clusters, again Lensing

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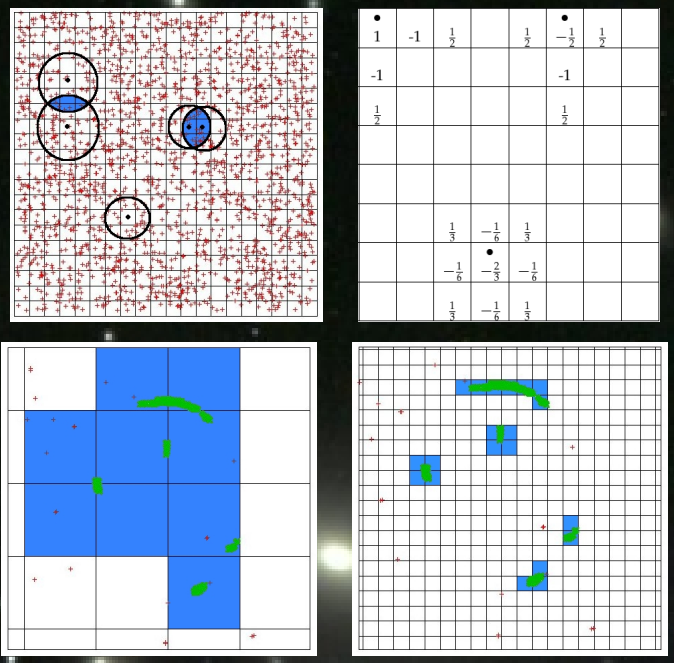
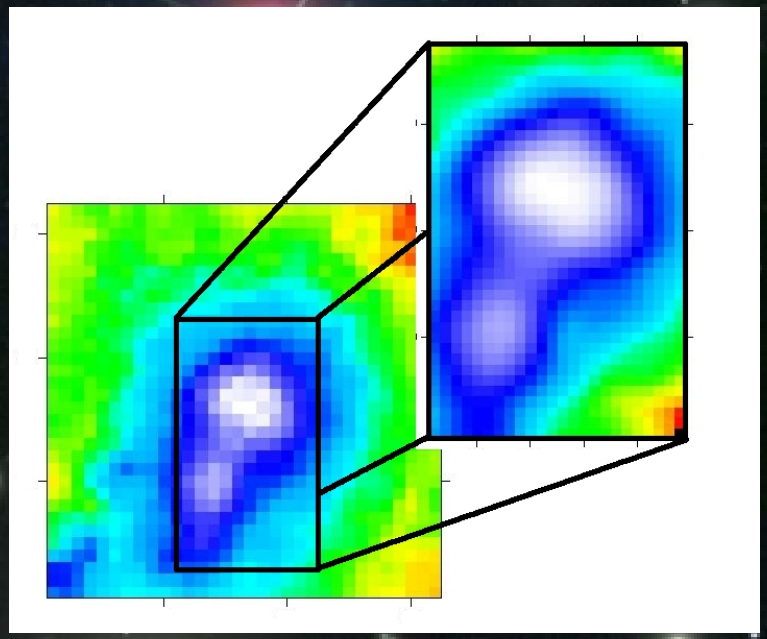
The Reconstruction Method (JM et al. 2009)





Maximum-Likelihood

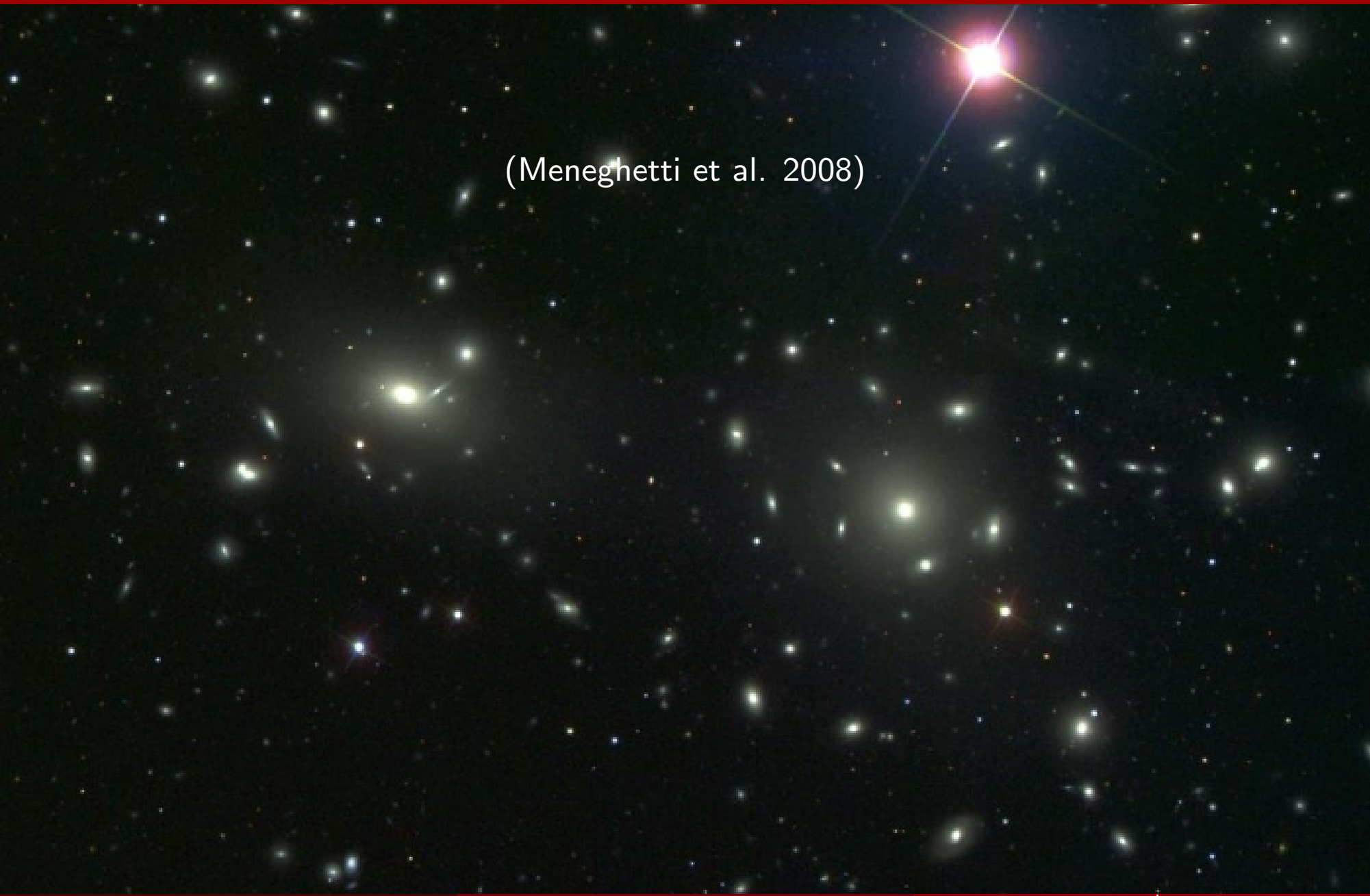
$$\chi^2(\psi) = \chi^2_w(\psi) + \chi^2_s(\psi)$$

$$\chi^2_w(\psi) = \sum_{i,j} \left(\varepsilon - \frac{Z(z)\gamma(\psi)}{1 - Z(z)\kappa(\psi)} \right)_i \mathcal{C}^{-1}_{ij} \left(\varepsilon - \frac{Z(z)\gamma(\psi)}{1 - Z(z)\kappa(\psi)} \right)_j$$

$$\chi^2_s(\psi) = \sum_i \frac{|(1 - Z(z)\kappa(\psi))^2 - |Z(z)\gamma(\psi)|^2|^2_i}{\sigma^2_i}$$

Input Data

1. Ellipticity catalogue
2. Flexion catalogue
3. Arc positions
4. Multiple image systems


(Meneghetti et al. 2008)

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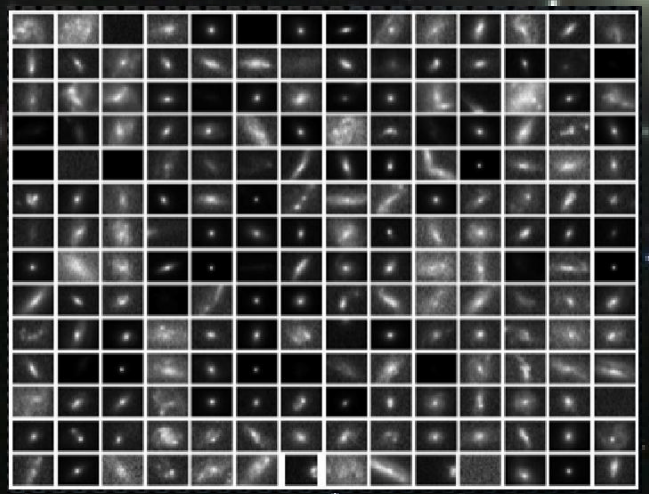
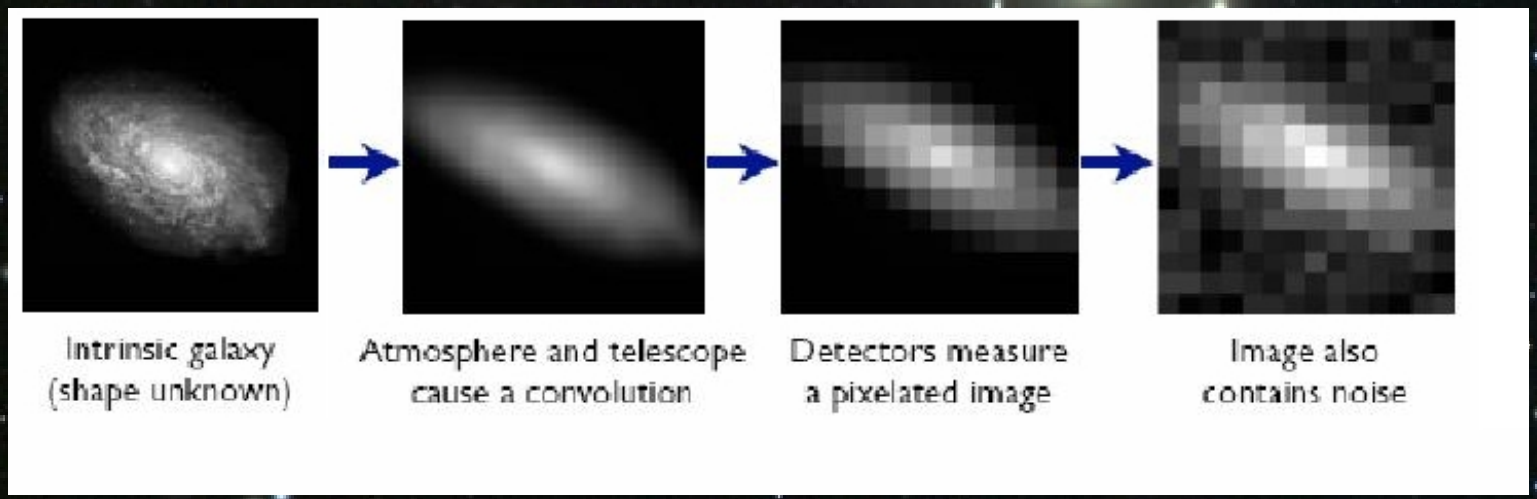
- Use shapelet decomposition of real galaxies ($\sim$ 10000 from HUDF (b,v,i,z) and $\sim$ 3000 from GOODS (z).



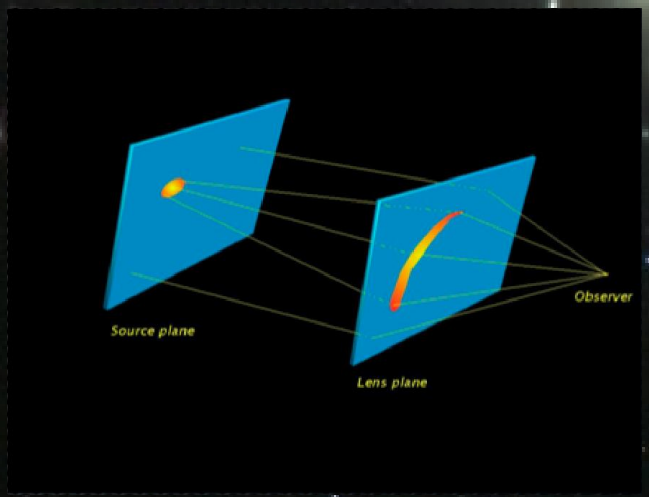
(Meneghetti et al. 2008)

- Use shapelet decomposition of real galaxies ($\sim$ 10000 from HUDF (b,v,i,z) and $\sim$ 3000 from GOODS (z).
- Add sky background, instrumental noises and the PSF.



(Meneghetti et al. 2008)

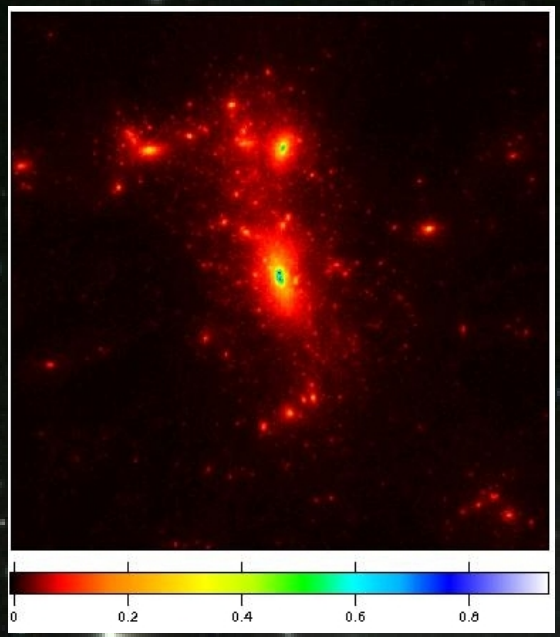
- Use shapelet decomposition of real galaxies ($\sim$ 10000 from HUDF (b,v,i,z) and $\sim$ 3000 from GOODS (z).
- Use simulated clusters or analytic profiles to add lensing.
- Add sky background, instrumental noises and the PSF.

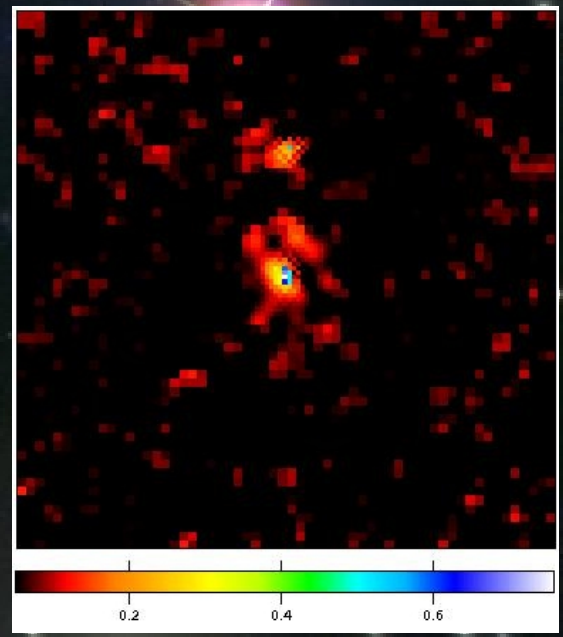


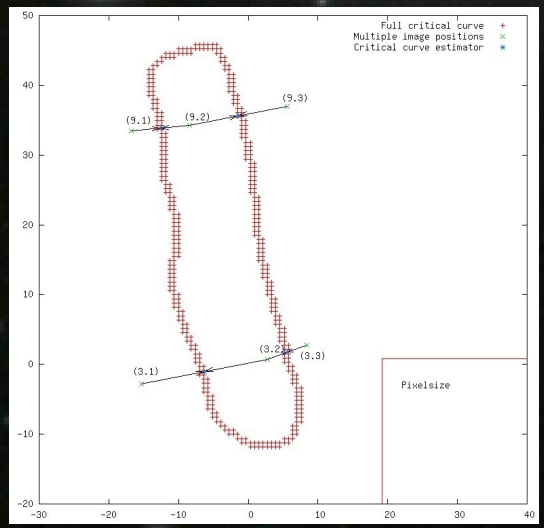
(Meneghetti et al. 2008)

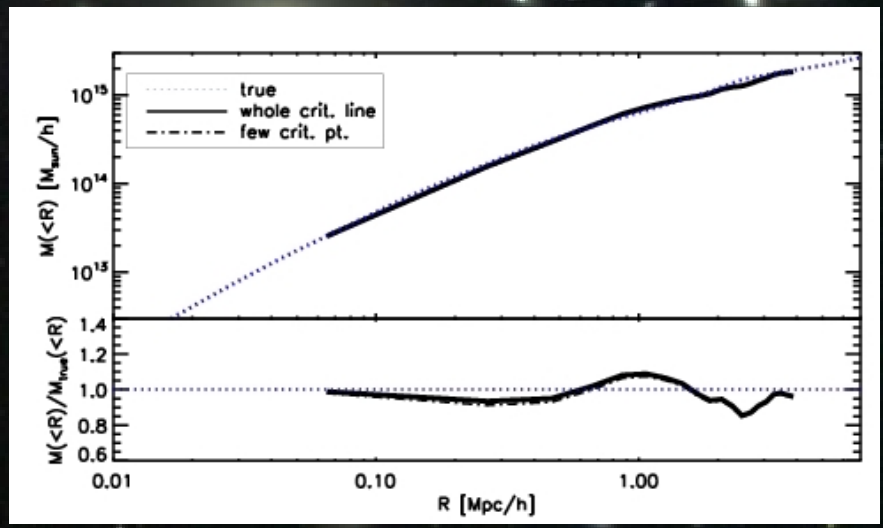
- Use shapelet decomposition of real galaxies ($\sim$ 10000 from HUDF (b,v,i,z) and $\sim$ 3000 from GOODS (z).
- Use simulated clusters or analytic profiles to add lensing.
- Add sky background, instrumental noises and the PSF.
- Produce a mock observation for different instruments.

Results: Simulated Cluster (JM et al. 2009)

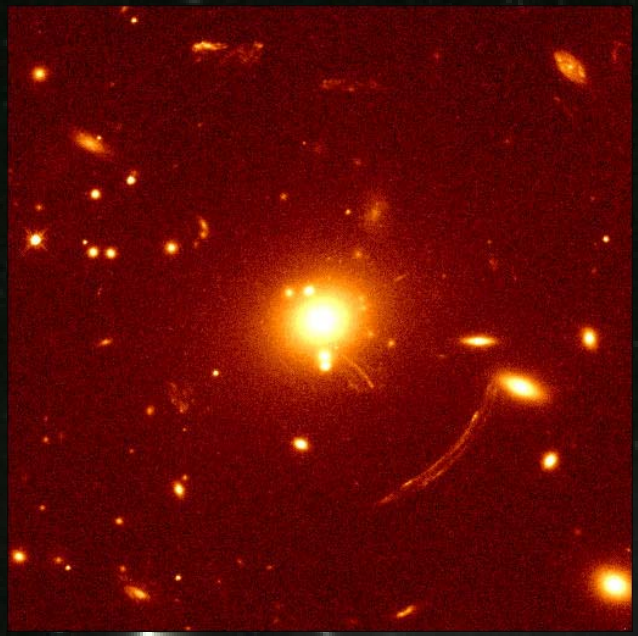


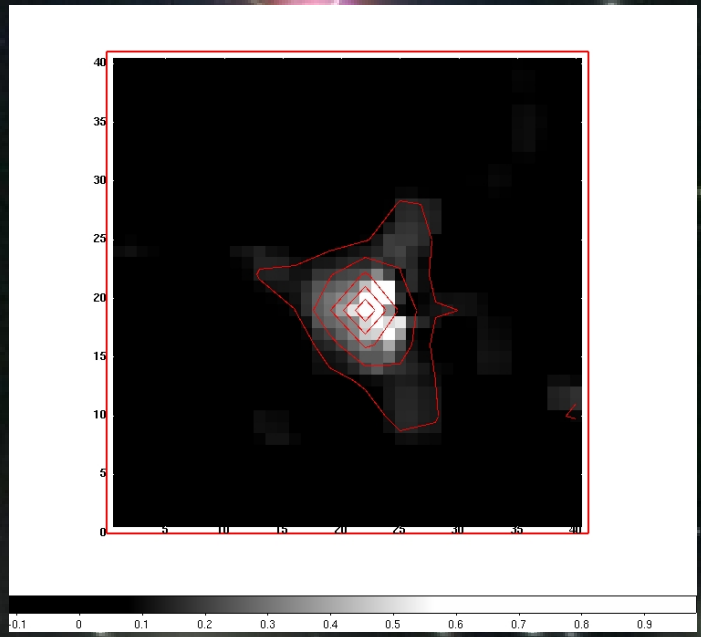


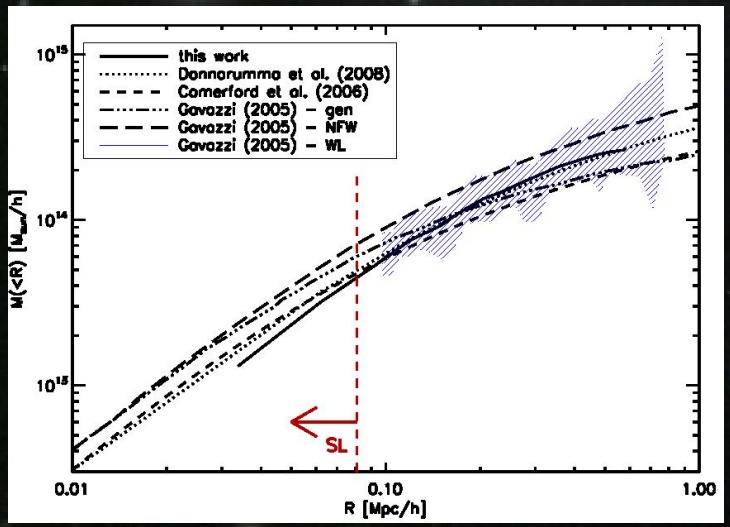




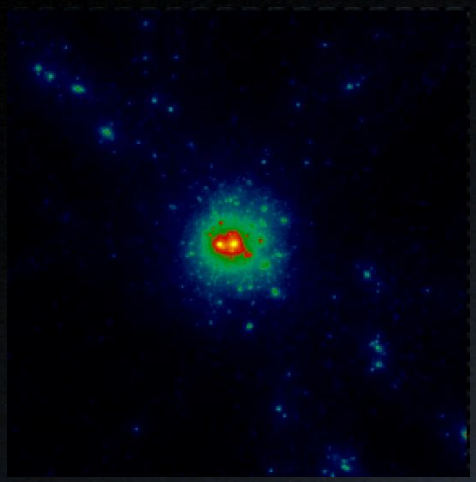
Results: MS 2137 (JM et al. 2009)

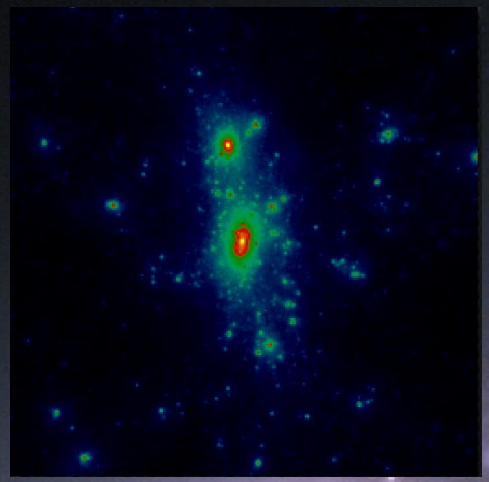


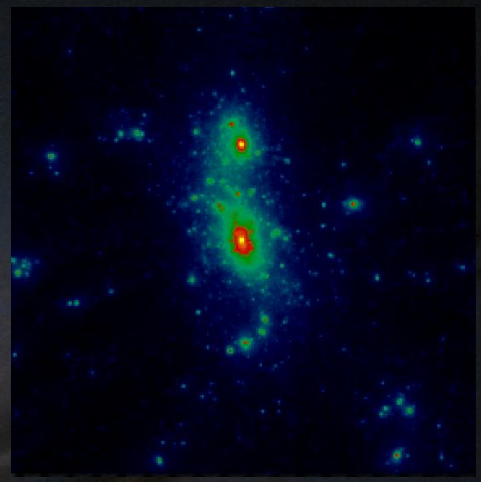


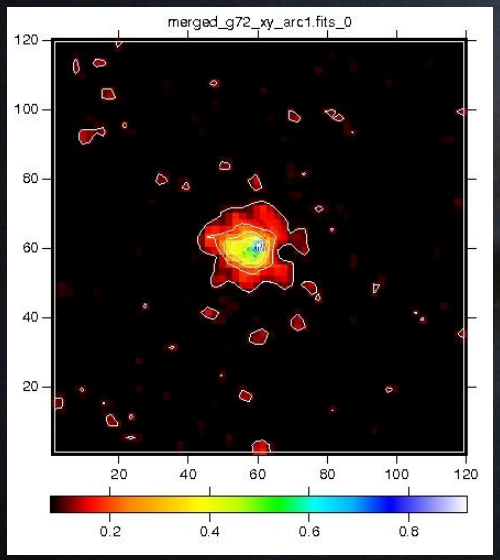


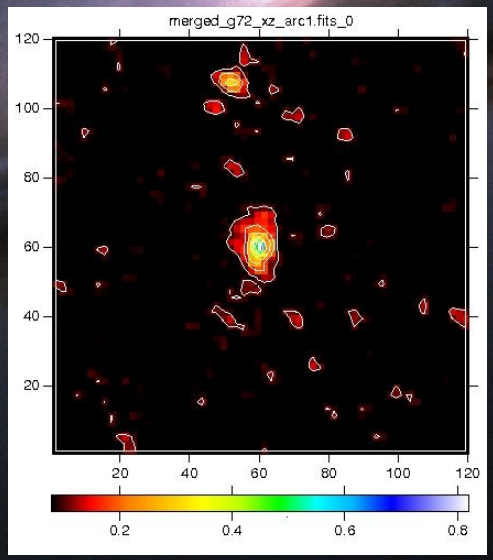
Results: Mass Comparison (Meneghetti, Rasia, JM et al. 2009)

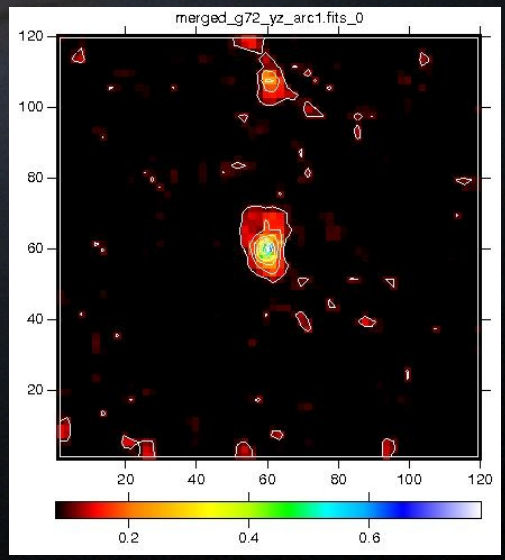




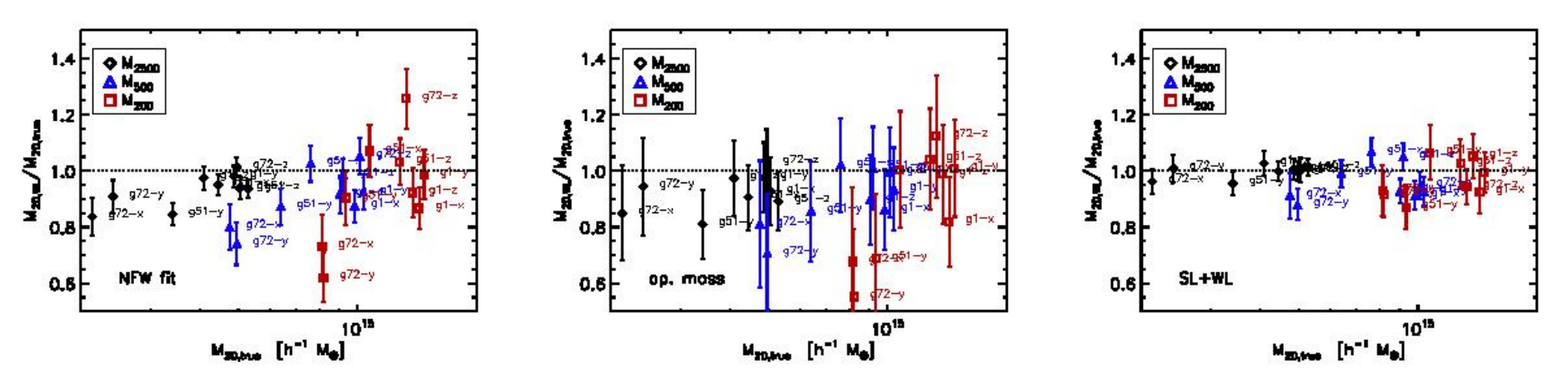


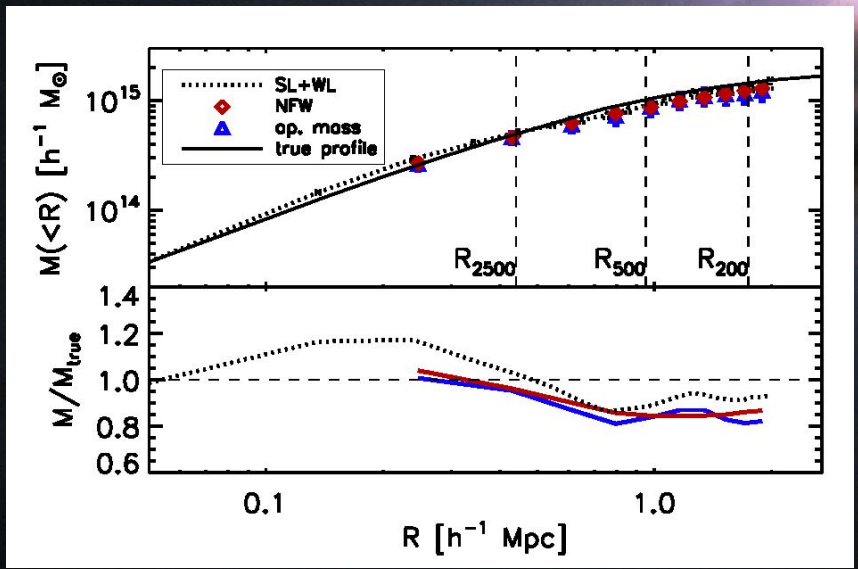


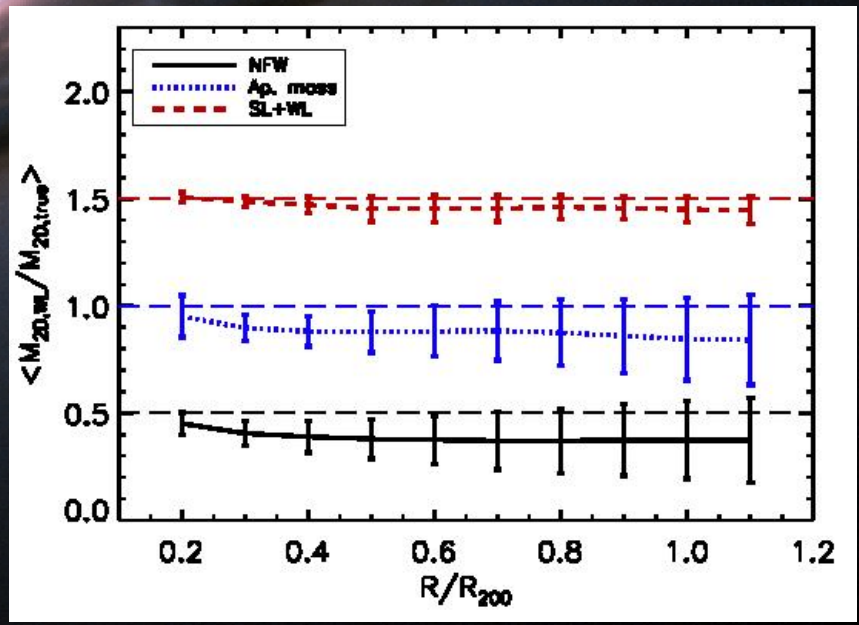




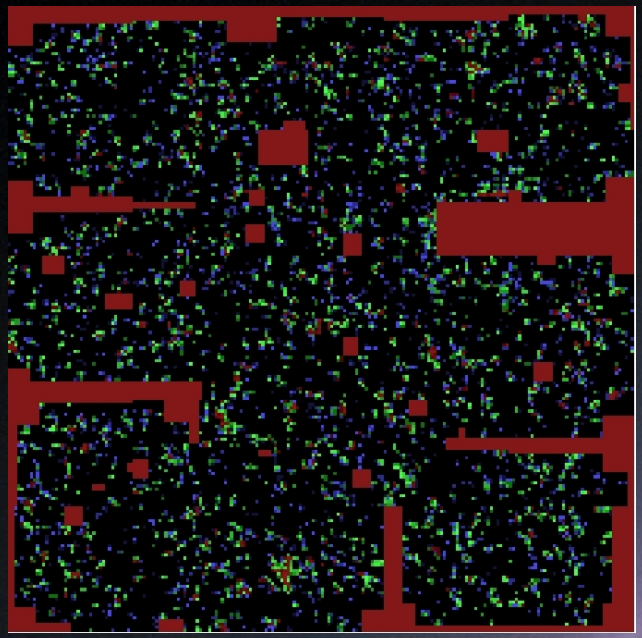
Quantitative Results (Meneghetti, Rasia, JM et al. 2009)

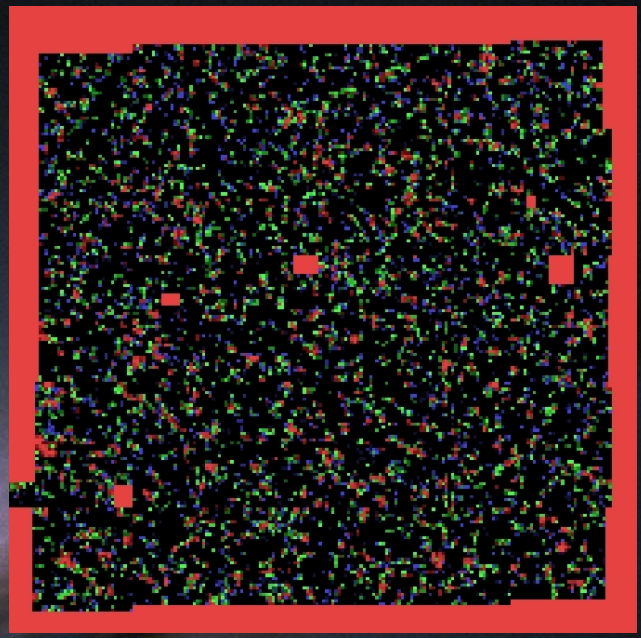


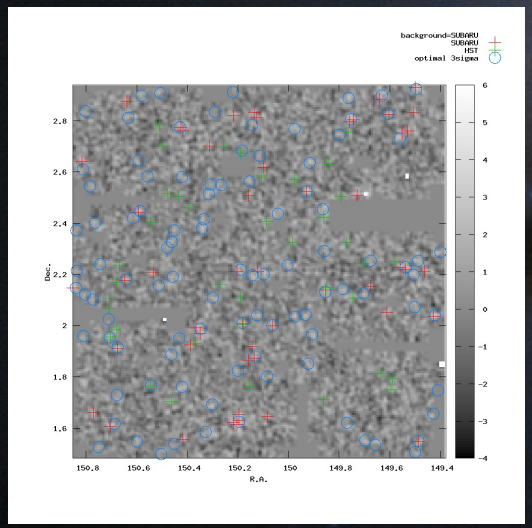


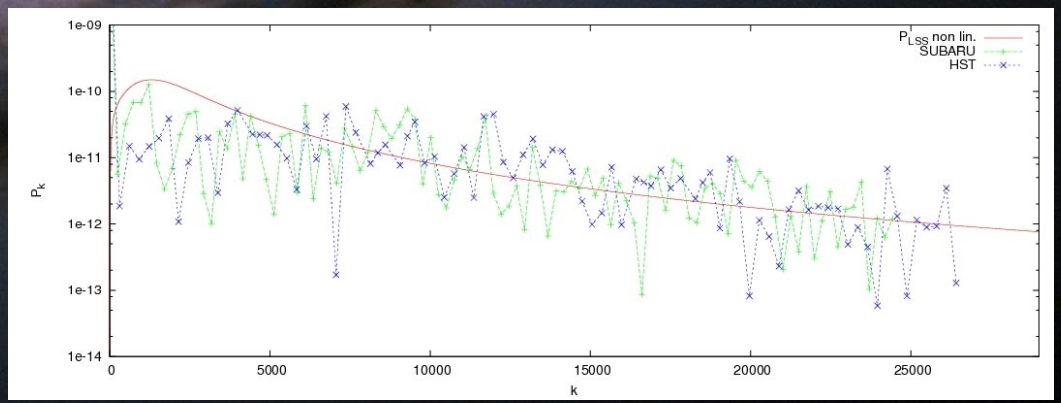


Results: COSMOS (with Matteo, waiting for Japan)

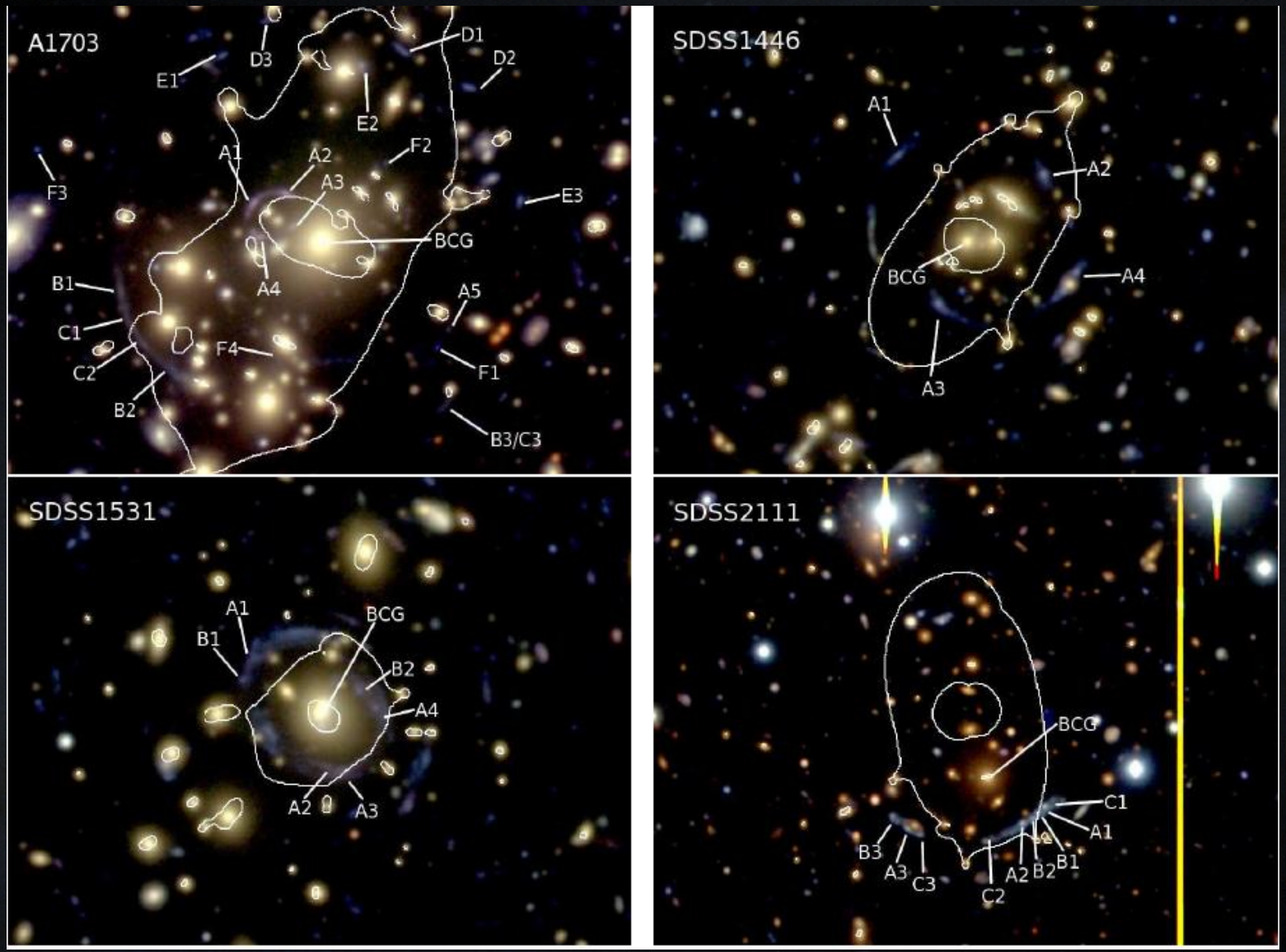








Outlook: Oguri Cluster Sample (arXiv:0901.4372)



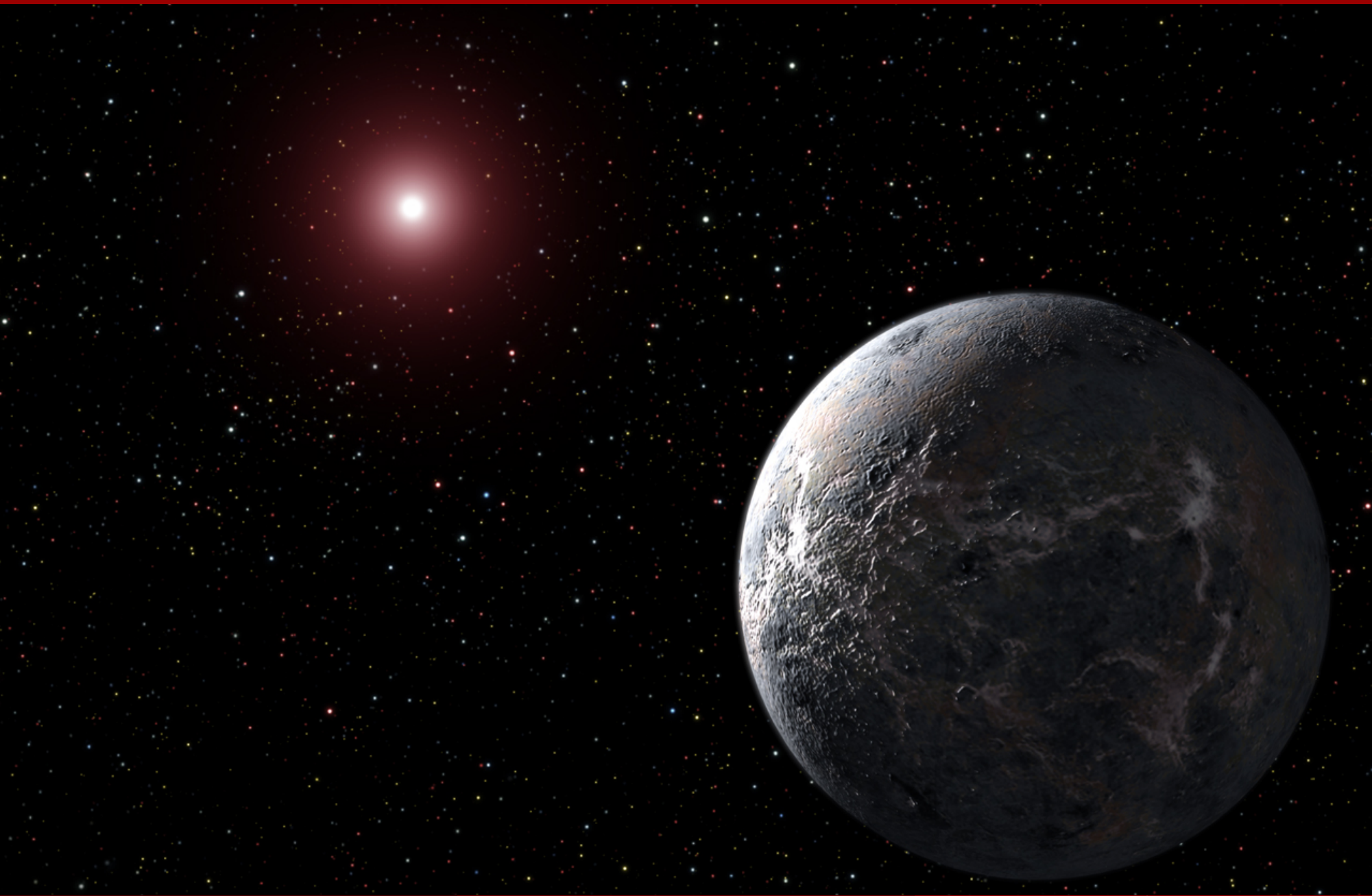
Outlook: Broadhurst Cluster Sample (arXiv:0805.2617)

TABLE 1

THE SUBARU DISTORTION MEASUREMENTS COMBINED WITH THE EINSTEIN-RADIUS CONSTRAINT

Cluster	z	Filters	Einstein Radius (arcsec)	$\langle D_{ds}/D_s \rangle$	$\frac{d \log N(<m)}{dm}$	M_{vir} ($10^{15}\ M_\odot\ h_{70}^{-1}$)	c_{vir}	χ^2/dof
A1689	0.183	$V_J i'$	52 ($z_s = 3.05$)	0.704	0.150	$1.59^{+0.24}_{-0.22}$	$15.69^{+3.96}_{-2.88}$	4.94/9
A1703	0.258	$g'r'i'$	33 ($z_s = 2.8$)	0.722	0.062	$1.30^{+0.24}_{-0.20}$	$9.92^{+2.39}_{-1.63}$	2.69/5
A370	0.375	$BR_C z'$	43 ($z_s = 1.5$)	0.606	0.088	$2.93^{+0.36}_{-0.32}$	$7.75^{+1.12}_{-0.92}$	5.54/8
RX J1347−11	0.451	$V_J R_C z'$	35 ($z_s = 1.8$)	0.553	0.066	$1.47^{+0.26}_{-0.23}$	$10.42^{+3.25}_{-2.13}$	6.25/7

Outlook: Future Plans (maybe in collaboration with M. Bradač)



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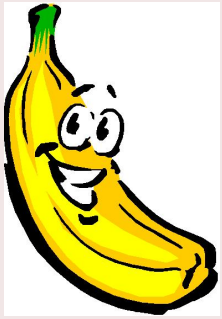
Flexion



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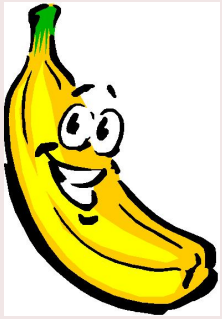
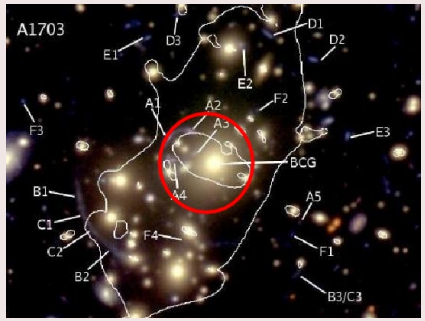


Innermost core



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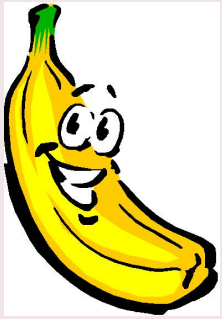
Flexion



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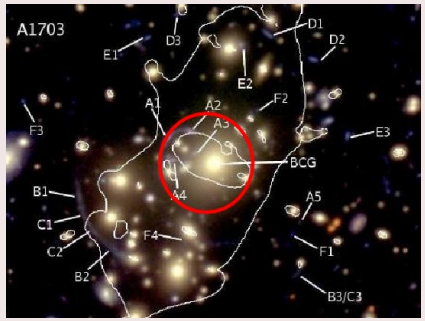
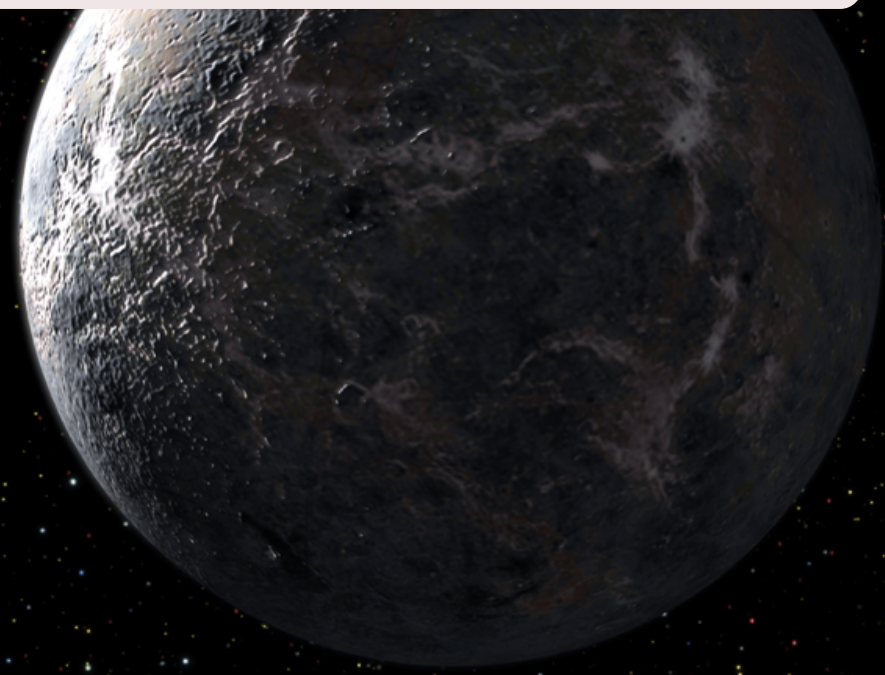


X-Ray



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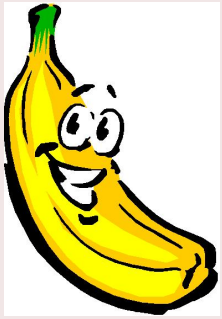
Flexion



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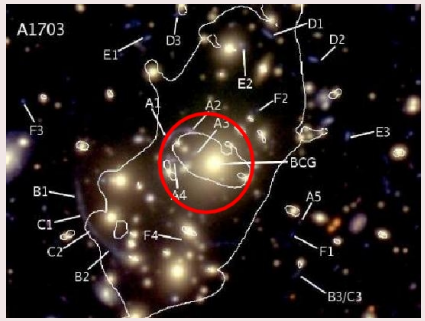
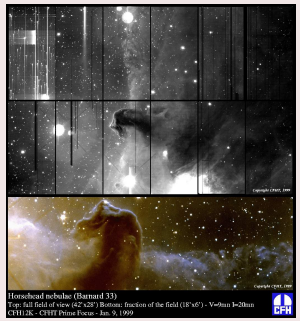


X-Ray

Full pipeline



How these images look like

Horsehead nebulae (Barnard 33)
Top: full field of view (42'x28') Bottom: fraction of the field (18'x6') - V=9mn I=20mn
CFH12K - CFHT Prime Focus - Jan. 9, 1999

Concrete SkyLens Projects

- Porting to C++.
- Problems with the background population.
  - Shapelets vs. Sersic fits.
  - Limited number of galaxies.
  - COSMOS extension.
- Feasibility of wide fields, parallelisation.
- Avoid multiple PSF convolution.
- Providing a user-friendly interface.