Colour gradients and nuclear star clusters in early-type galaxies in the Coma cluster

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Outline

- Colour gradients (den Brok+ MNRAS 2011)

  - Introduction

  - Data

  - Results

- Nuclear star clusters (den Brok+ in prep)
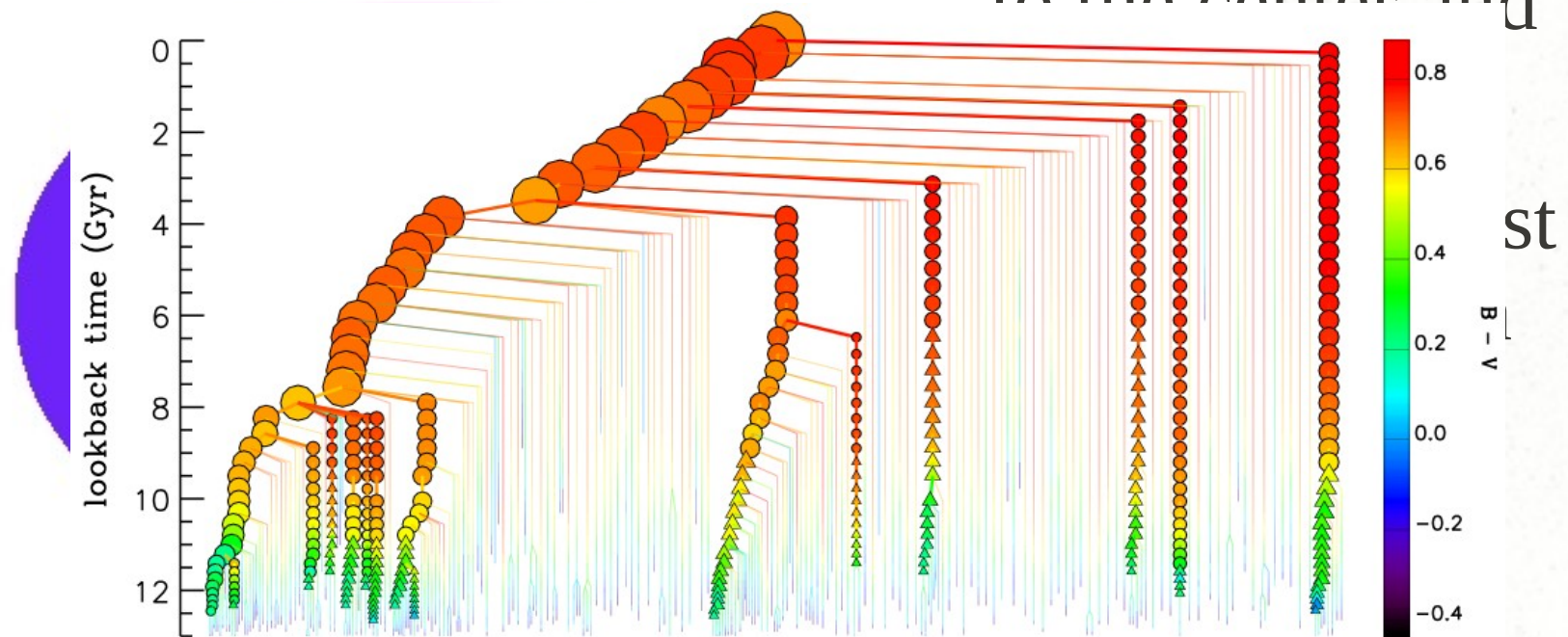
- Conclusions

Metallicity gradients
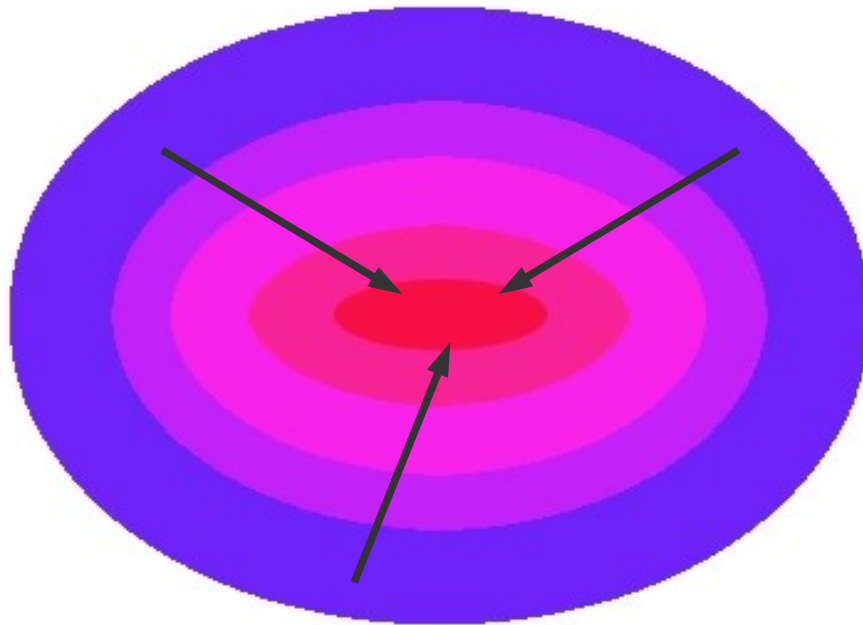
- Enriched gas falls to the center and forms stars

- Subsequent burst more metal rich

- Sensitive to formation scenario

- See also posters by Peletier et al., Roediger et al.

Metallicity gradients

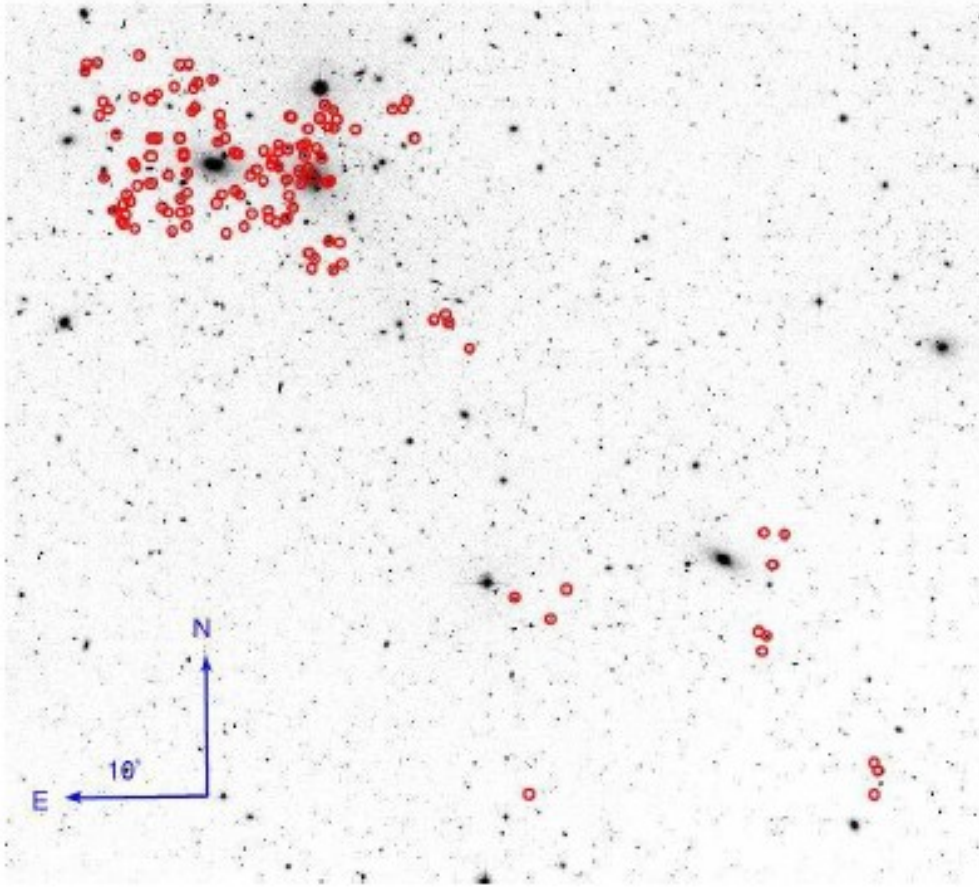- Enriched gas falls
  to the center and

  st

De Lucia & Blaizot (2007)

Why in Coma?

- Coma most convenient *very* dense environment in the local Universe (100Mpc, low extinction)

- Uniform sample, no (relative) distance uncertainties

- Cold gas is probably stripped: almost no internal extinction/residual star formation
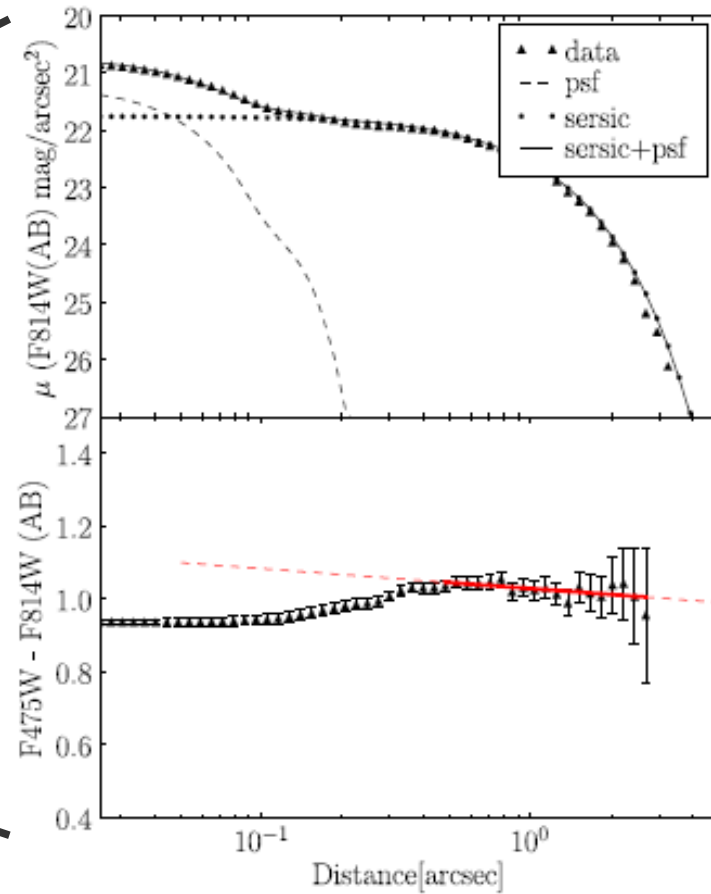
Sample

- 142 early type galaxies in Coma, most confirmed members LRIS/HectoSpec (sample of Neil Trentham & Henry Ferguson)

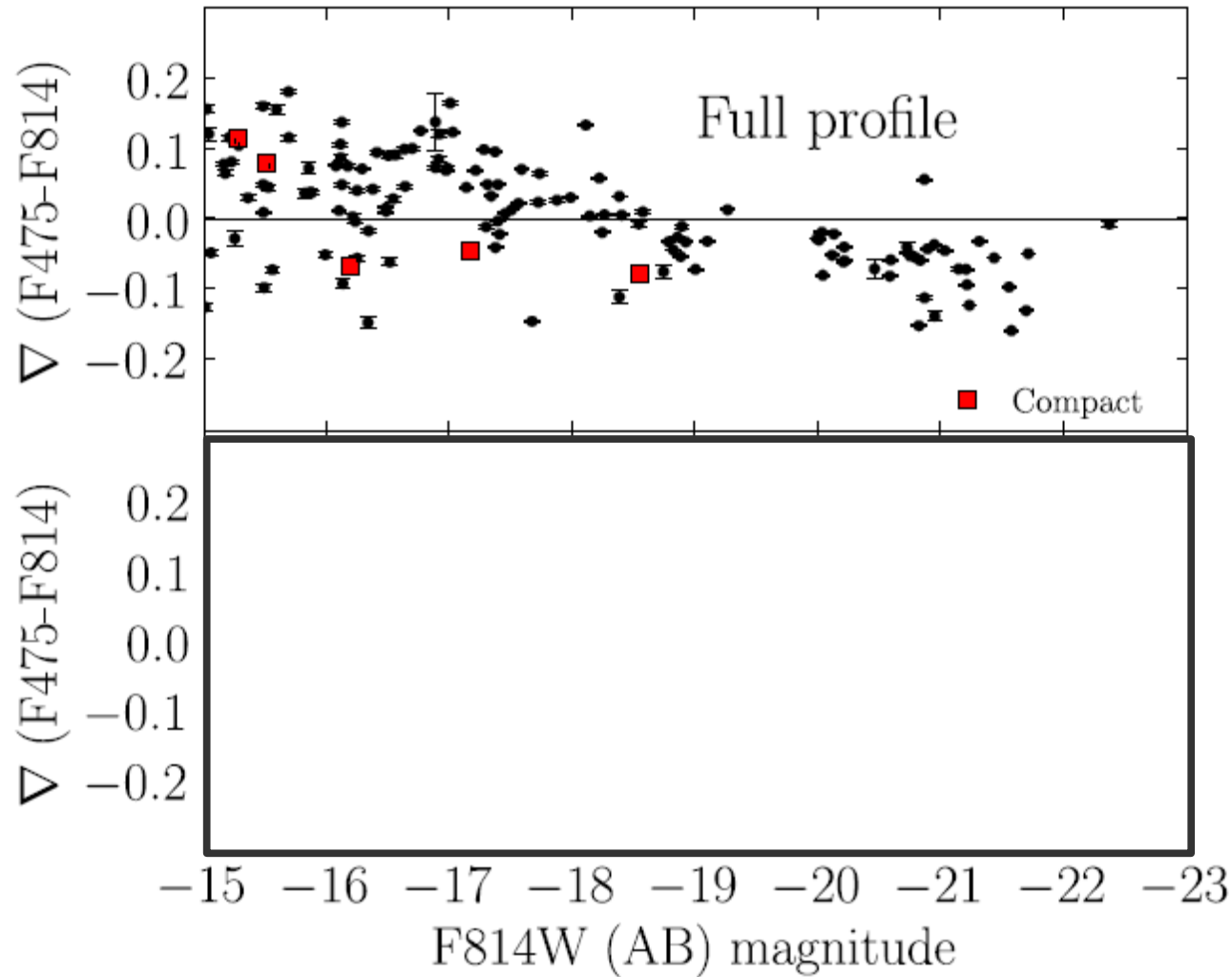- Outskirts are undersampled – no strong conclusions on environtment

Analysis
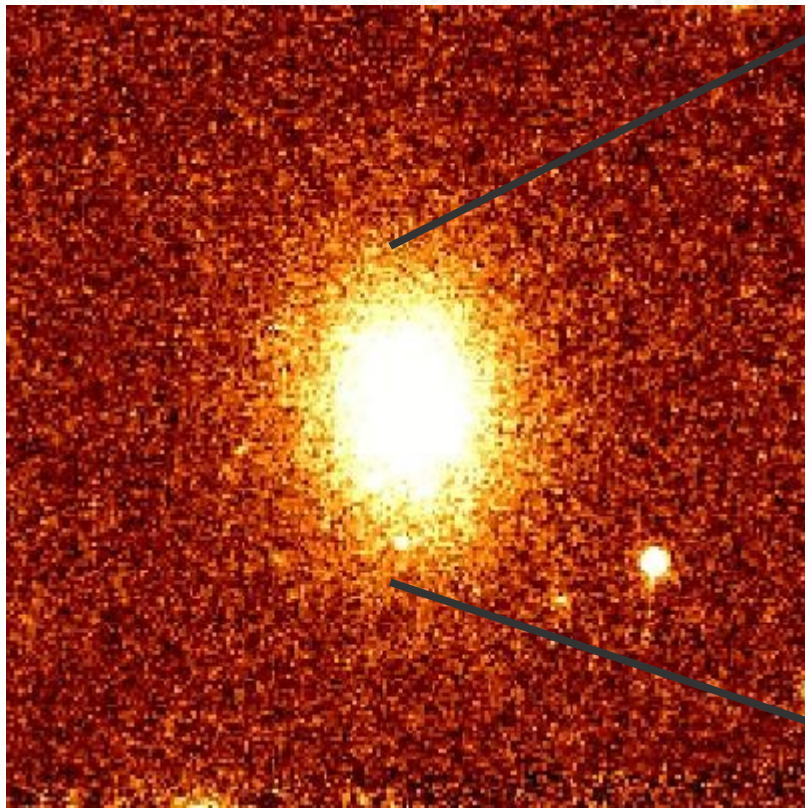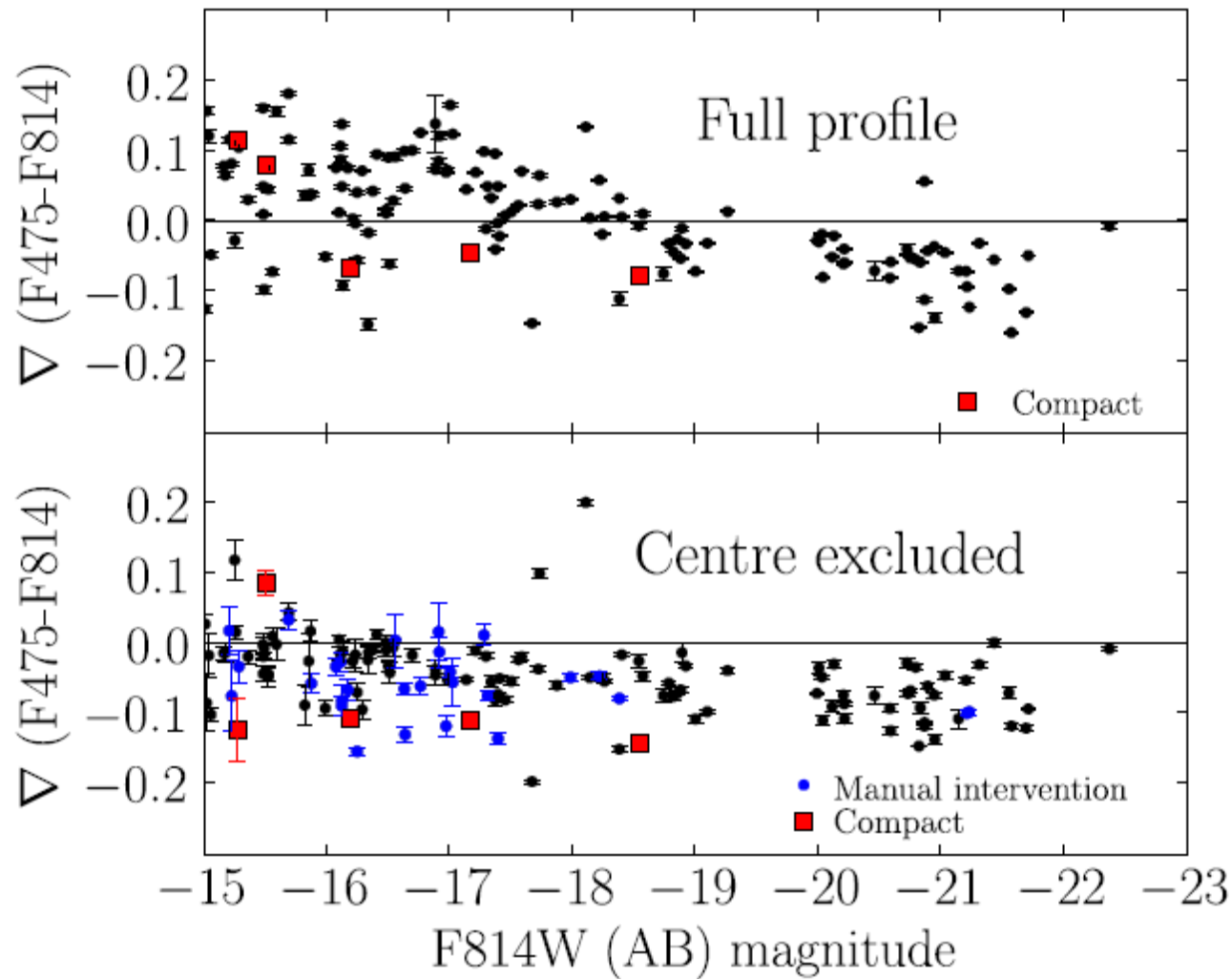

2D structural fit
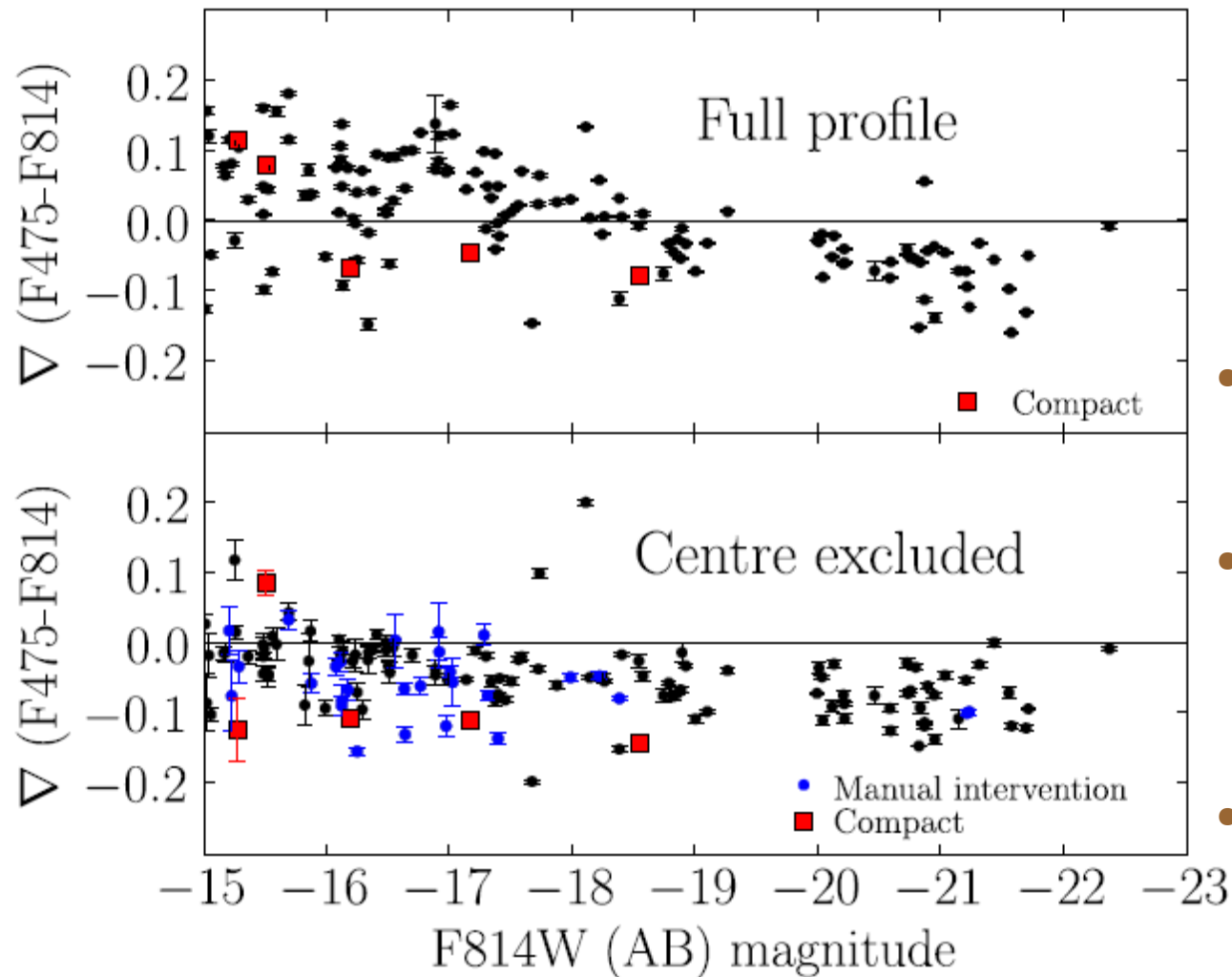
F814W image

Radial colour profile

Results

- Star clusters probably responsible for positive gradients in past
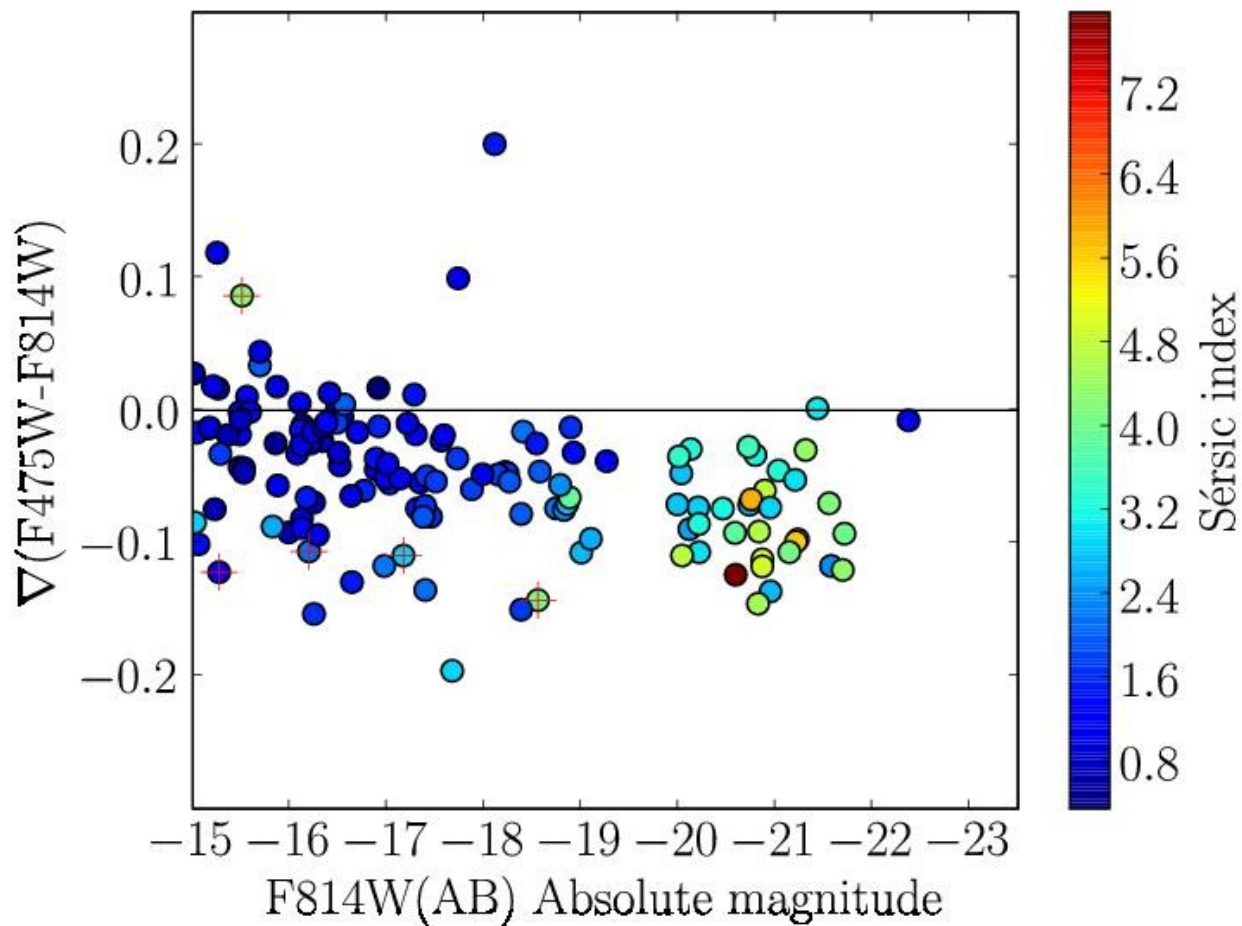
Results

- Star clusters probably responsible for positive gradients in past
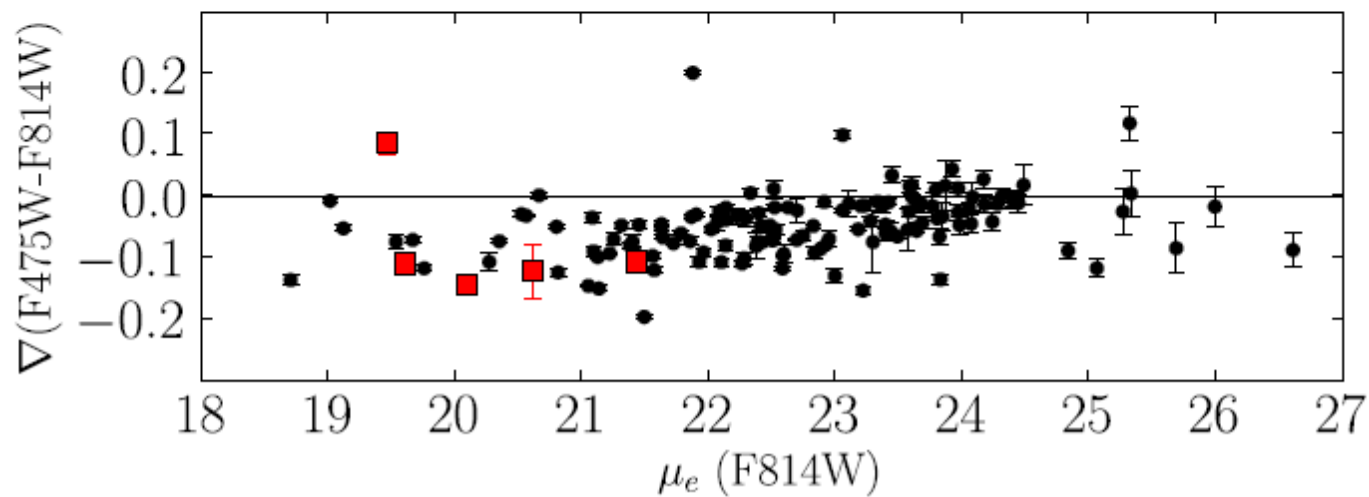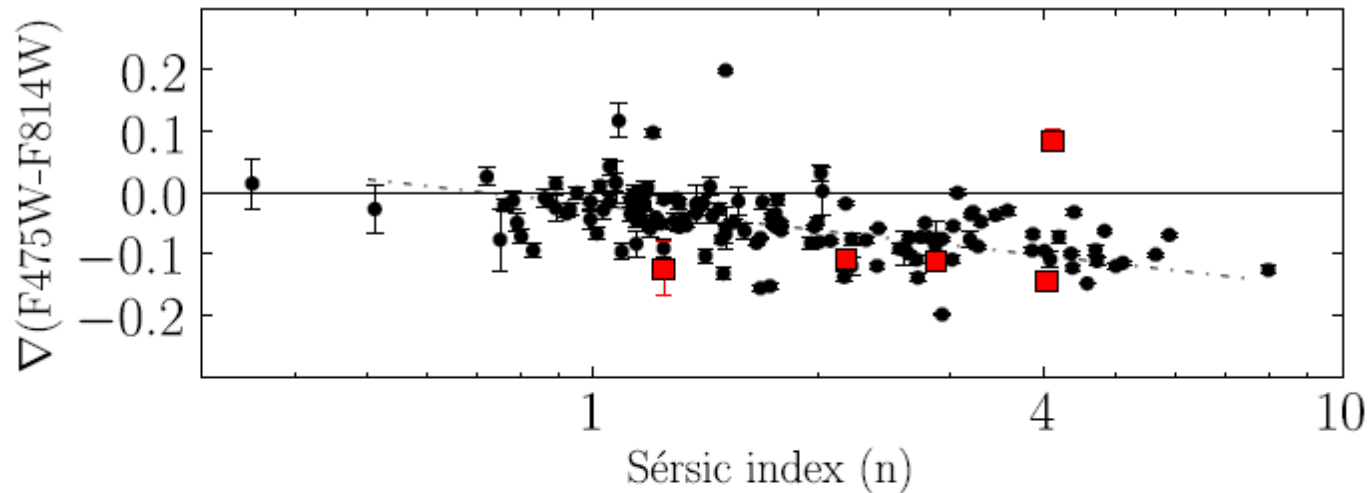
Results

- ALL galaxies have on average negative metallicity gradients, even dwarfs

- Quite a lot of scatter

- Dwarfs have on average shallower gradients
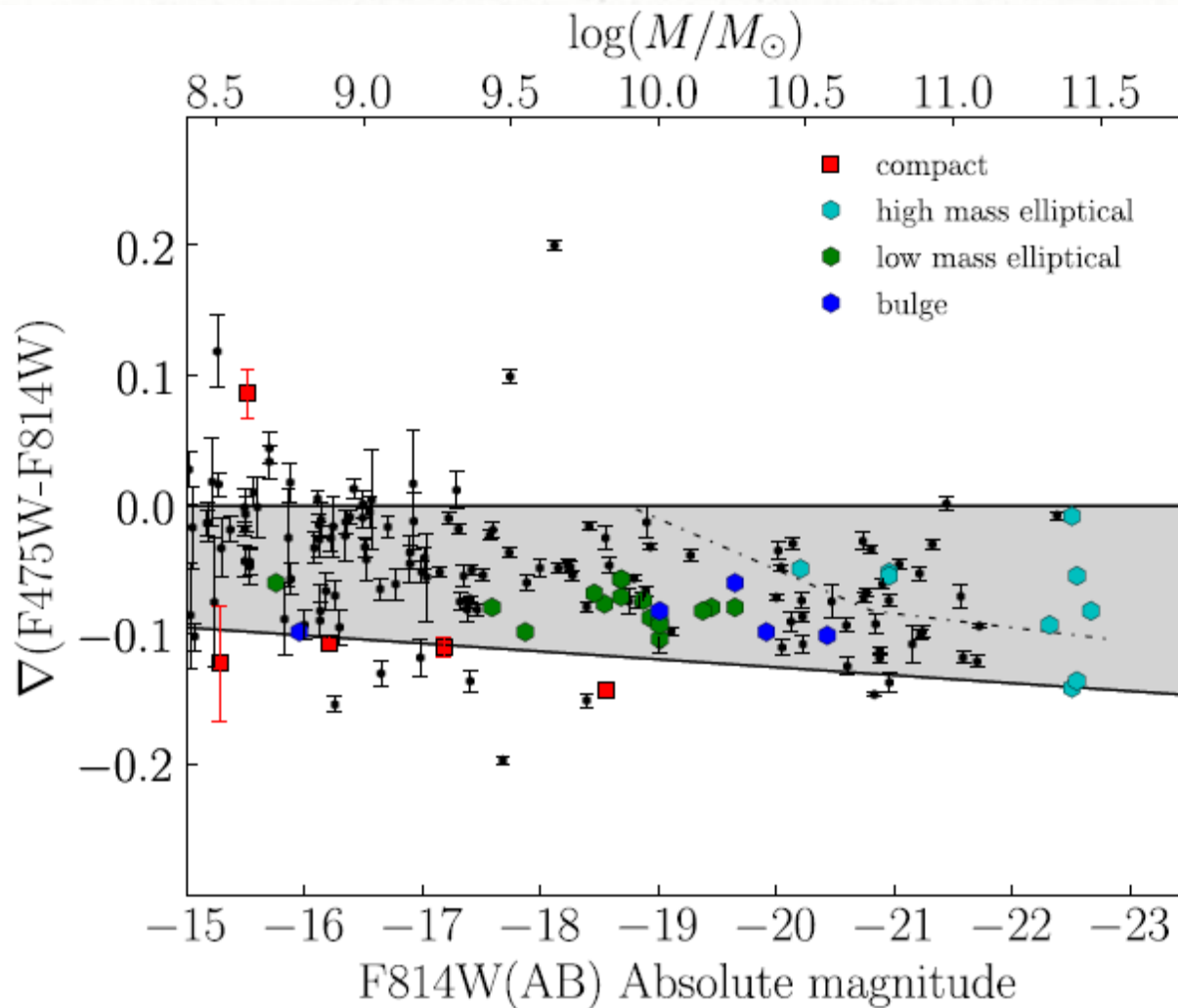
- cEs have steep(er) gradients

Results

- Galaxies with higher Sersic indices have higher

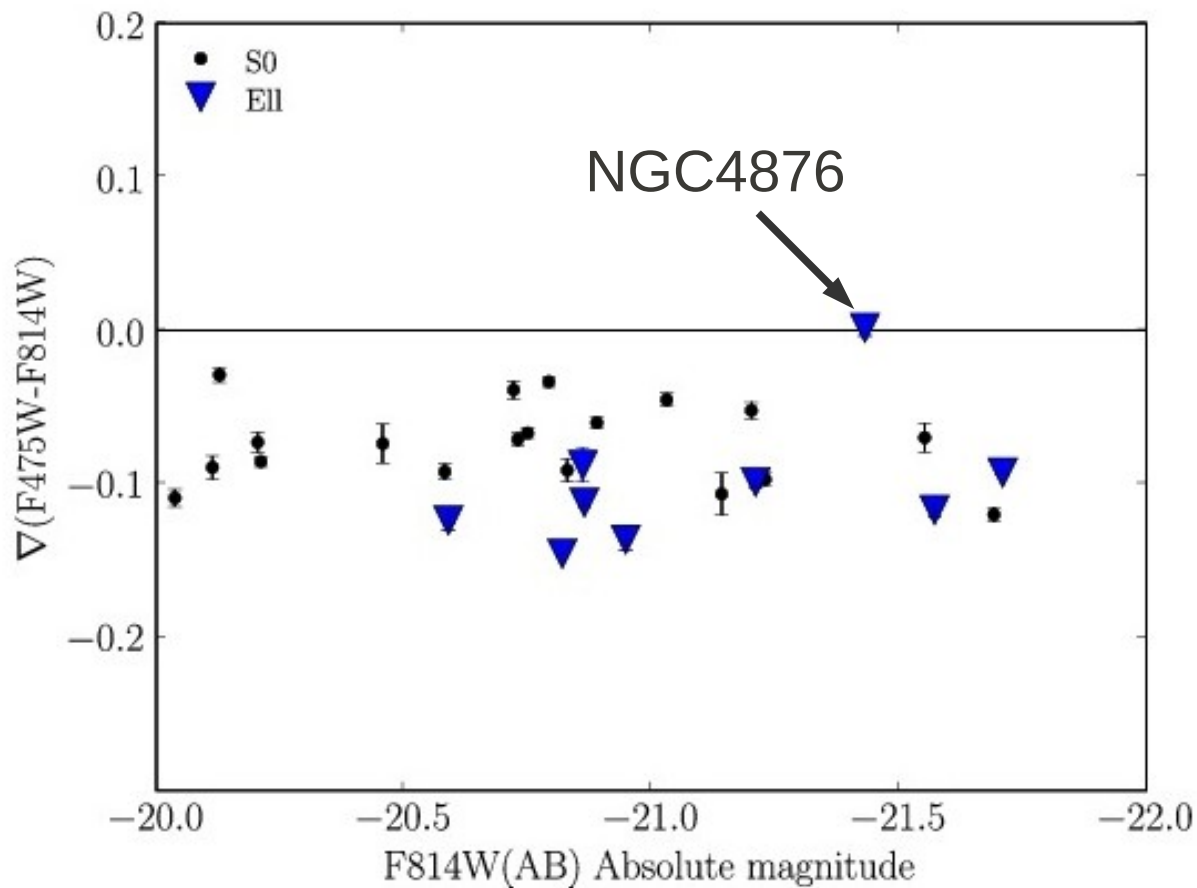# *Correlations with structural parameters*

What do simulations tell

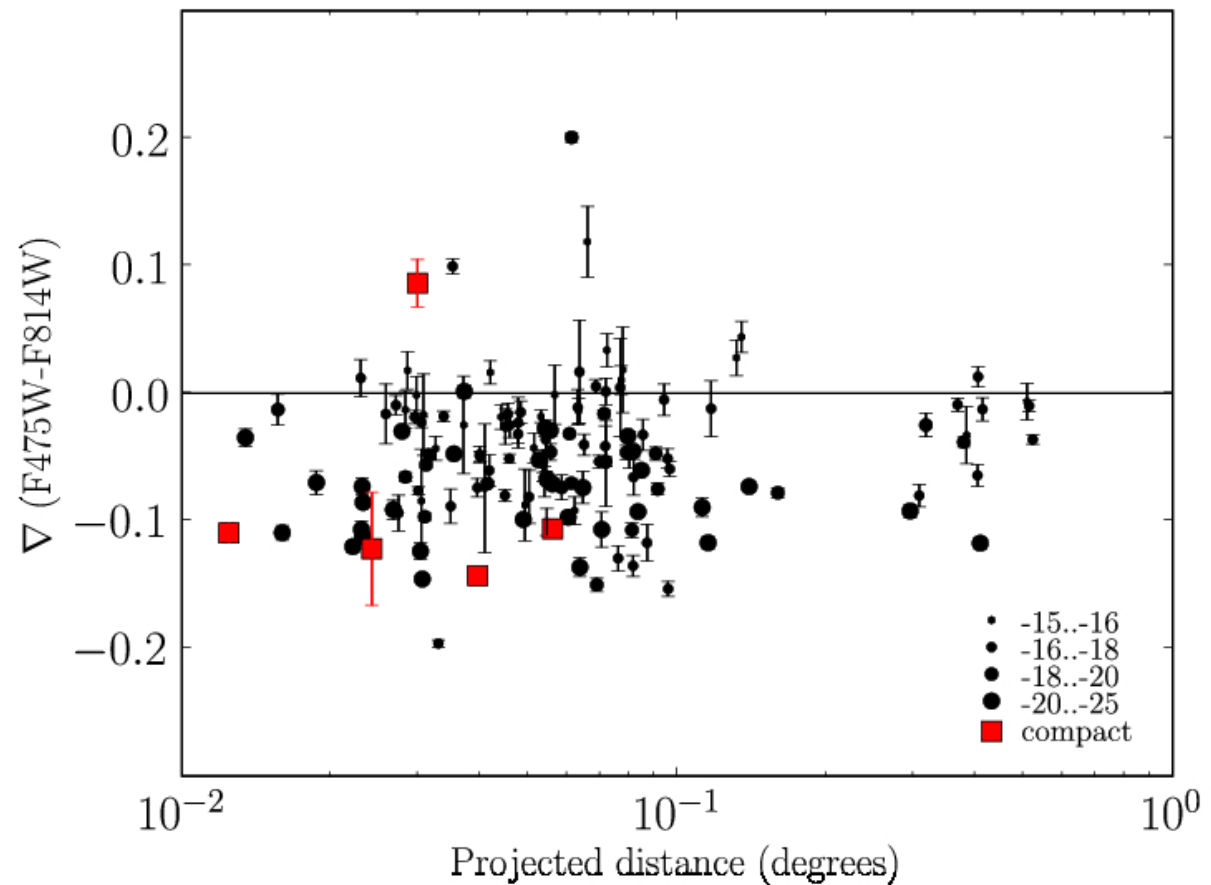- Simulations from Di Pipino (2010) and Kawata & Gibson (2003)

Are gradients smaller in galaxies with disc components?
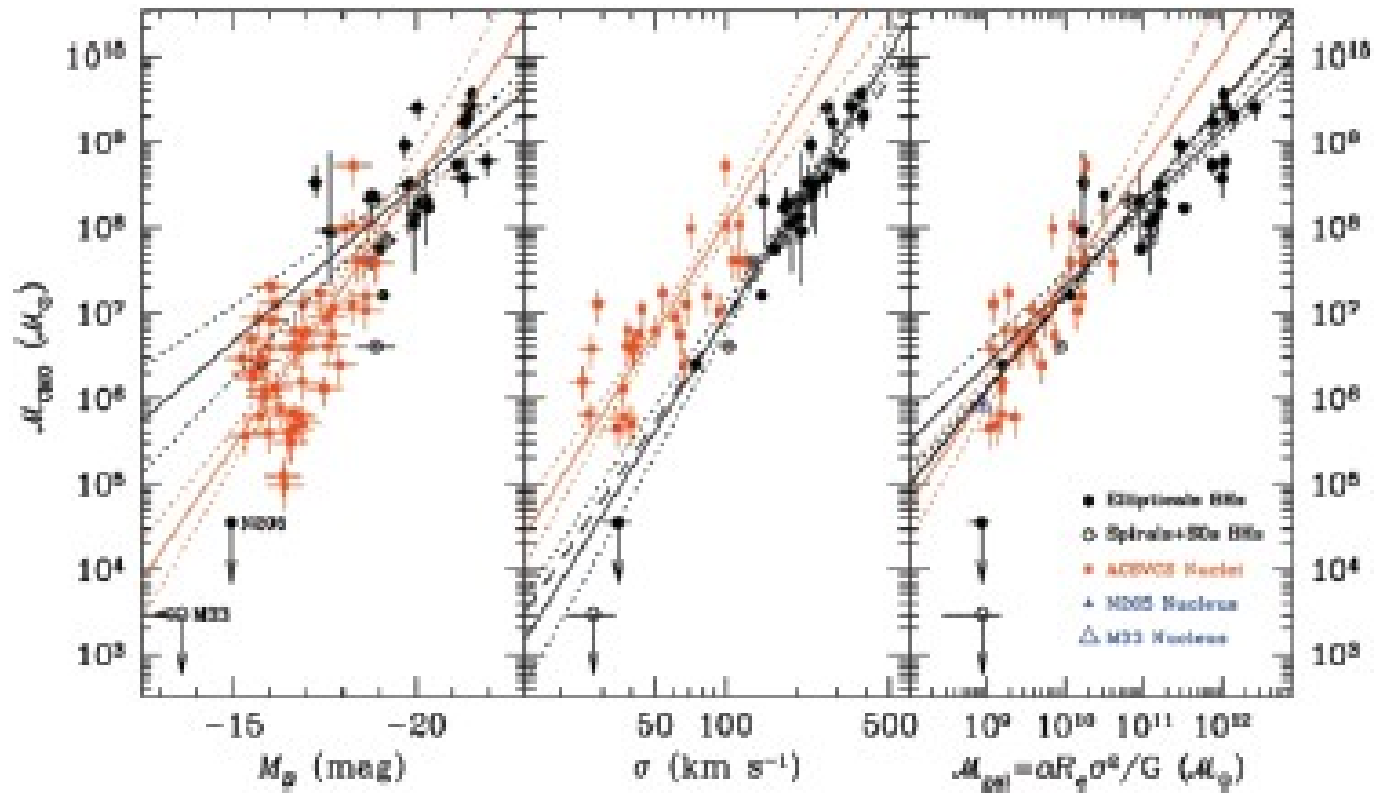

- Classifications according to Dressler (1980)

- Angular momentum prevents gas from falling to the centre?

Environmental effects

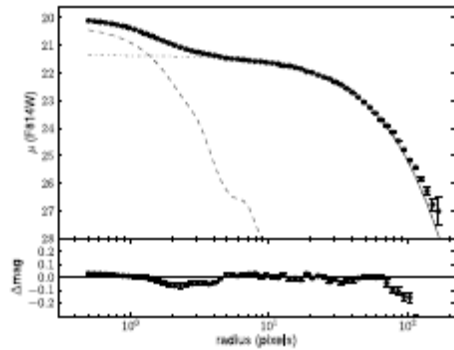Not much evidence for environmental influence
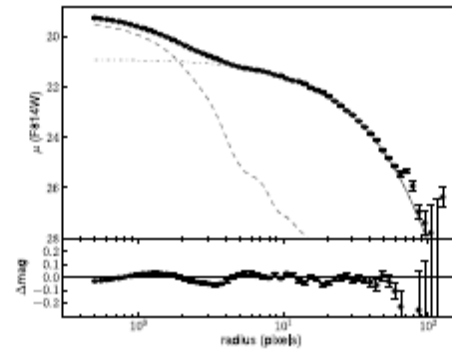
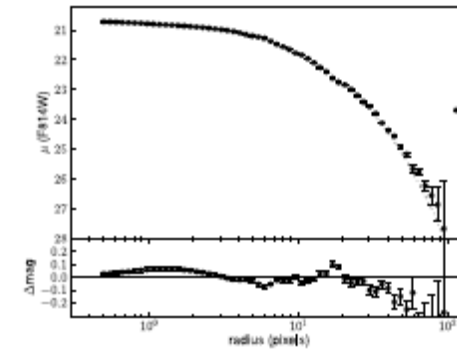# *Nuclear star clusters*

Ferrarese+2006, Wehner & Harris 2006
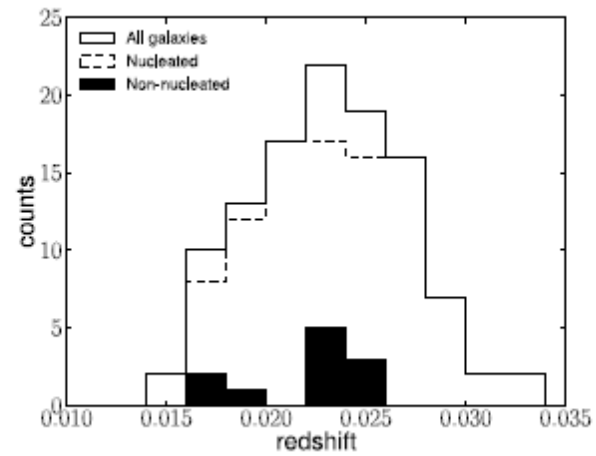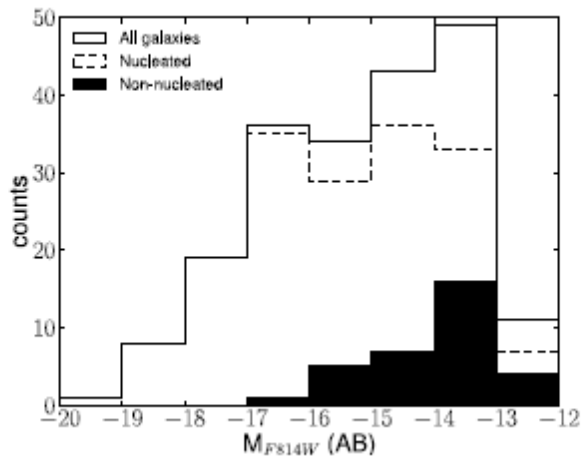
Nuclear star clusters
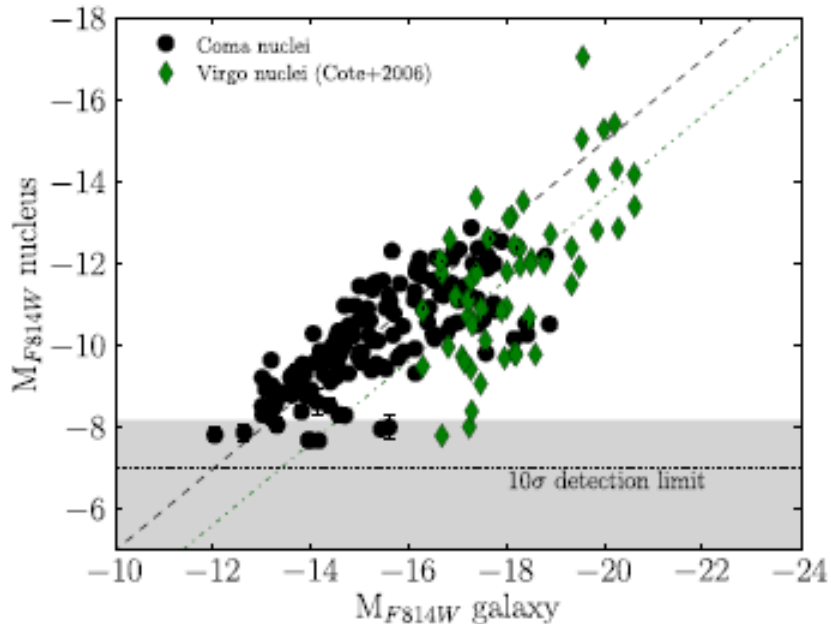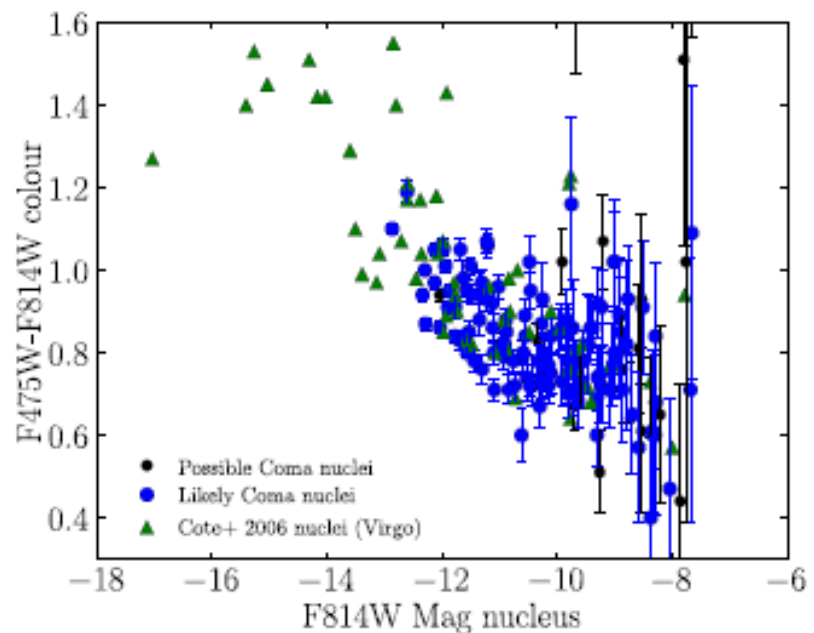

(a) 741871-4   (b) 741871-2602   (c) 741871-706

Nuclear star clusters

Nuclei strongly related to the host magnitude, see also Cote+2006, Lotz+2004

Colour magnitude extremely tight: Scatter <0.08 mag in colour, flattening in colour on faint end?
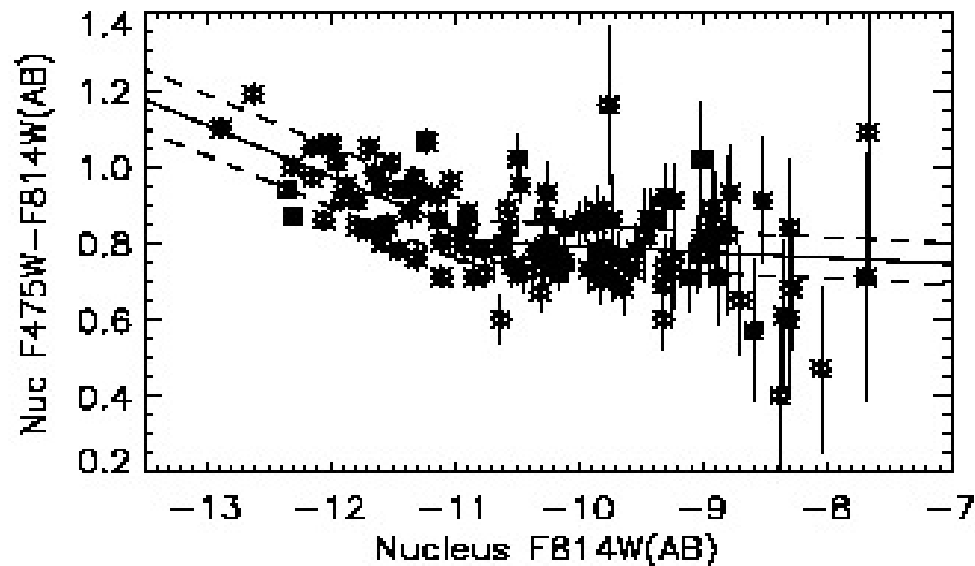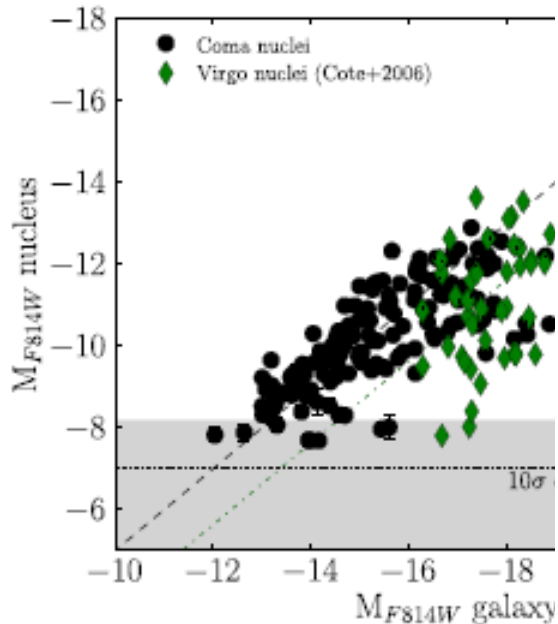
Nuclei...

Nuclei strongly related to the host magnitude, see also Cote+2006, Lotz+2003

Colour magnitude extremely tight:
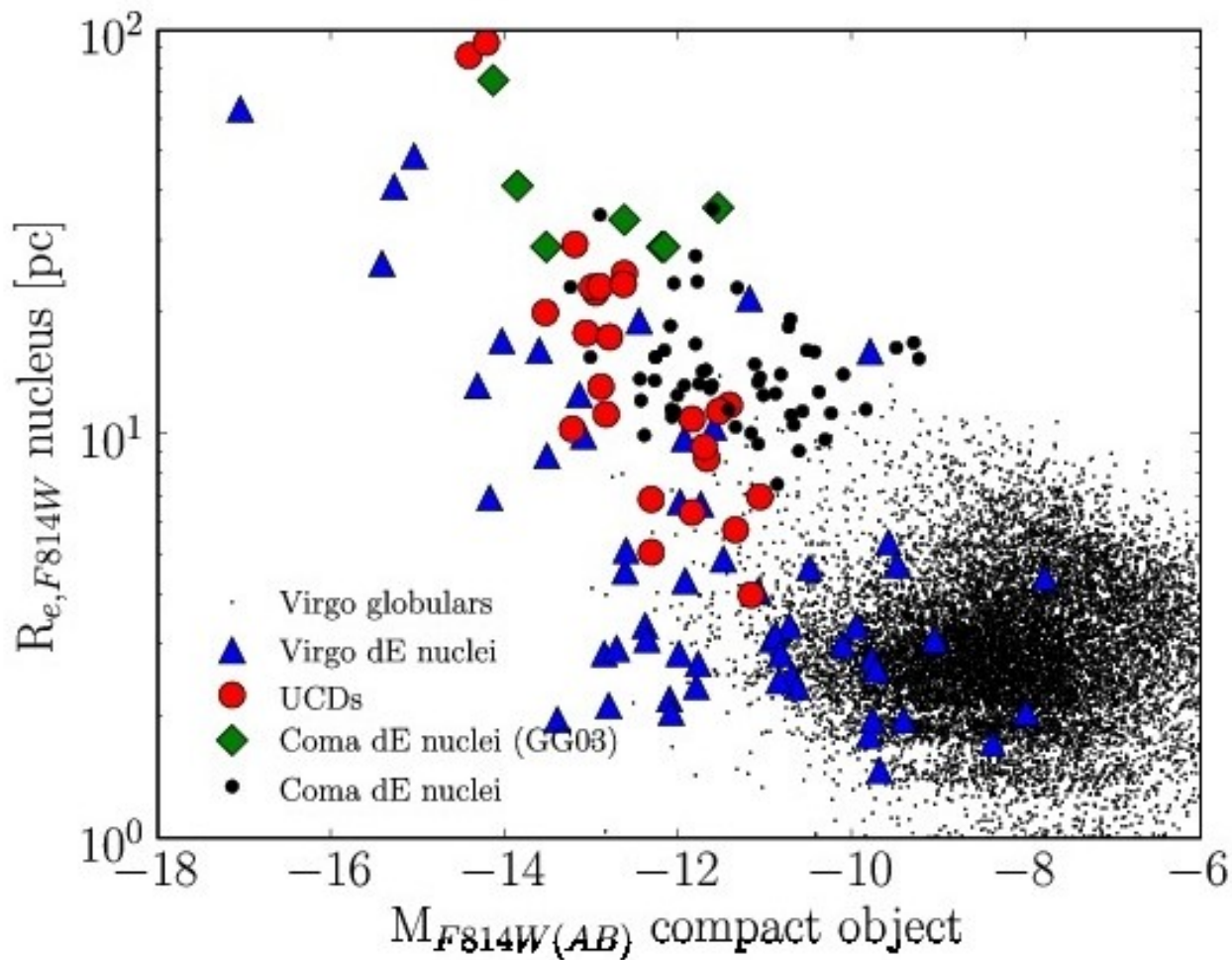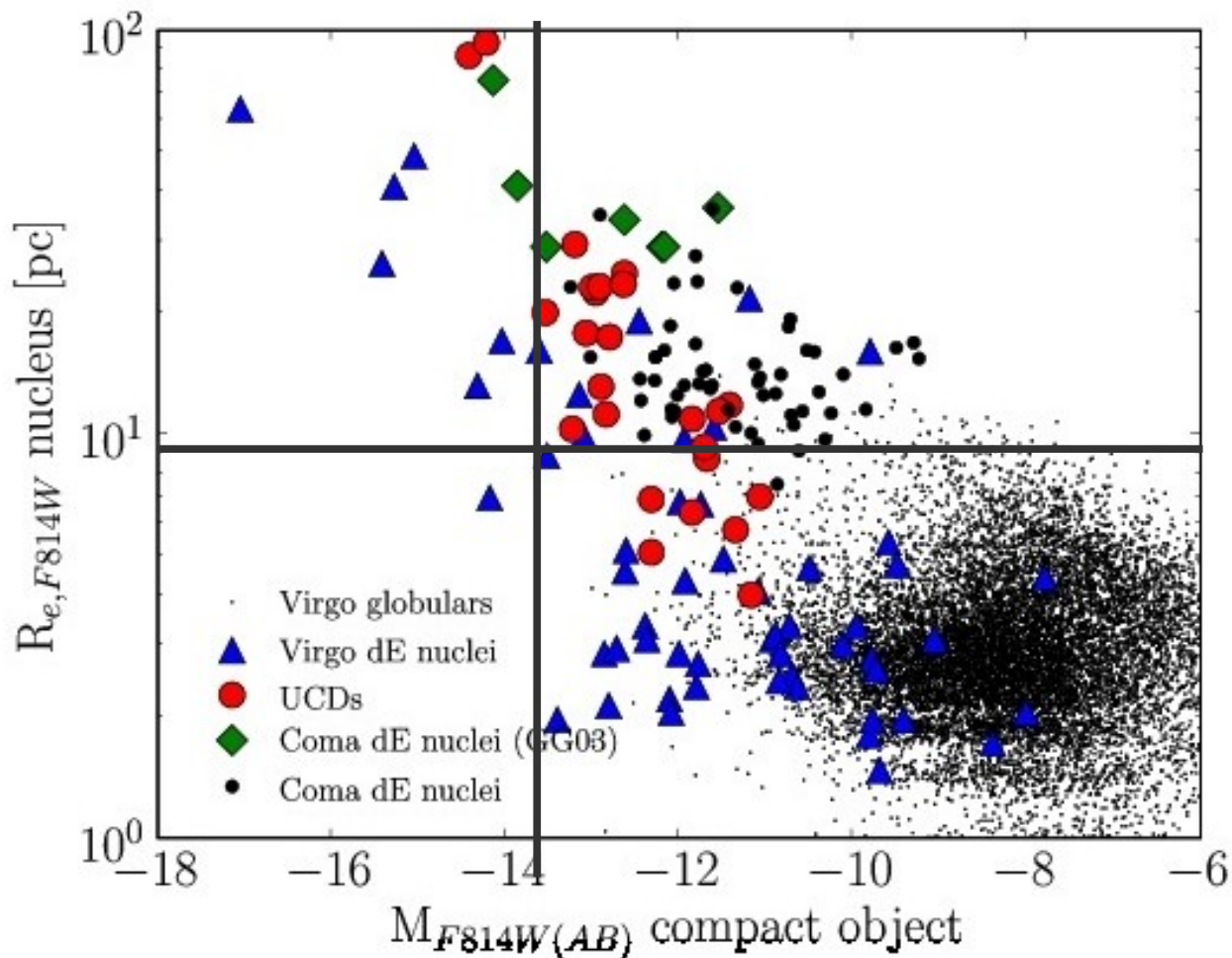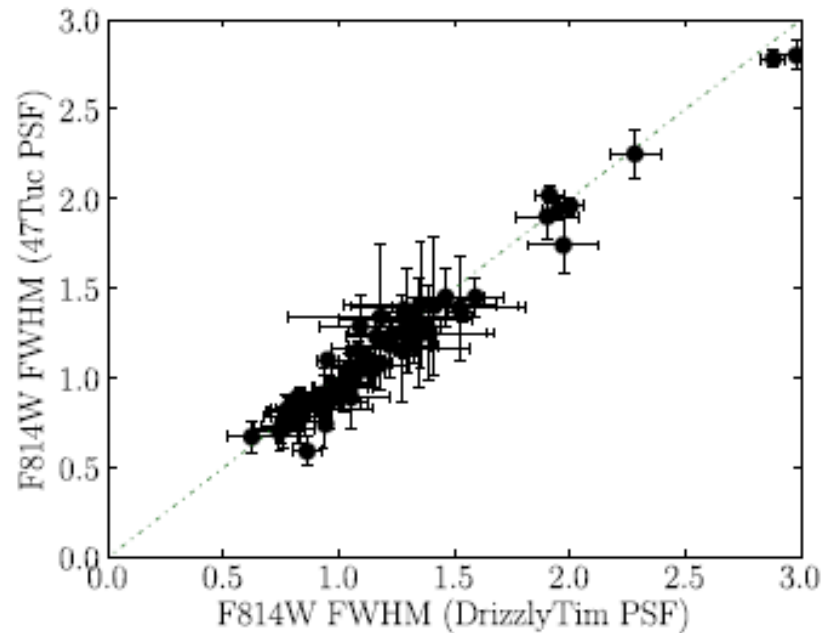Scatter <0.08 mag in colour, flattening in colour on faint end?

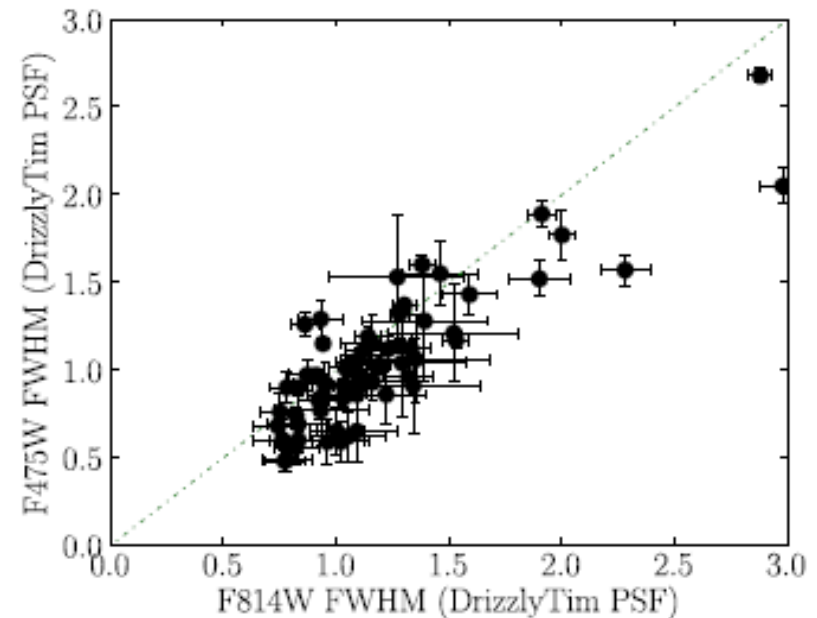# *Are star clusters excessively large in Coma?*

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Are star clusters excessively large in Coma?

Empirical PSF

F475W size

Conclusions

- Colour gradients provide strong constraints on galaxy formation scenarios

- Colour gradients primarily negative, also for dwarf galaxies – nuclear star cluster has strong influence.

- Compact galaxies, and galaxies with high Sersic index have steep gradients. S0s generally less steep gradients

- Simulations poorly reproduce observations

- Nuclear star clusters formed in secular process, very tight CM relation, big sizes in Coma