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Global properties of the WINGS galaxy clusters

Mauro D'Onofrio

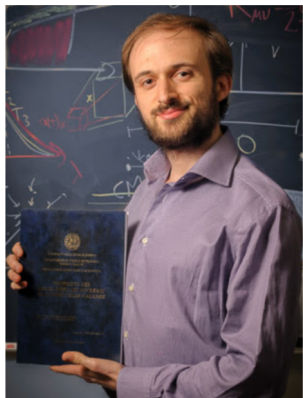
Dipartimento di Fisica e Astronomia di Padova

VST meeting Napoli 5 Giugno 2018



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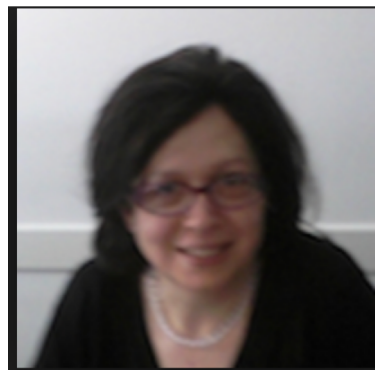
Collaborators



Stefano Cariddi
Dip. Di Fisica e
Astronomia di PD



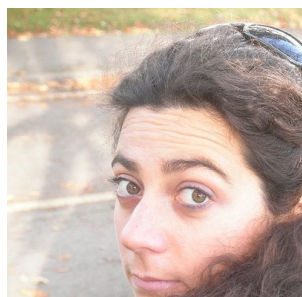
Giovanni Fasano (PI)
Padova Observatory
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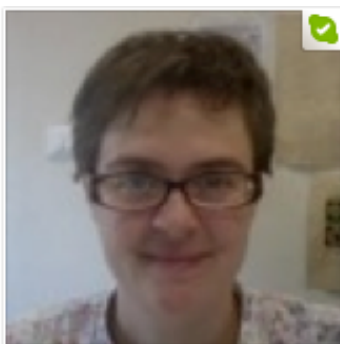
Paola Marziani
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Benedetta Vulcani
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Alessia Moretti
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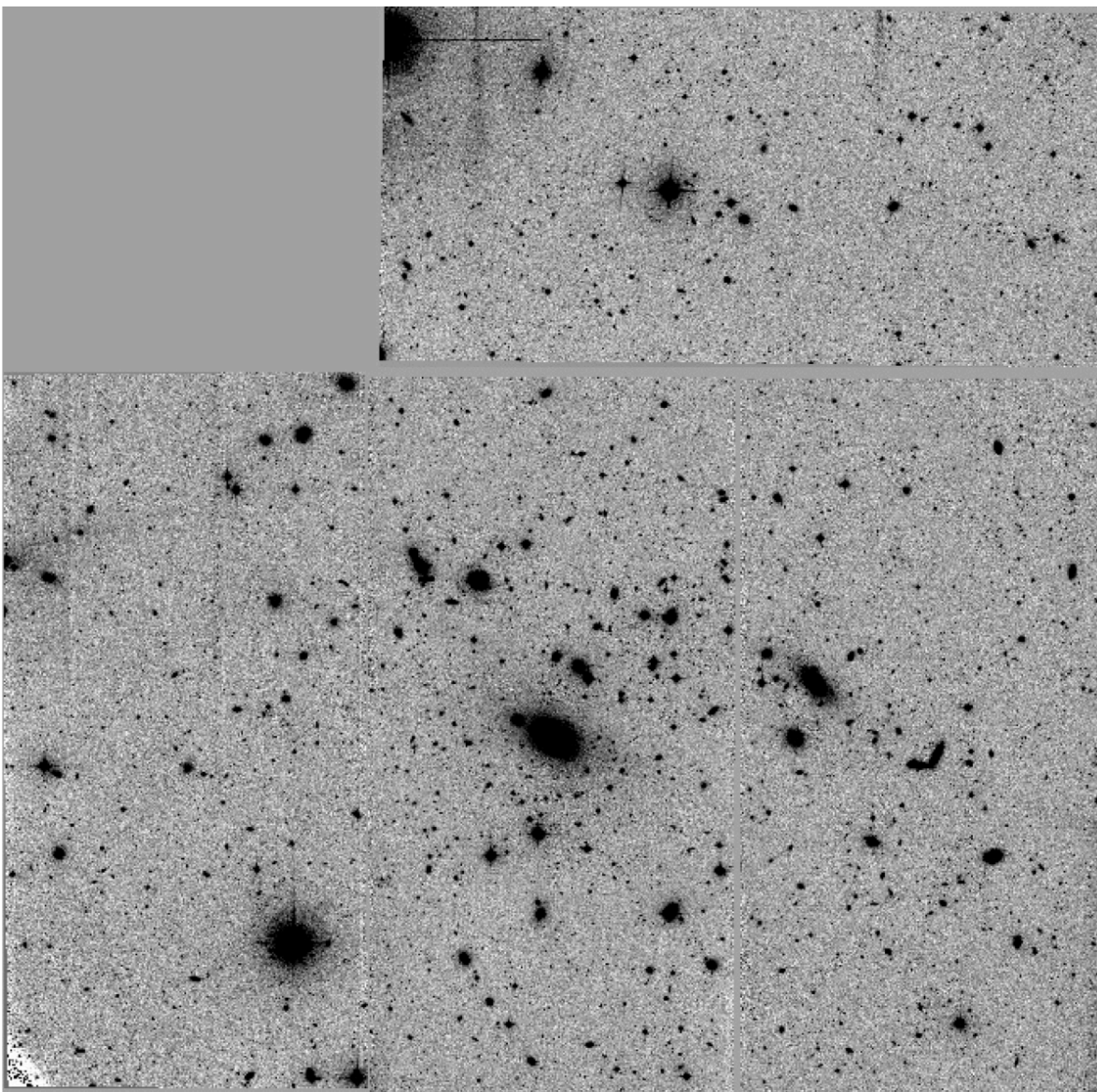
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THE WINGS-OMEGAWINGS SAMPLE

The data



**THE WINGS-OMEGAWINGS
DATABASE**

**BV 34'X34' IMAGES OF 77
CLUSTERS $0.04 < Z < 0.07$**

**BVu OMEGACAM 1x1 deg
IMAGES OF 46 CLUSTERS**

**SEXTRACTOR, GASPHOT
AND MORPHOT
ANALYSIS (Re, n, T, etc...)**

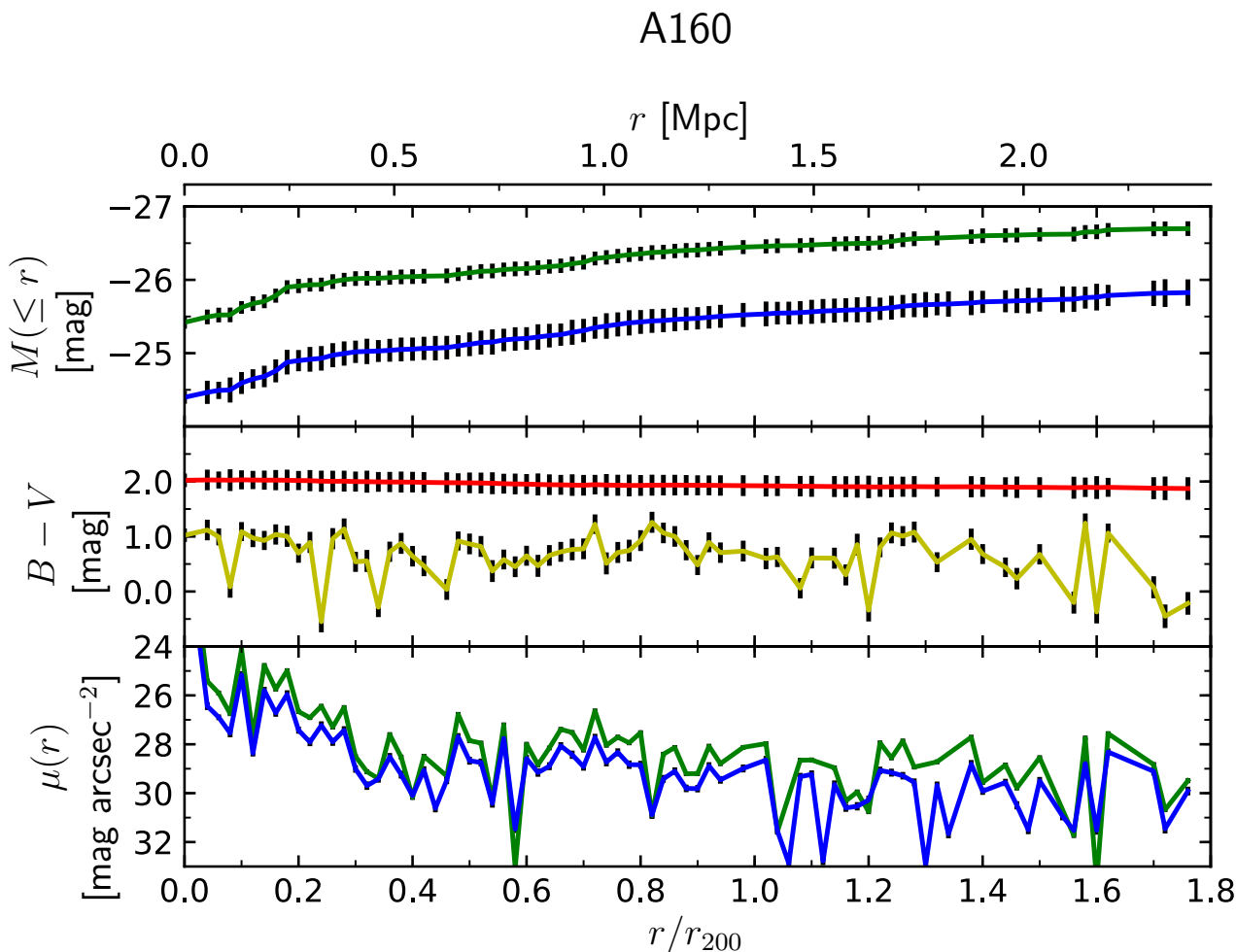
**MED-RES SPECTROSCOPY
DATA FOR THOUSAND OF
GALAXIES (SFR, SFH, AGE...)**



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The cluster growth curves

$$I(r_n) = \sum_{i=1}^n (cc_i \cdot 10^{-0.4m_i}) - \pi r_n^2 \cdot I_{field}$$

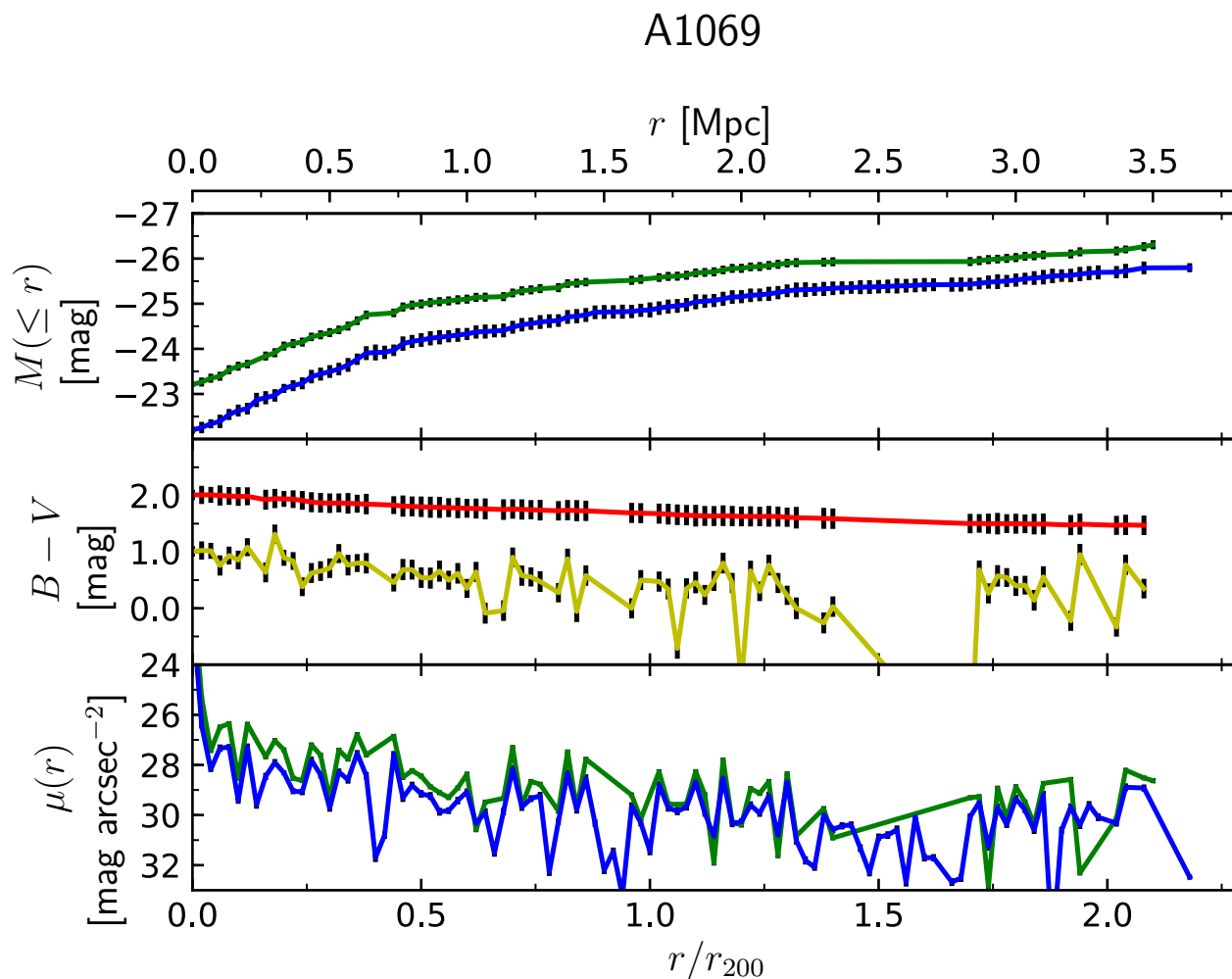


From Cariddi et al. 2017



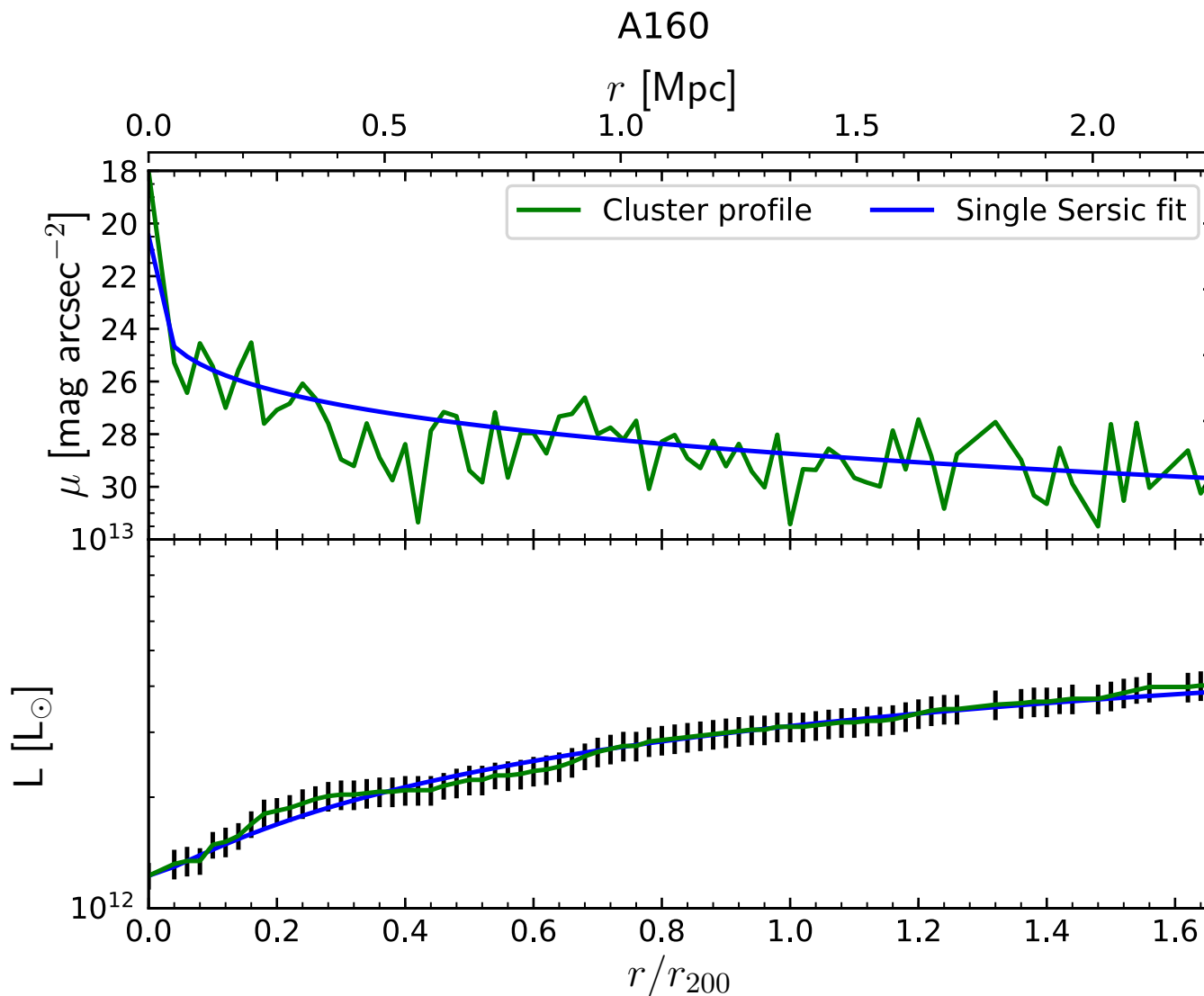
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The cluster growth curves



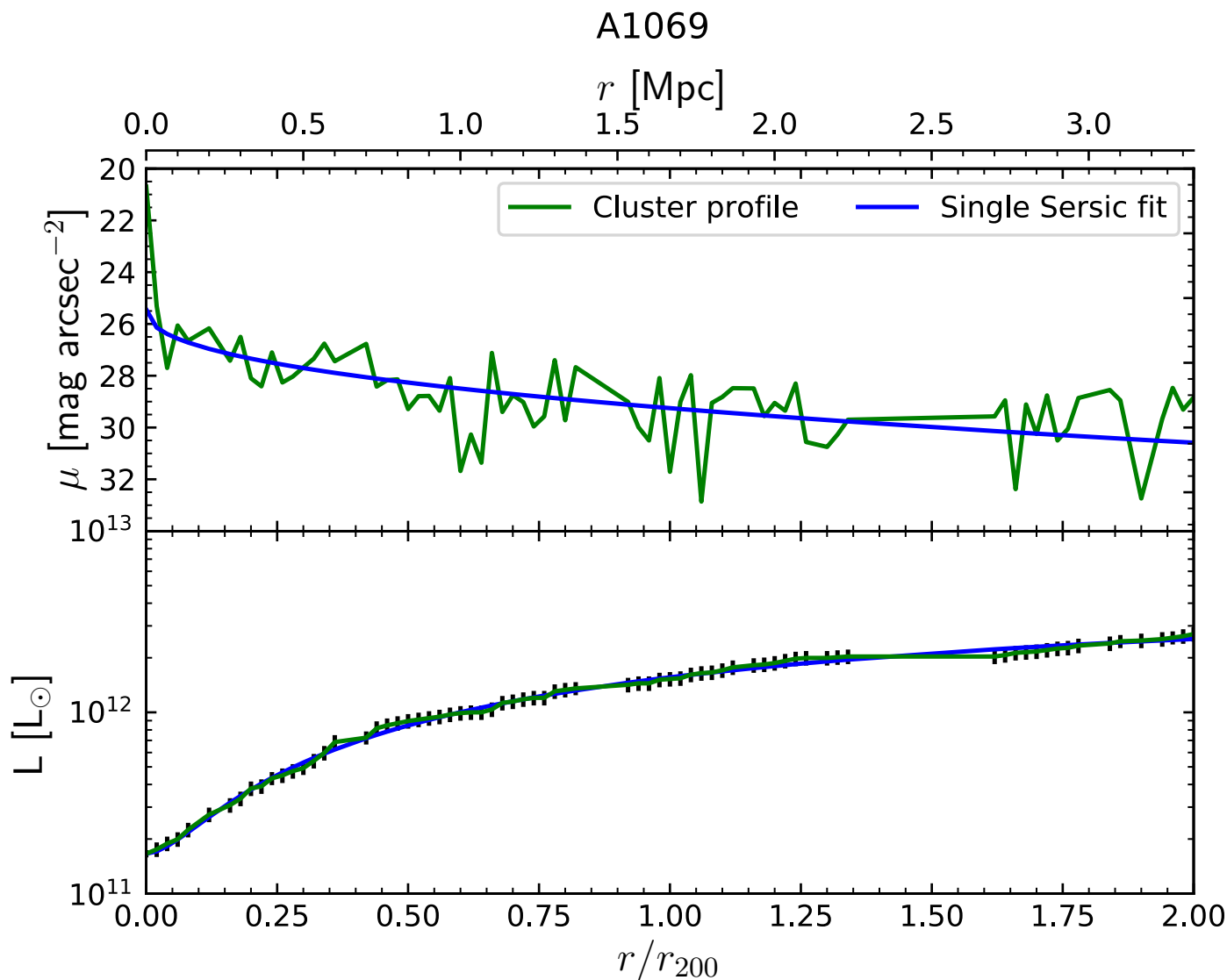


The fit with the Sersic law



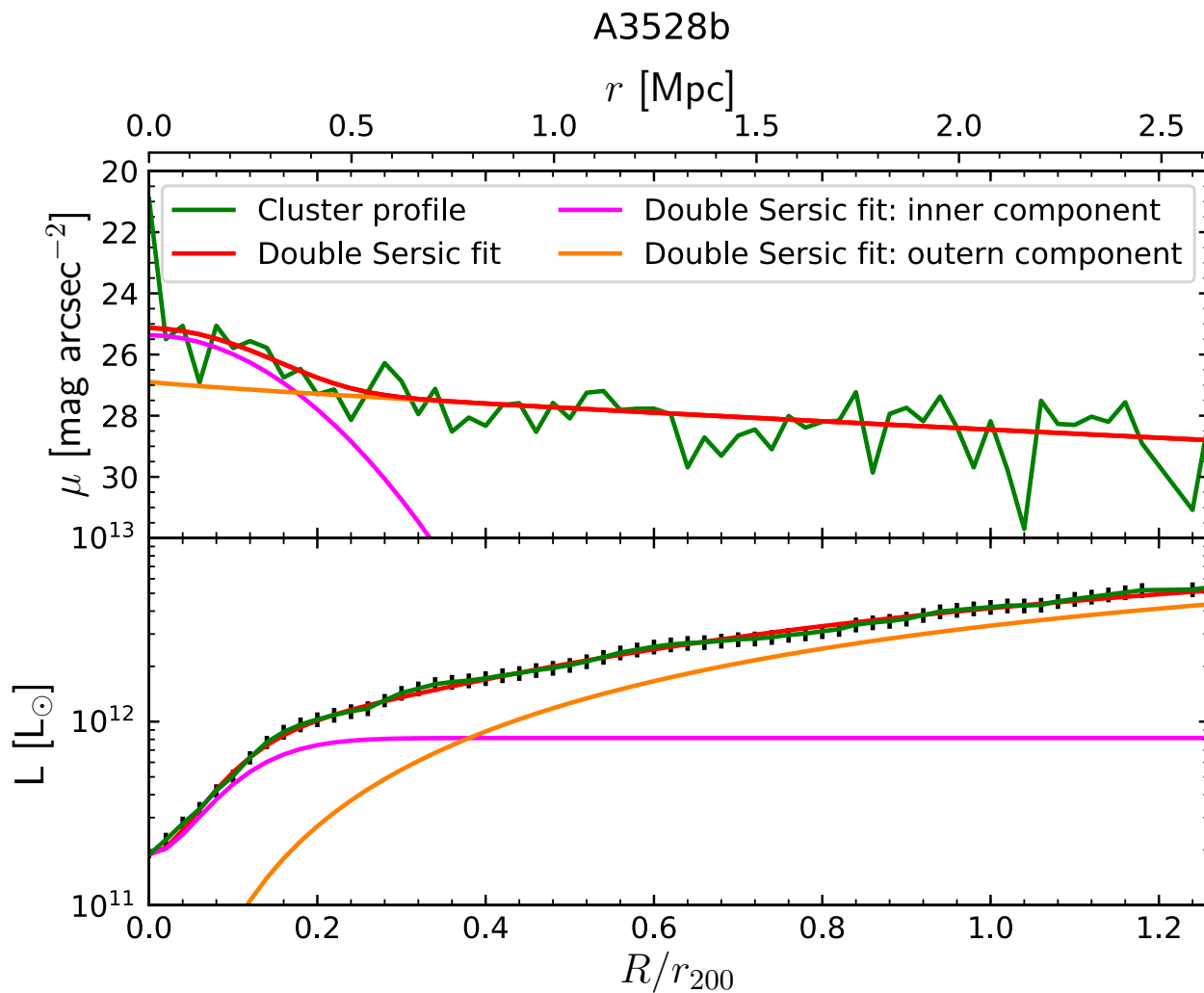


The fit with the Sersic law





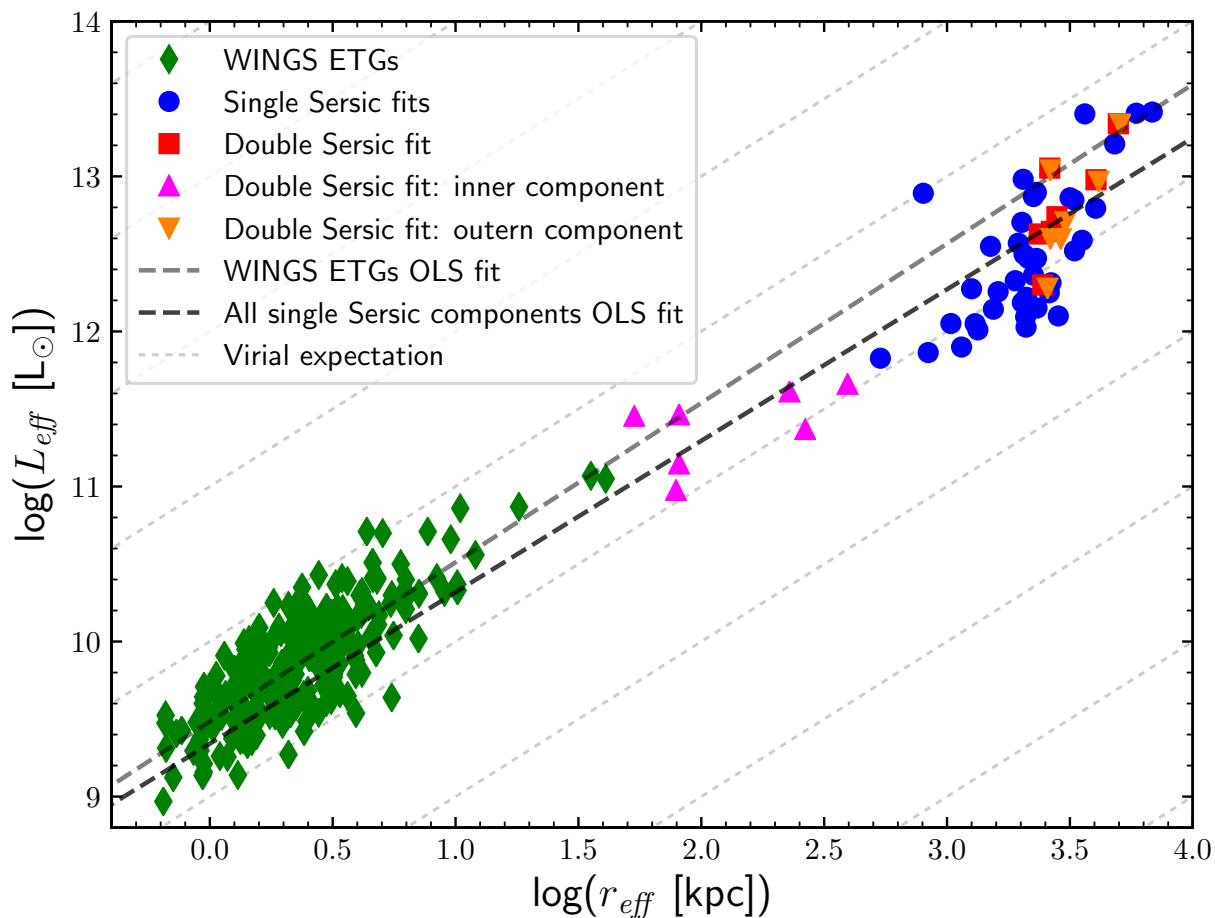
The fit with the double Sersic law





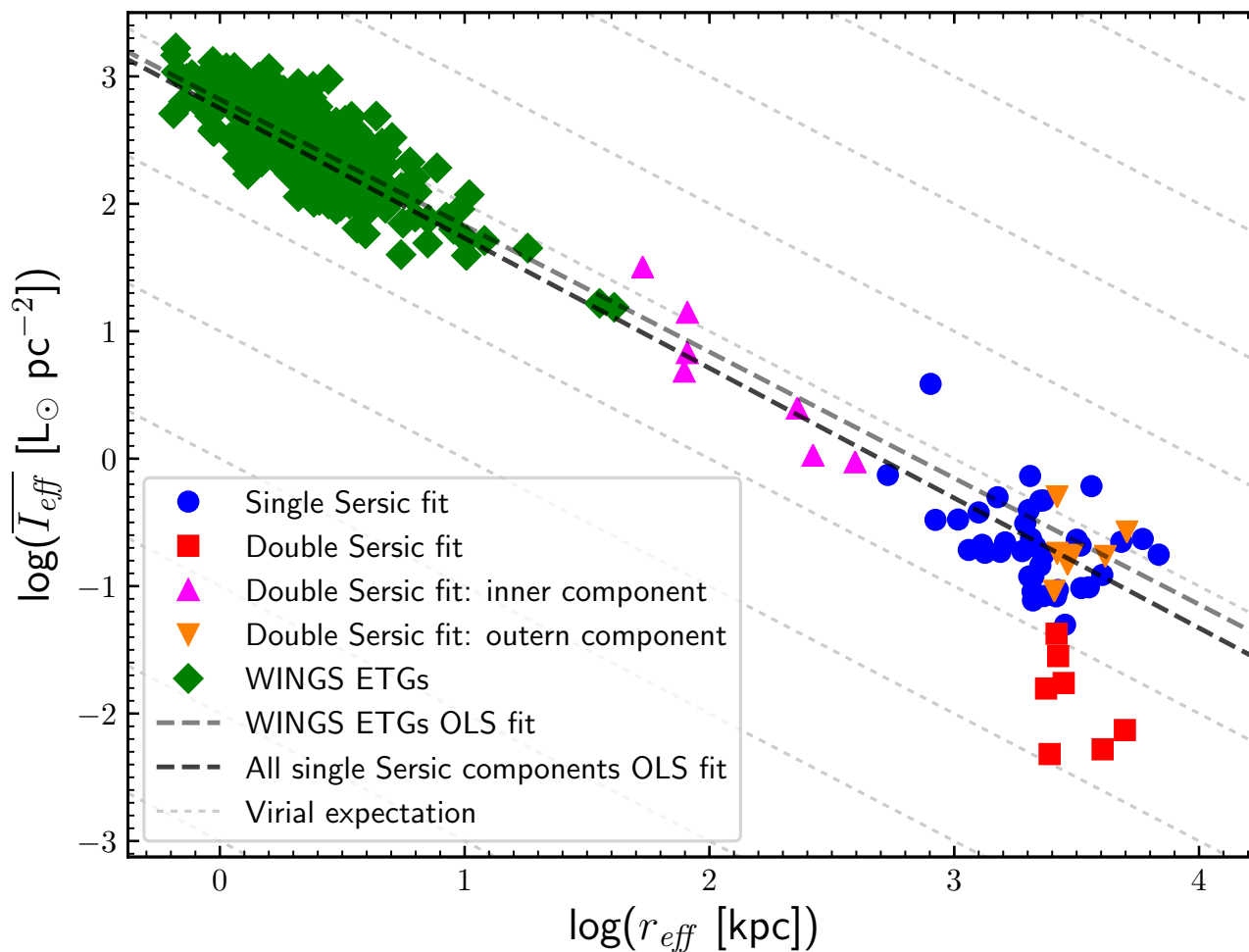
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Scaling relations of galaxies and clusters



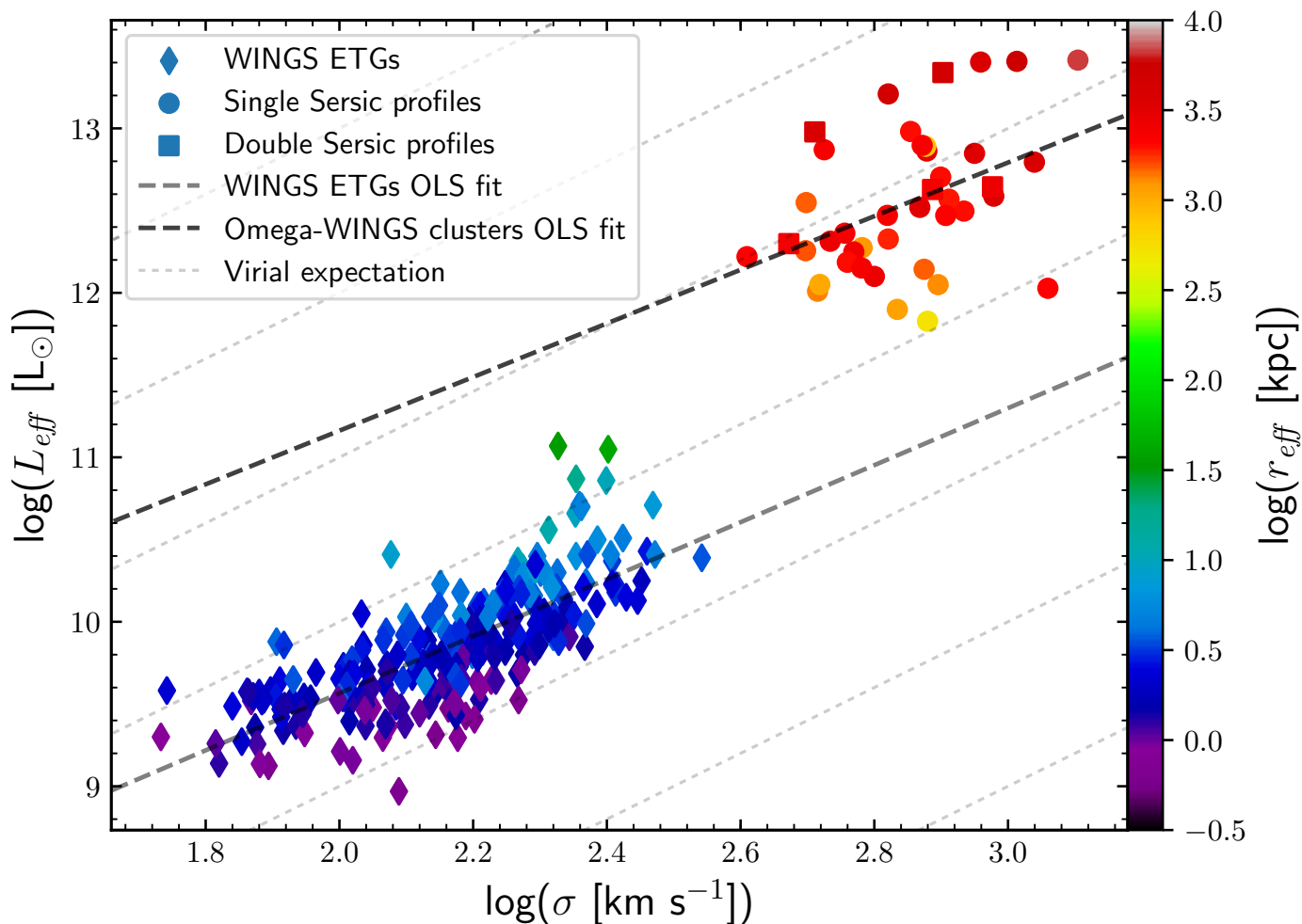


Scaling relations of galaxies and clusters



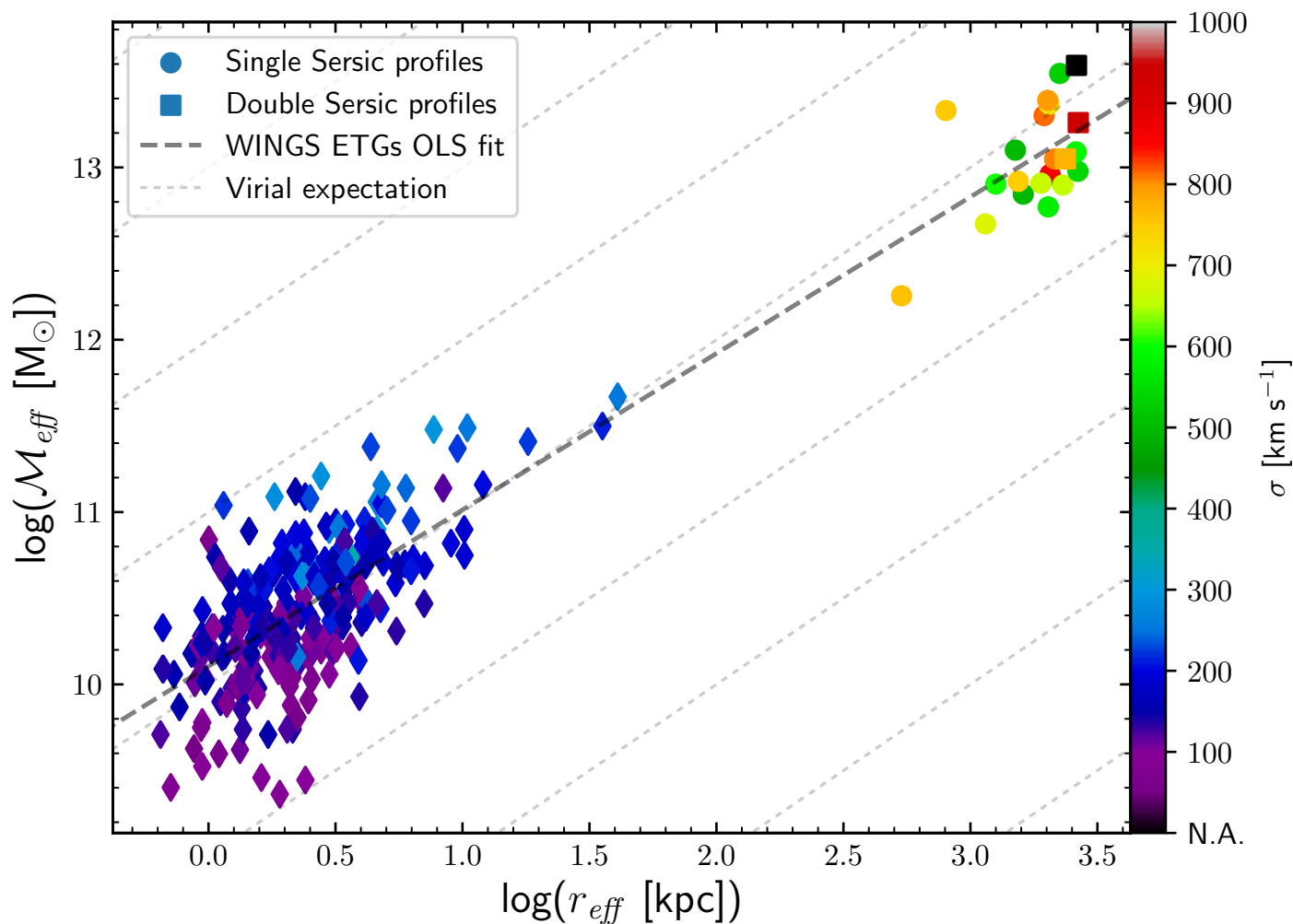


Scaling relations of galaxies and clusters



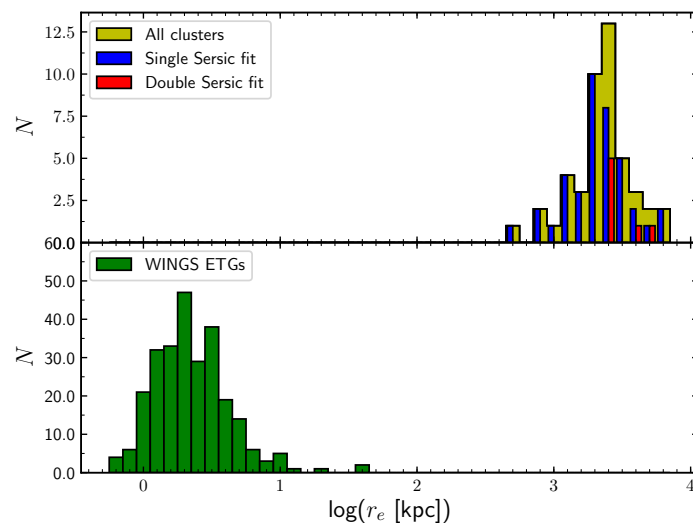
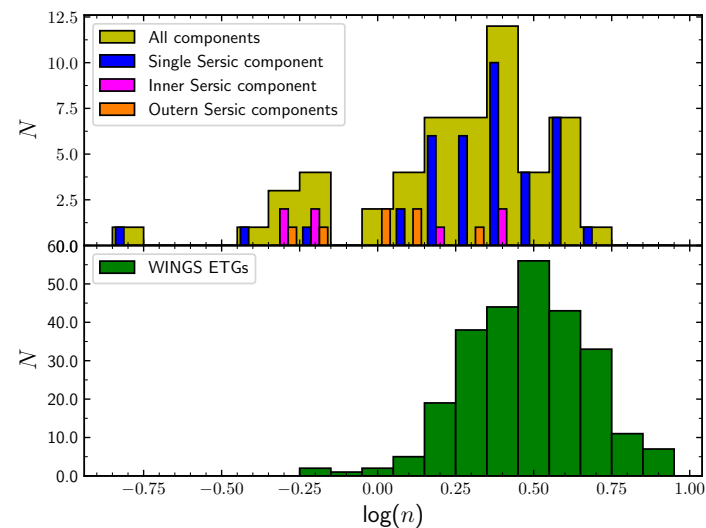
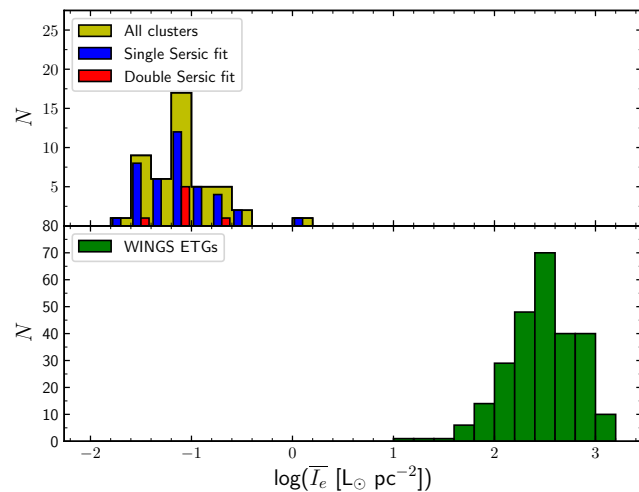


Scaling relations of galaxies and clusters





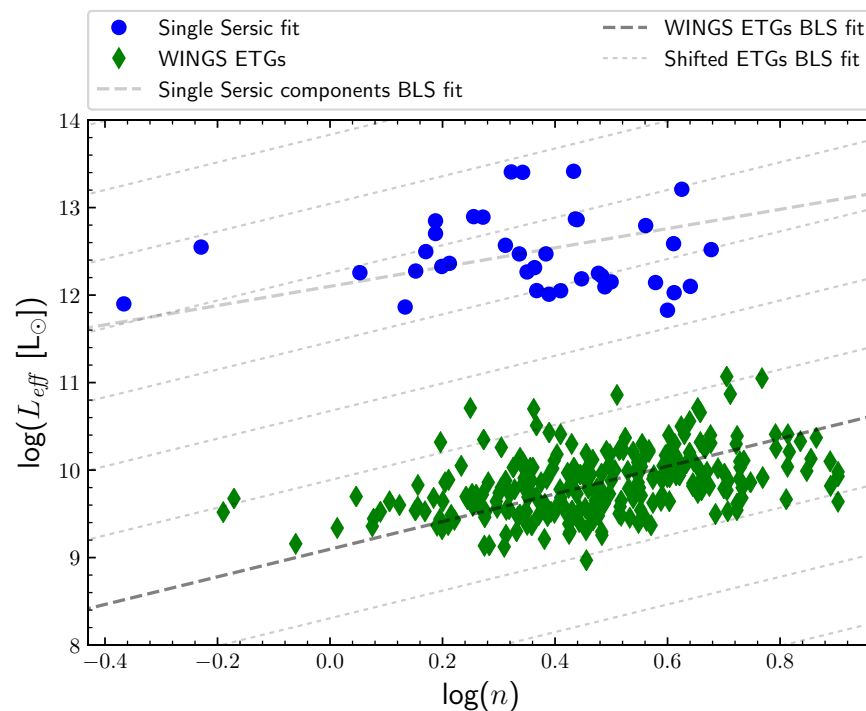
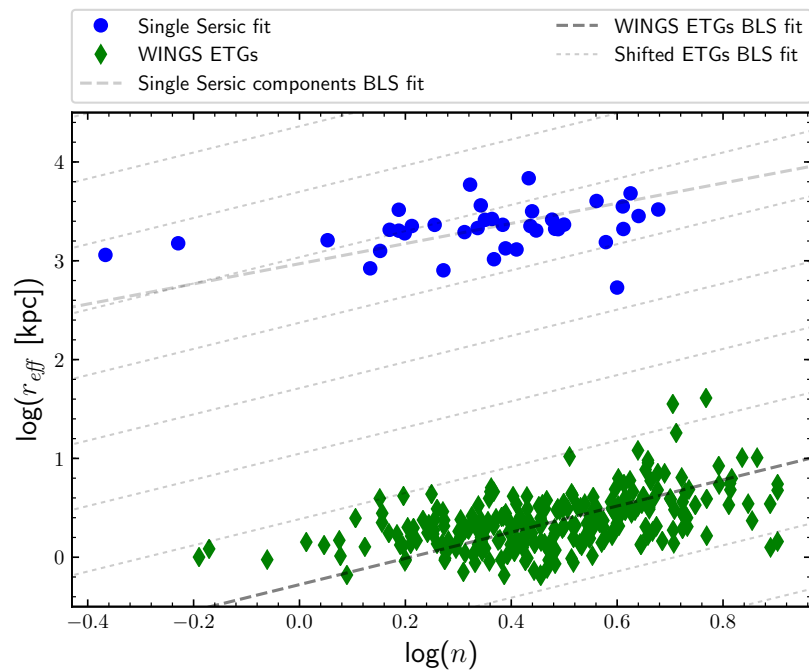
Clusters structural parameters





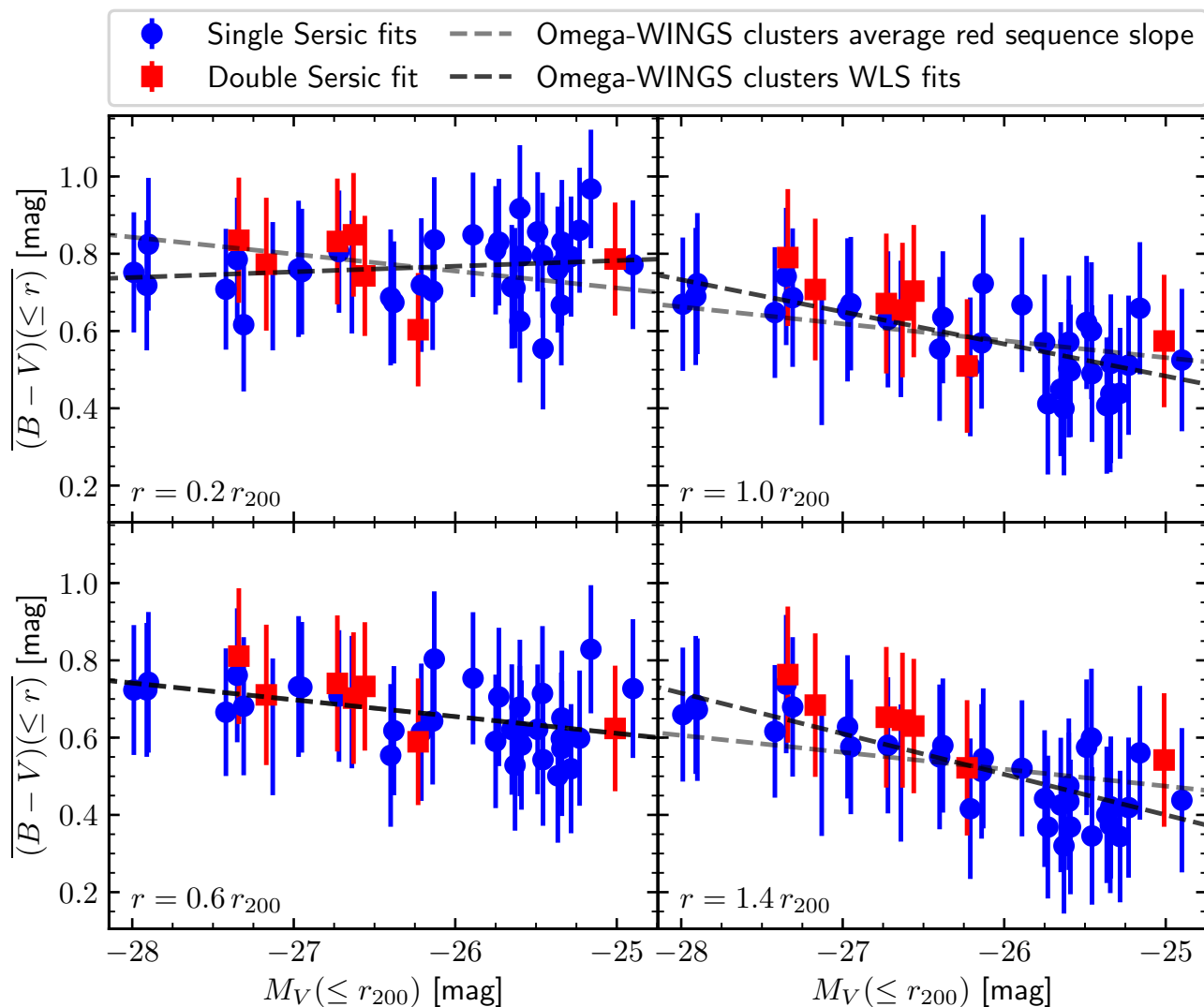
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The non-homology of clusters



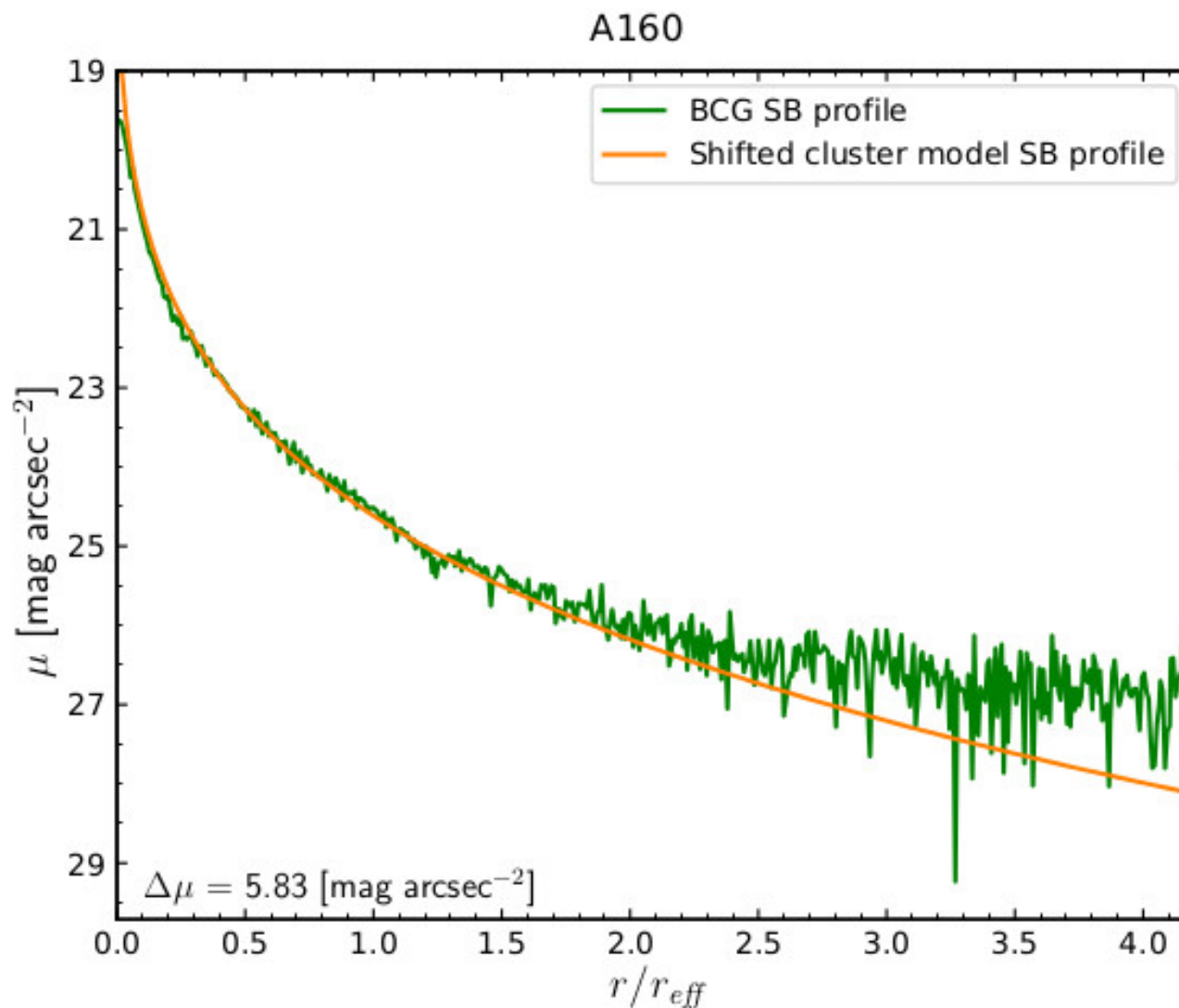


The c-m relation of clusters



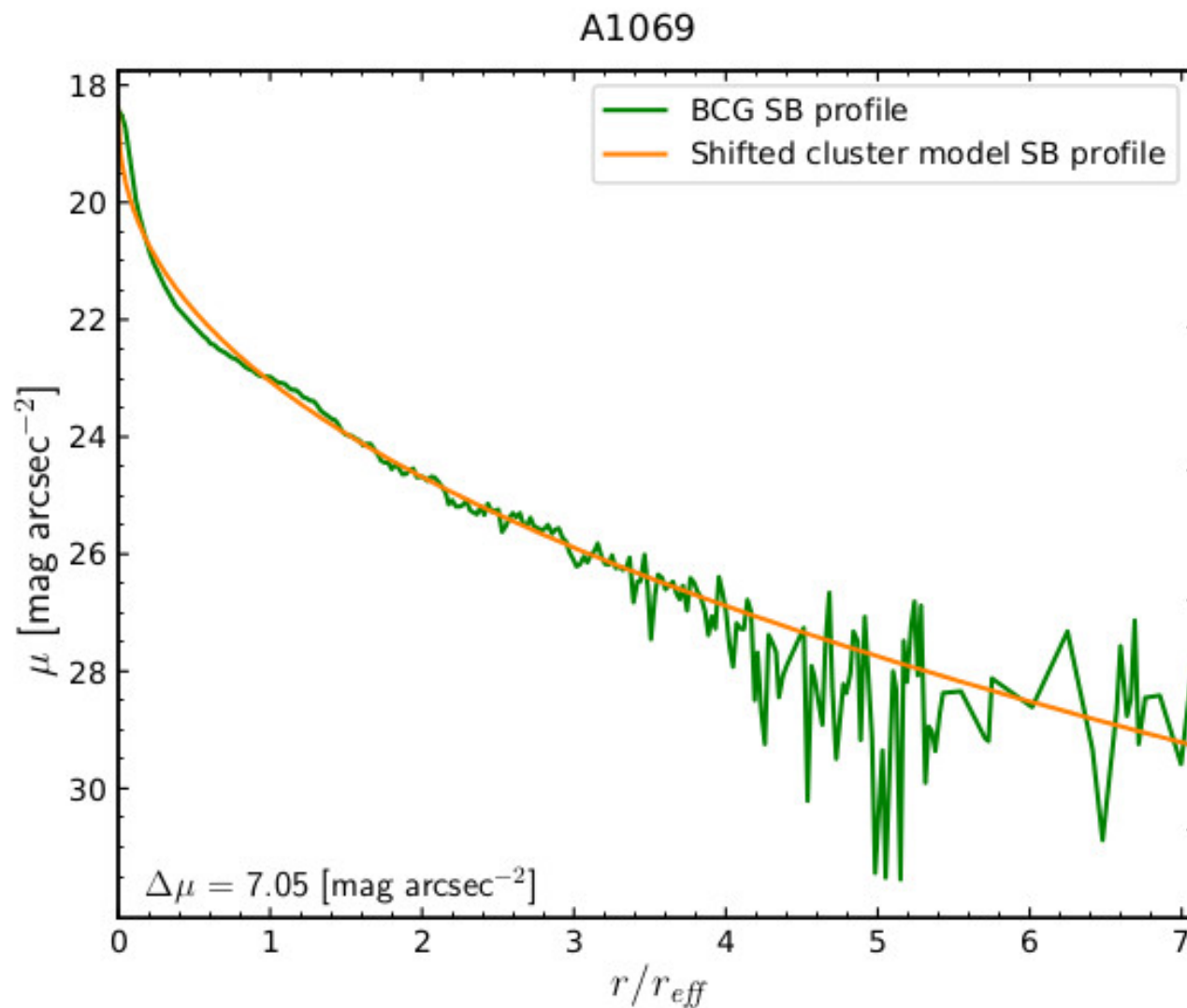


Galaxy-cluster SB profiles

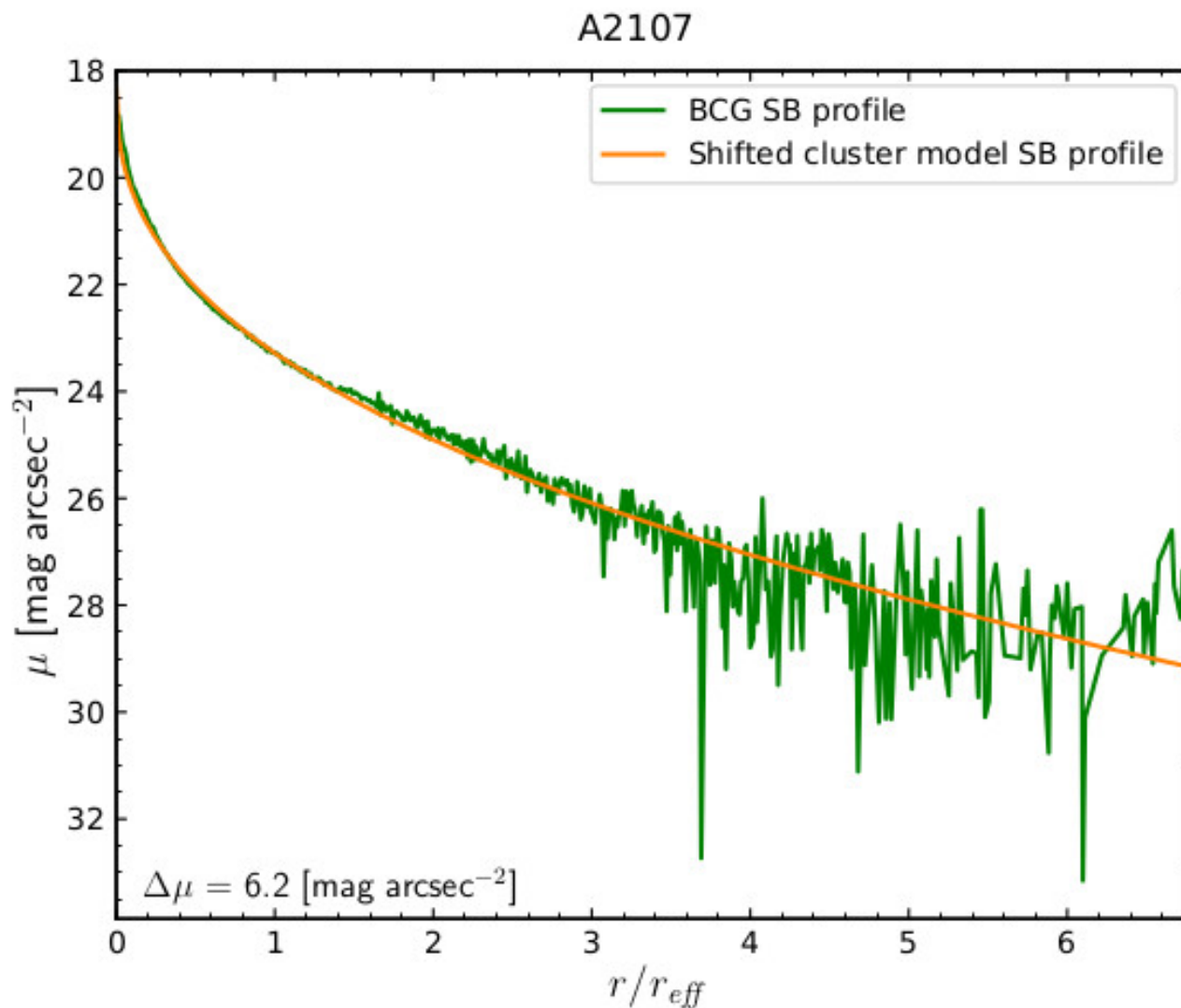




Galaxy-cluster SB profiles

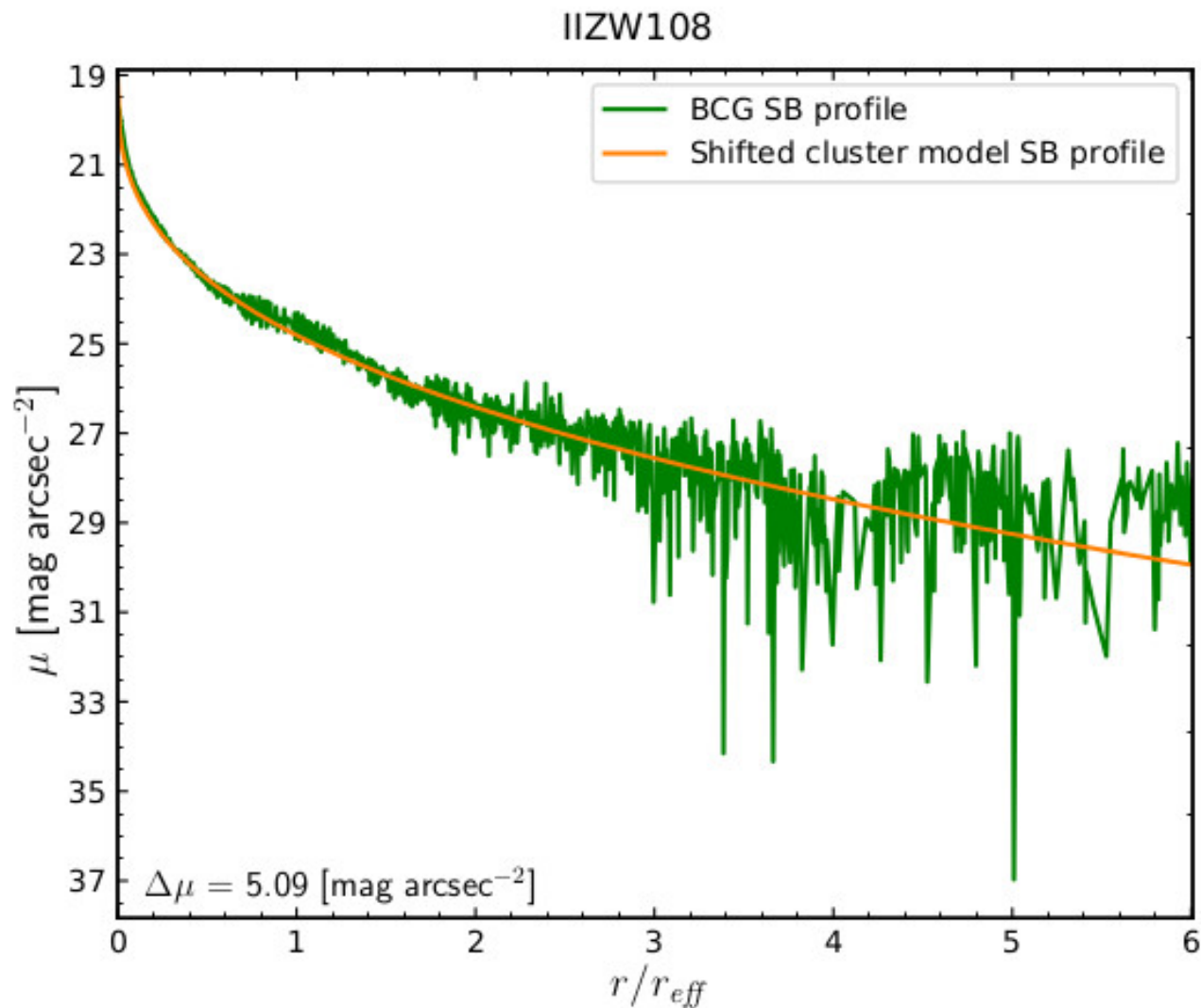


Galaxy-cluster SB profiles





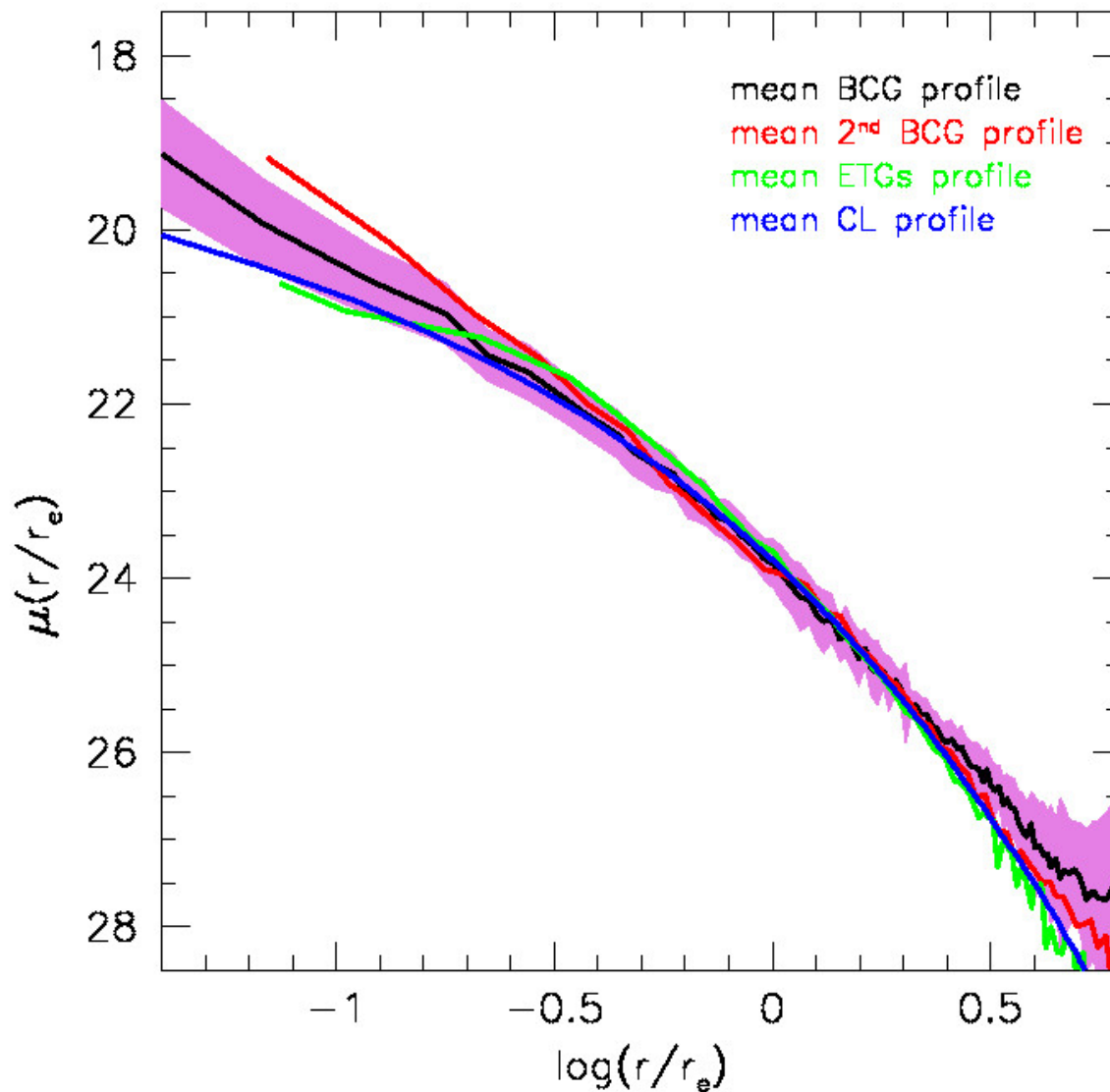
Galaxy-cluster SB profiles





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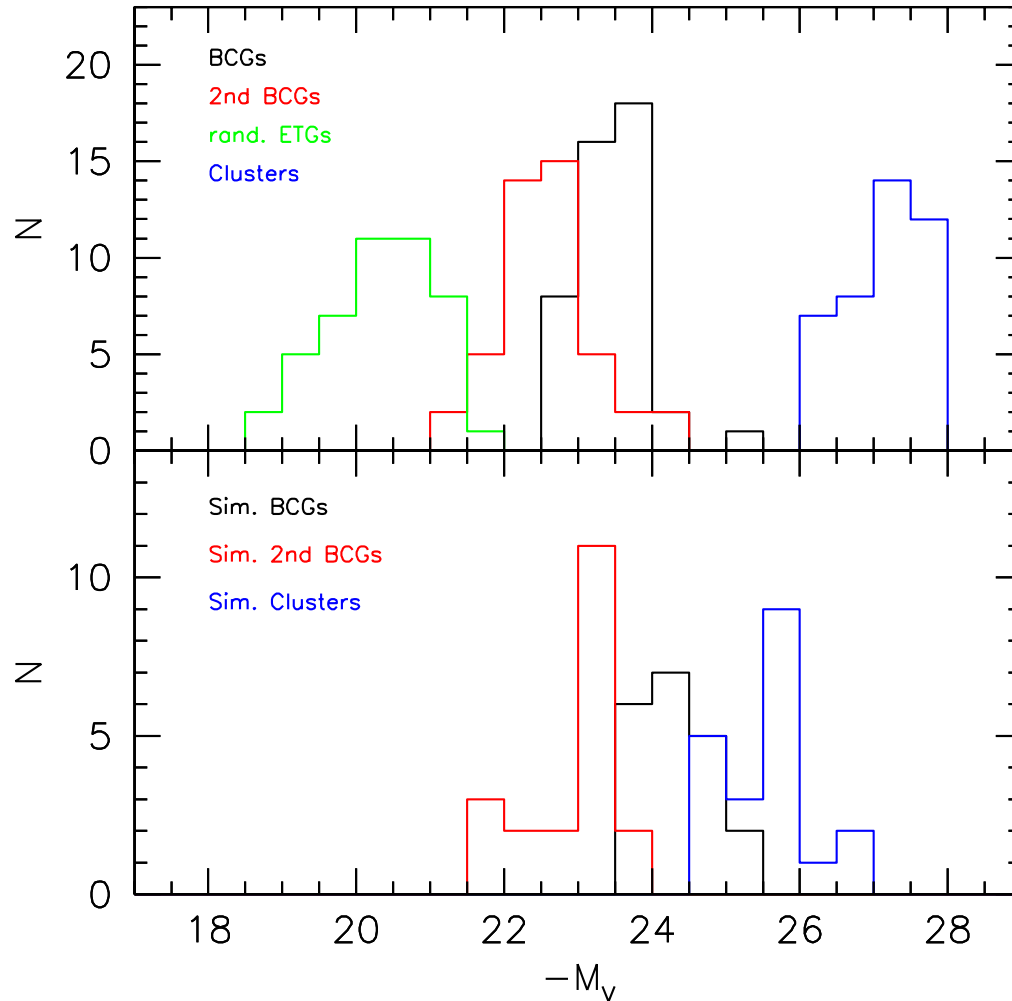
Mean galaxy & cluster SB profiles





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Galaxy-cluster luminosities



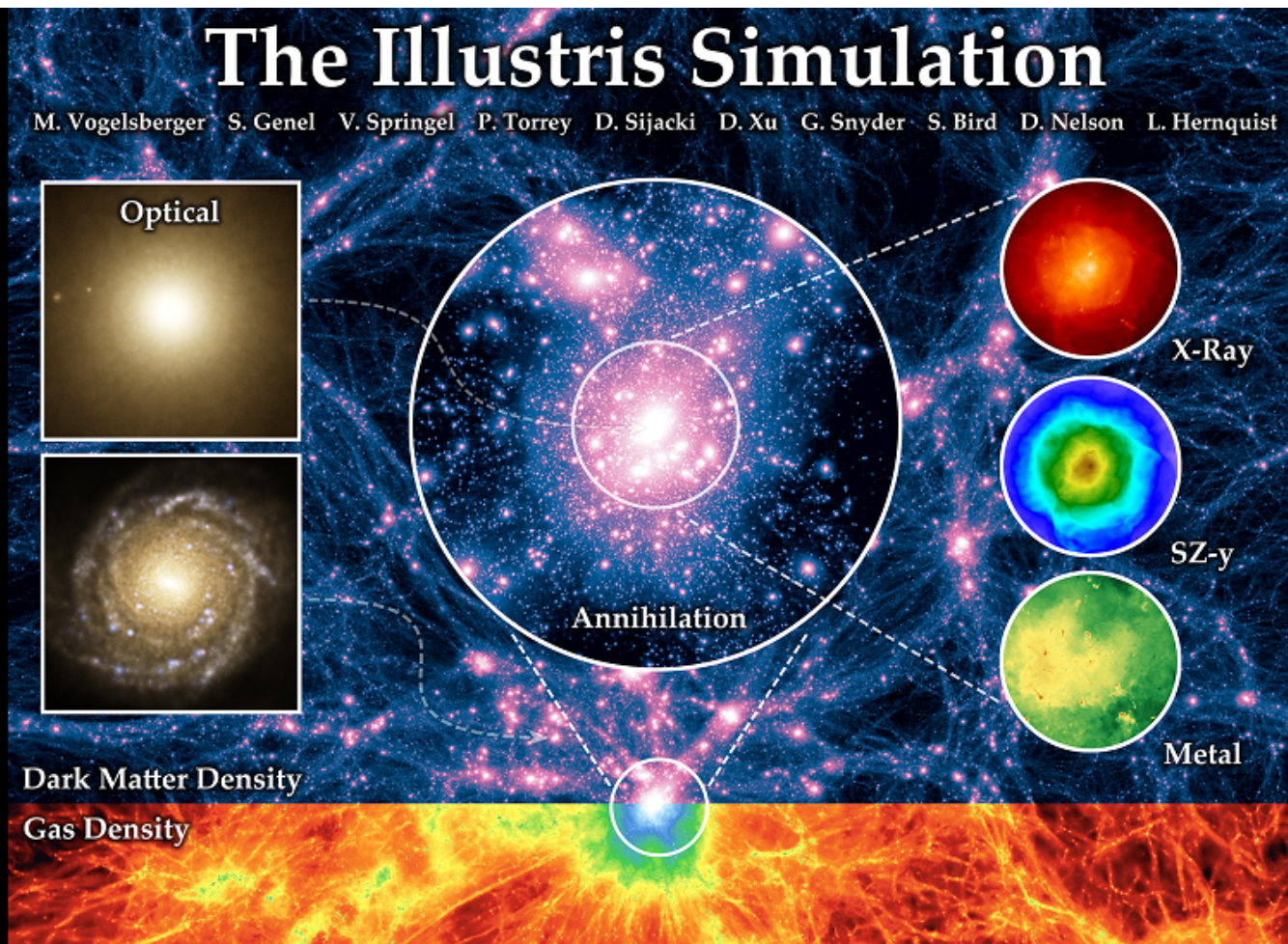
**ILLUSTRIS
SIMULATIONS
Vogelsberger+14
Nelson+15**



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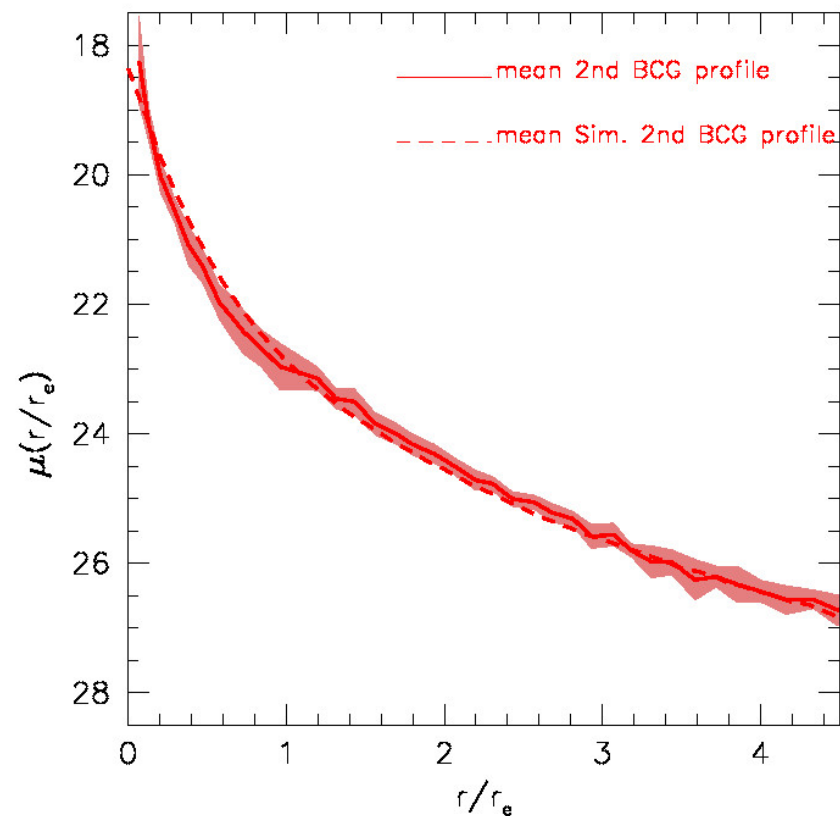
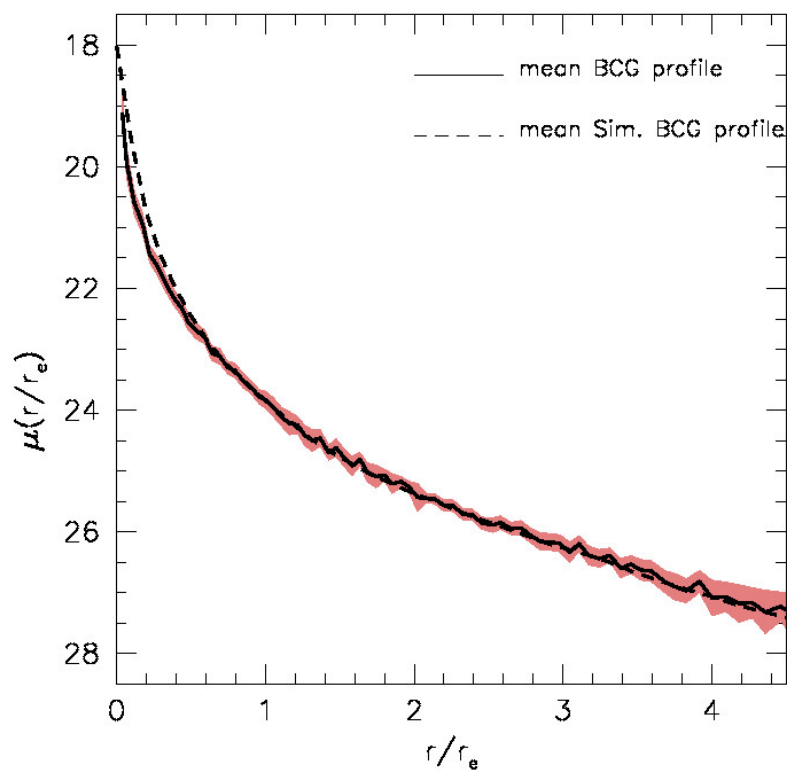
ILLUSTRIS SIMULATIONS

Vogelsberger+14 Nelson+15





ILLUSTRIS SIMULATIONS

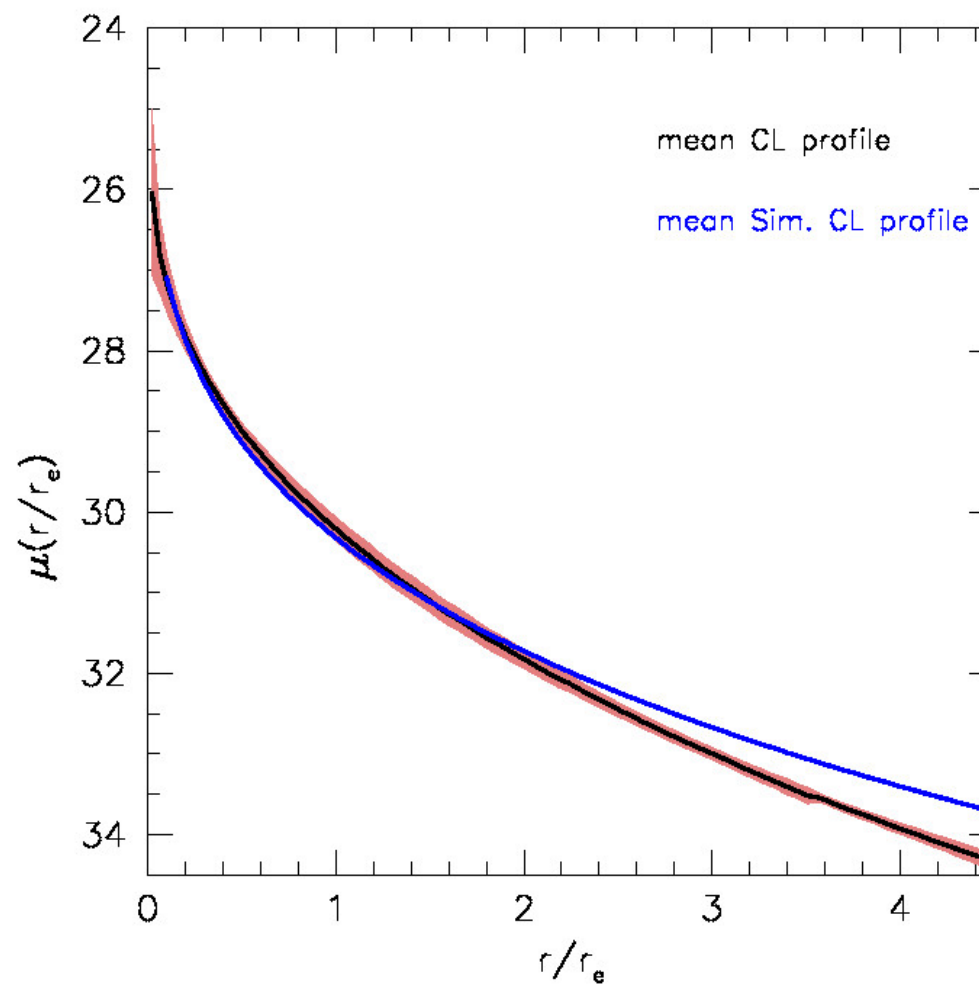




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Observations vs simulations

ILLUSTRIS
SIMULATIONS

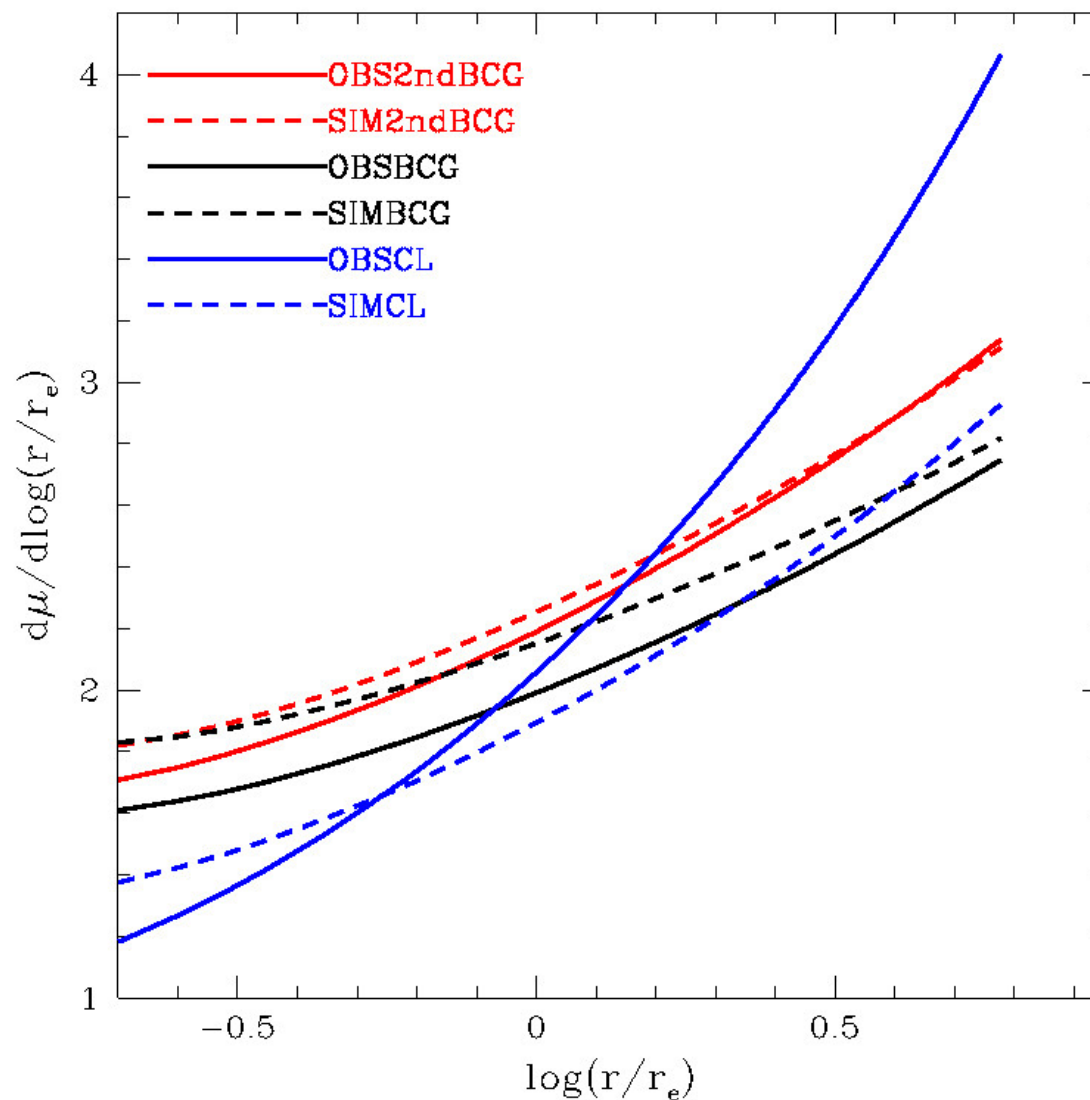




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Observations vs simulations

ILLUSTRIS
SIMULATIONS

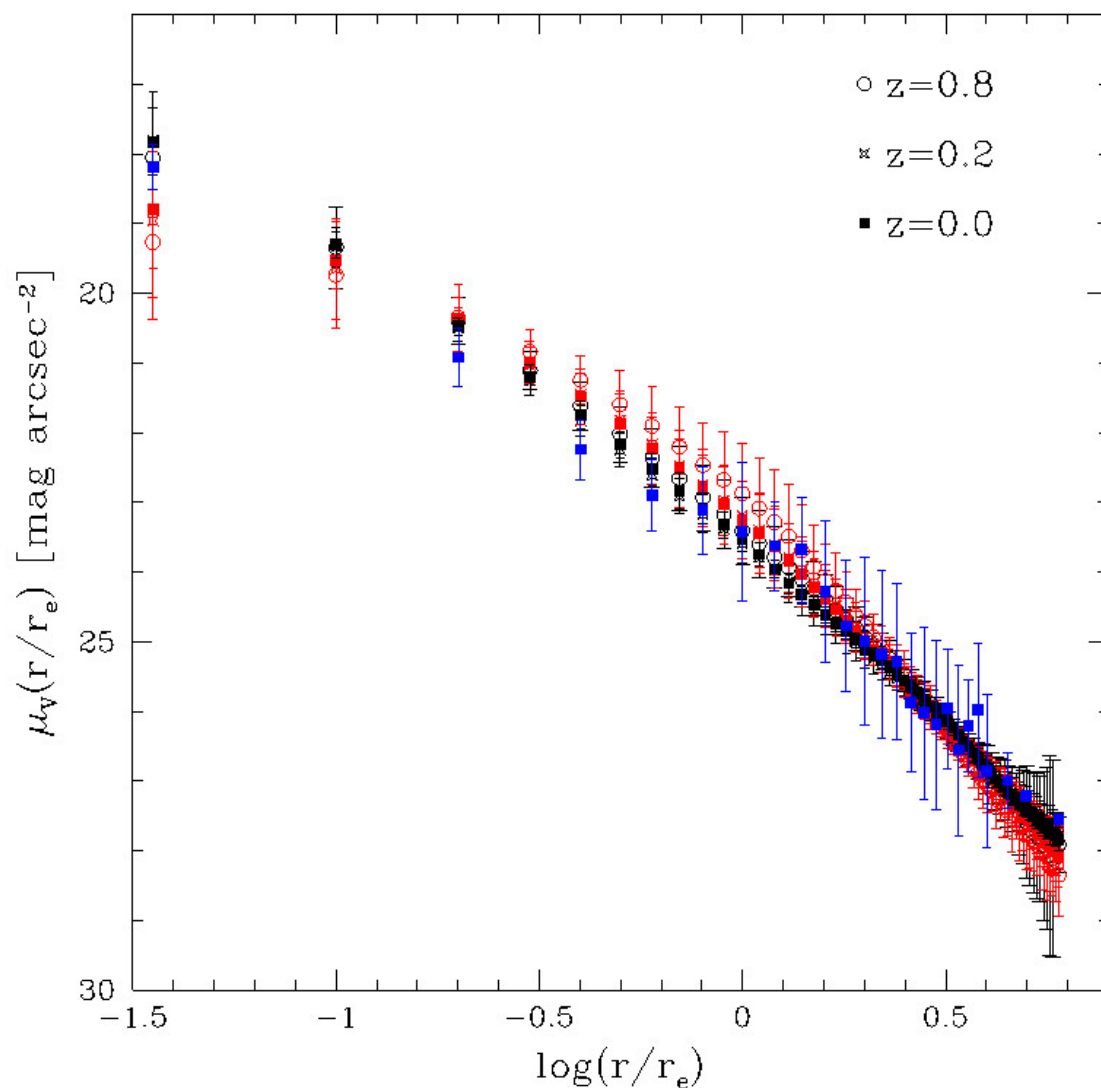




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Predictions from simulations

ILLUSTRIS SIMULATIONS

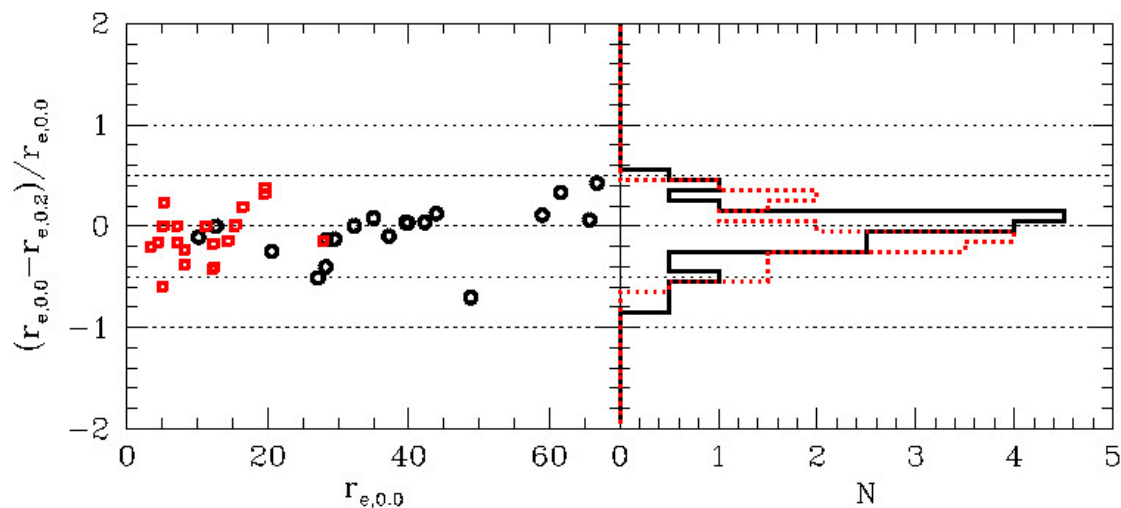
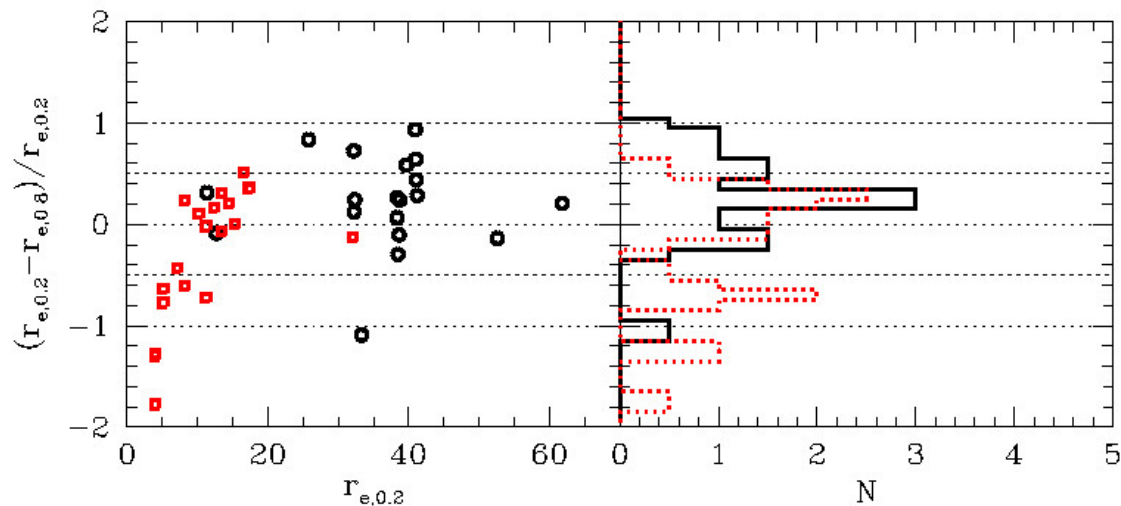




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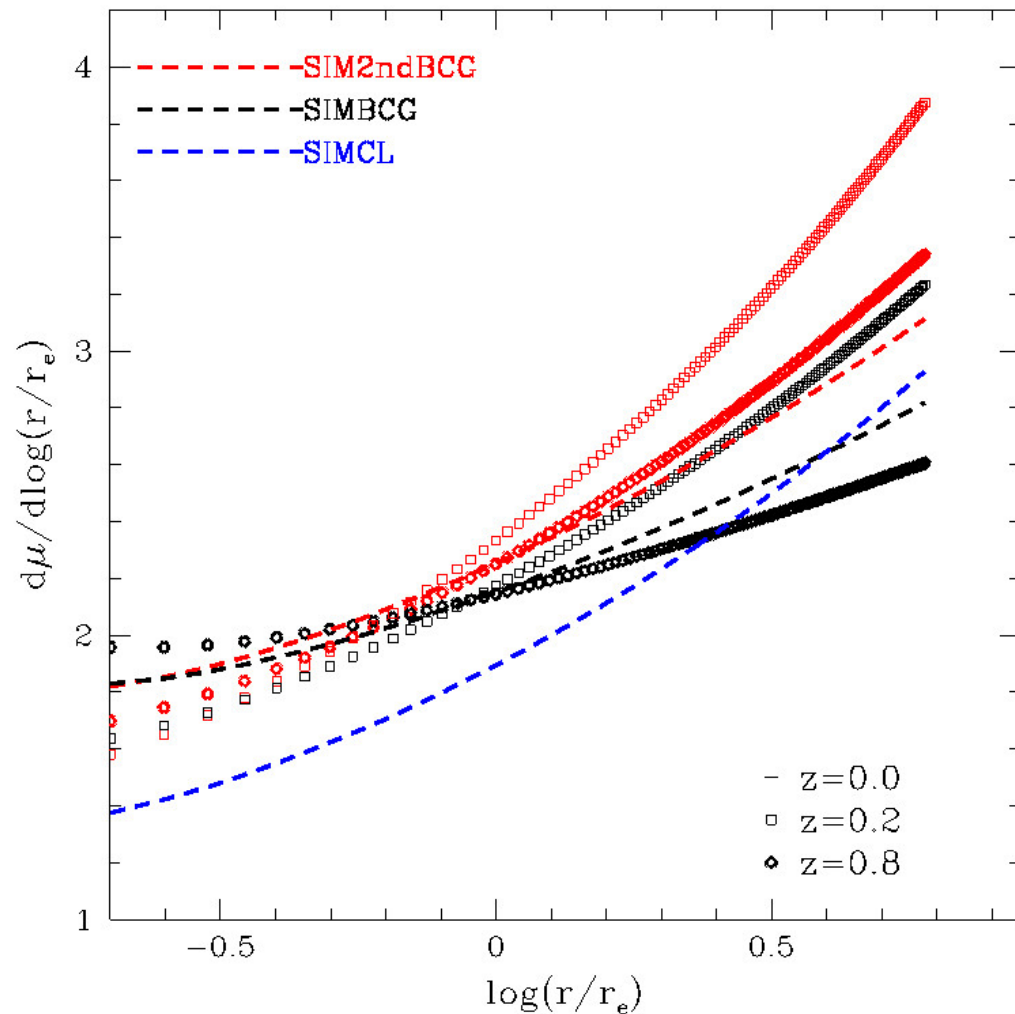
Predictions from simulations

ILLUSTRIS SIMULATIONS





ILLUSTRIS SIMULATIONS

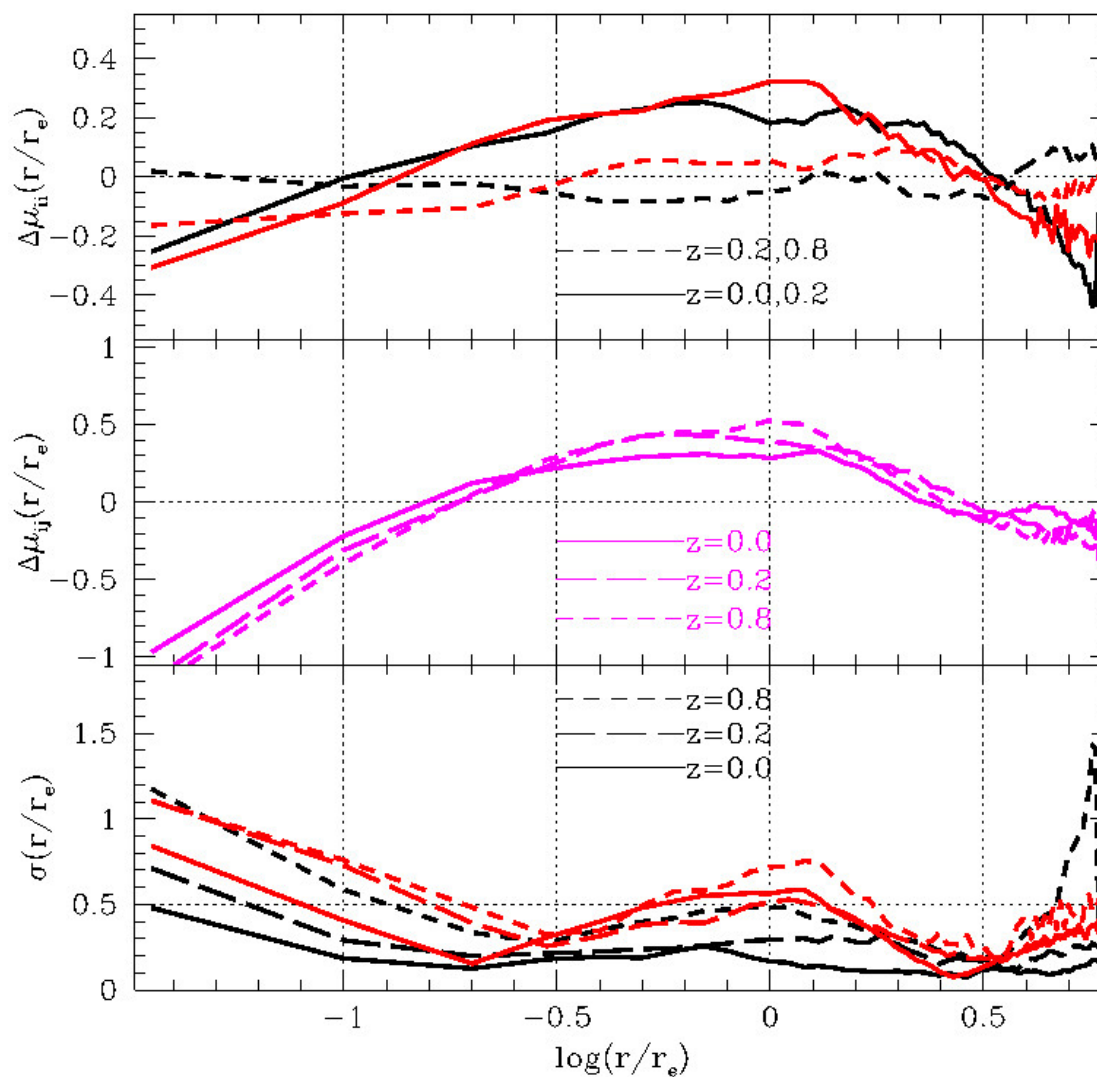




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Predictions from simulations

ILLUSTRIS SIMULATIONS





The WINGS-OMEGAWINGS data provide direct evidences that:

- **Local galaxy-clusters share the same scaling relations of ETGs**
- **They are non-homologus structures very similar to normal ETGs**
- **Their SB profiles can be superposed to that of ETGs**
- **All ETG profiles are identical between $0.3 R_e$ and $2 R_e$**
- **Numerical simulations provide a good approximation of the observed profiles at $z=0$**
- **Simulations give more luminous BCGs and less luminous clusters at $z=0$**
- **The light profiles evolve in a mild way from $z=0.8$**