

Dicothomy in galactic colour gradients

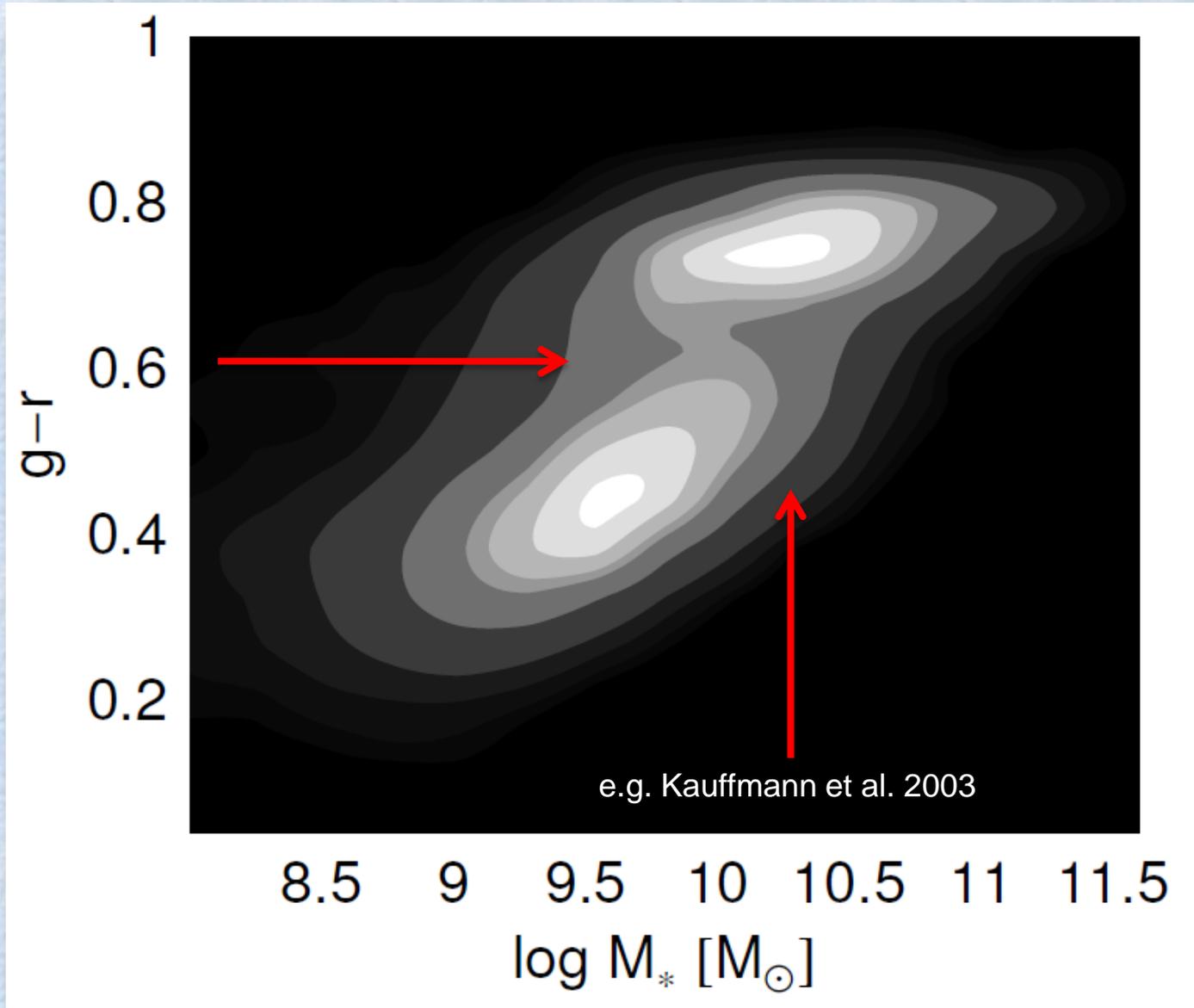


Universität Zürich

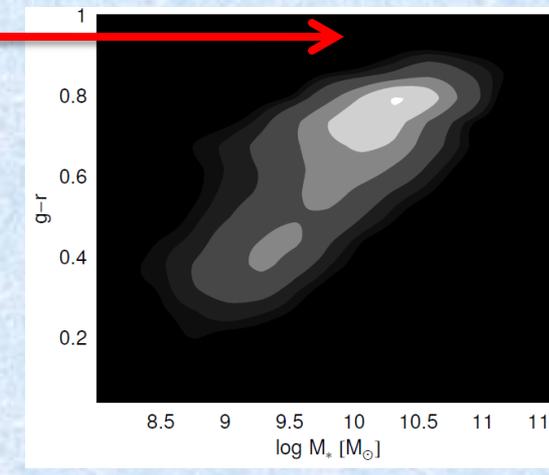
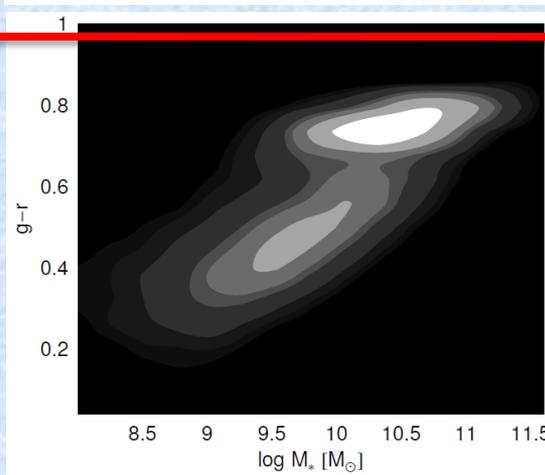
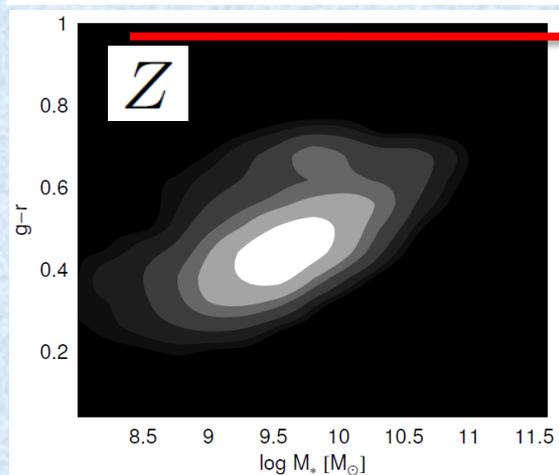
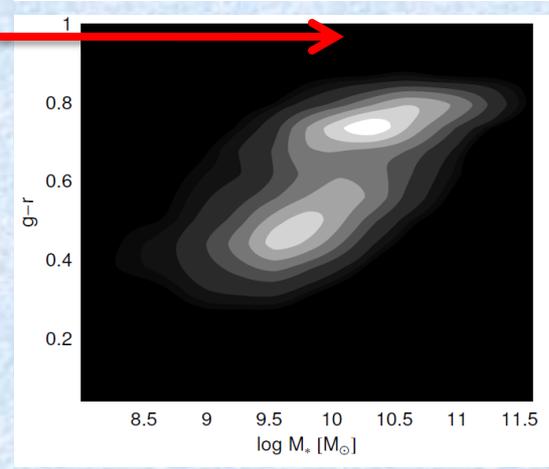
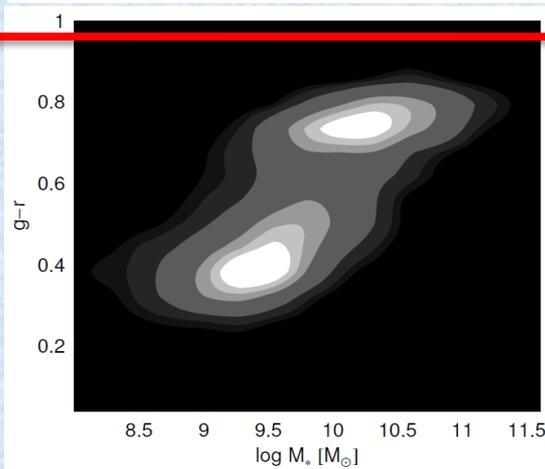
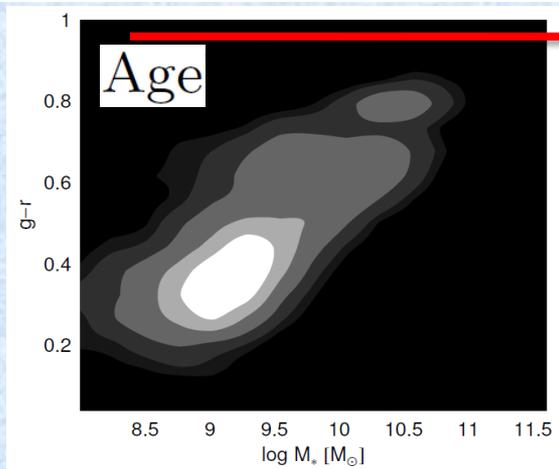
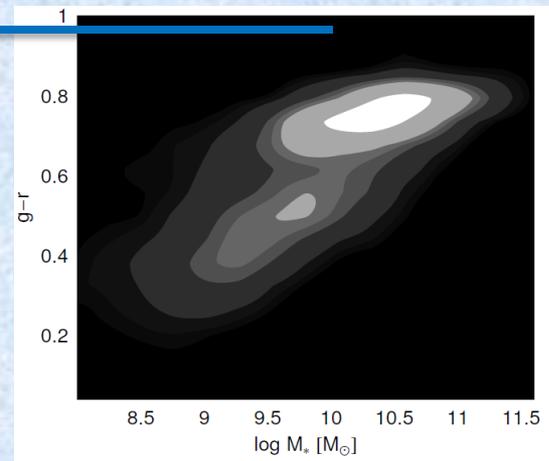
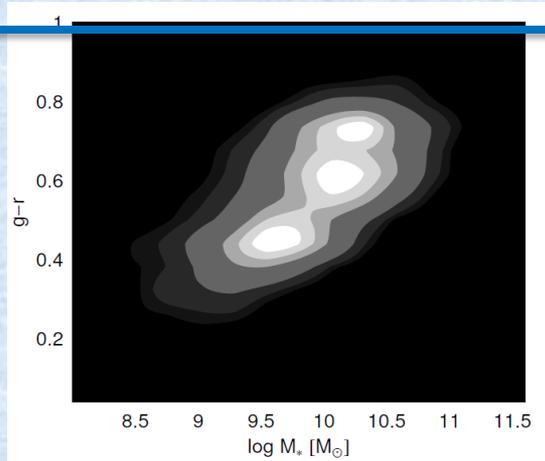
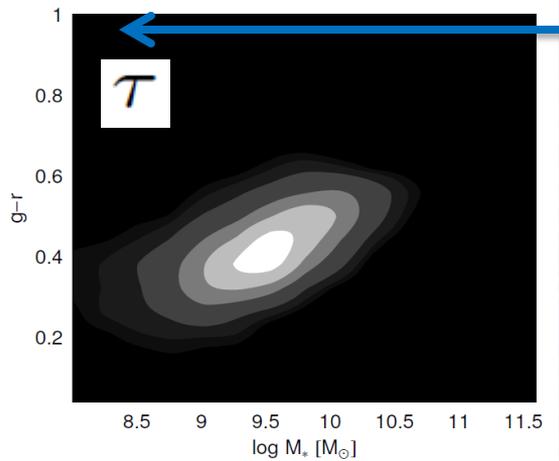
ITP Zurich

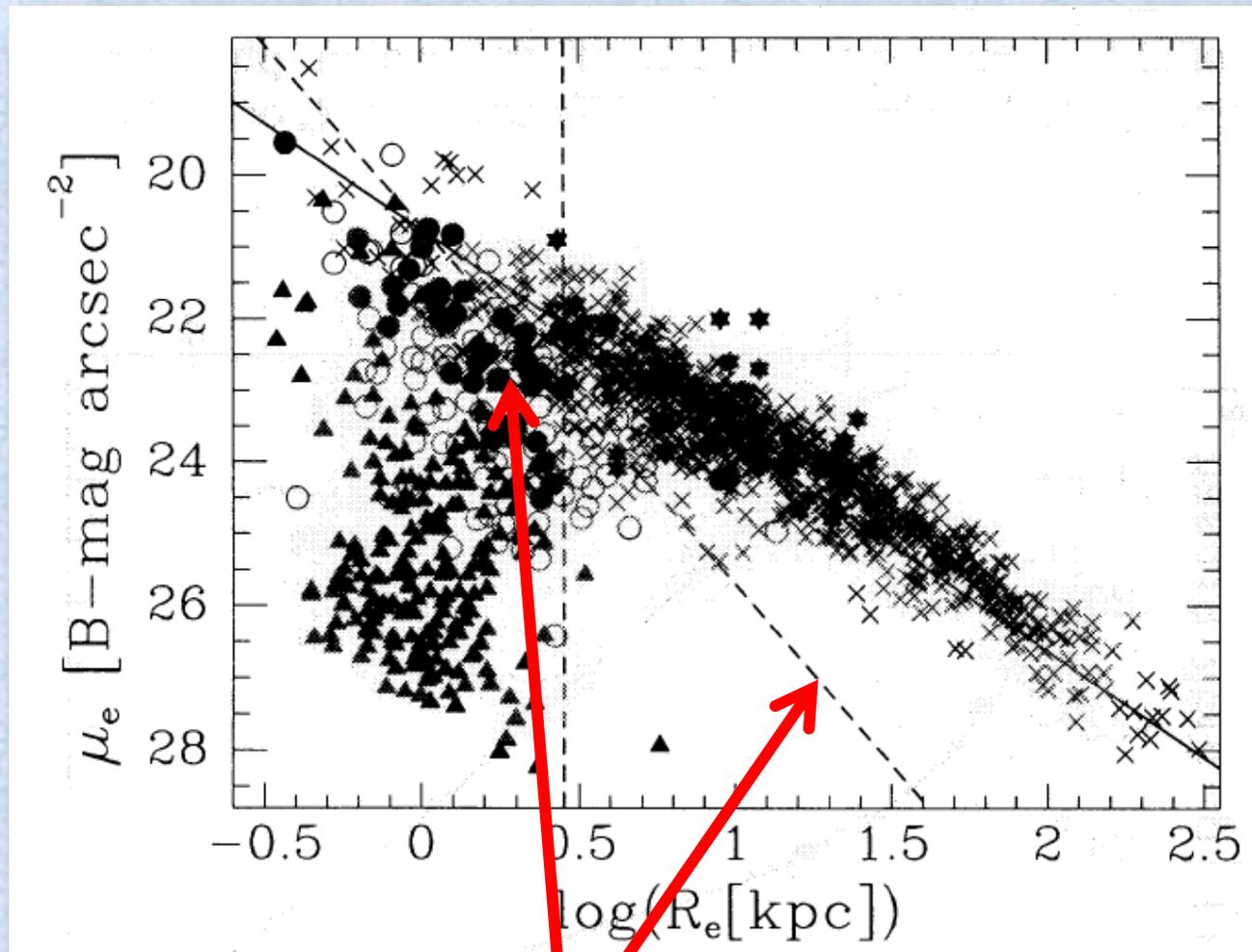
Crescenzo Tortora

Colour mass diagram



Gladders et al. 1998, Strateva et al. 2001, Andreon 2003, Kauffmann et al. 2003, Baldry et al. 2004, Balogh et al. 2004, Bell et al. 2004, Bell 2008, Romeo et al. 2008

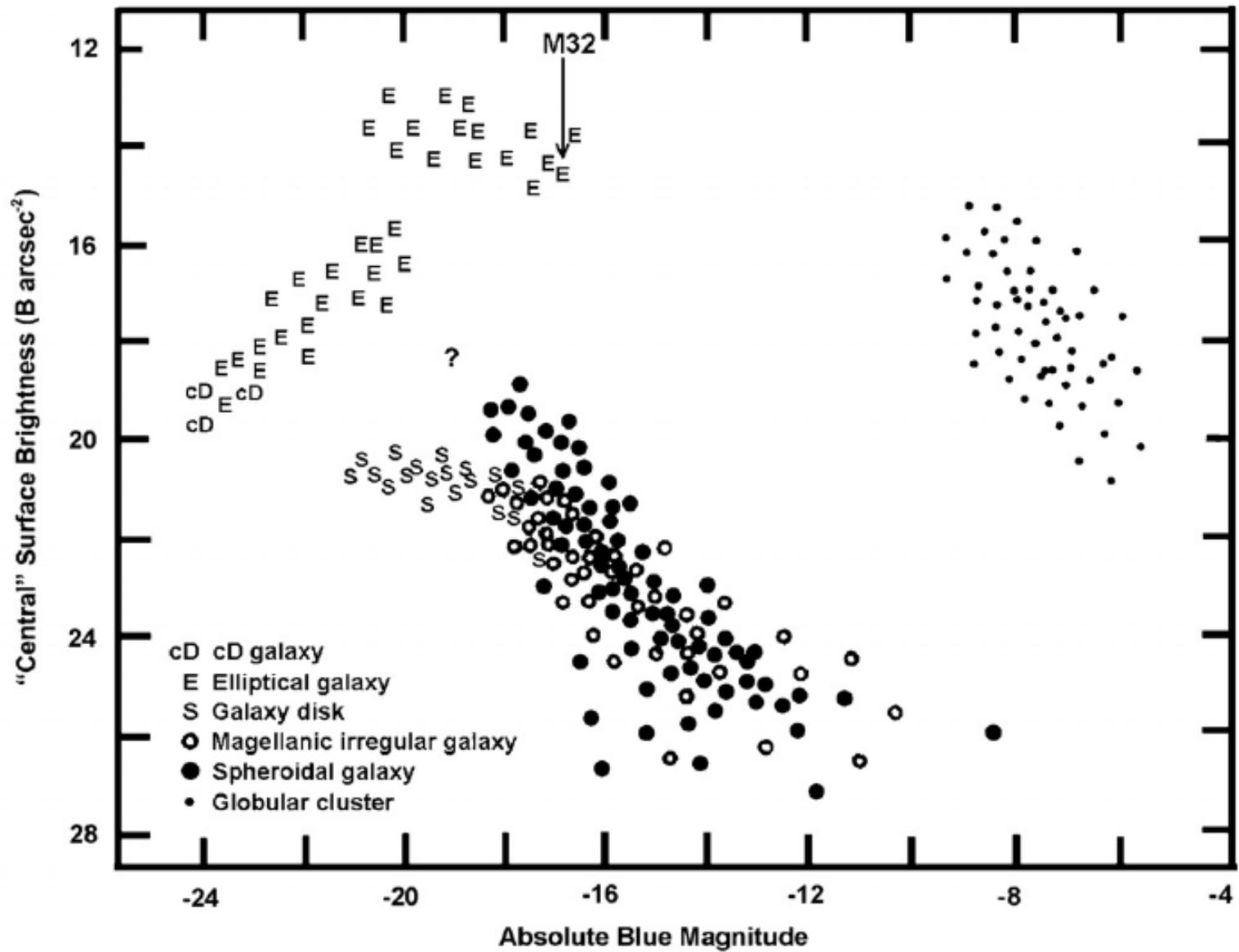




$$M_B \sim -19.3$$

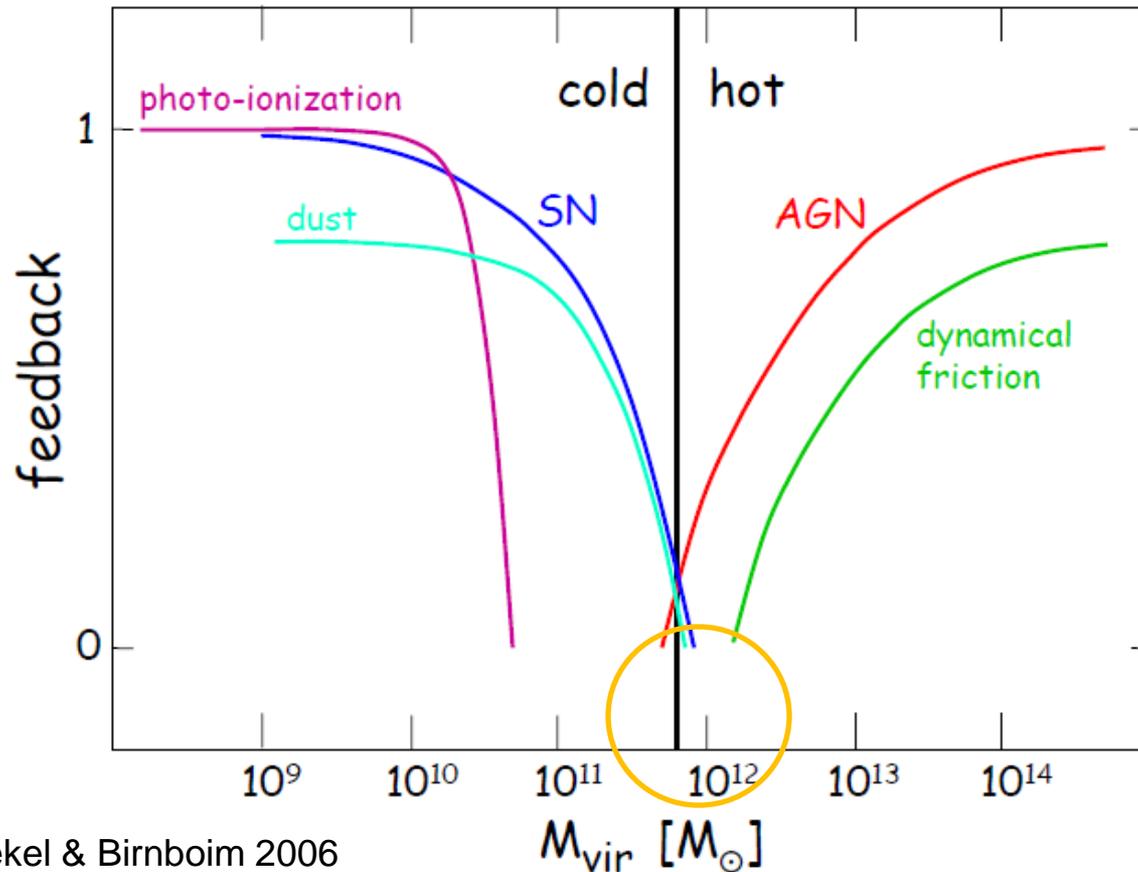
$$M_r \sim -20.5$$

e.g. Size-mass relation
(Shen et al. 2003)



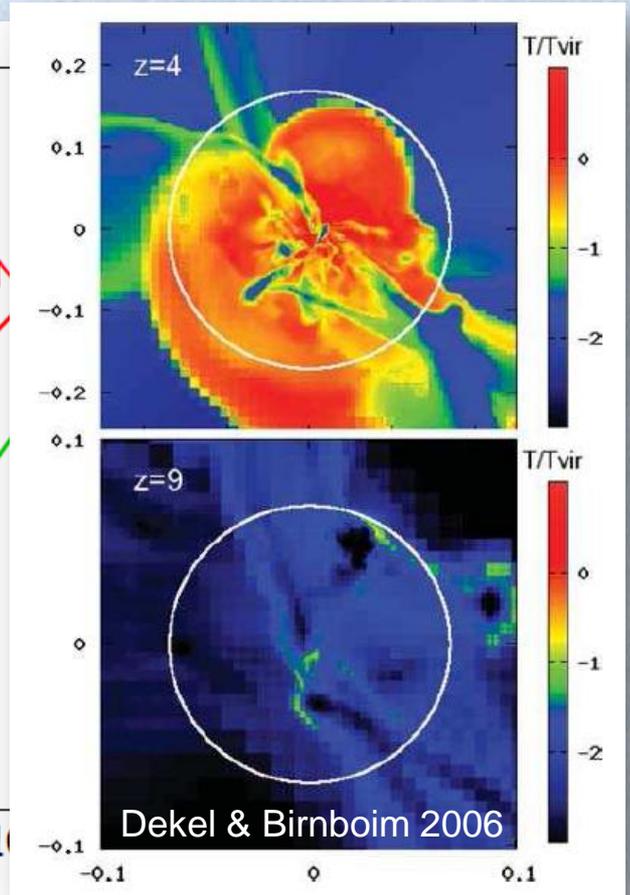
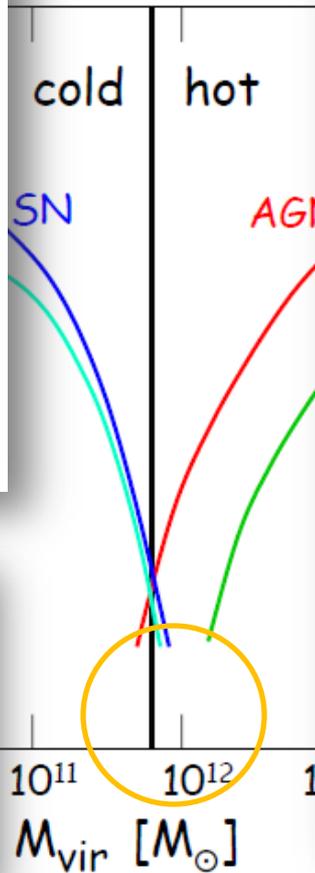
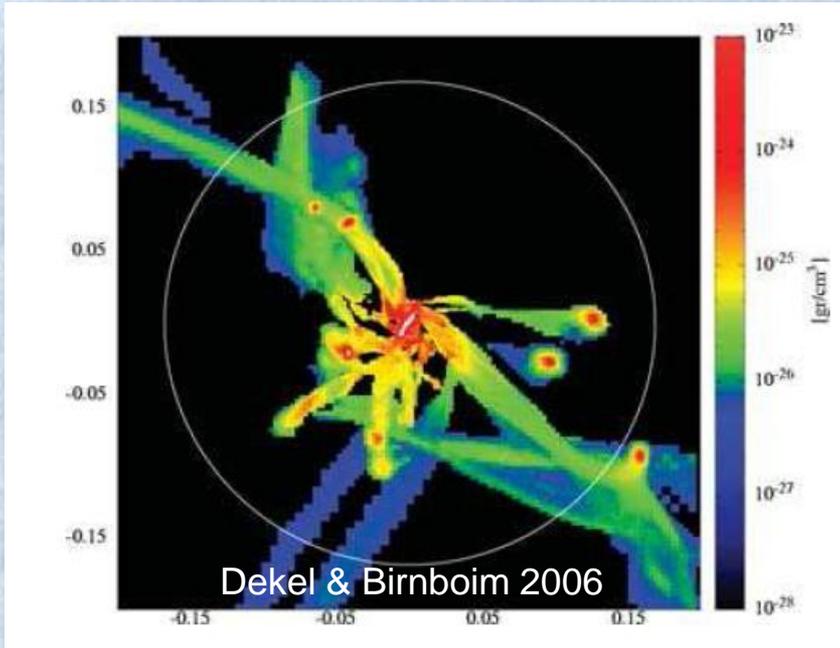
from Kormendy et al. 2009

Efficiency of feedback processes and shock heating mass



Dekel & Birnboim 2006

Efficiency of feedback processes and shock heating mass



Colour and stellar population gradients in galaxies: correlation with mass

C. Tortora,^{1,2★} N. R. Napolitano,³ V. F. Cardone,⁴ M. Capaccioli,² Ph. Jetzer¹
and R. Molinaro^{3,5}

LTGs

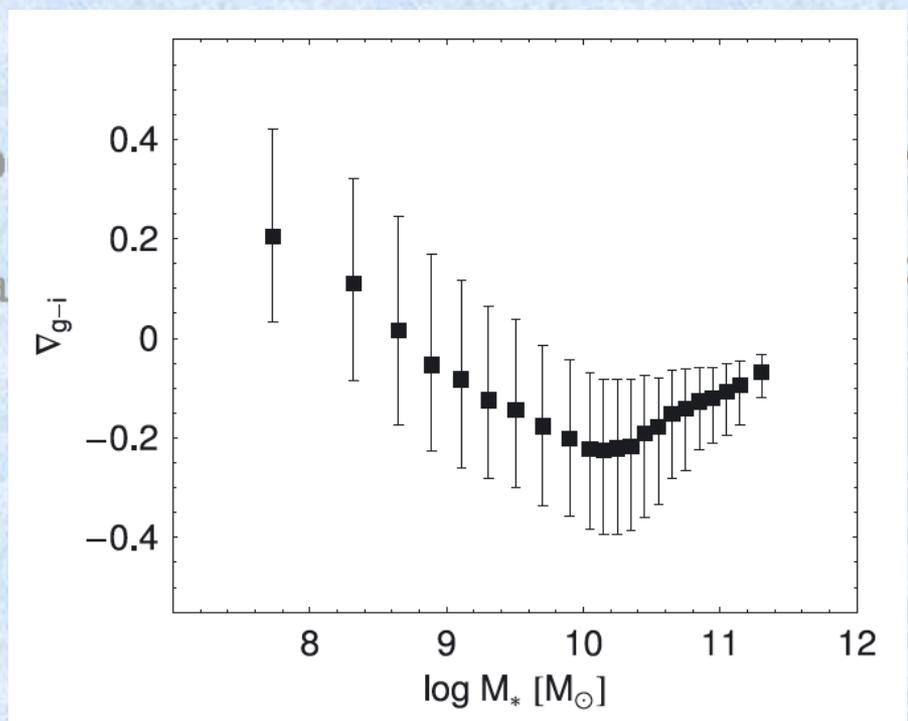
ETGs

Colour and stellar population

C. Tortora,^{1,2*} N. R. Naug¹
and R. Molinaro^{3,5}

LTGs

ETGs



relation with mass

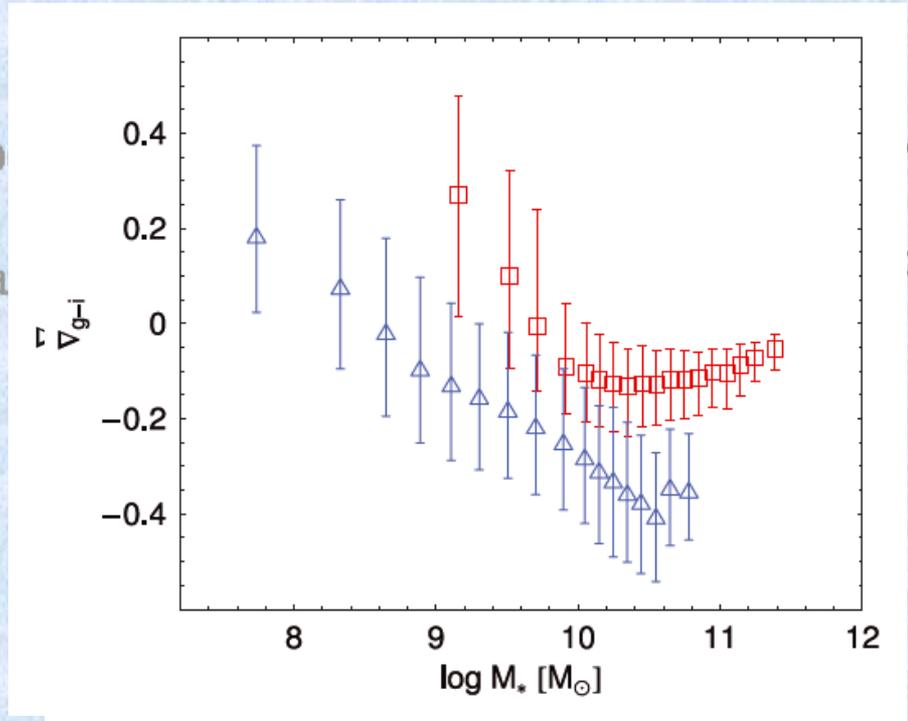
² Ph. Jetzer¹

Colour and stellar population

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relation with mass

² Ph. Jetzer¹

Colour and stellar population

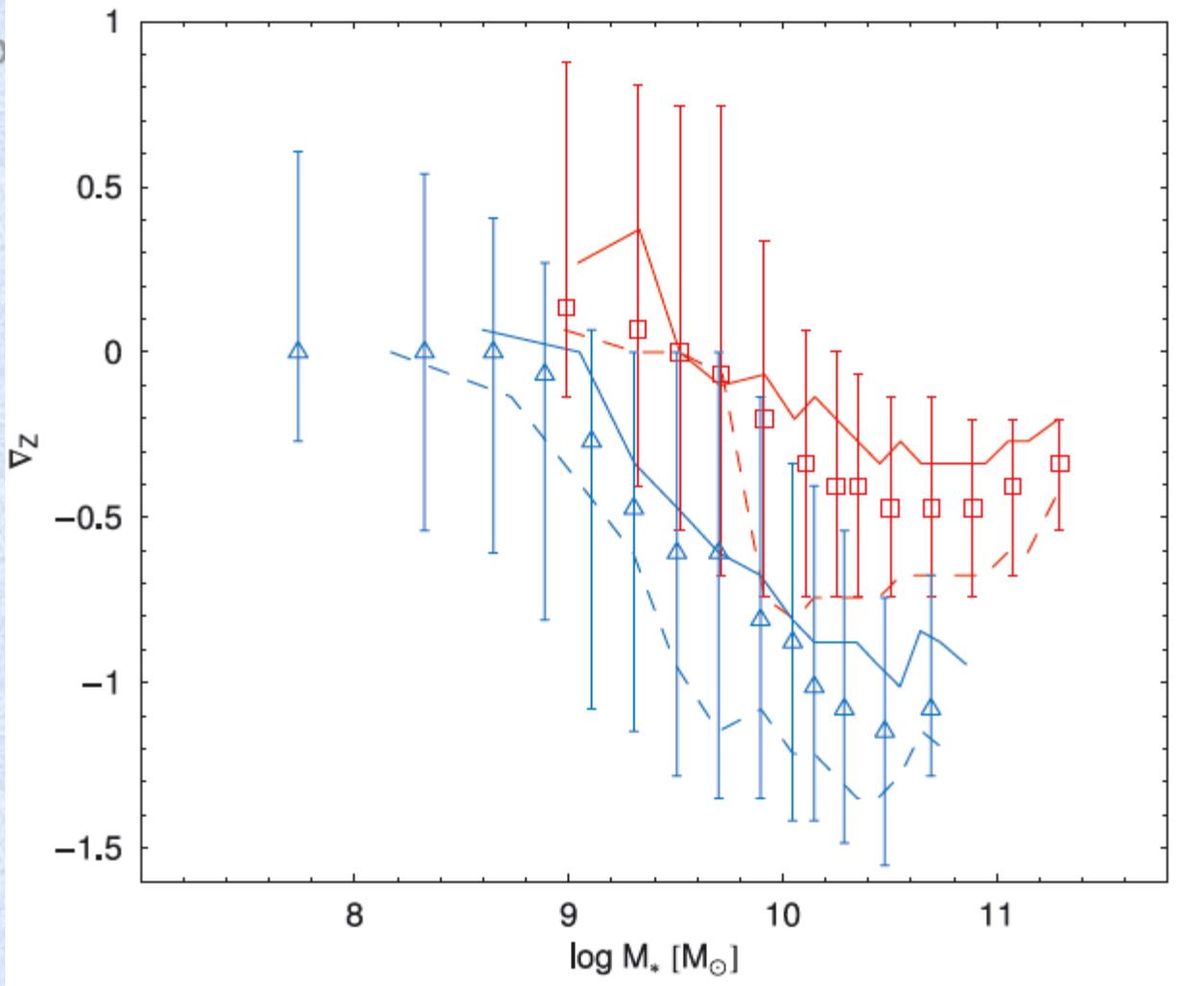
C. Tortora,^{1,2*} N. R. Na
and R. Molinaro

LTGs

ETGs

relation with mass

² Ph. Jetzer¹



Colour and stellar p

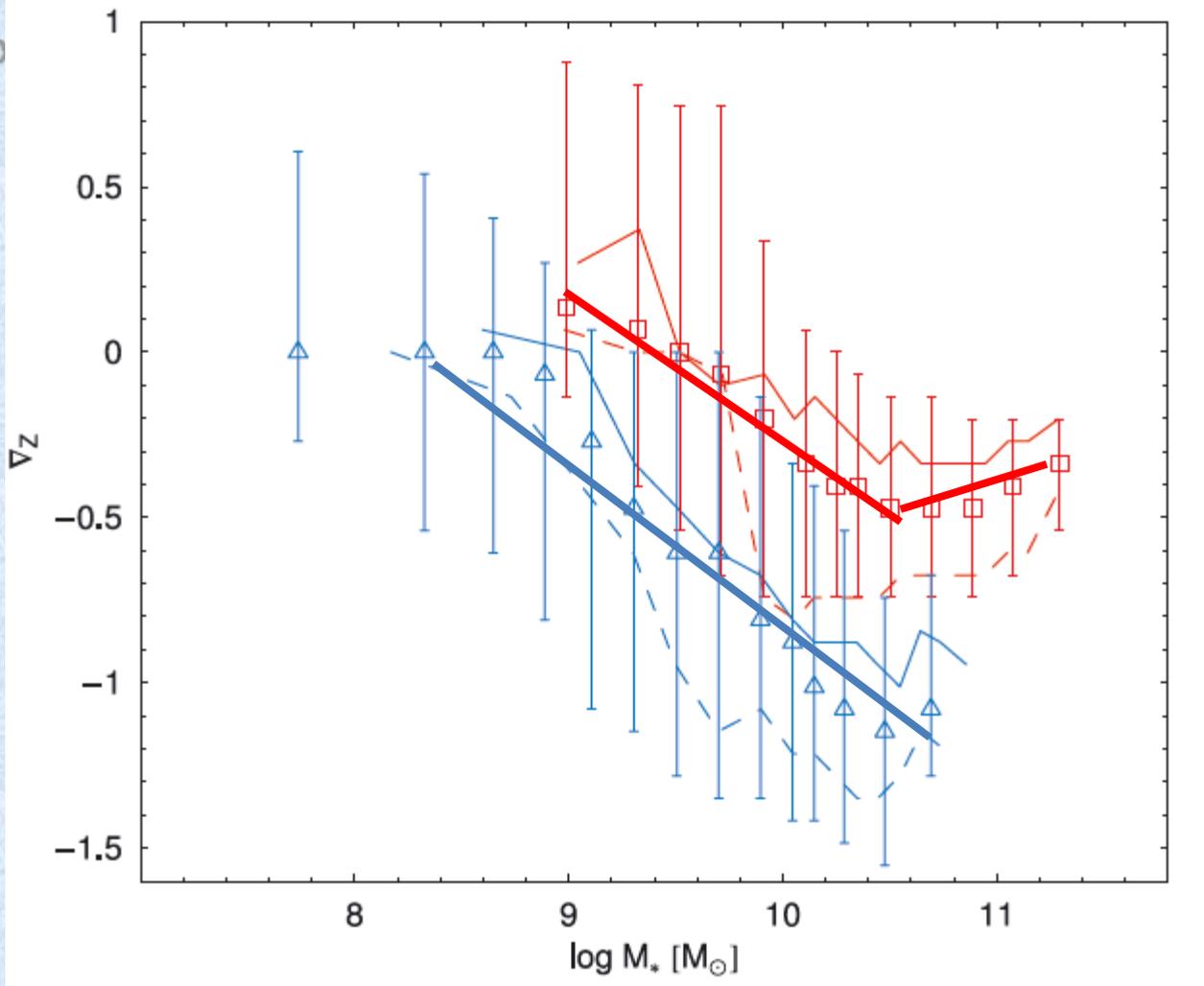
C. Tortora,^{1,2*} N. R. Na
and R. Molinaro

LTGs

ETGs

relation with mass

² Ph. Jetzer¹

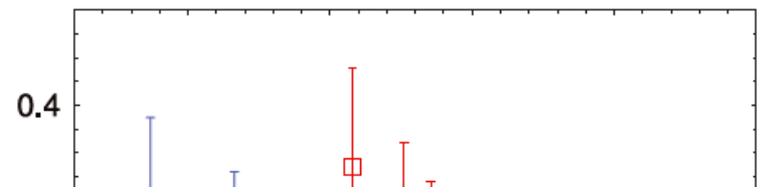


Colour and stellar p

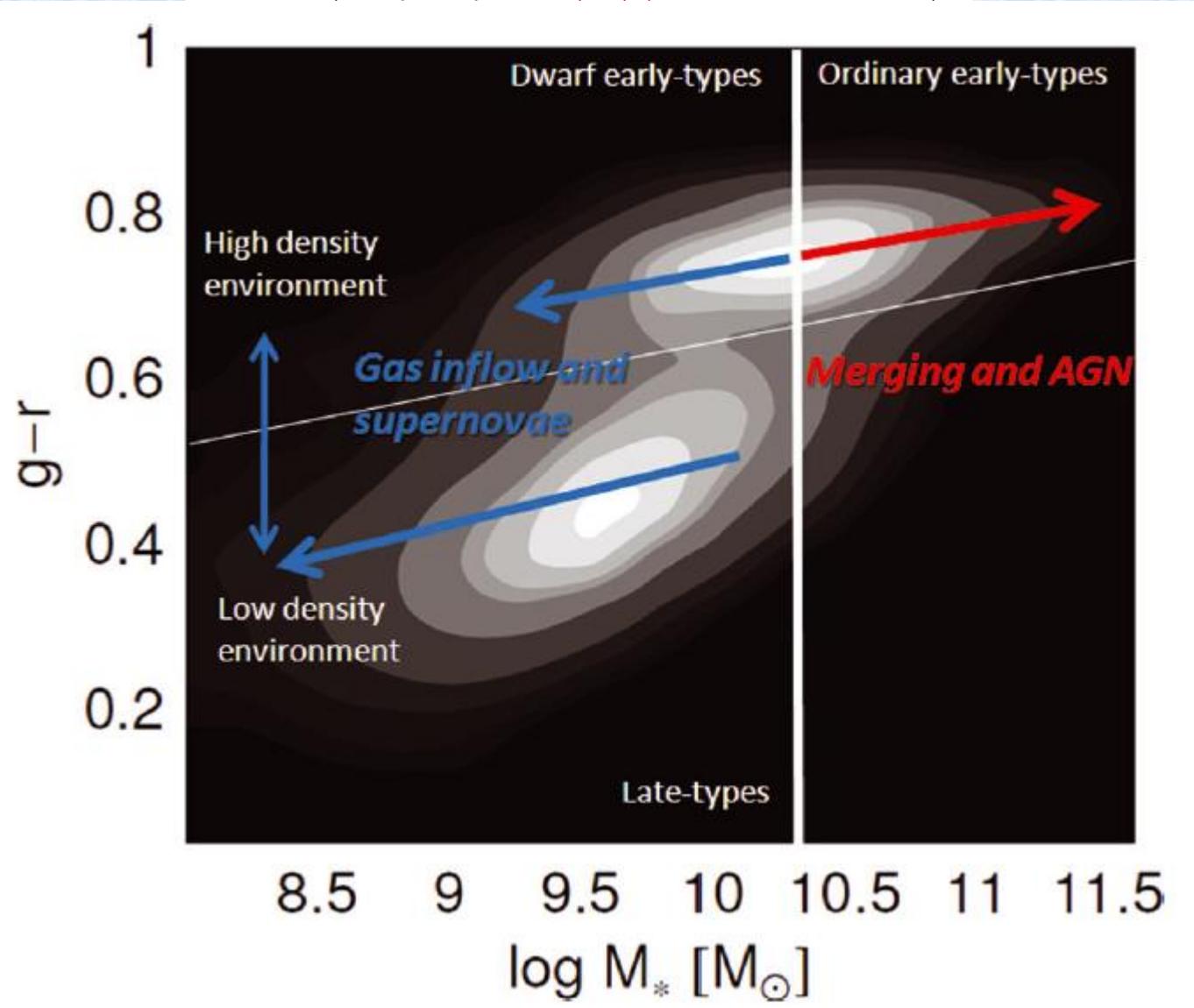
C. Tortora,^{1,2}
and R. Molina

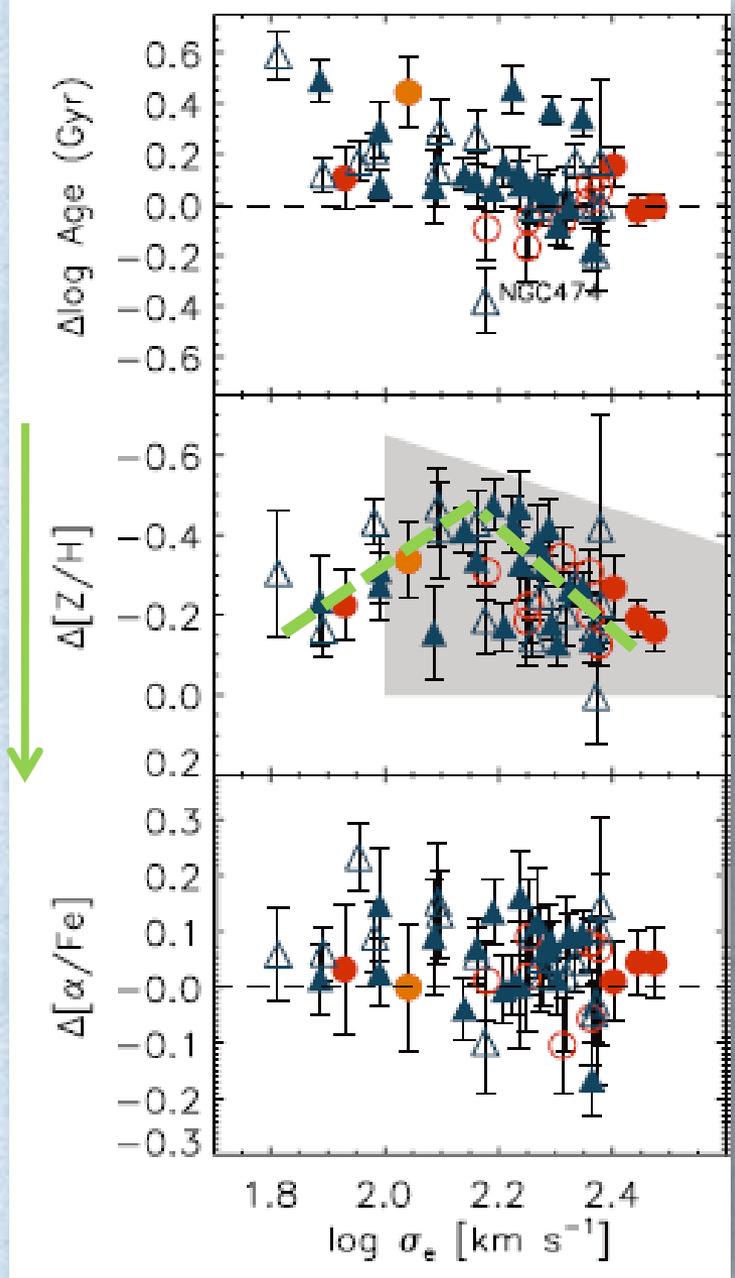
LTGs

ETGs



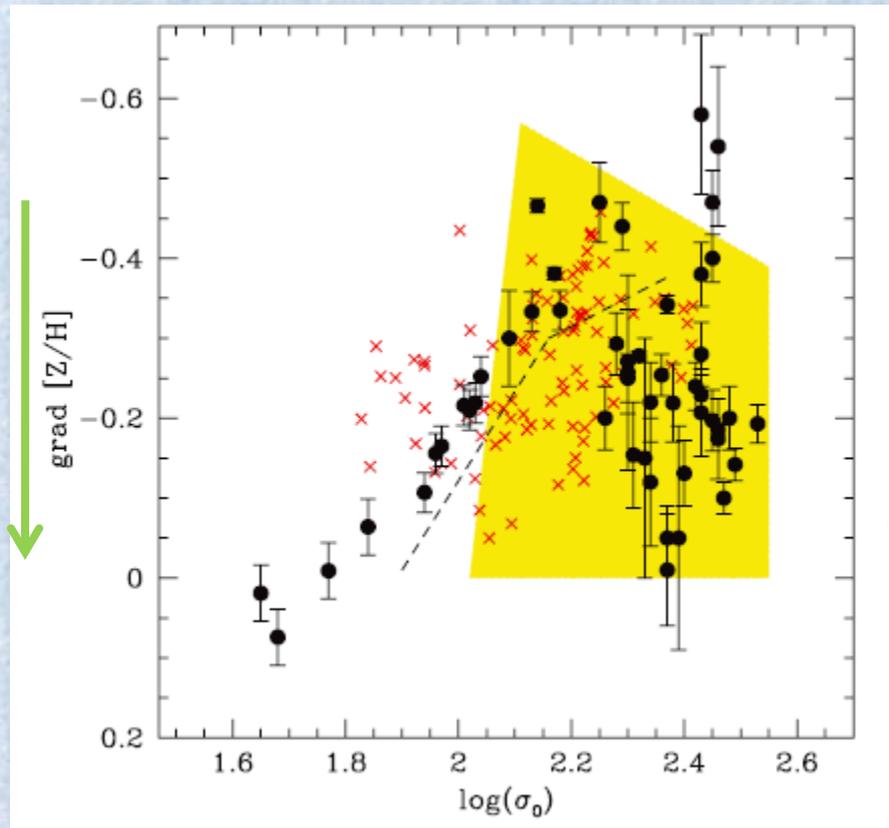
relation with mass





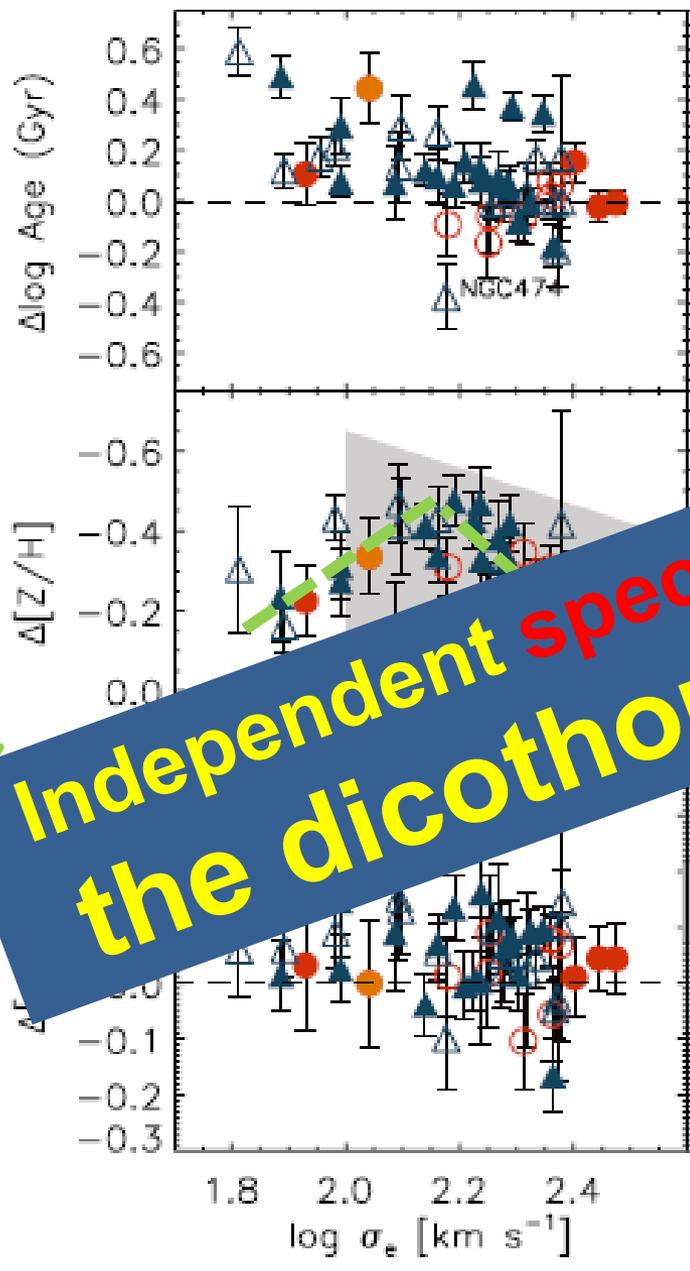
Kuntschner et al. 2010 (Sauron XVII)

Faint+bright galaxies



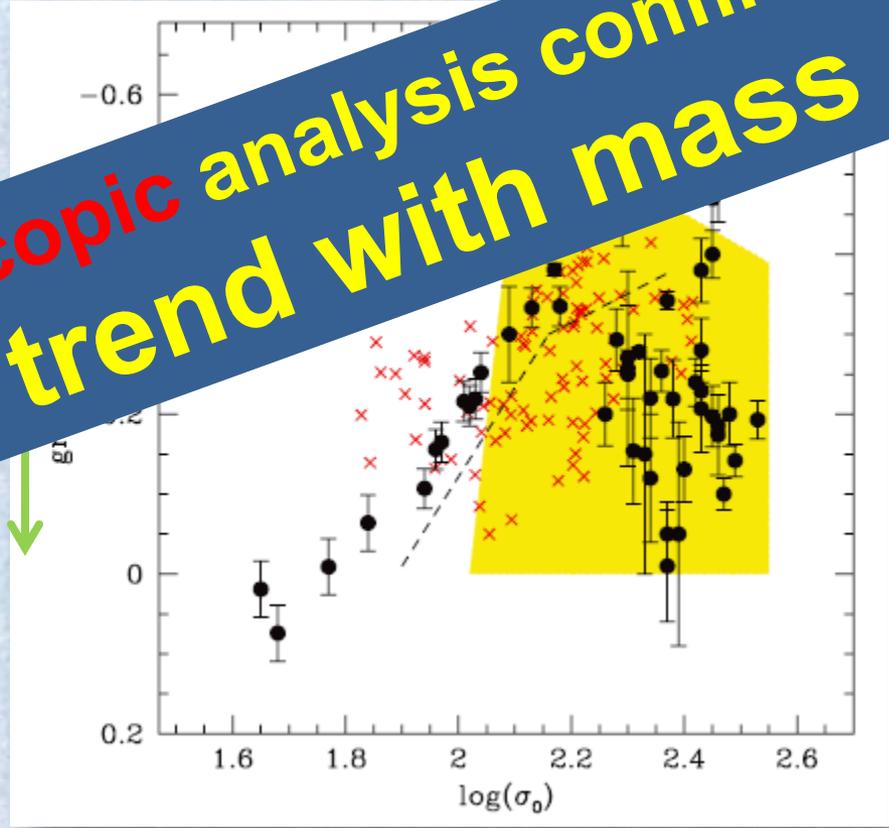
Spolaor et al. 2010

See also Spolaor et al. 2009 and Rawle et al. 2010



Faint+bright galaxies

Independent spectroscopic analysis confirm the dichotomic trend with mass



Spolaor et al. 2010

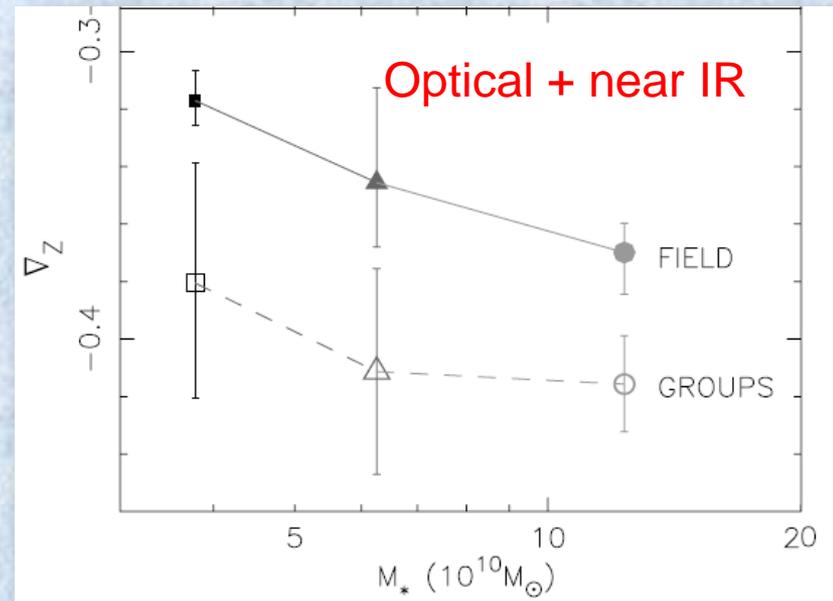
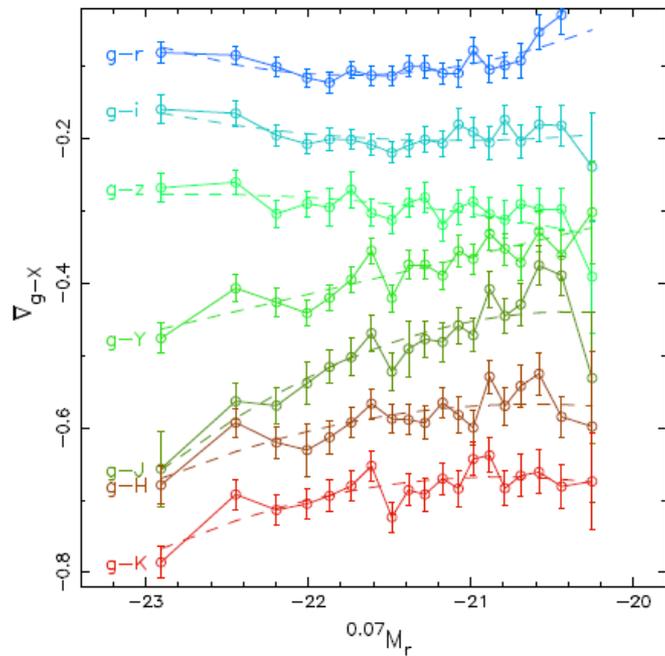
Kuntschner et al. 2010 (Sauron XVII)

See also Spolaor et al. 2009 and Rawle et al. 2010

Bright galaxies (SPIDER sample, see La Barbera's talk)

La Barbera et al. 2010, 2011

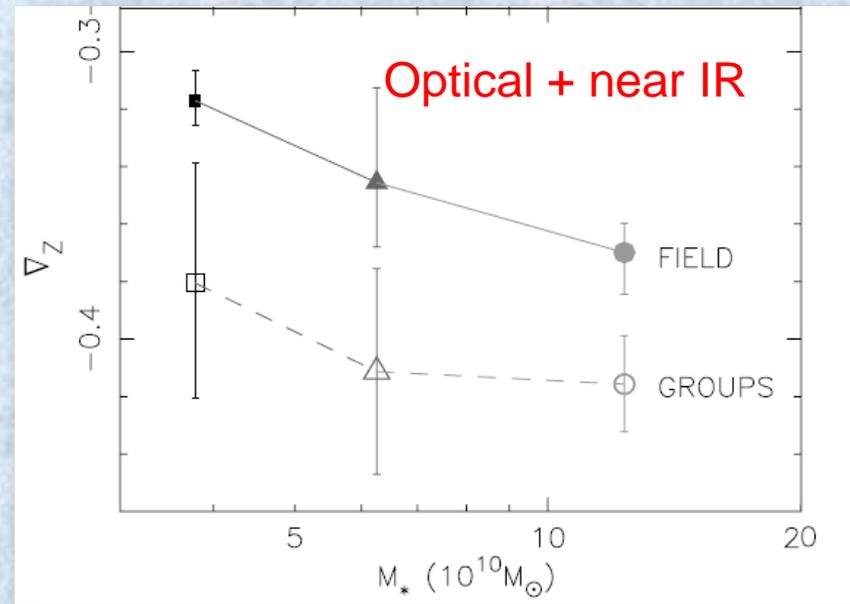
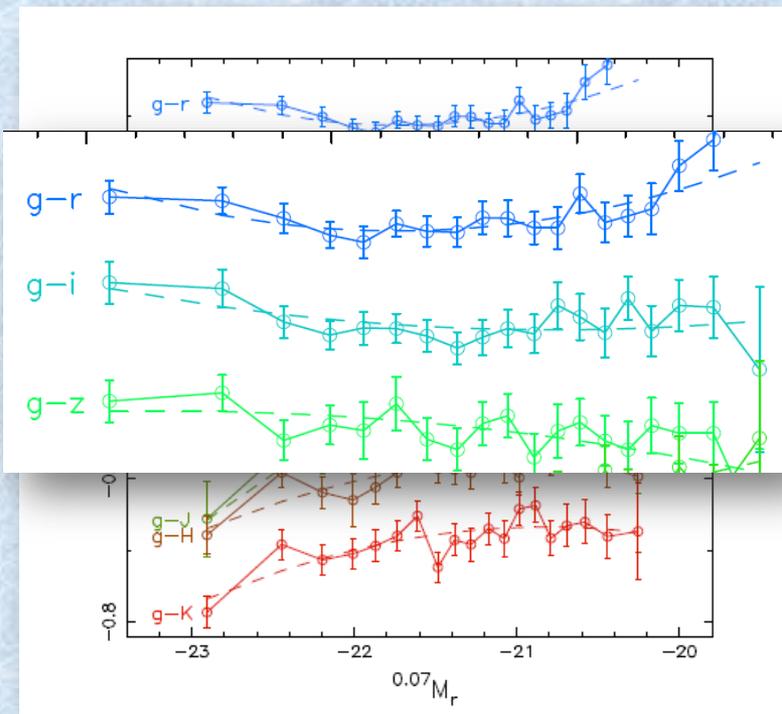
La Barbera et al. 2010



Bright galaxies (SPIDER sample, see La Barbera's talk)

La Barbera et al. 2010, 2011

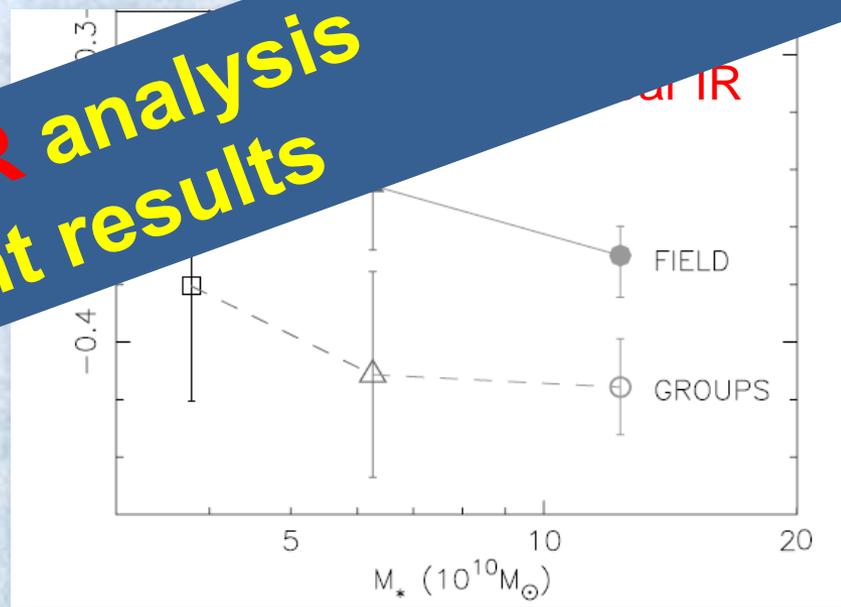
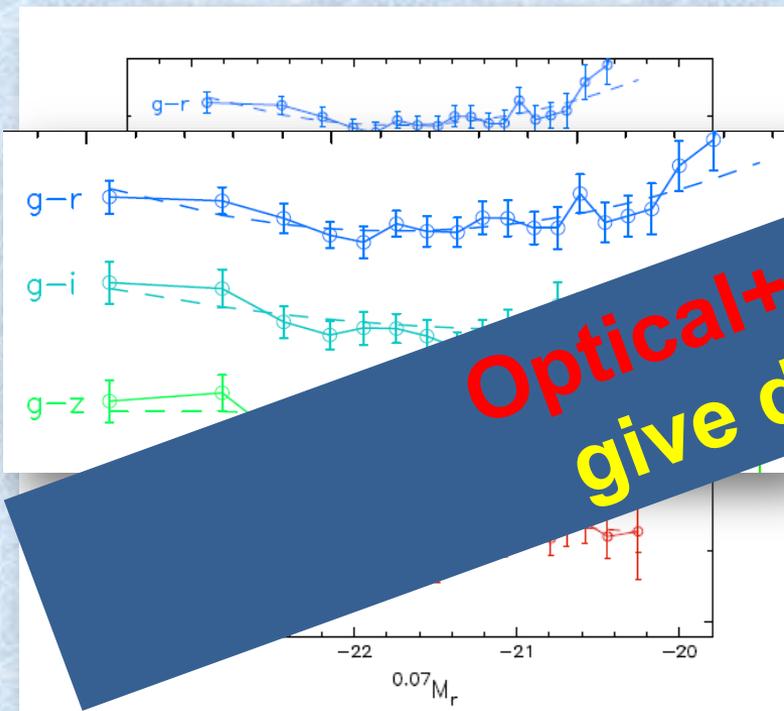
La Barbera et al. 2010



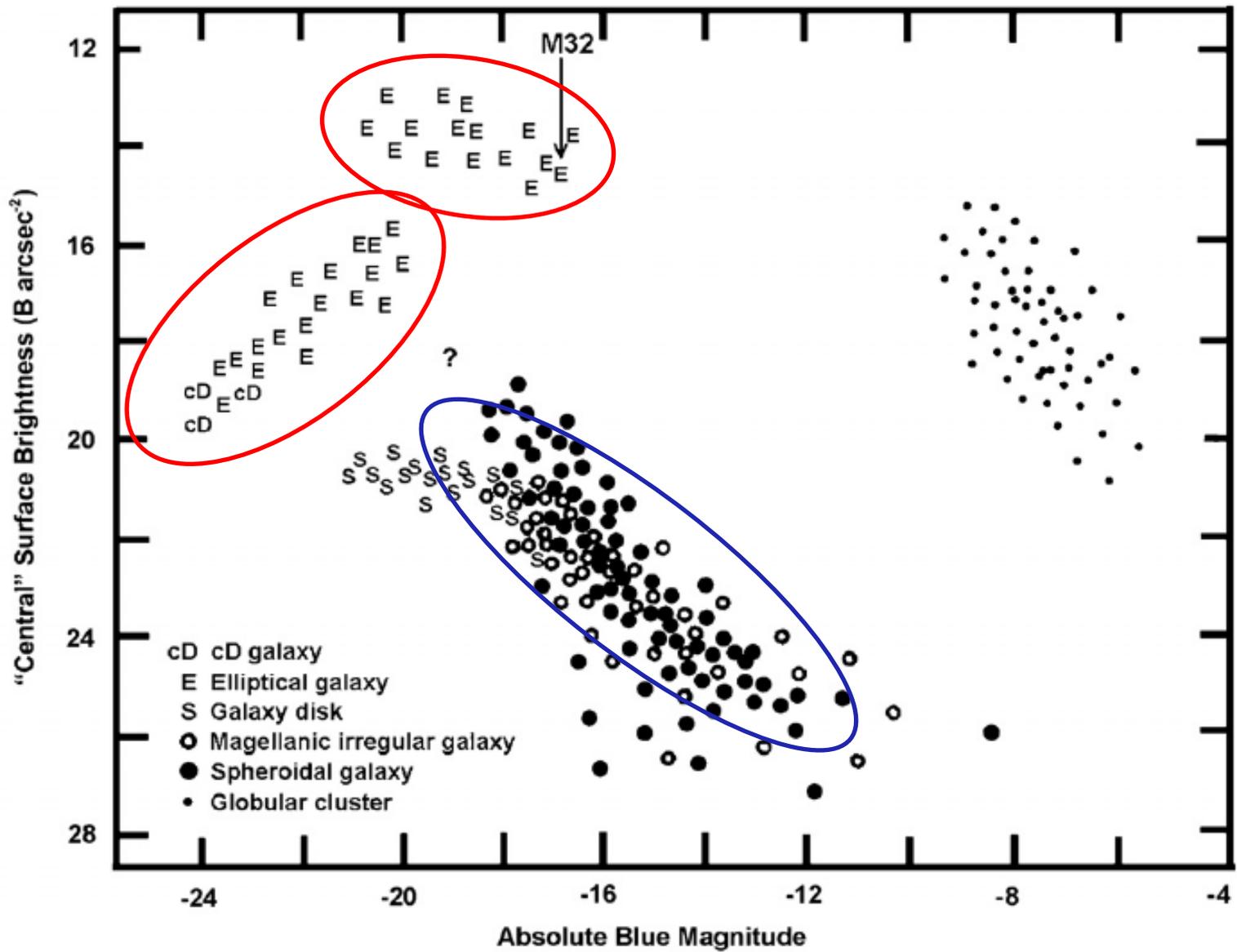
Bright galaxies (SPIDER sample, see La Barbera's talk)

La Barbera et al. 2010, 2011

La Barbera et al. 2010



**Optical+near IR analysis
give different results**



.....and colour gradients?

Data sample

40 Virgo cluster galaxies, classified in Es, S0s and Sphs in *Kormendy et al. 2009*

STRUCTURE AND FORMATION OF ELLIPTICAL AND SPHEROIDAL GALAXIES^{*,†,‡}

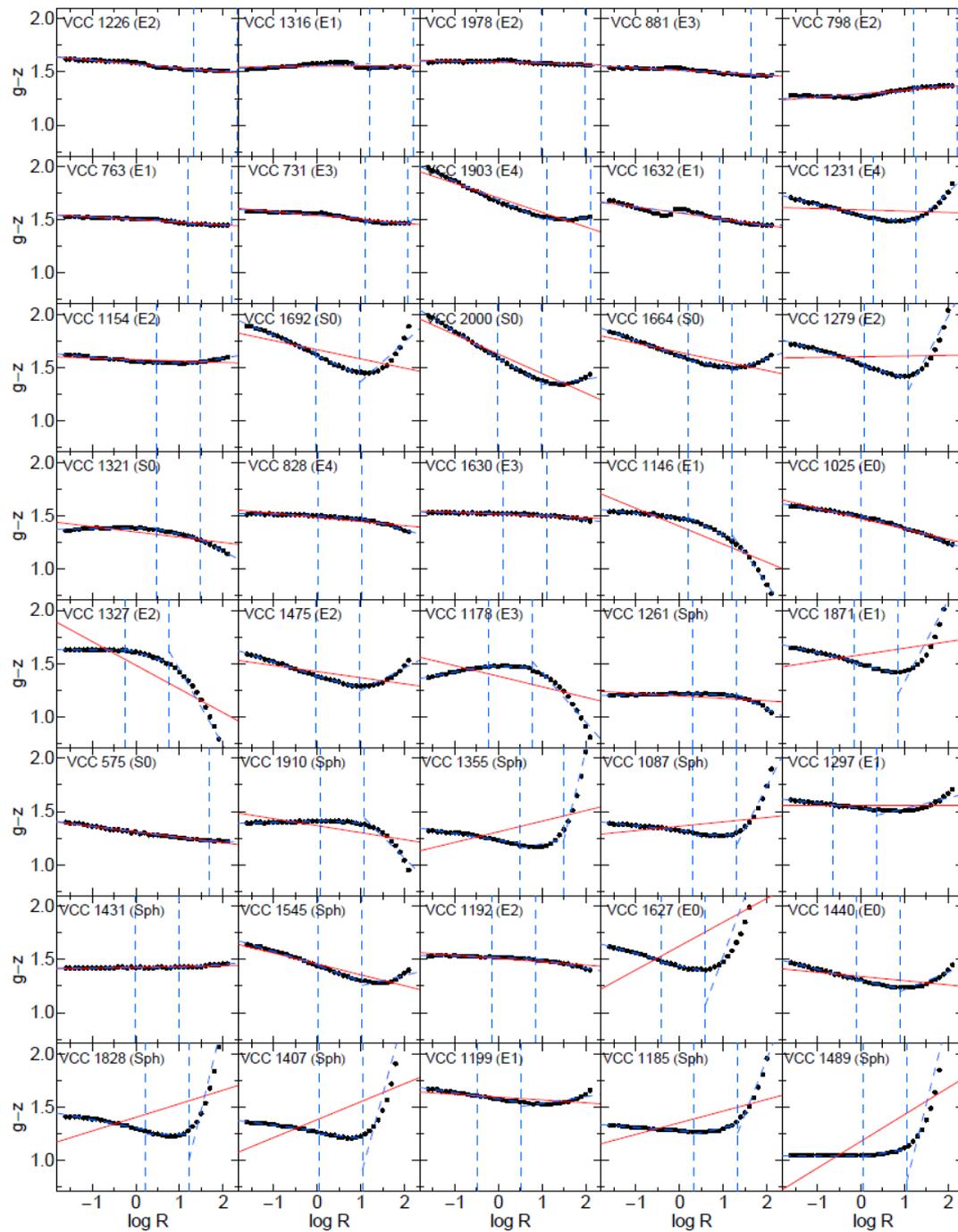
JOHN KORMENDY^{1,2,3}, DAVID B. FISHER^{1,2,3}, MARK E. CORNELL¹, AND RALF BENDER^{1,2,3}

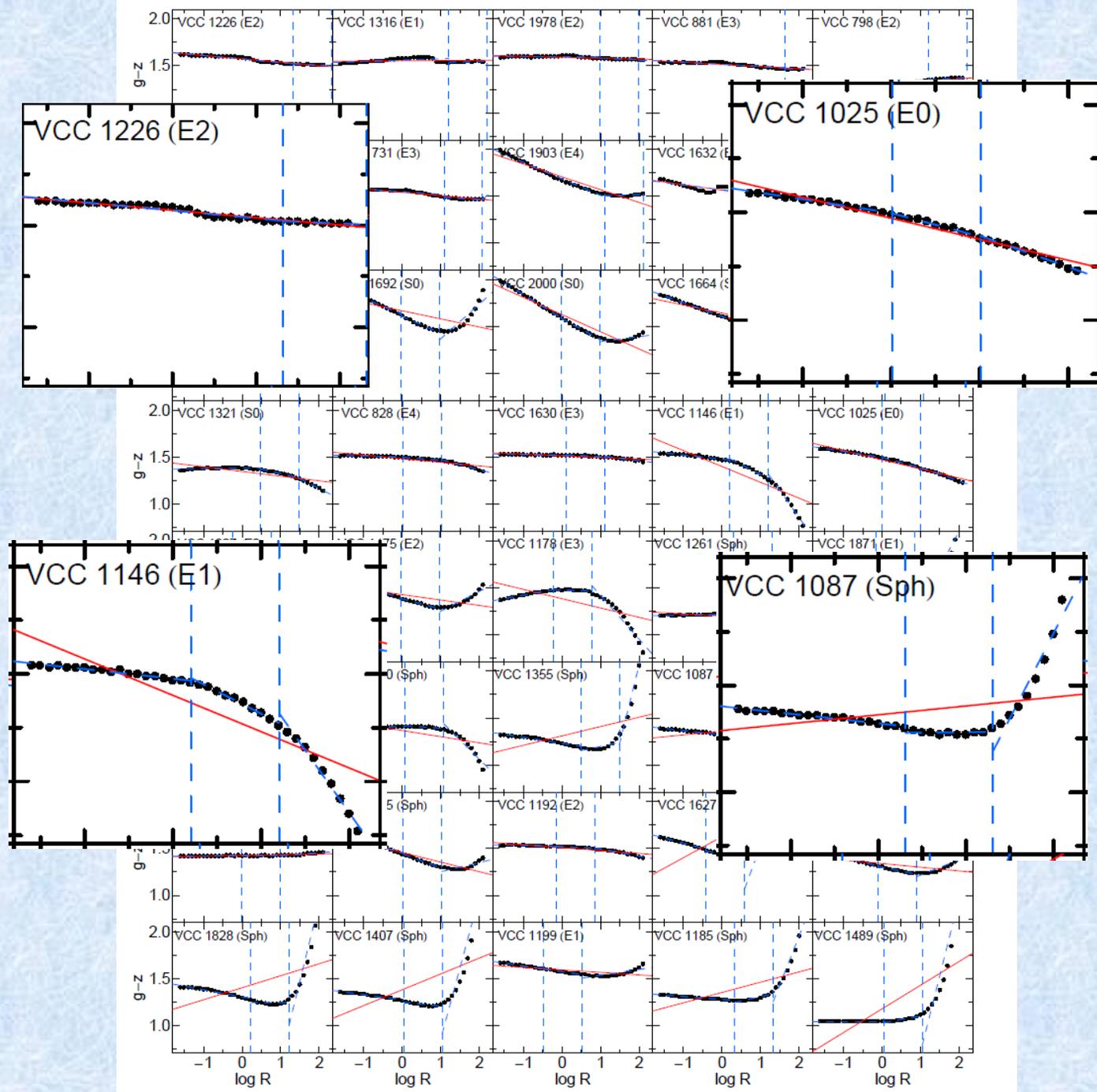
Colour profiles and other structural parameters from *Ferrarese et al. 2006*

THE ACS VIRGO CLUSTER SURVEY. VI. ISOPHOTAL ANALYSIS
AND THE STRUCTURE OF EARLY-TYPE GALAXIES¹

LAURA FERRARESE,² PATRICK CÔTÉ,² ANDRÉS JORDÁN,^{3,4} ERIC W. PENG,² JOHN P. BLAKESLEE,^{5,6} SLAWOMIR PIATEK,⁷
SIMONA MEI,⁵ DAVID MERRITT,⁸ MILOŠ MILOSAVLJEVIĆ,^{9,10} JOHN L. TONRY,¹¹ AND MICHAEL J. WEST¹²

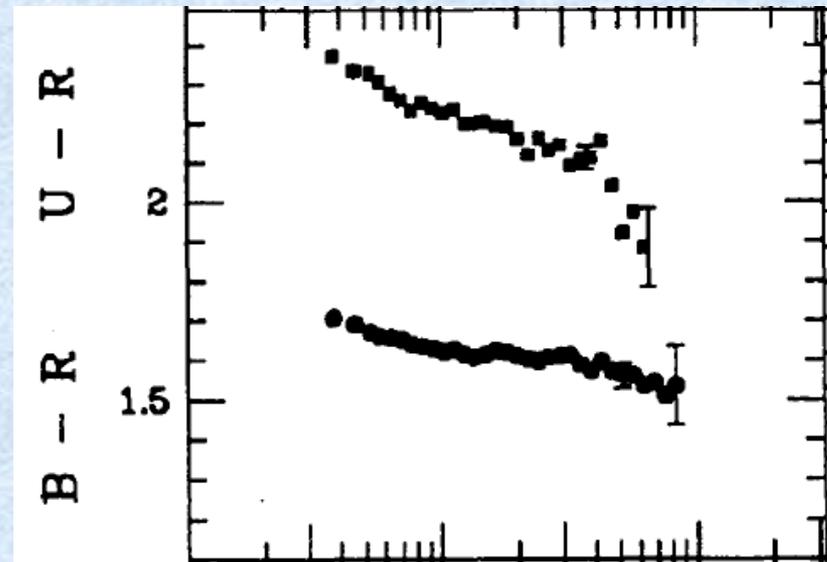
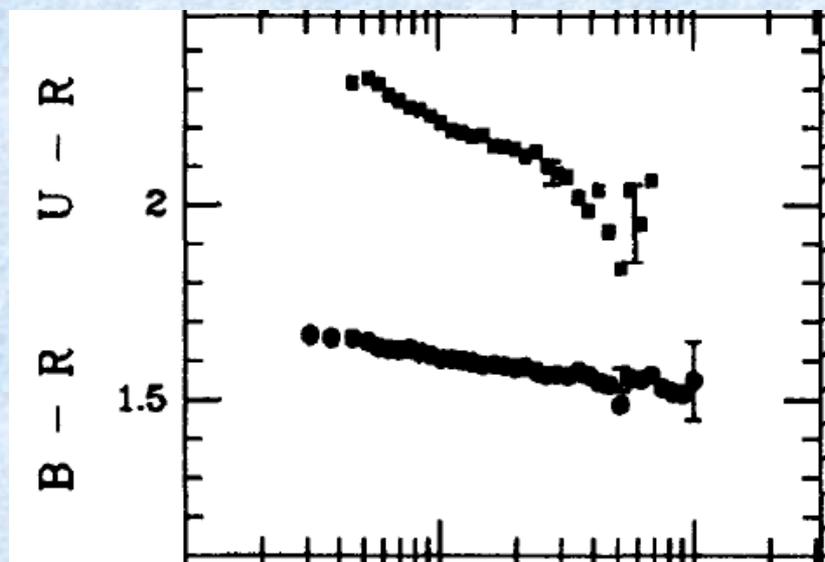
https://www.astrosci.ca/users/VCSFCS/Data_Products.html





Almost all the (bright) ellipticals (and S0s) have monotonically decreasing colour profiles (i.e. negative gradients)

Peletier et al. 1990, Forbes et al. 2005, Wu et al. 2005, La Barbera et al. 2005, 2011, Tortora et al. 2010, den Brok et al. 2011, etc.



Peletier et al. 1990

Few ellipticals and spheroidals have U-shaped colour profiles, like the ones found in some disk galaxies

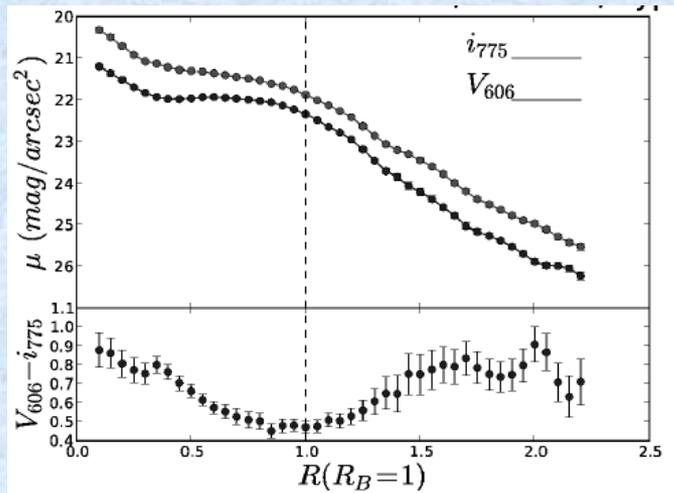
Azzollini, Trujillo & Beckman 2008; Bakos, Trujillo & Pohlen 2008; Mart'inez-Serrano et al. 2009



Observations



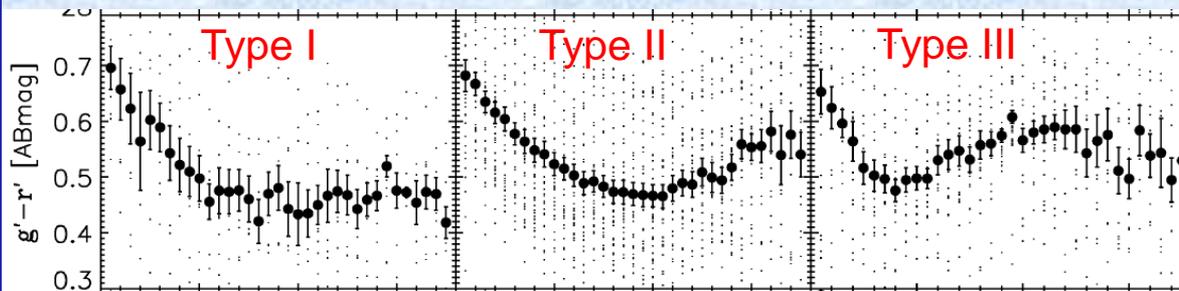
GEMSz033233.89m274237.9, $z = 0.59$



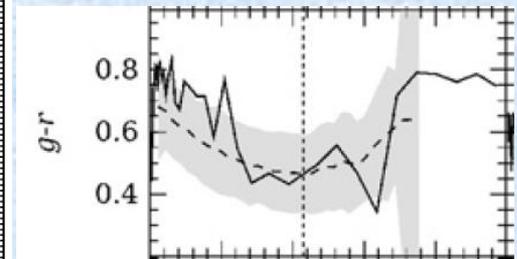
Azzollini, Trujillo & Beckman 2008

The truncation in stellar disc induces a minimum in the colour profile at the break R_B and they are classified in three classes which depend on R_B

Simulations

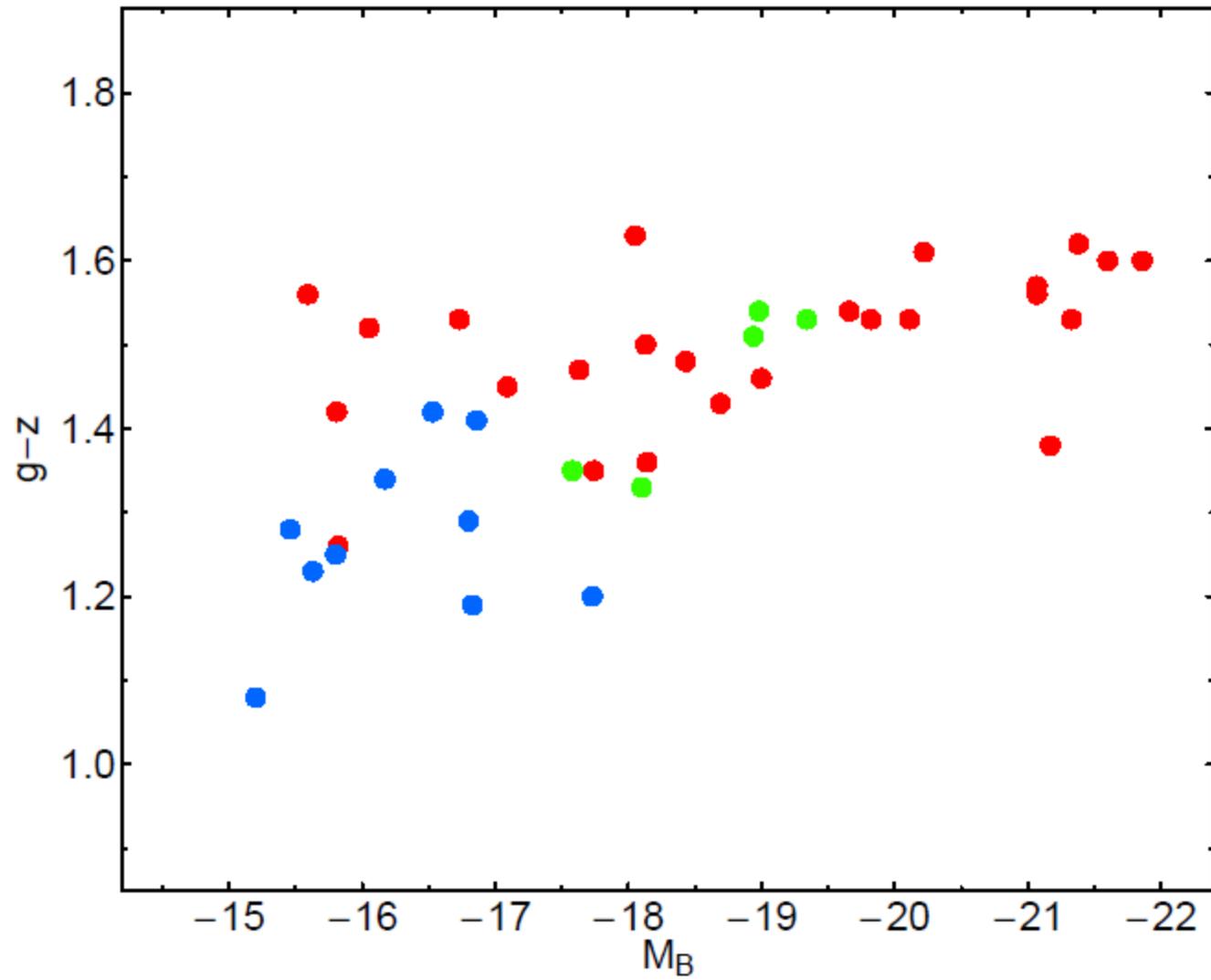


Bakos, Trujillo & Pohlen 2008

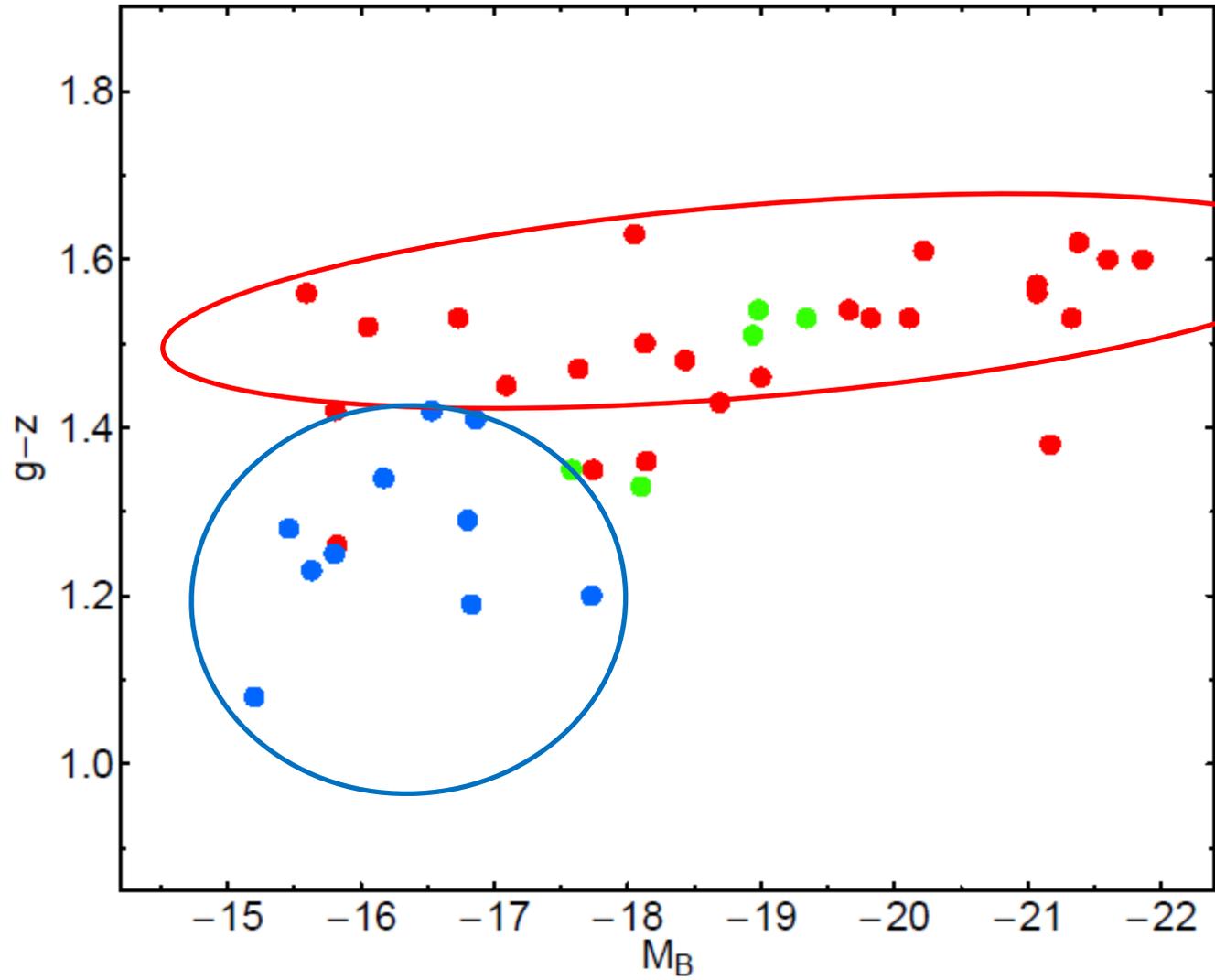


Mart'inez-Serrano et al. 2009

Es S0s Sphs



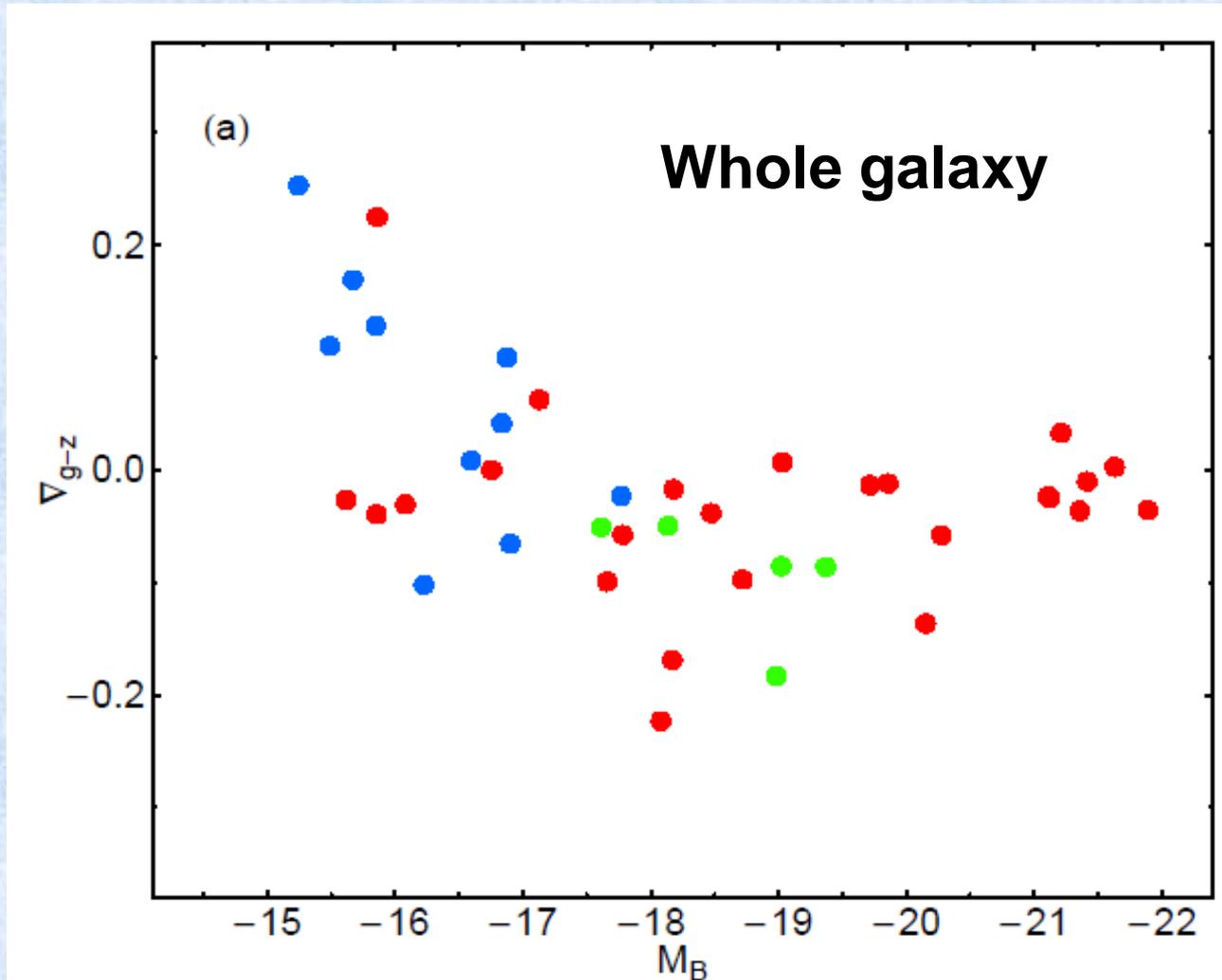
Es S0s Sphs



Es

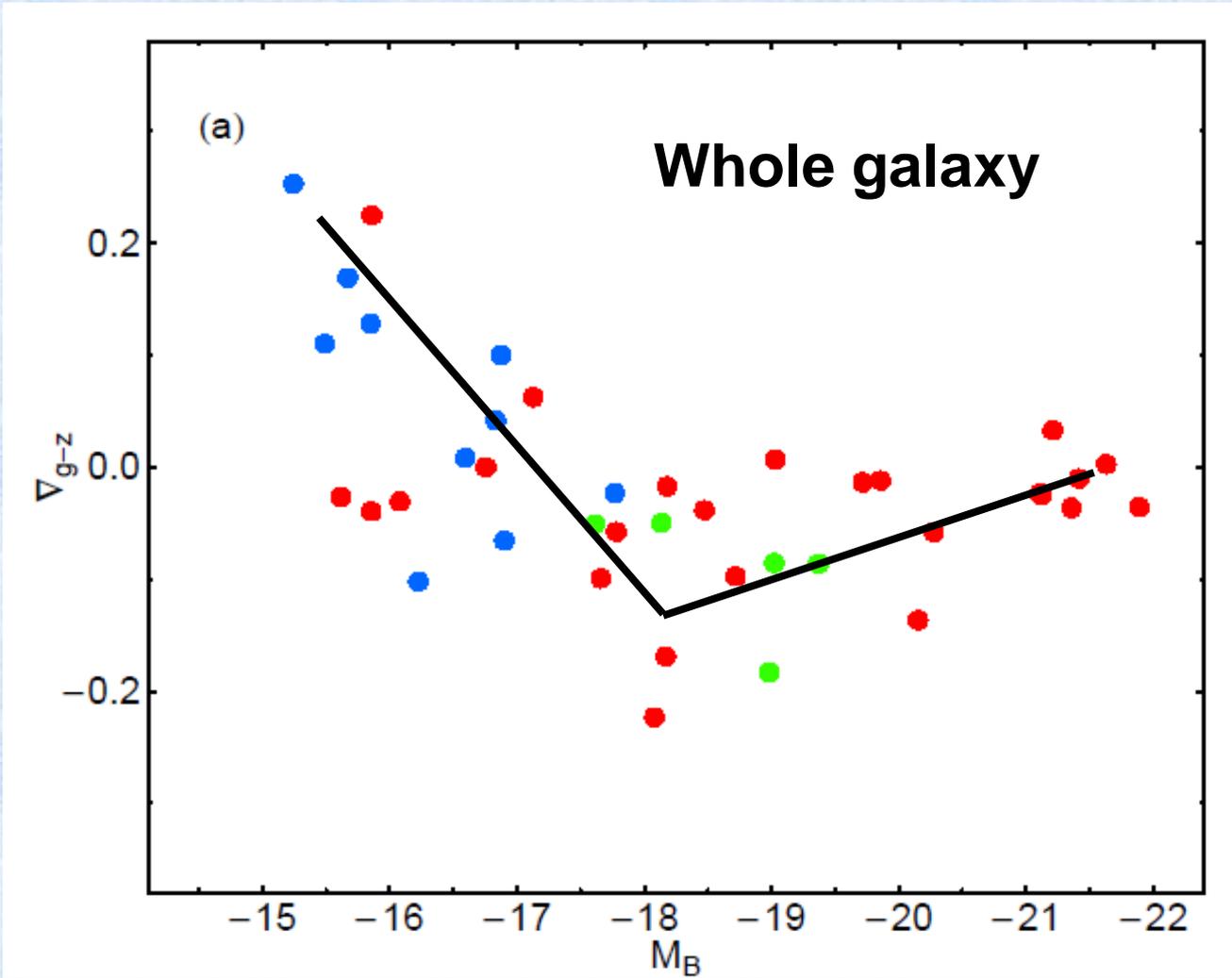
S0s

Sphs



Correlations are statistically significant at 99% confidence level

Es S0s Sphs

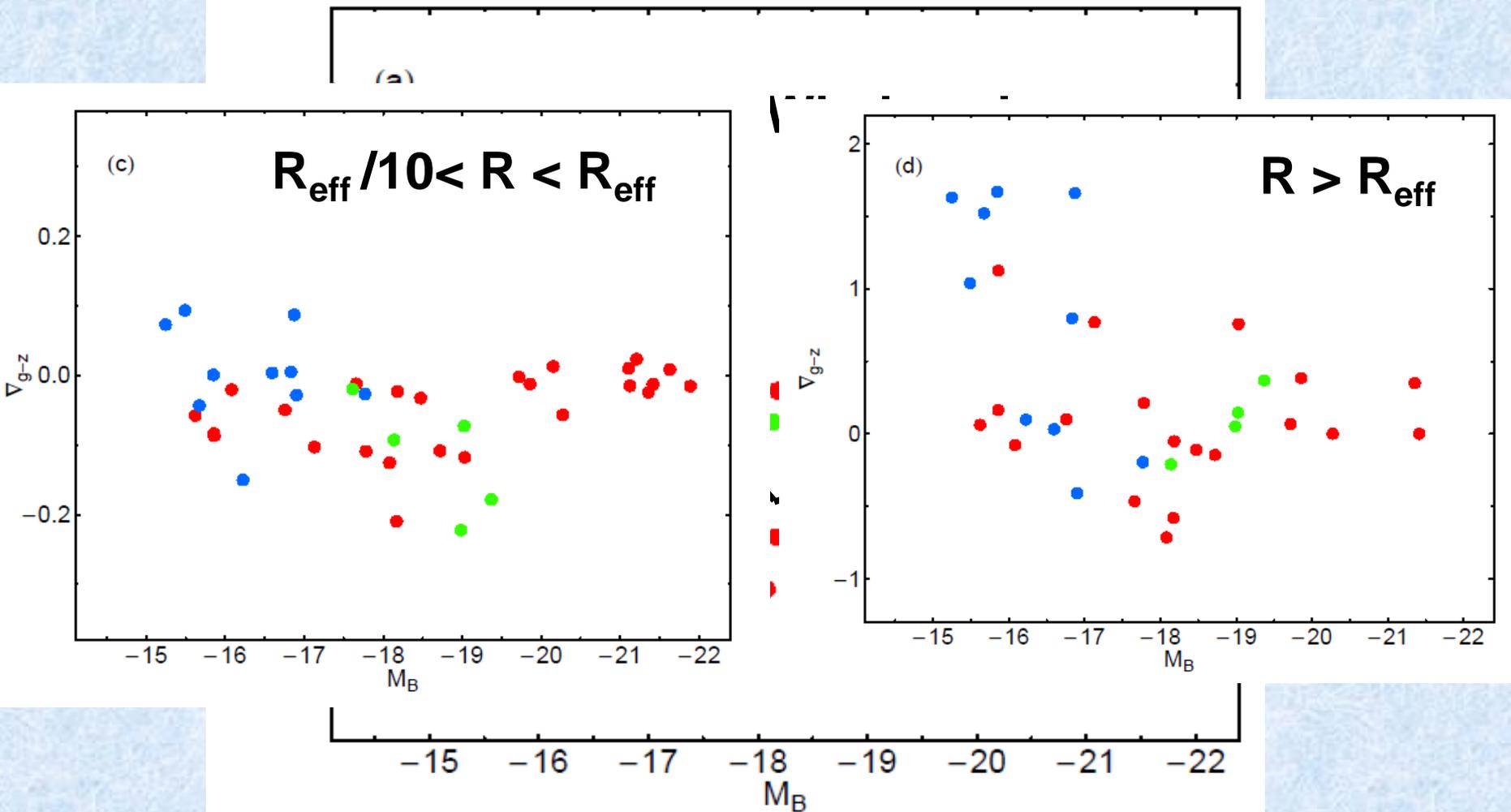


Correlations are statistically significant at 99% confidence level

Es

S0s

Sphs

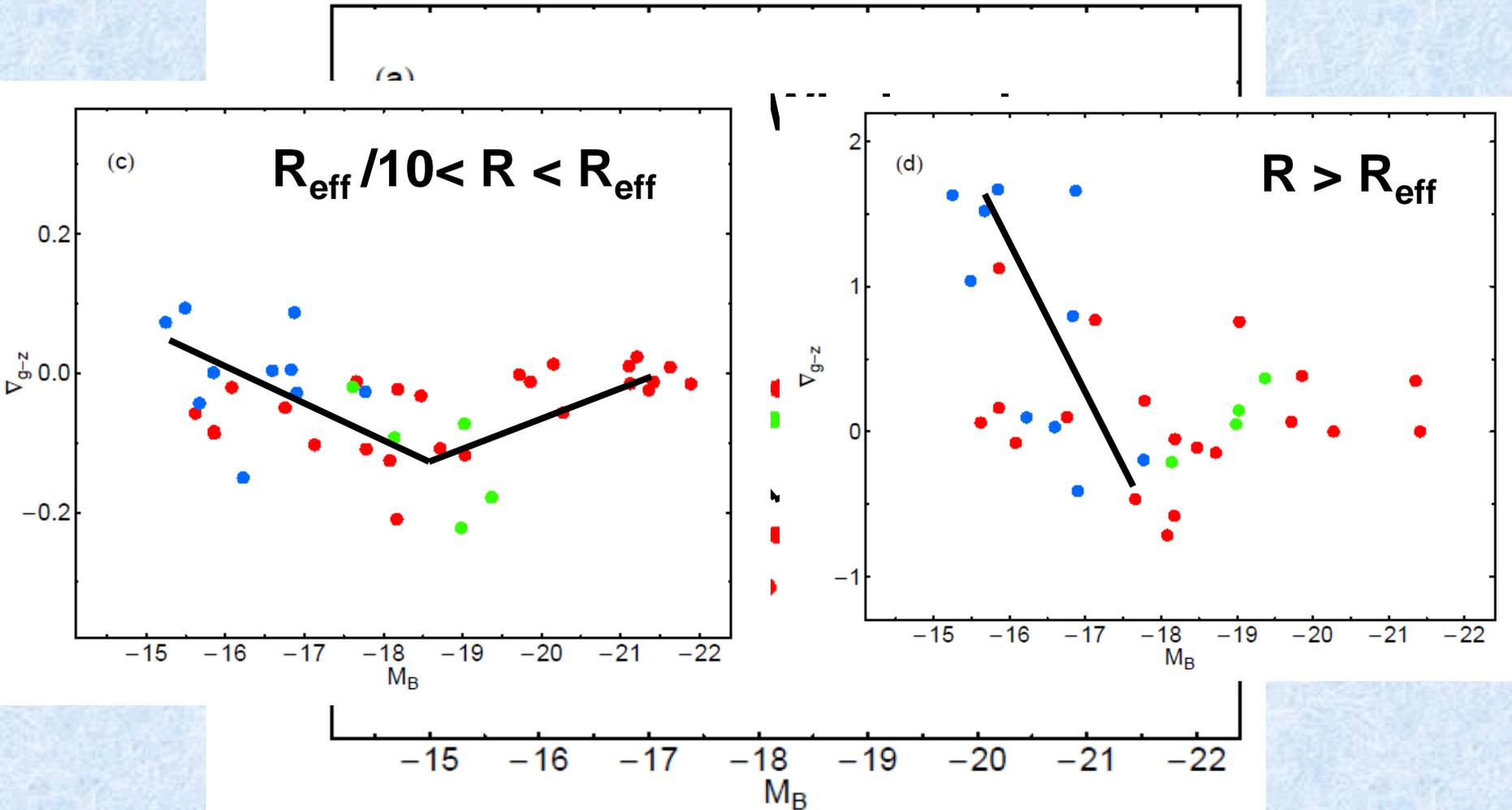


Correlations are statistically significant at 99% confidence level

Es

S0s

Sphs



Correlations are statistically significant at 99% confidence level

What do we learn?

- Bright galaxies (Es) and fainter ones (dEs and Sphs) show quite **different colour profiles**, which can point to quite different physical processes.
- On average, colour gradients become steeper (shallower) as a function of luminosity/mass for faint and bright galaxies, respectively. Mainly Sphs (which are the faintest galaxies) show **behaviours similar to later-type galaxies** (e.g. Kormendy et al. 2009)
- Sphs and dE have U-shaped profiles, and positive gradients in the external regions (**expanding shell from SN feedback?**), while the brightest Es have almost null gradients (**dry merging?**)

The combination of photometry and spectra (and more updated synthetic spectral models) are needed to derive information about physical processes

VLT Survey Telescope (VST)

FIRST IMAGES



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FIRST IMAGES



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Due to the combination of the best observational conditions and the high spatial resolution of the camera, VST is the ideal tool to provide surface photometry data of unprecedented quality



Grazie per l'attenzione