The evolution of the Fundamental Plane to z~1: results from the LEGA-C Survey

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The evolution of the Fundamental Plane to z~1: results from the LEGA-C survey

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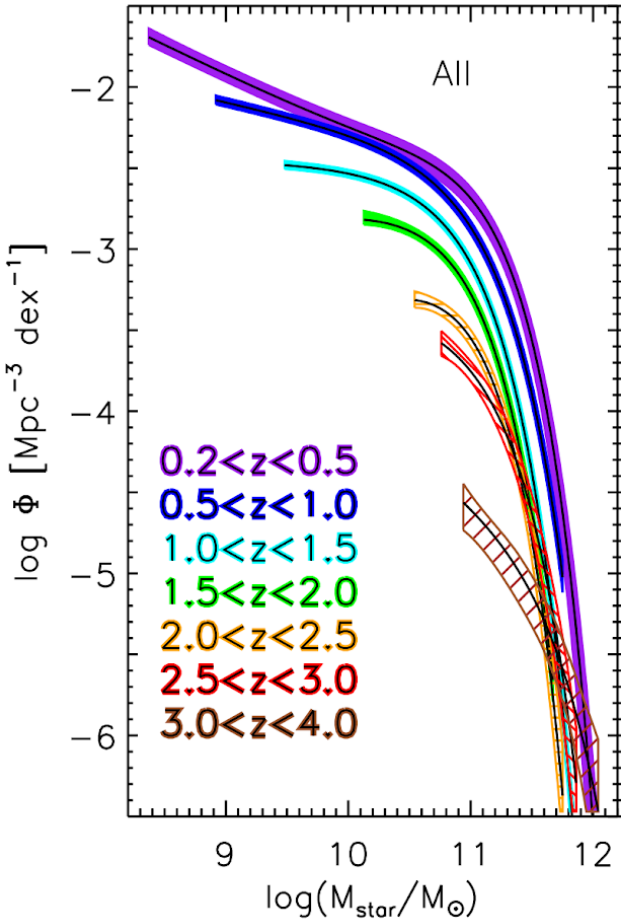
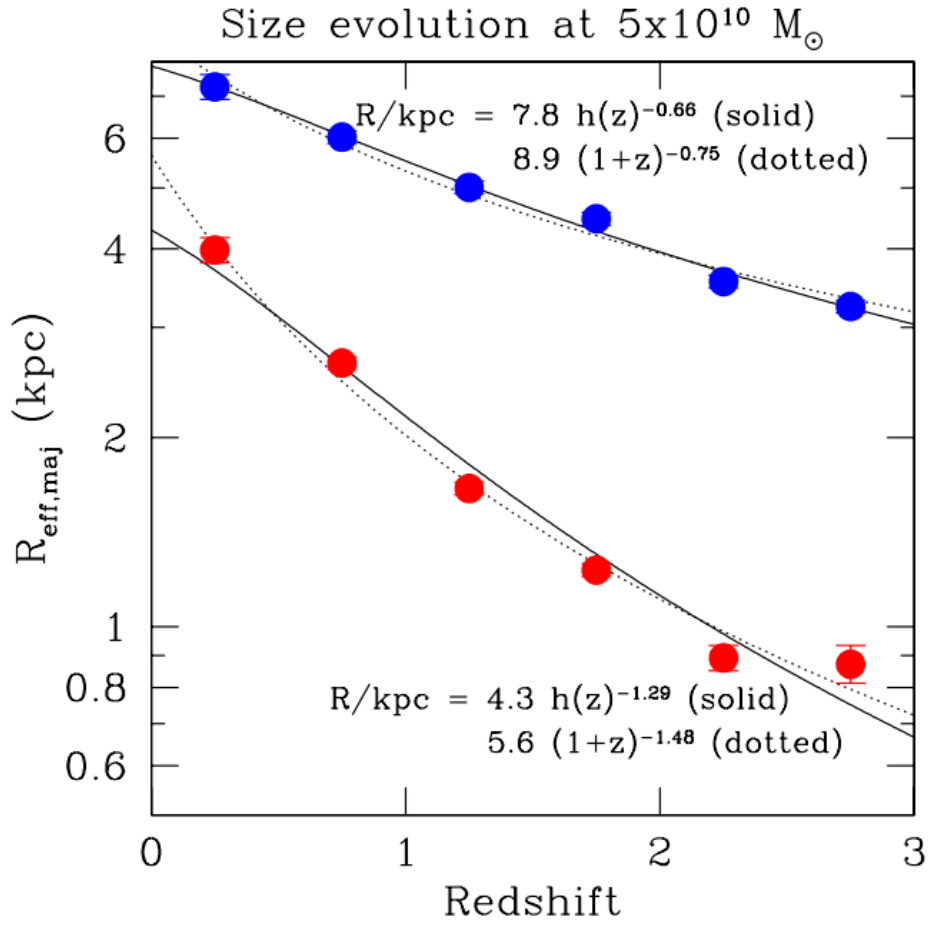
arxiv:2010.12586; arxiv:2103.12753

Galspec21, 12-16 April 2021

Probing galaxy growth over cosmic time

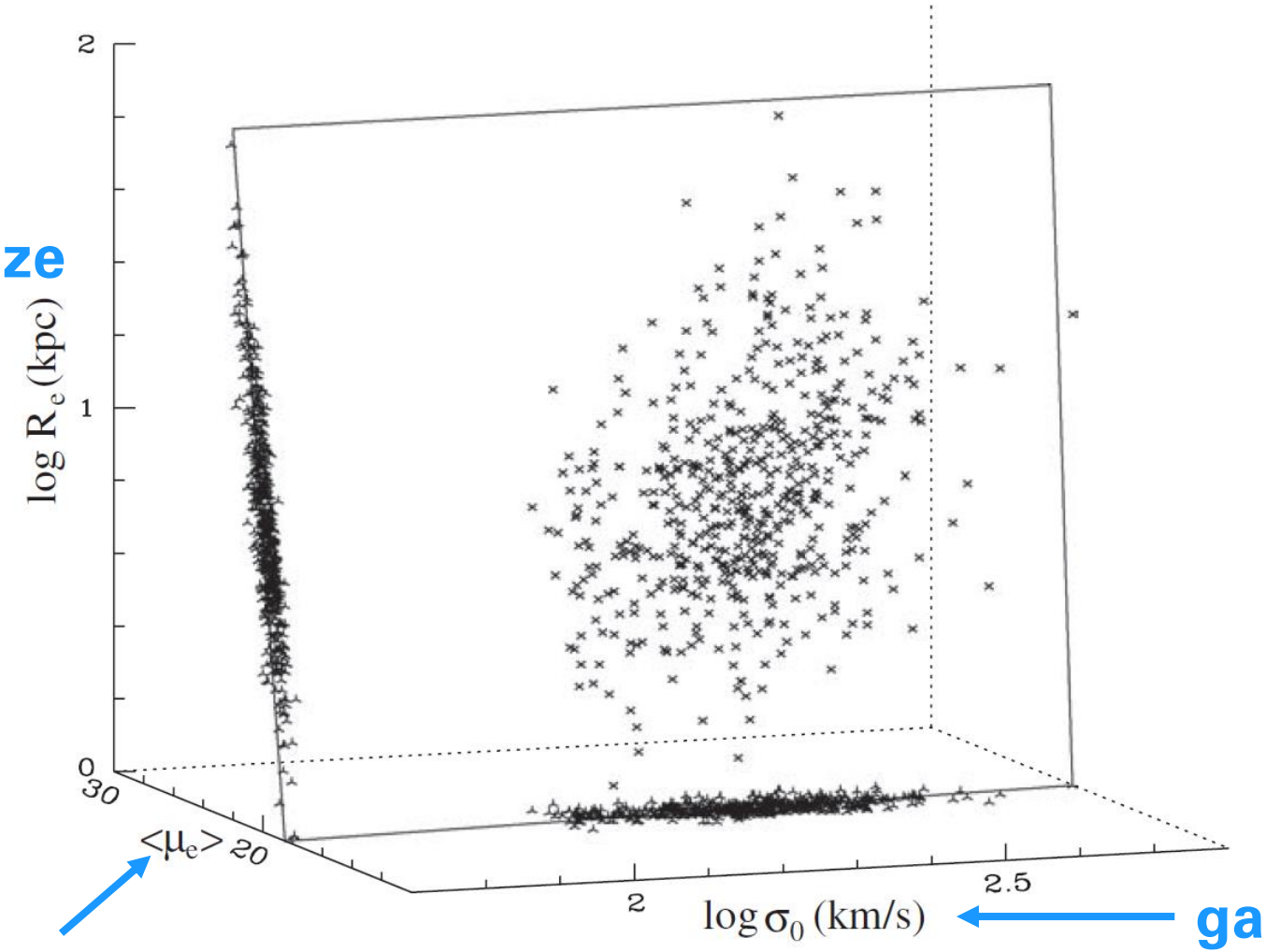


Muzzin+ 2013



Van der Wel+ 2014

The Fundamental Plane



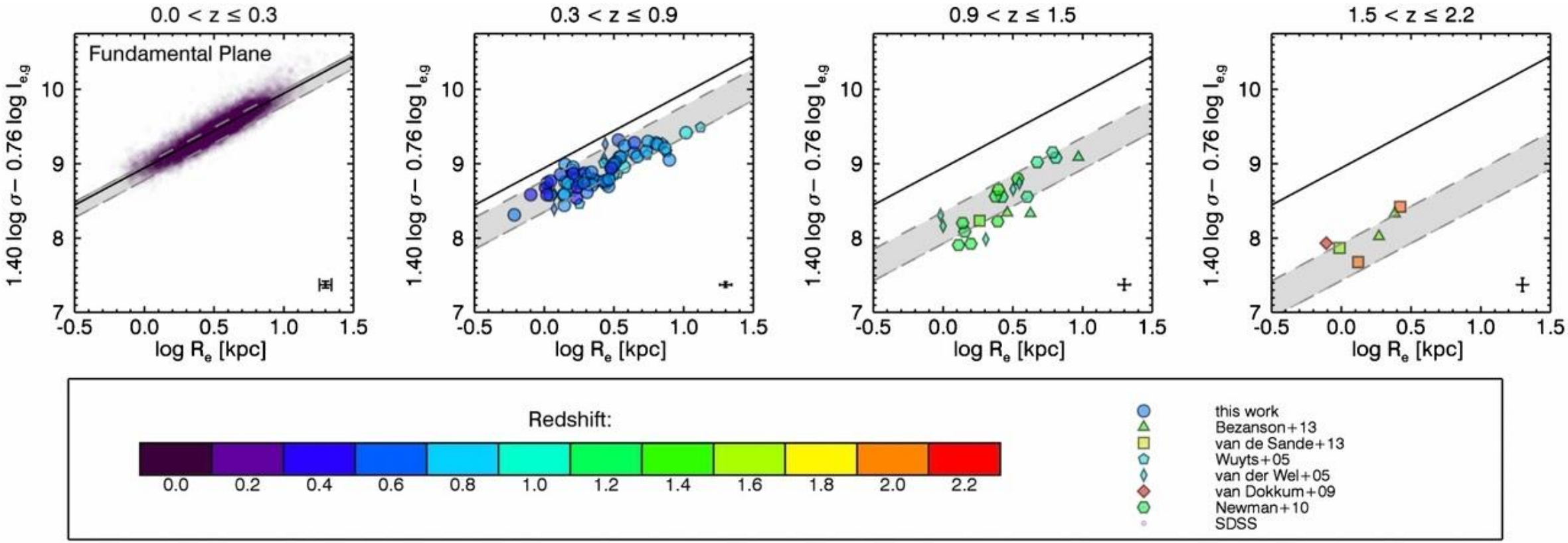
galaxy size

surface brightness

galaxy kinematics

Mo, van den Bosch & White 2010

Redshift evolution of the FP traces the evolution in M/L

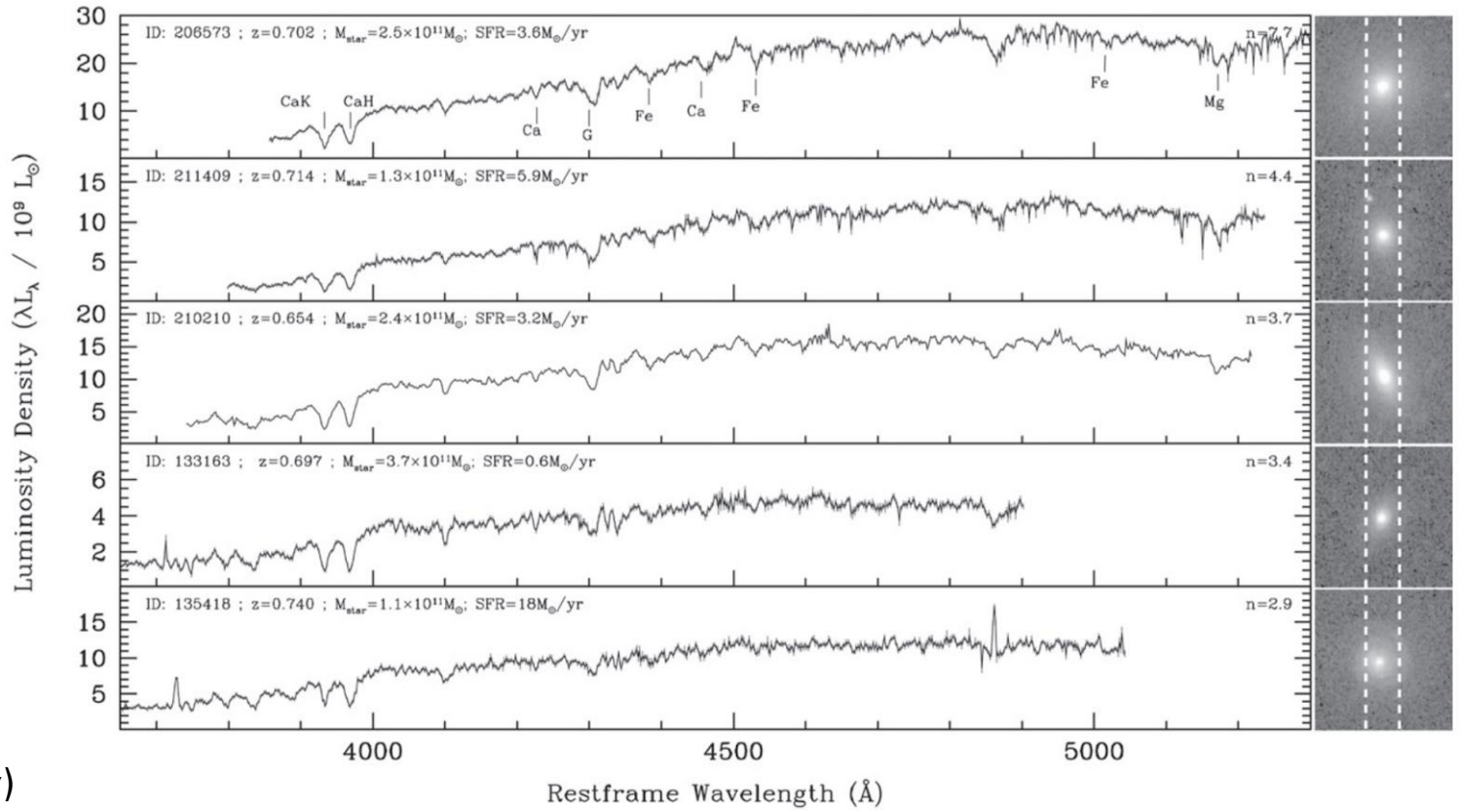


Bezanson+ 2013

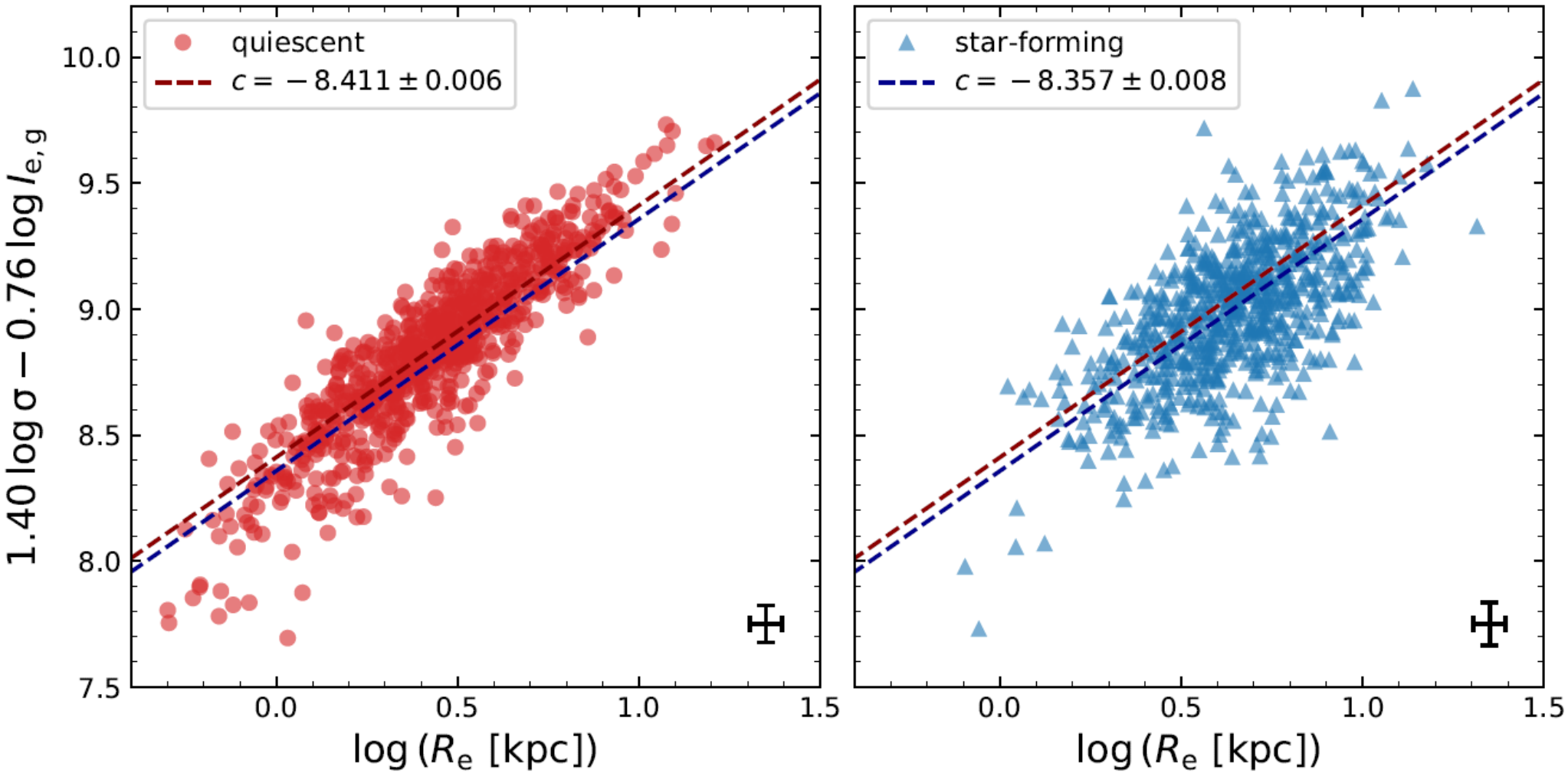
LEGA-C Survey

- Measuring kinematics at high redshifts is challenging
- LEGA-C: Deep spectroscopic survey of massive galaxies with VIMOS
  (van der Wel+ 2016, Straatman+ 2018)
- ~3000 K-band selected galaxies at intermediate redshifts (0.6<z<1.0)
  - Factor ~10 improvement in sample size!

+ great wealth of ancillary data (galaxy morphologies, multi-wavelength photometry)

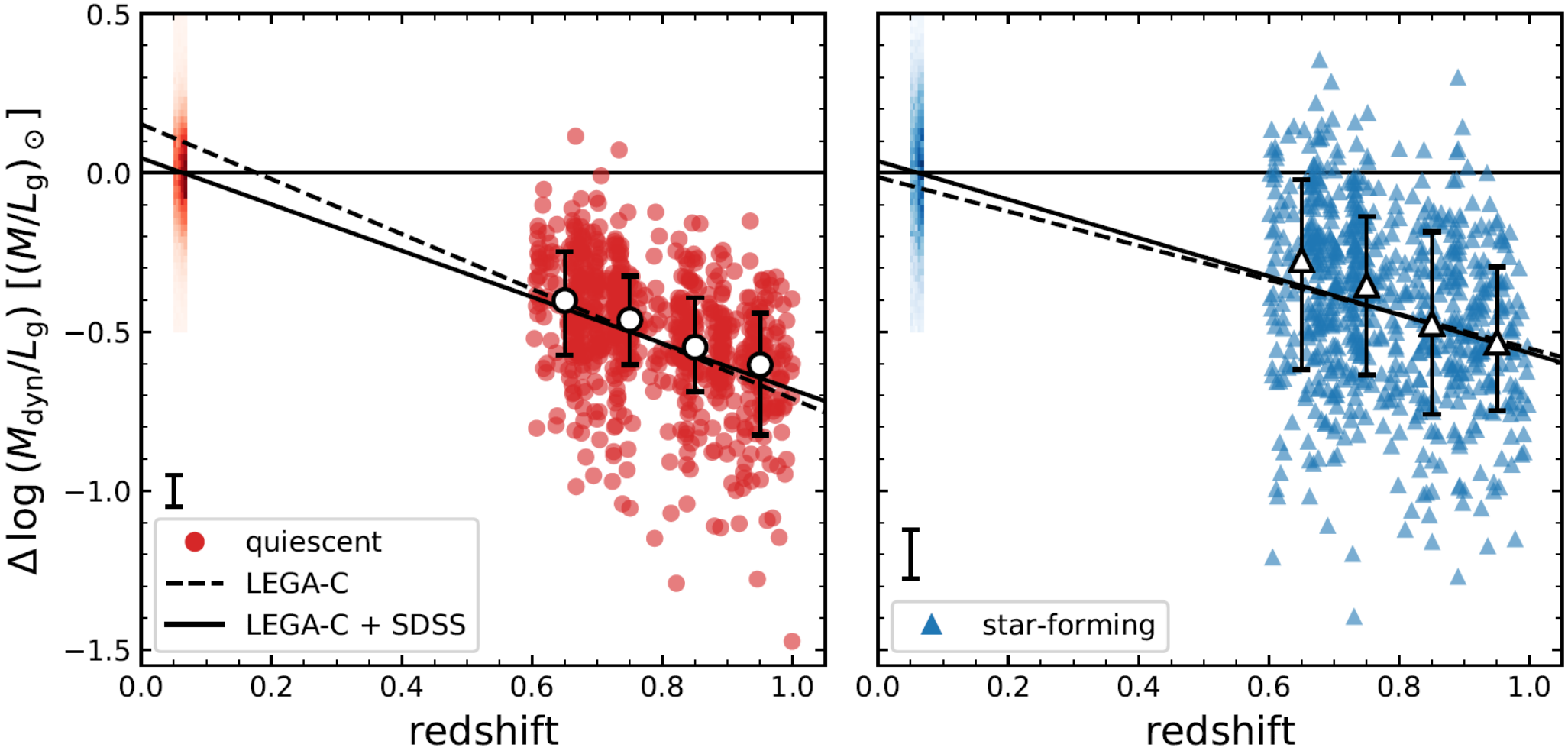


van der Wel+ 2016

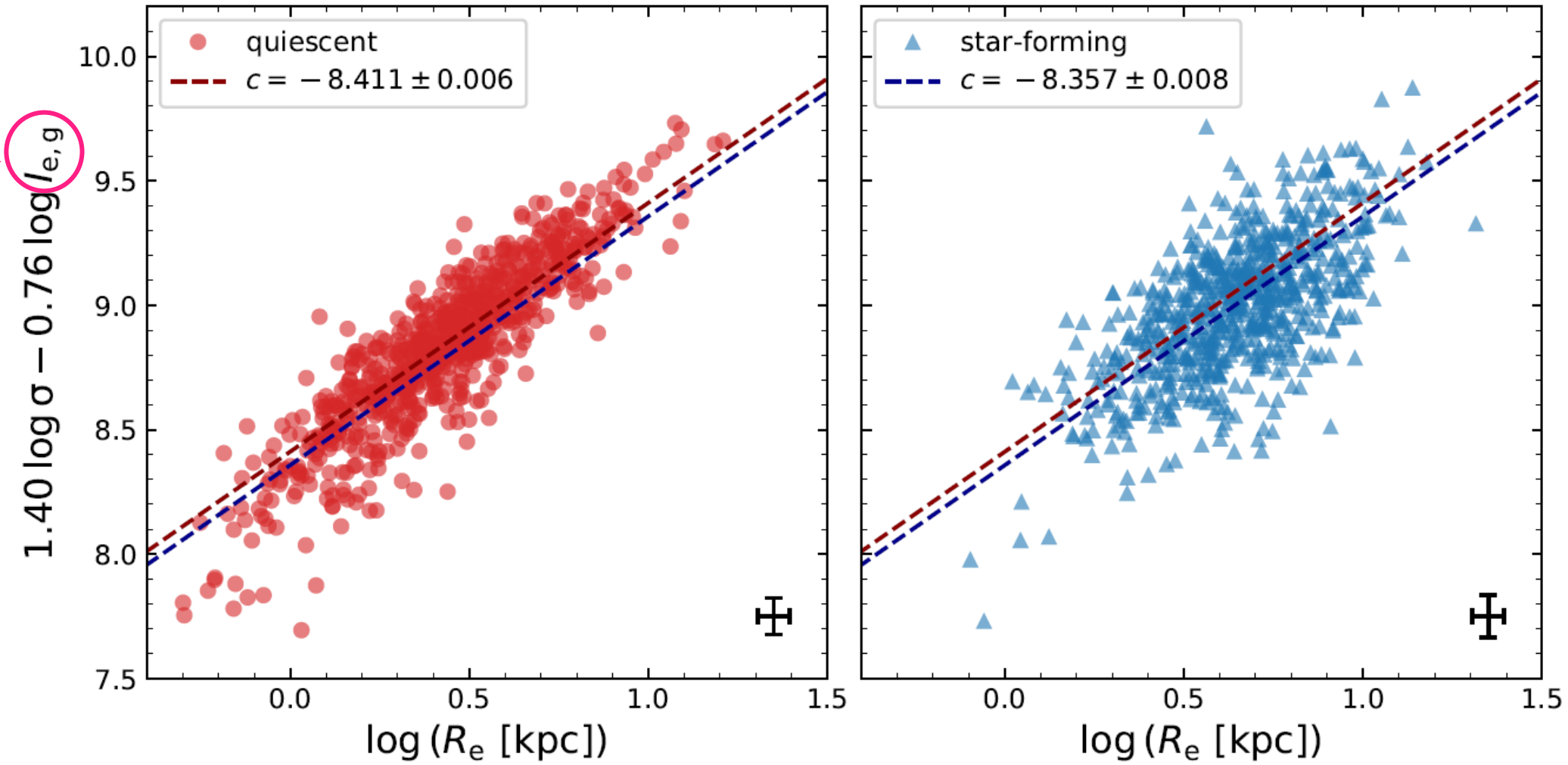


de Graaff+ 2021

Strong evolution in the FP -> change in M/L

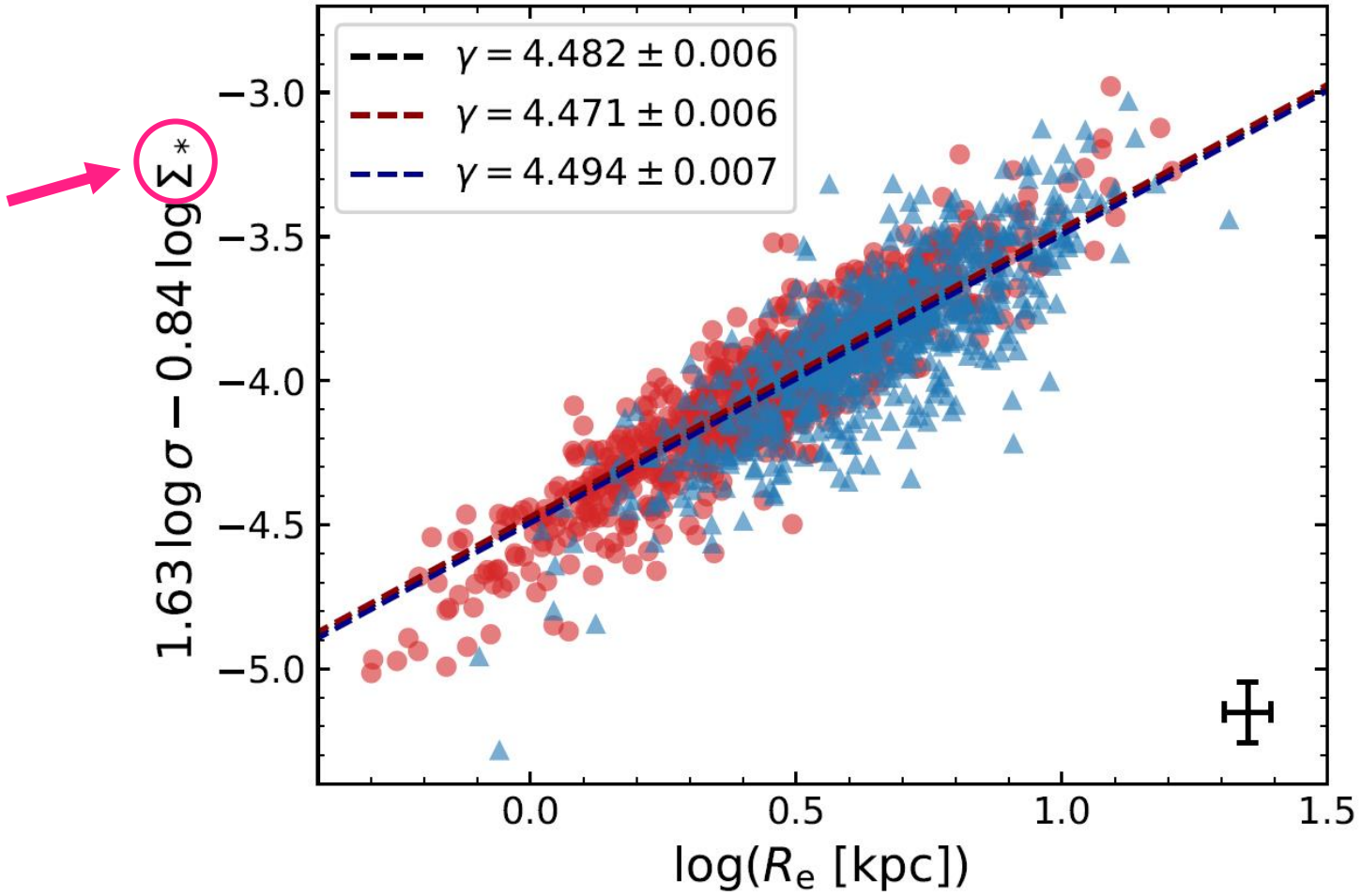


de Graaff+ 2020



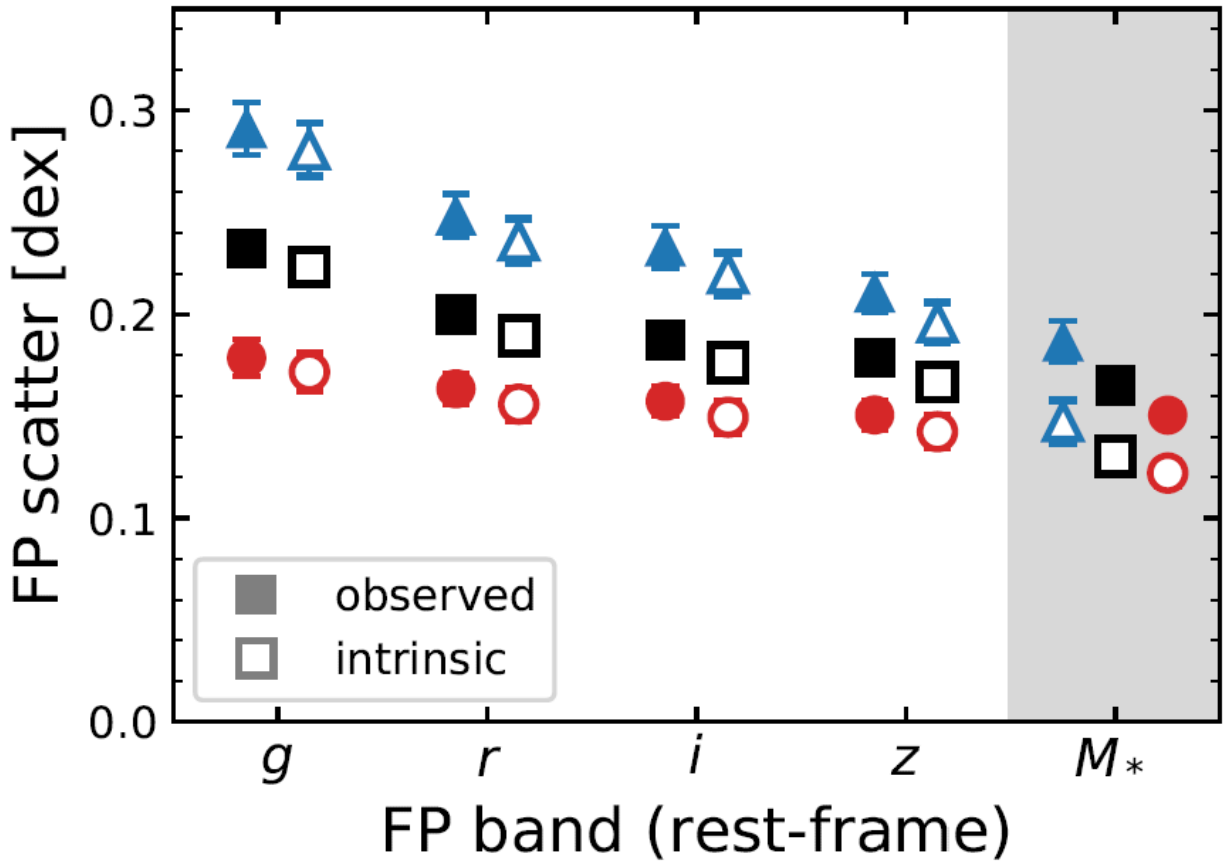
de Graaff+ 2021

All galaxies lie on the same mass plane!



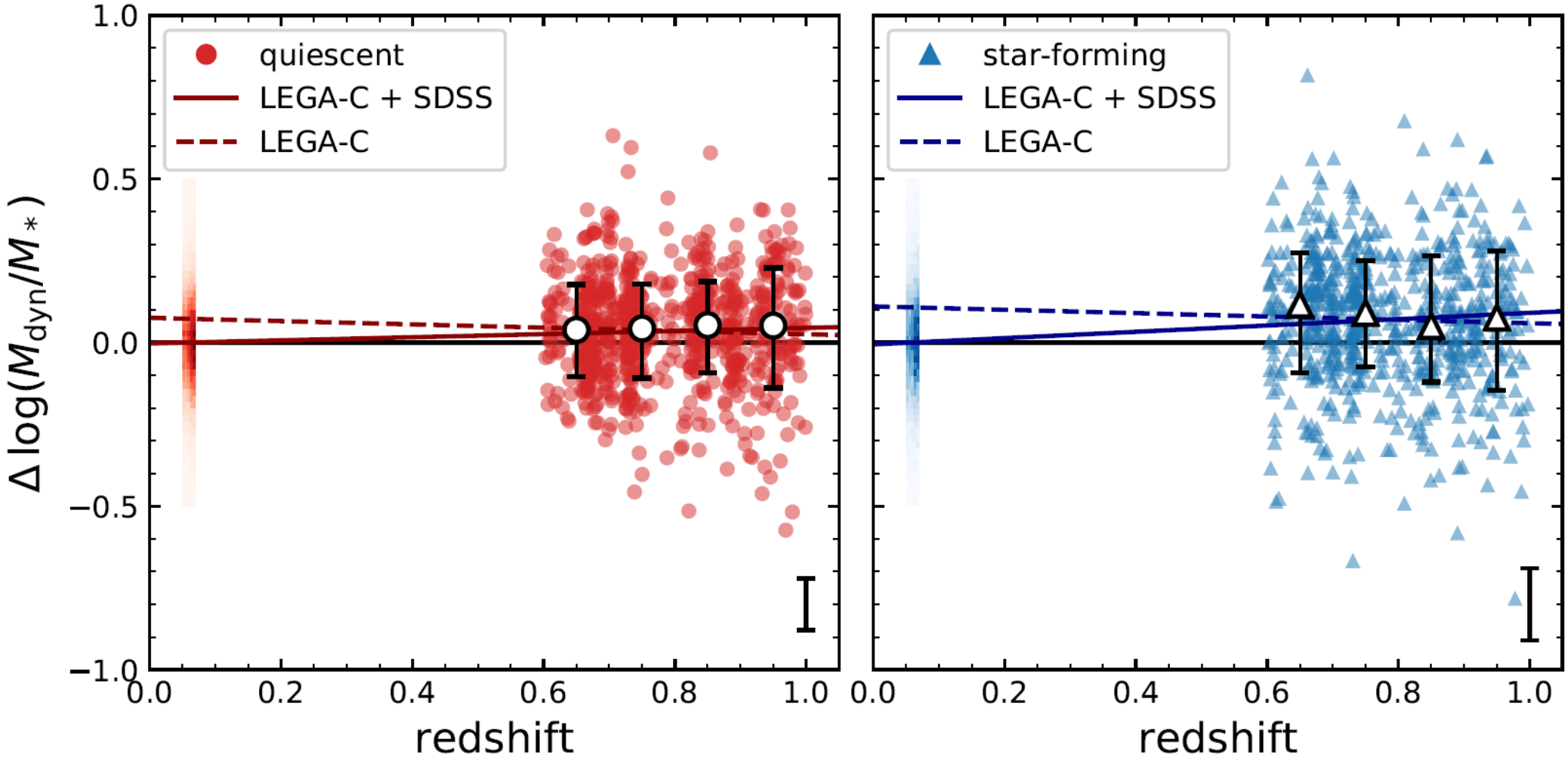
de Graaff+ 2021

Effects of varying stellar populations



de Graaff+ 2021

Redshift evolution?



de Graaff+ 2020

Summary/prospects

- Massive galaxies lie on the same mass fundamental plane across 7 Gyr of cosmic time, despite large variation in their properties

- Progenitors and descendants lie on the same scaling relation:

  Evolution in the morphology and stellar kinematics of galaxies must be tightly coupled

- We can use the mass fundamental plane as a tool to track the structural evolution of massive galaxies across time