A new window on galaxy evolution

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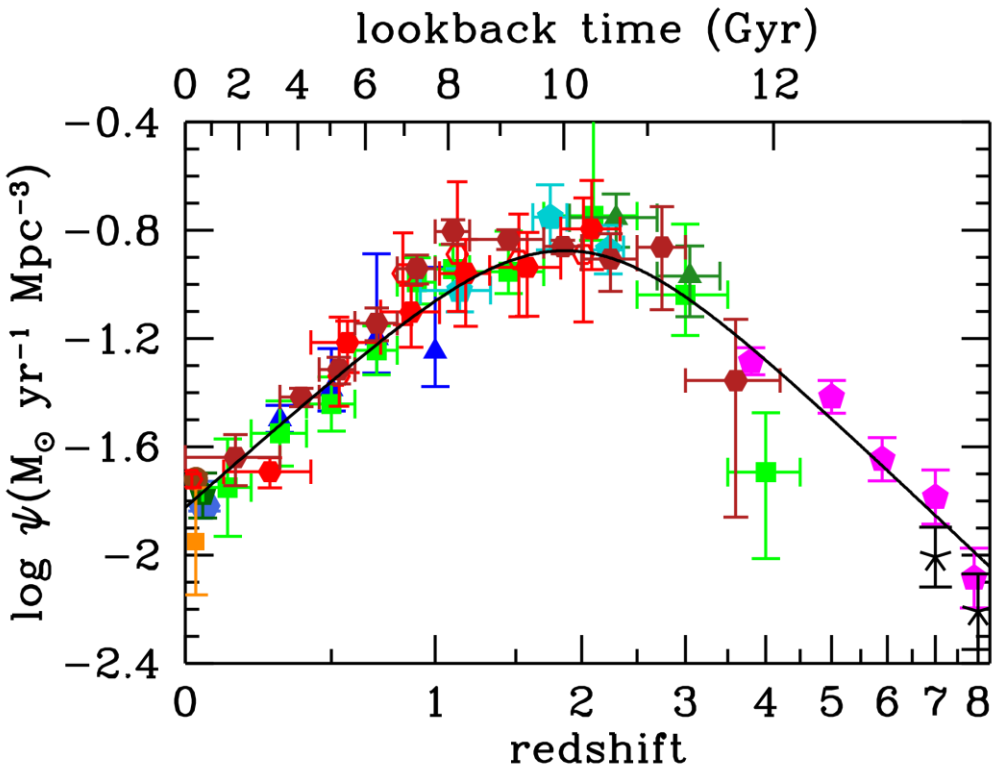
Galaxy evolution

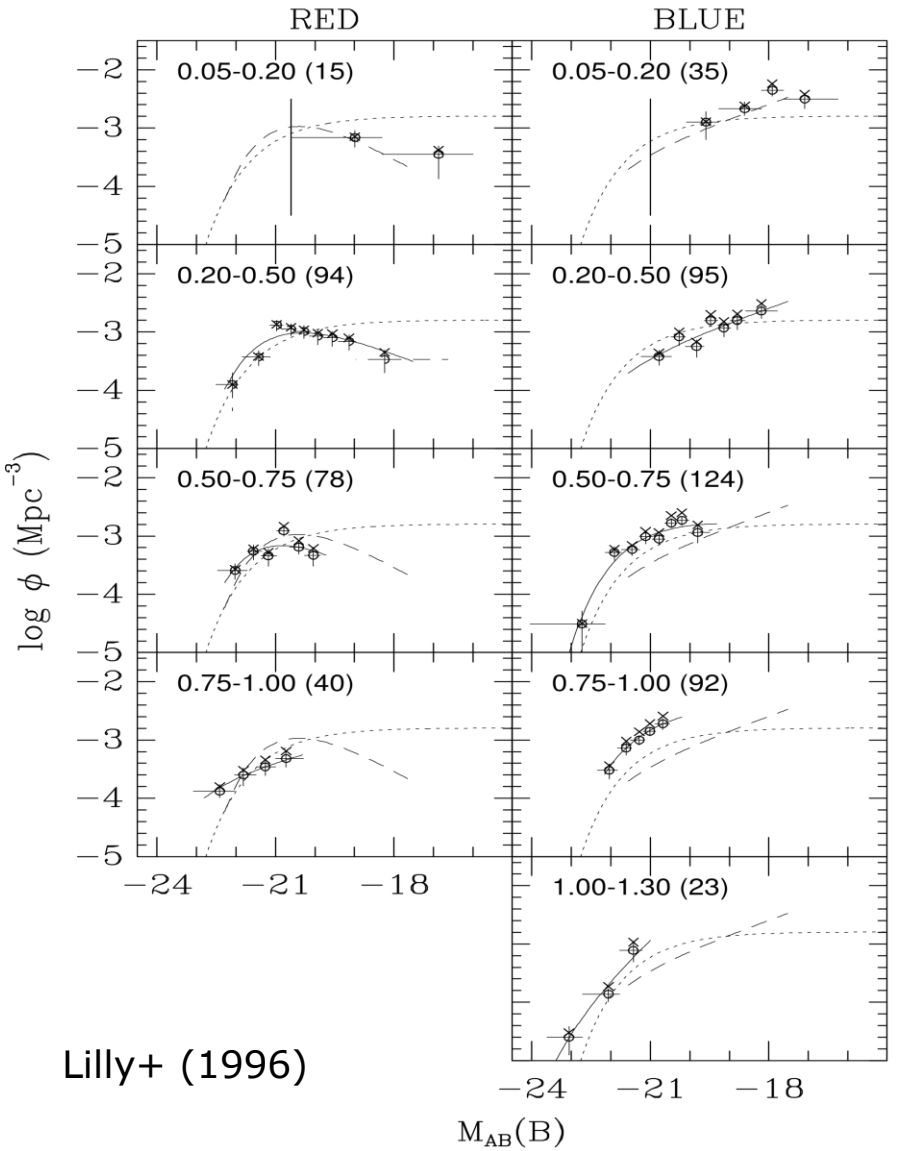
Star formation rate density



(see Madau & Dickinson 2014 for a review)

Canadian-France Redshift Survey

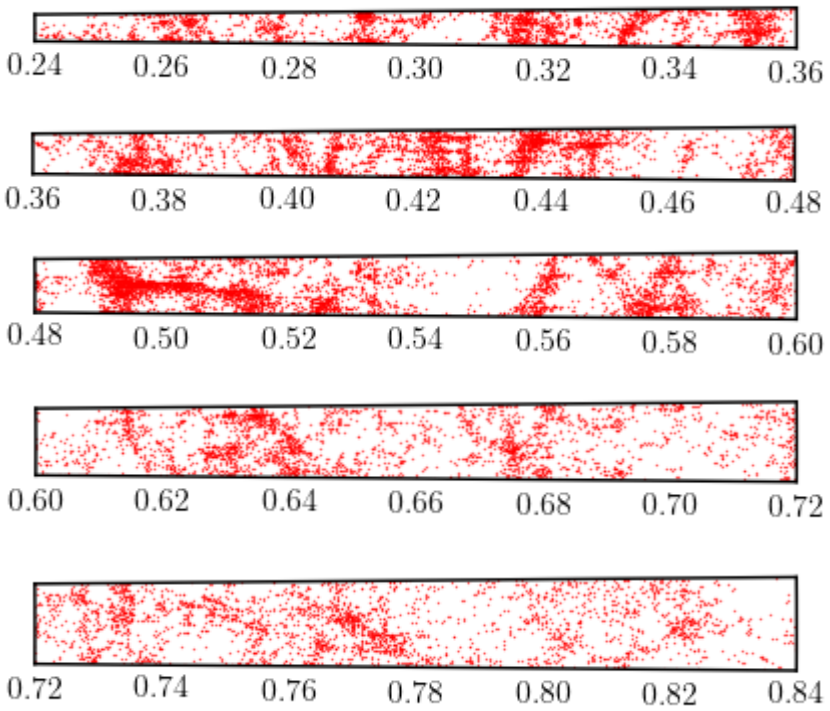
Luminosity function



Lilly+ (1996)

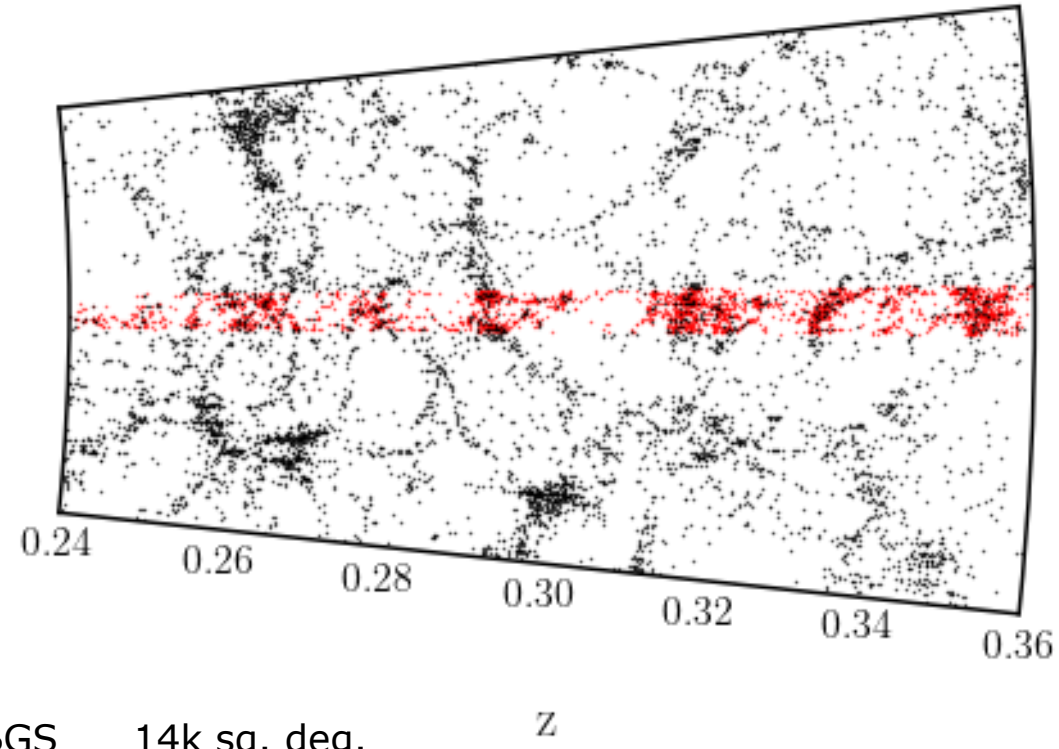
Mapping galaxies to trace their evolution

zCOSMOS *(i<22.5) 1.7 sq. deg*



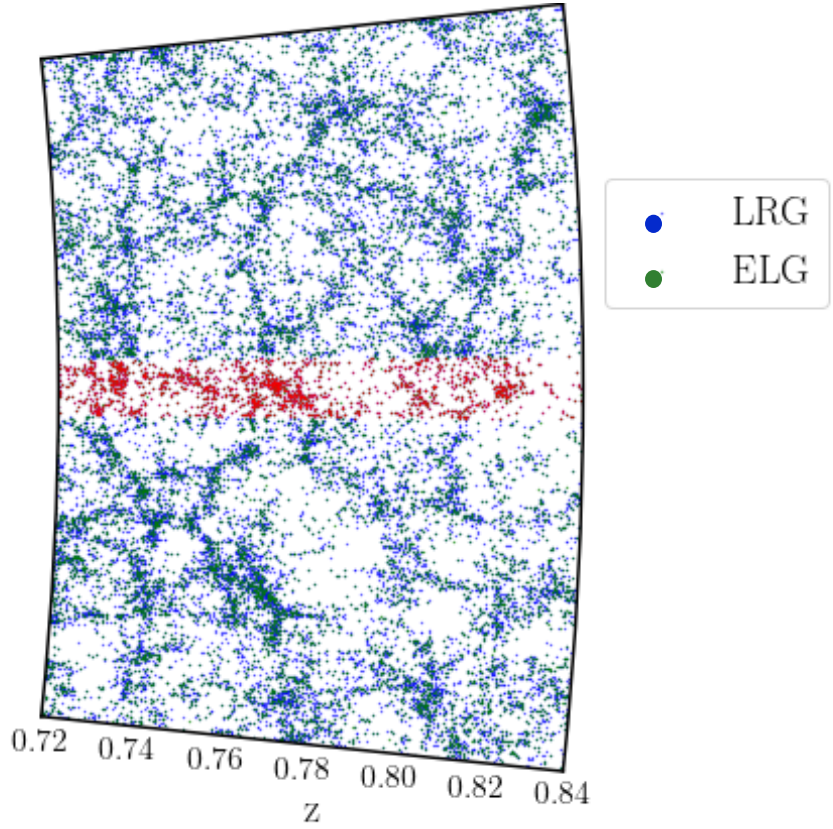
- zCOSMOS (2006) observed about 20k *i*-band selected galaxies (*i*<22.5).
- Connection between galaxy evolution and large-scale environments.

Mapping galaxies to trace their evolution



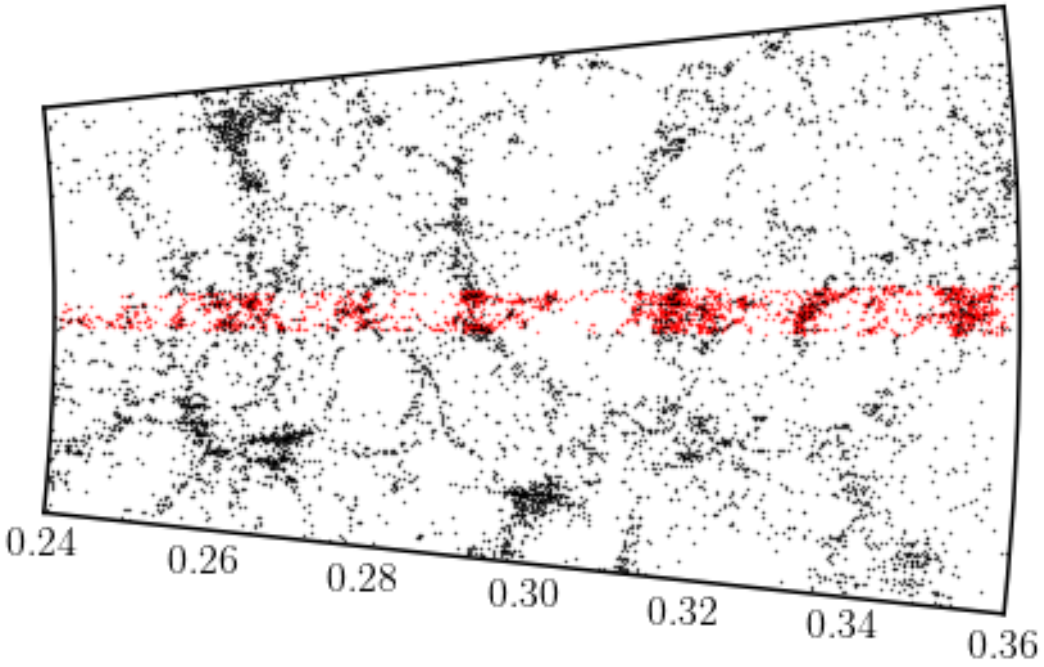
DESI BGS 14k sq. deg.
(r < 19.8)

zCOSMOS
(i < 22.5) 1.7 sq. deg



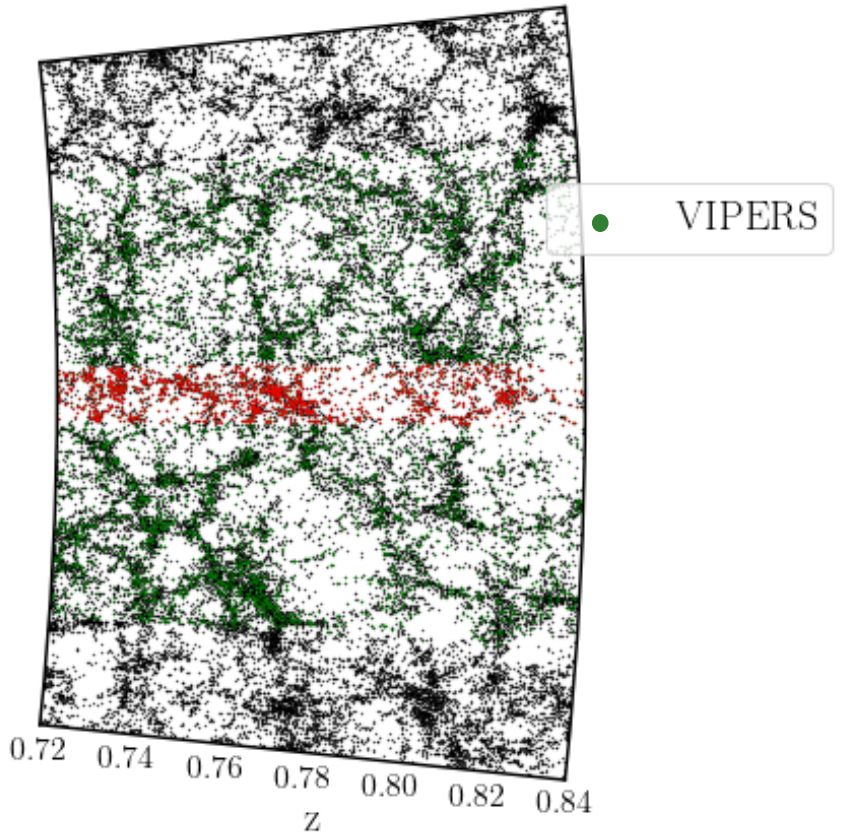
DESI LRG,ELG
(zfiber<21.5, g<23.5,
Also color cuts)

Mapping galaxies to trace their evolution



GAMA
(r < 19.8)

200 sq. deg.



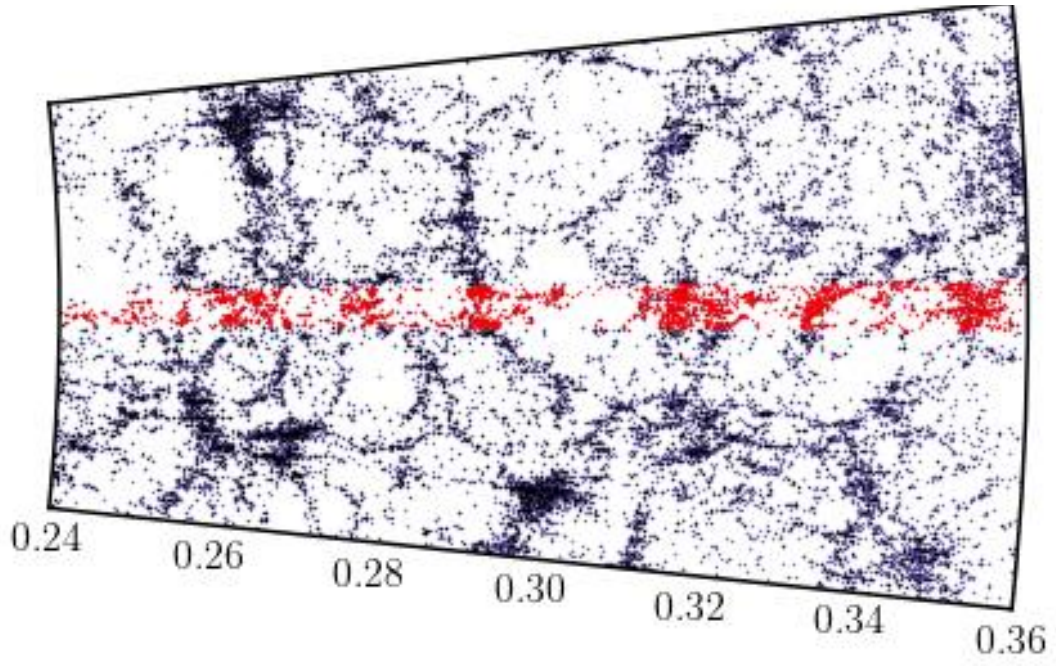
zCOSMOS
(i < 22.5)

1.7 sq. deg

VIPERS
(46% spectroscopic sampling)
(i<22.5)

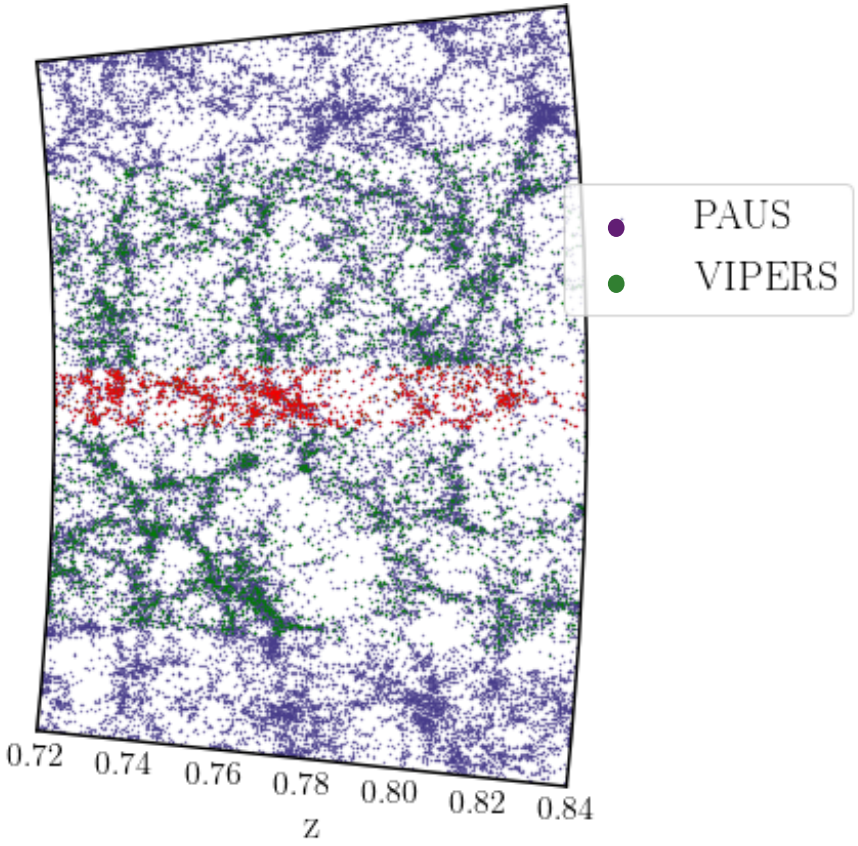
24 sq. deg

Mapping galaxies to trace their evolution



GAMA
(r < 19.8)

200 sq. deg.



zCOSMOS
(i < 22.5)

1.7 sq. deg

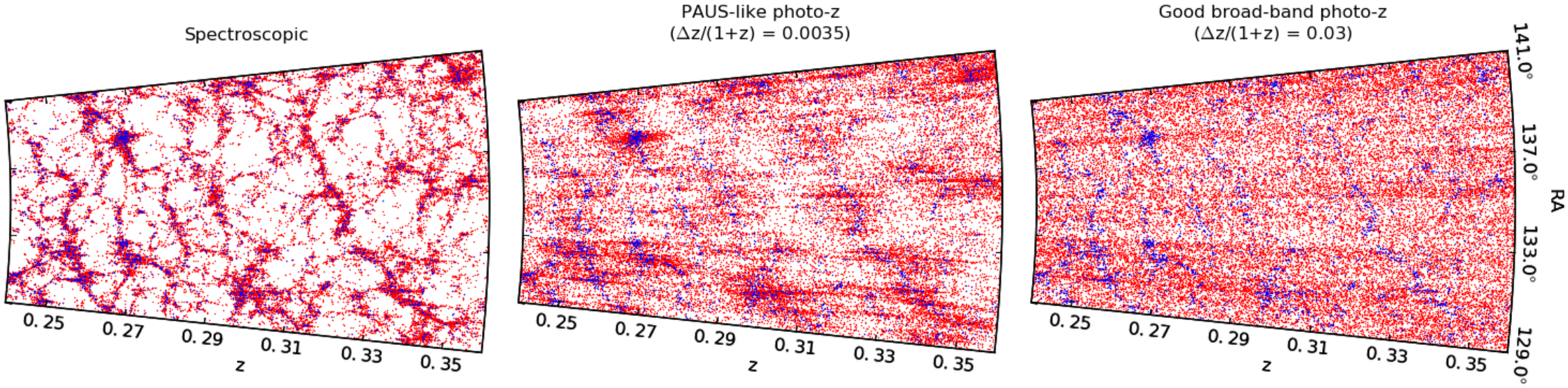
PAUS
(i<23)

60 sq. deg.

VIPERS
(*i<22.5*)

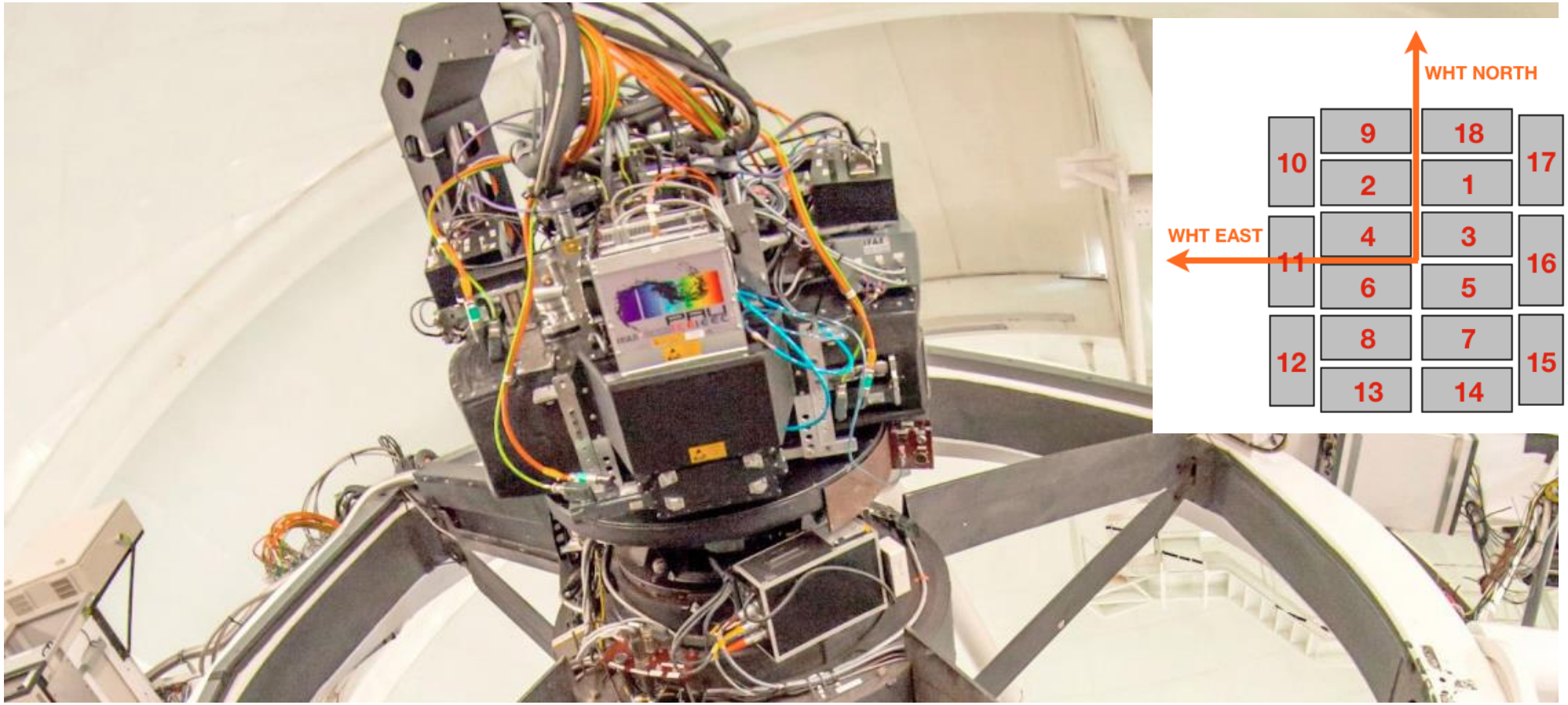
24 sq. deg

Photometric redshift survey



Stothert+ (2018)

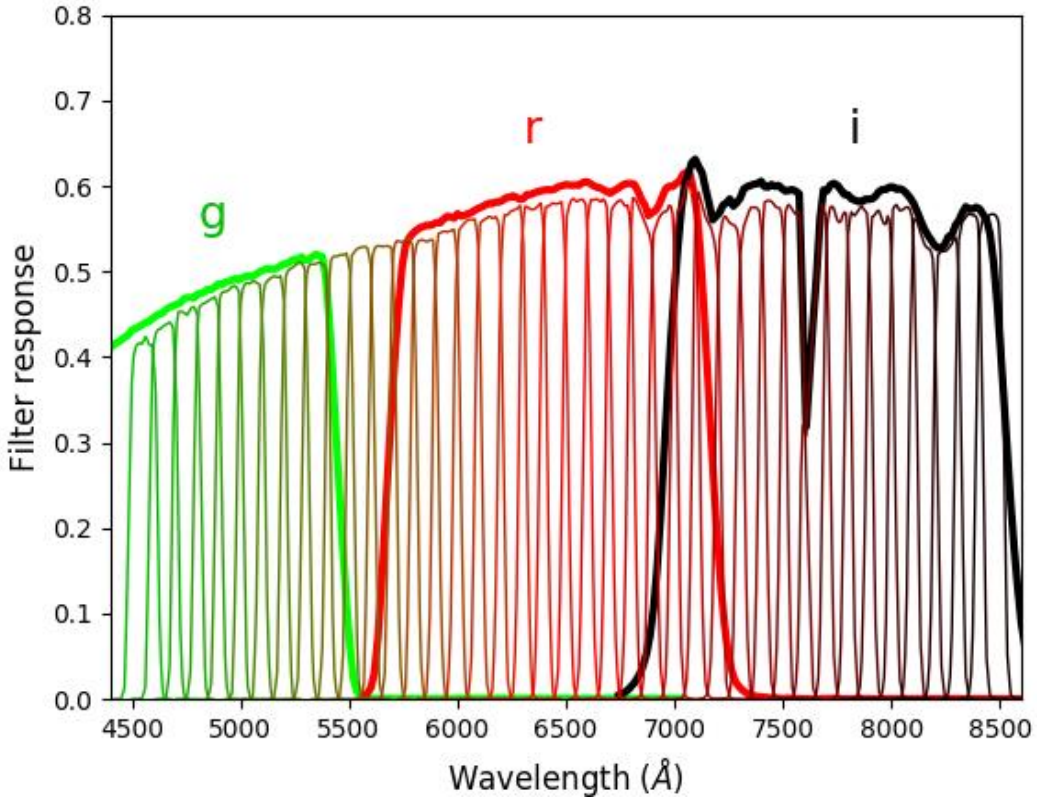
The Physics Of The Accelerating Universe Survey (PAUS)



The PAUS collaboration: ICE, IFAE (Barcelona), Durham, UCL, Leiden

The Physics Of The Accelerating Universe Survey (PAUS)

40 Narrow bands

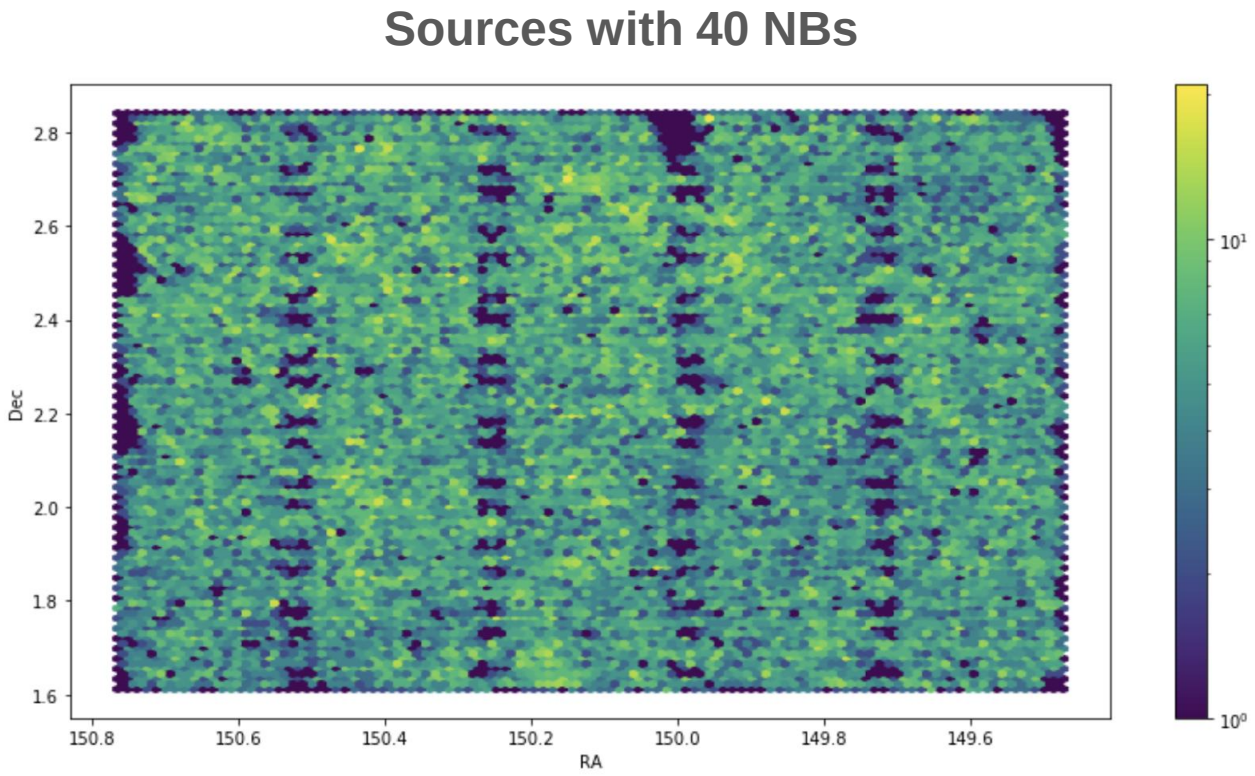


- 40 x130Å-wide NB filters covering 4500-8500 Å.
- Provide low-resolution spectra ($\Delta\lambda/\lambda \sim 2\%$, or $R \sim 50$)
- Expected photometric galaxy redshift accuracy of $\sigma(z) \sim 0.0035\times(1+z)$

Stothert+ (2018)

The Physics Of The Accelerating Universe Survey (PAUS)

Most recent production (last week)

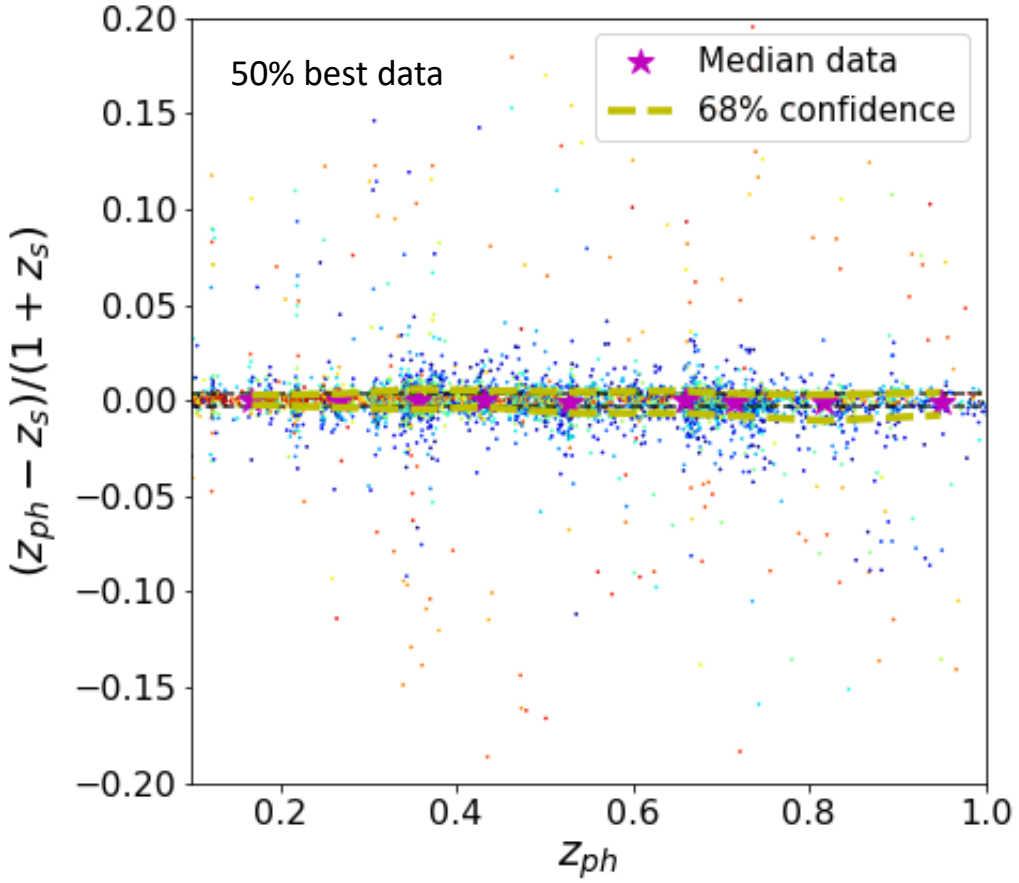


- PAUS has covered 45 sq. deg. in 196 nights (50% lost to poor weather)

The PAUS collaboration: ICE, IFAE (Barcelona), Durham, UCL, Leiden

Photometric redshift accuracy

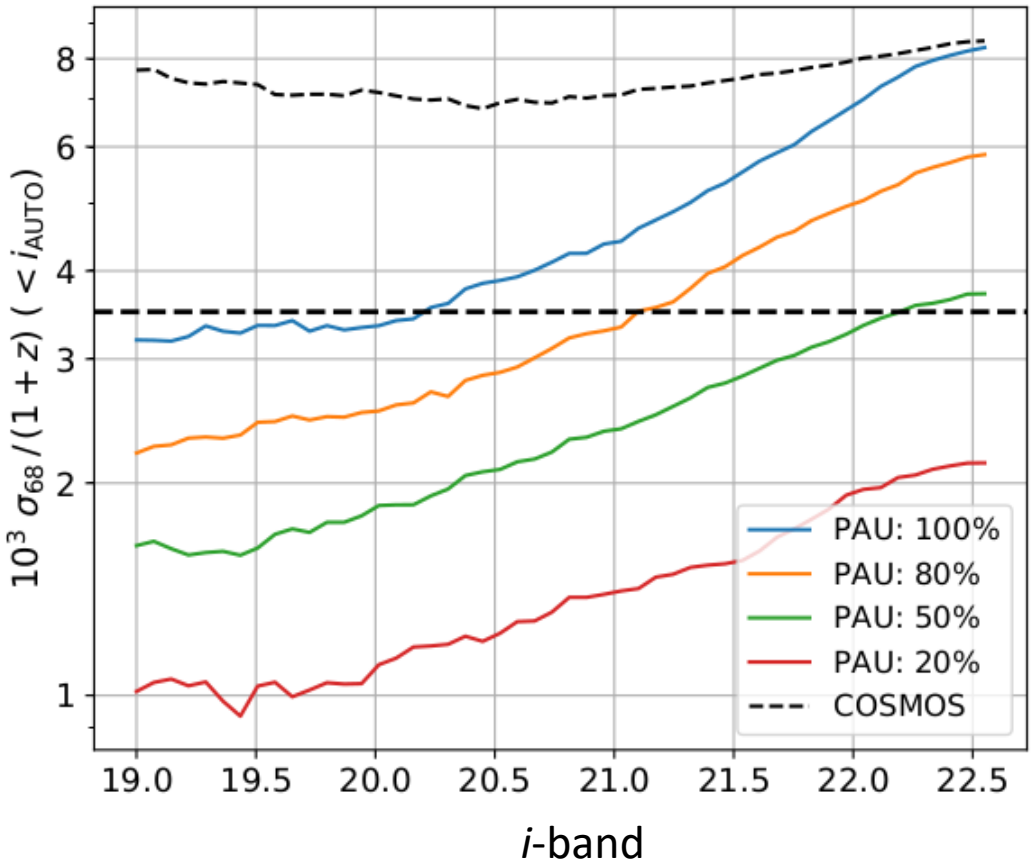
Aim: 0.35% error on photo-z



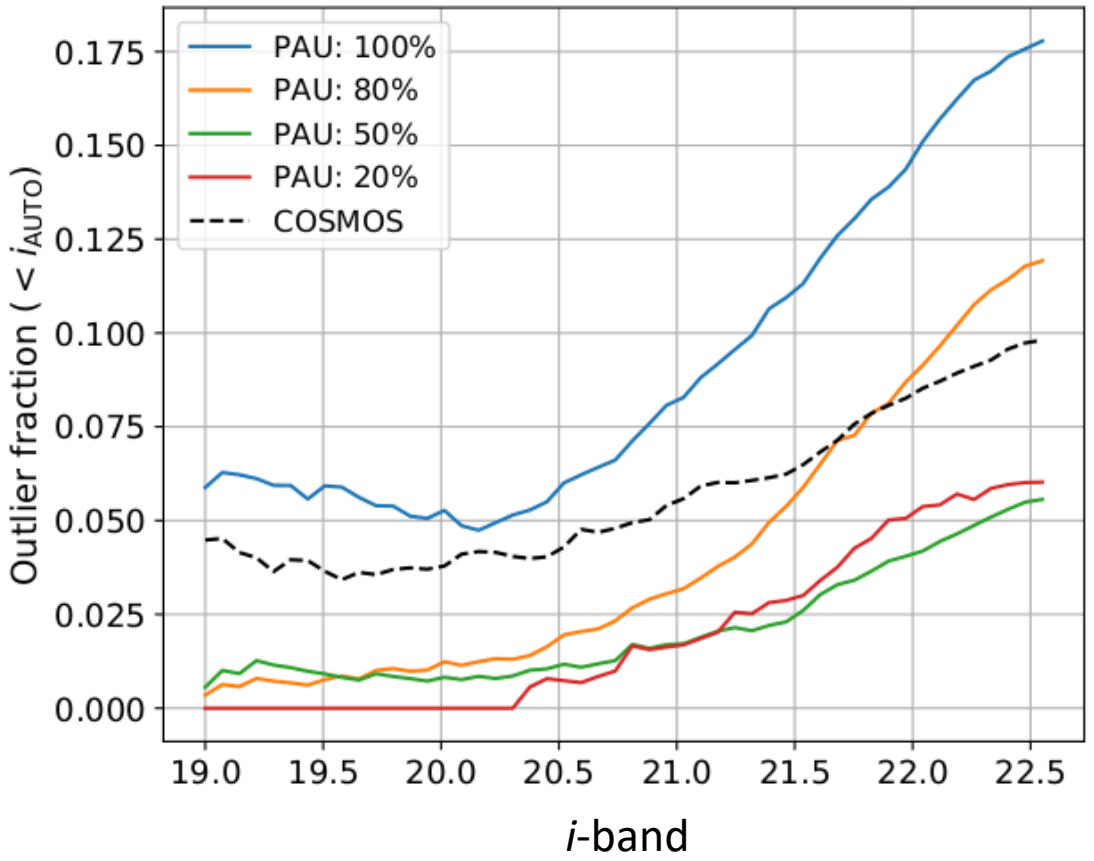
- Photo-z performance validated on the COSMOS field.
- Photo-z precision σ(z)/(1 + z) ~ 0.001 for a high-quality selection, driven by the identification of emission lines.
- Precision required to study clustering of galaxies.

Photometric redshift accuracy

σ_{68}: 68% confidence region



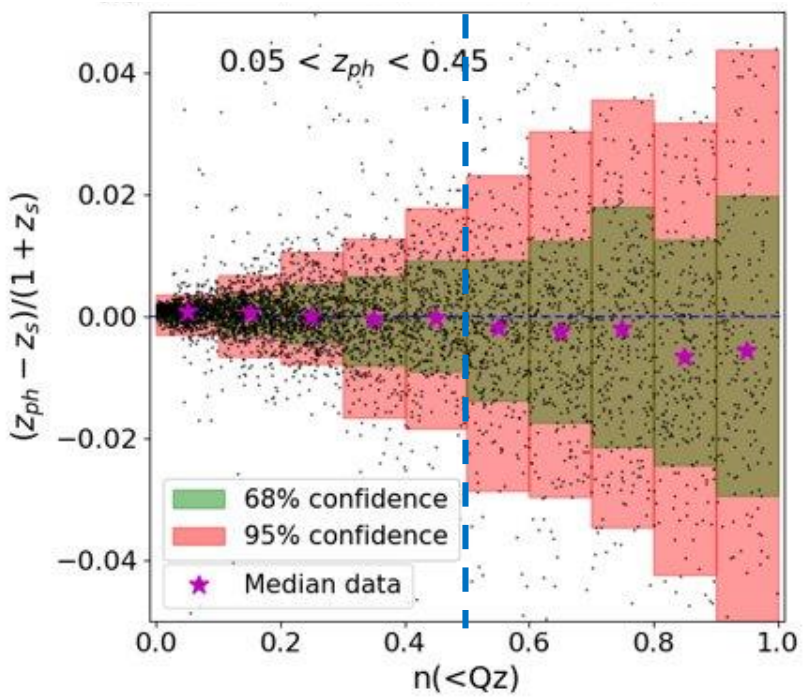
Outliers: $\left|\frac{\Delta z}{1+z}\right| > 0.02$

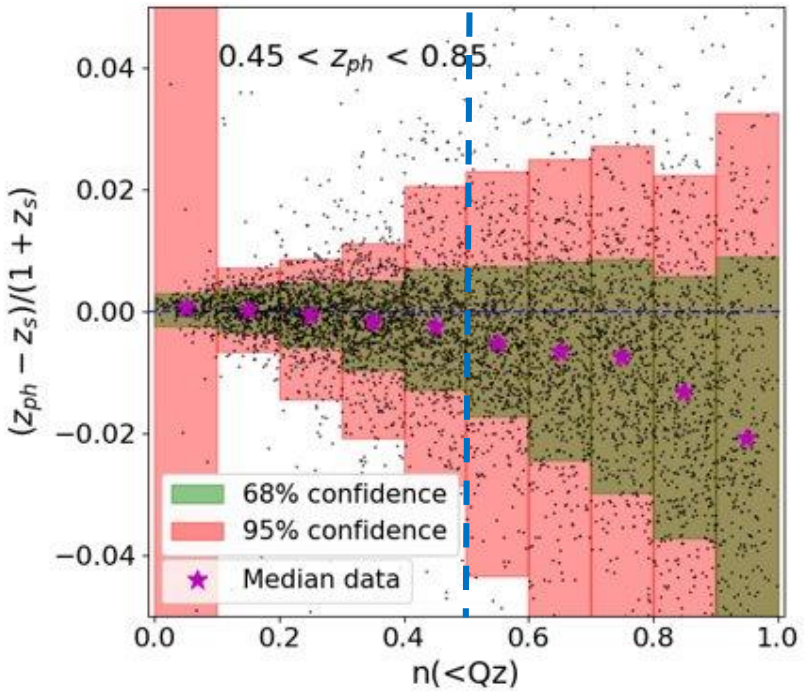


Eriksen+ (2018)

Photometric redshift quality validation

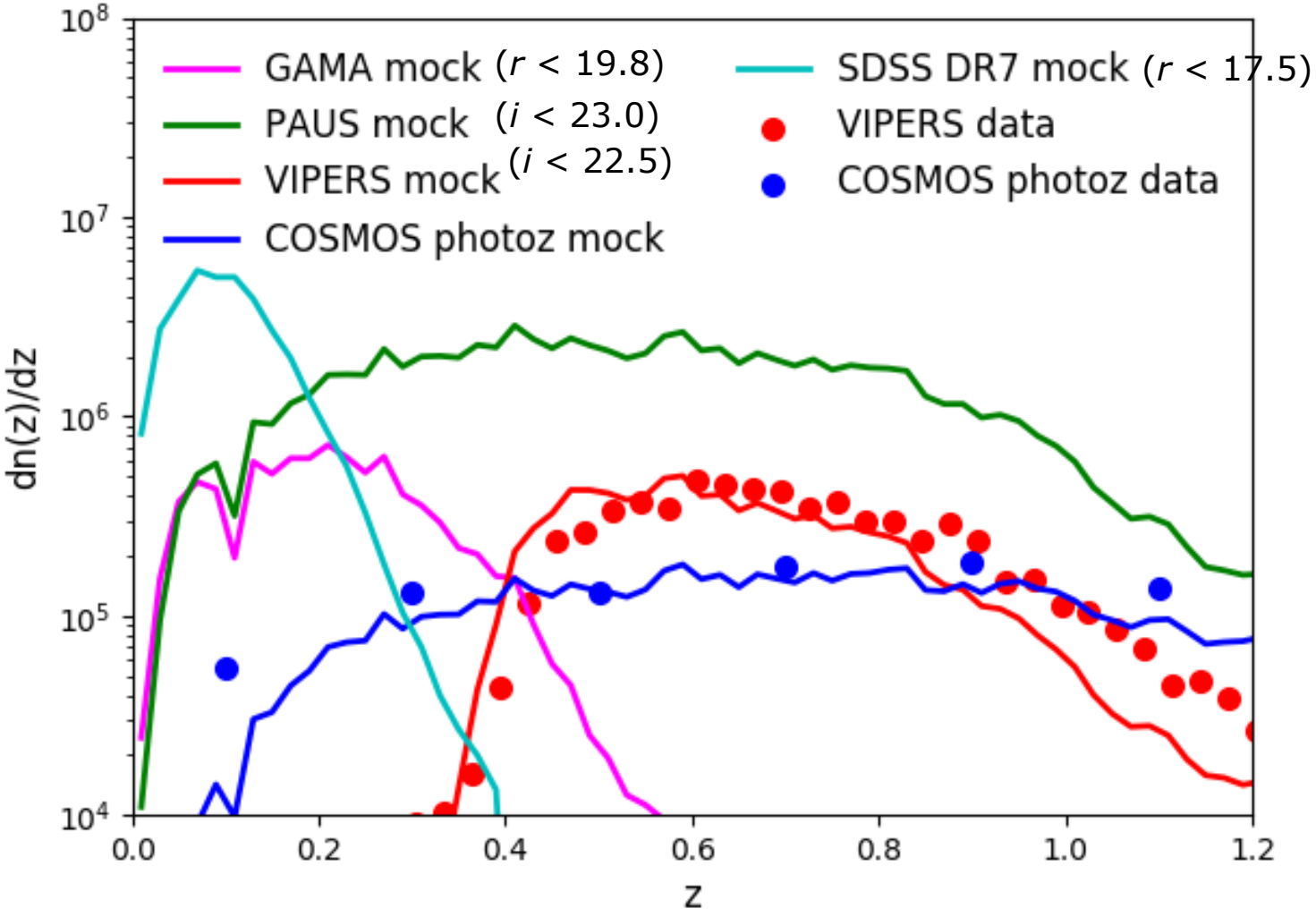
COSMOS field data





Data: good quality bad quality good quality bad quality

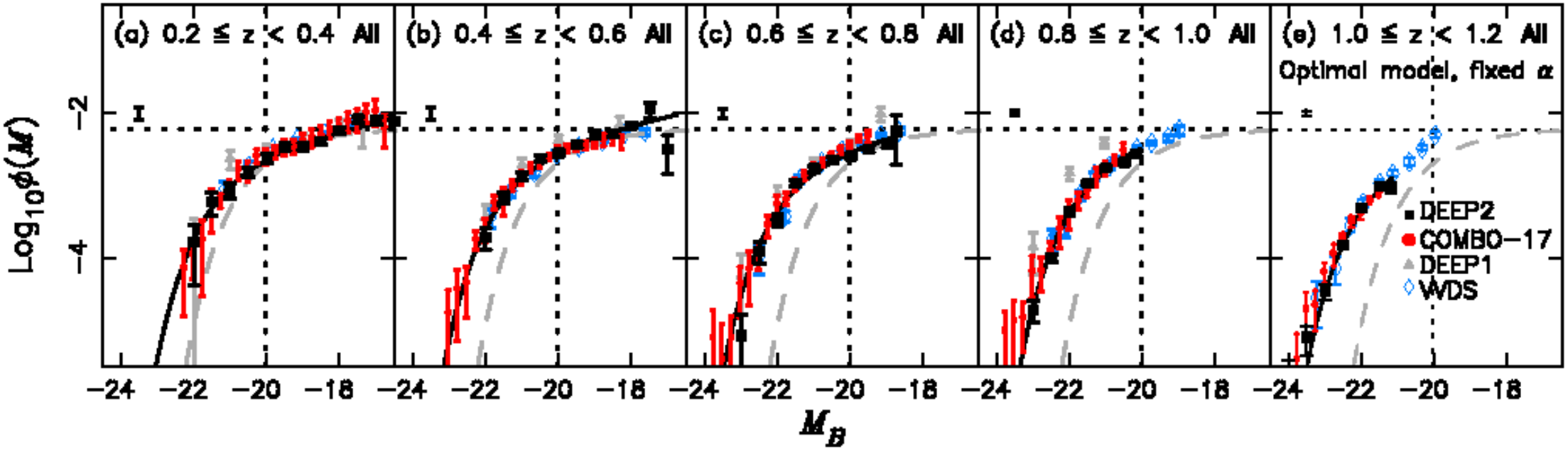
PAUS redshift distribution



Almost 10 times bigger than other surveys in a comparable redshift range

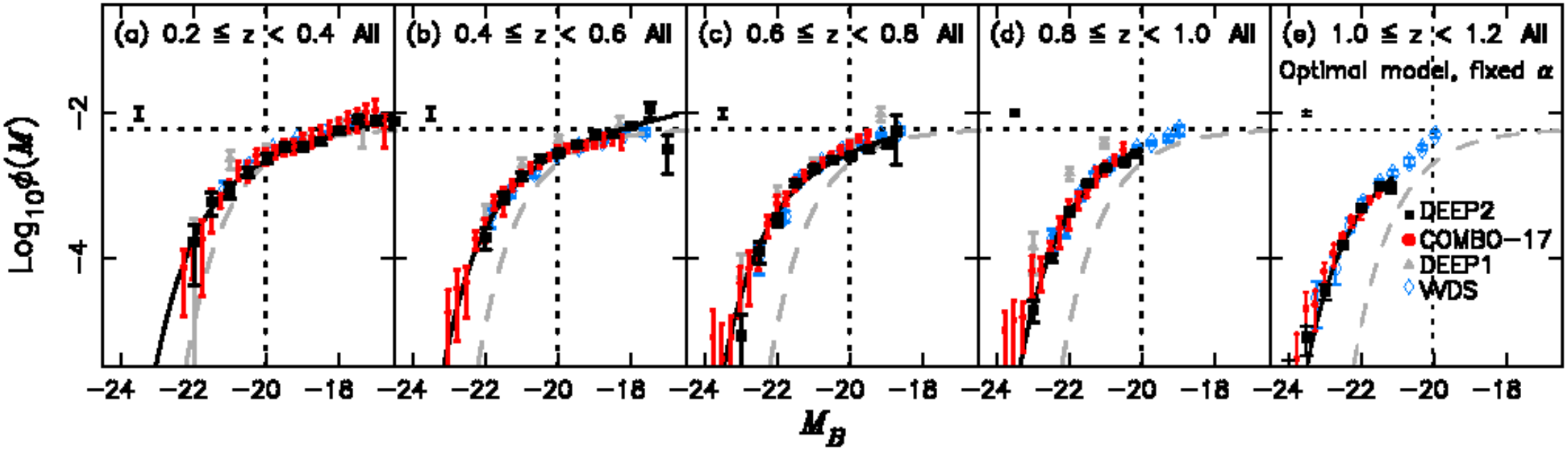
Stothert+ (2018)

The galaxy luminosity function



Faber+ (2007)

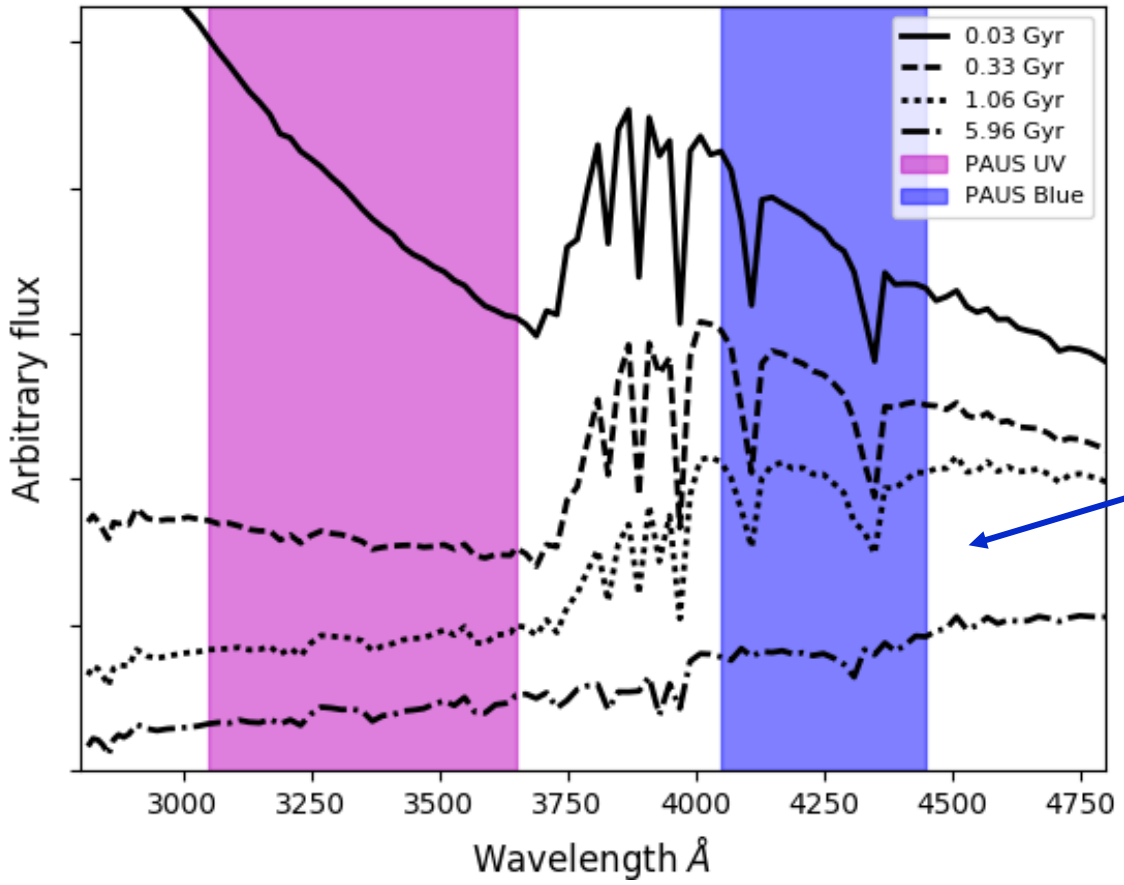
The galaxy luminosity function



K-correction needed!

Faber+ (2007)

PAUS-Blue Magnitude



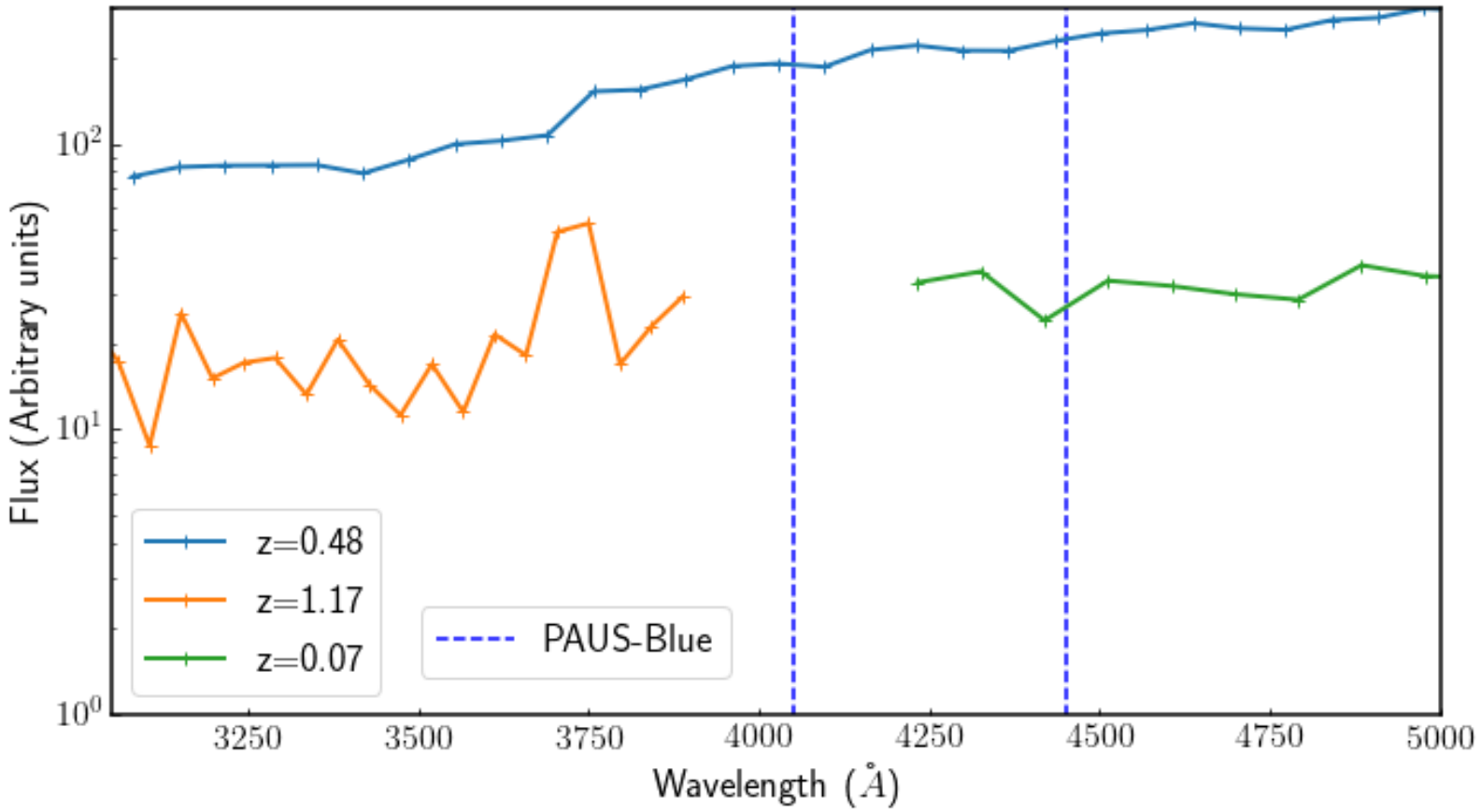
Feature	Wavelength Range Å	Redshift Range
$D4000_N$	3850-3950 , 4000-4100	0.17 - 1.07
$D4000_W$	3750-3950 , 4050-4250	0.20 - 1.00
PAUS UV (M^h_{UV})	3050-3650	0.48 - 1.39
PAUS Blue (M^h_B)	4050-4450	0.11 - 0.90

Narrow band limits

Stothert+ (2018)

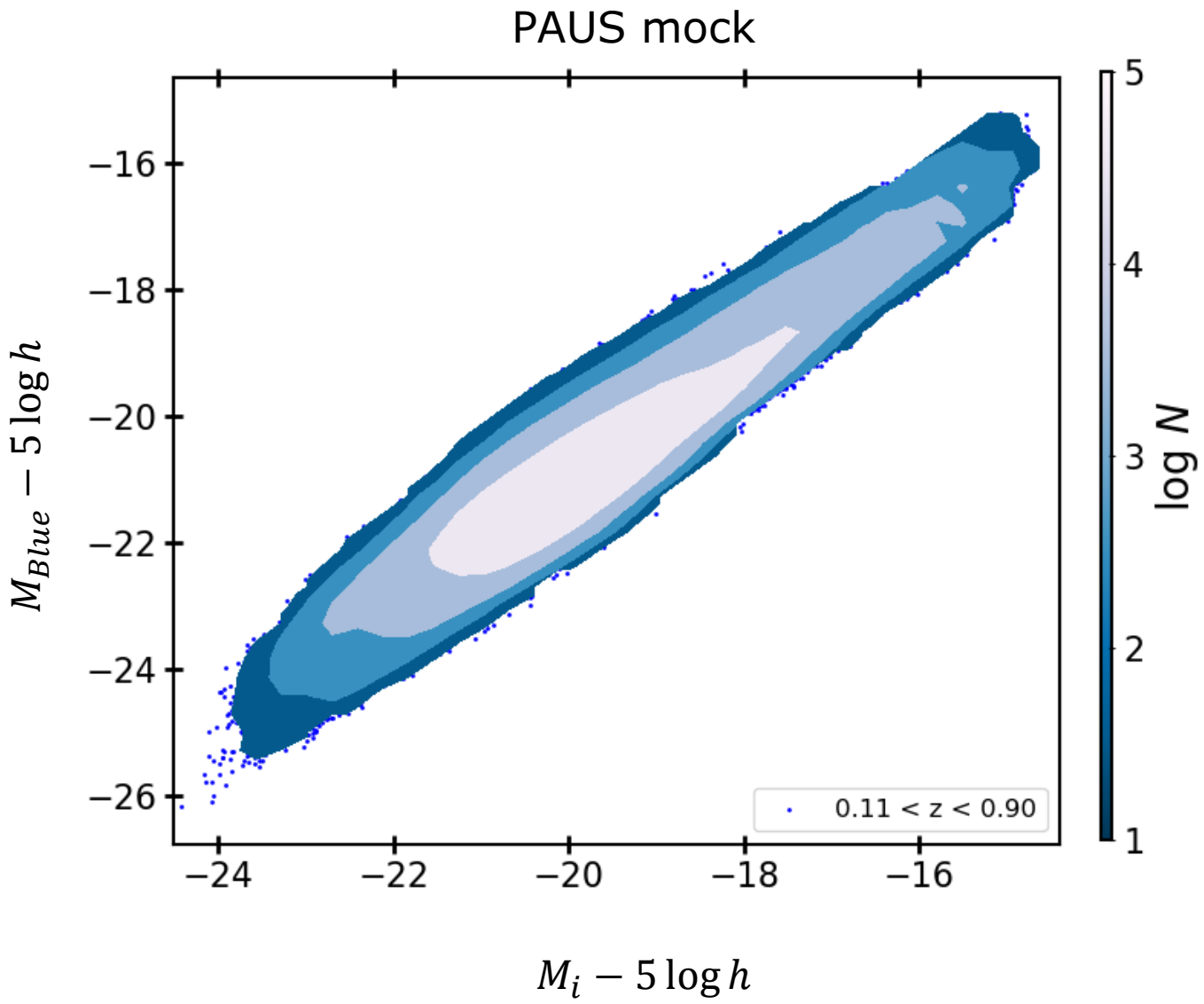
PAUS-Blue Magnitude

PAUS data

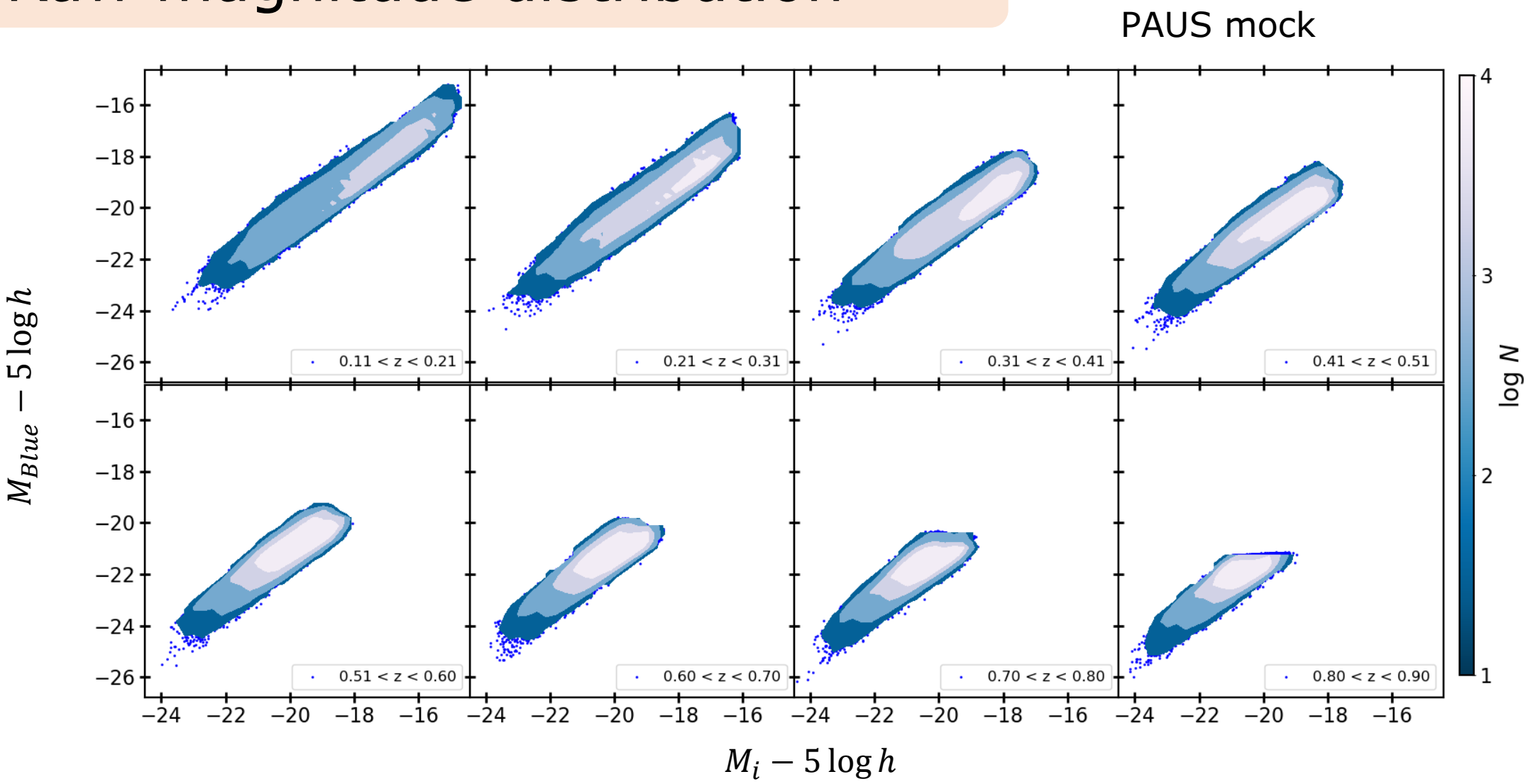


The NBs cover a range between 4500-8500 Å and can be used to construct an artificial blue band for galaxies at $0.11 < z < 0.9$.

Raw magnitude distribution

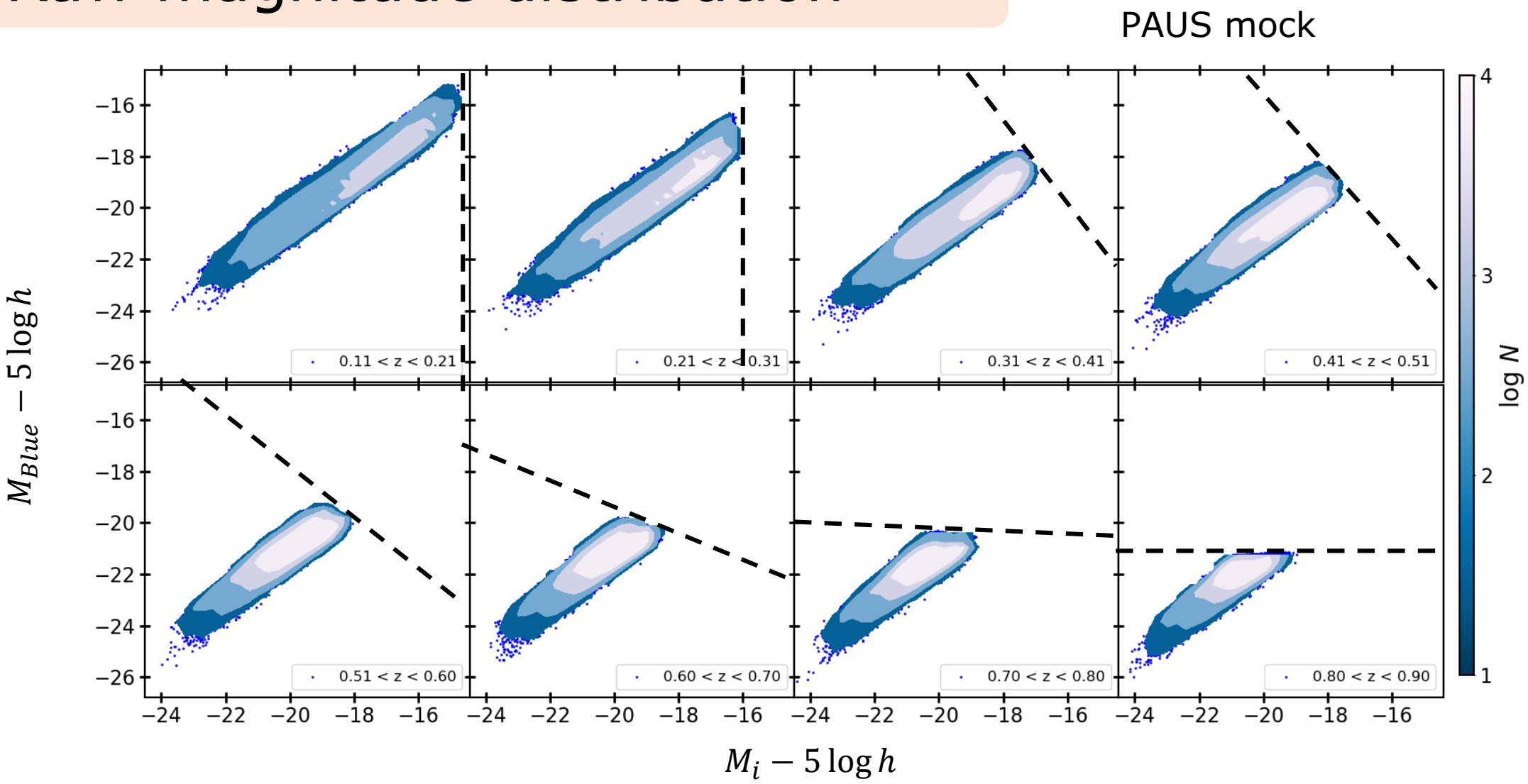


Raw magnitude distribution



As the selection of galaxies in PAUS is made in the *i*-band, this must be accounted when we compute the luminosity function in the *b* band.

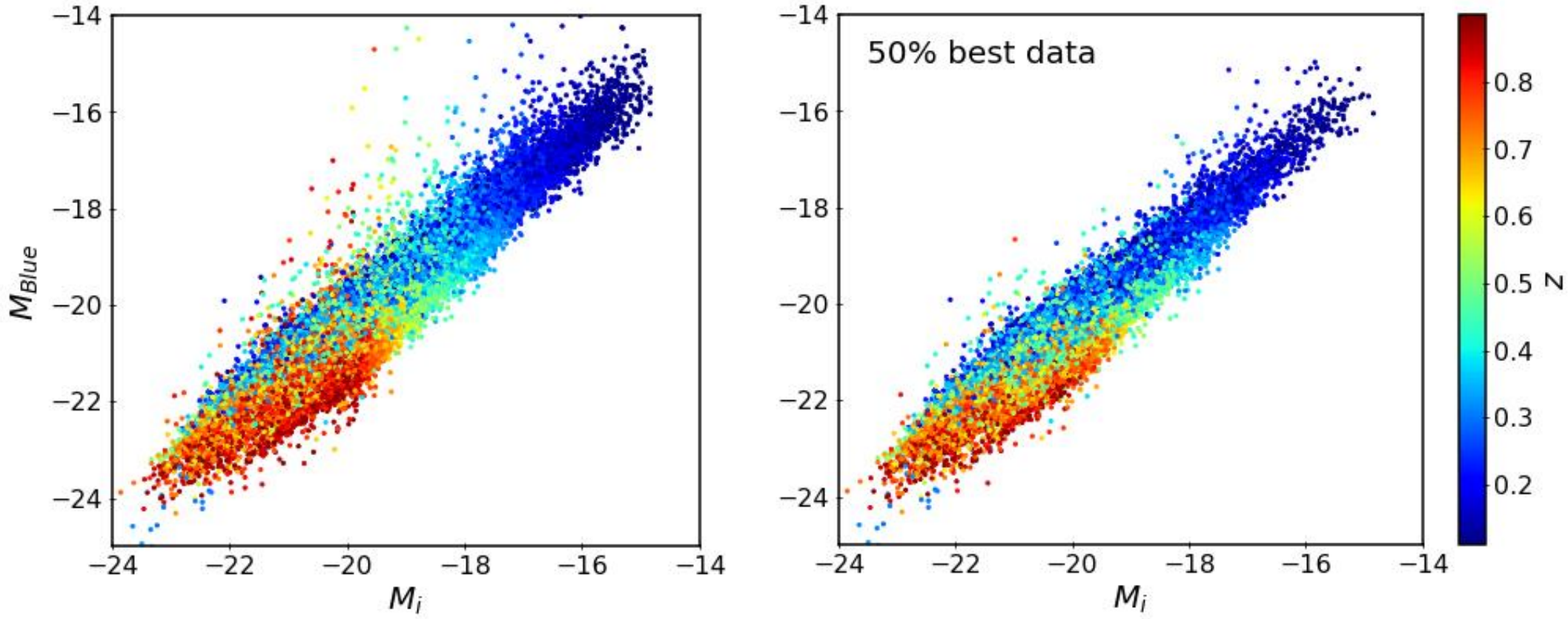
Raw magnitude distribution



As the selection of galaxies in PAUS is made in the *i*-band, this must be accounted when we compute the luminosity function in the *b* band.

Preliminary PAUS results data COSMOS field

PAUS data



Future work

- Check that the blue magnitude defined in PAUS agrees with the blue broad band definition.

- Compute the luminosity function in the PAUS-Blue restframe magnitude considering the *i*-band selection.

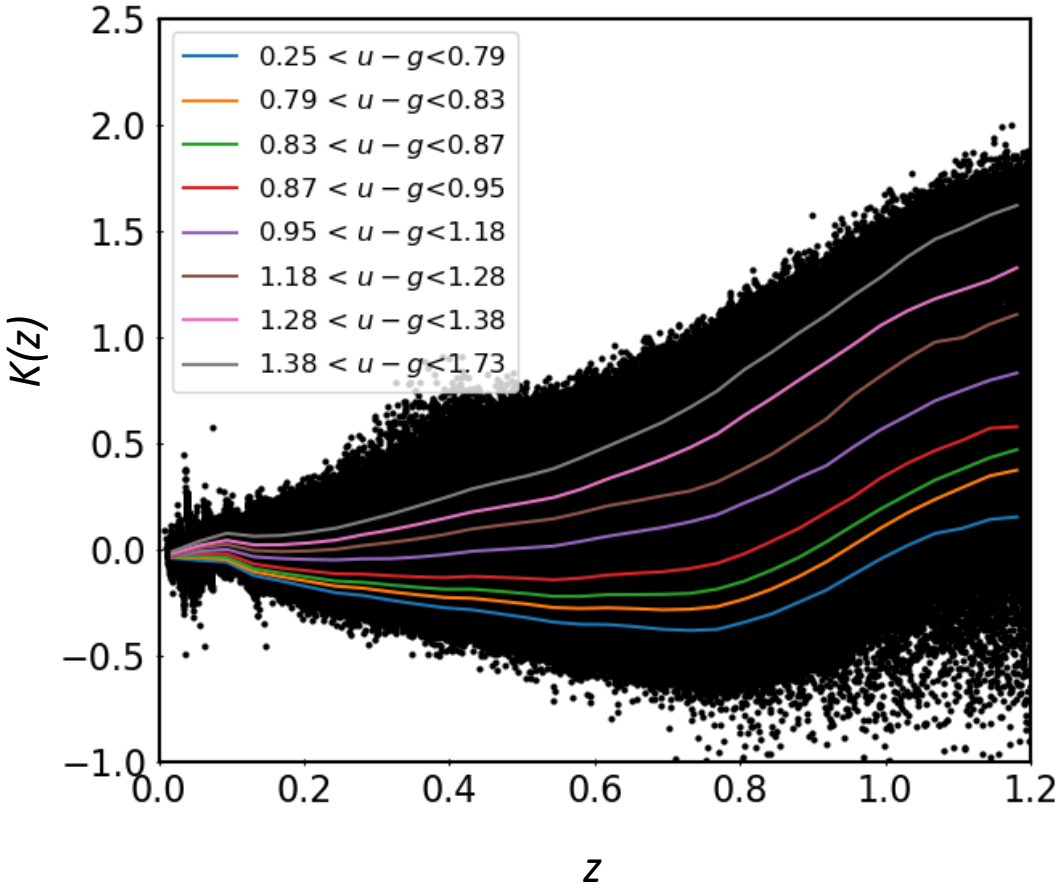
- Add uncertainties on mock lightcone redshift to see the impact on the Luminosity function.

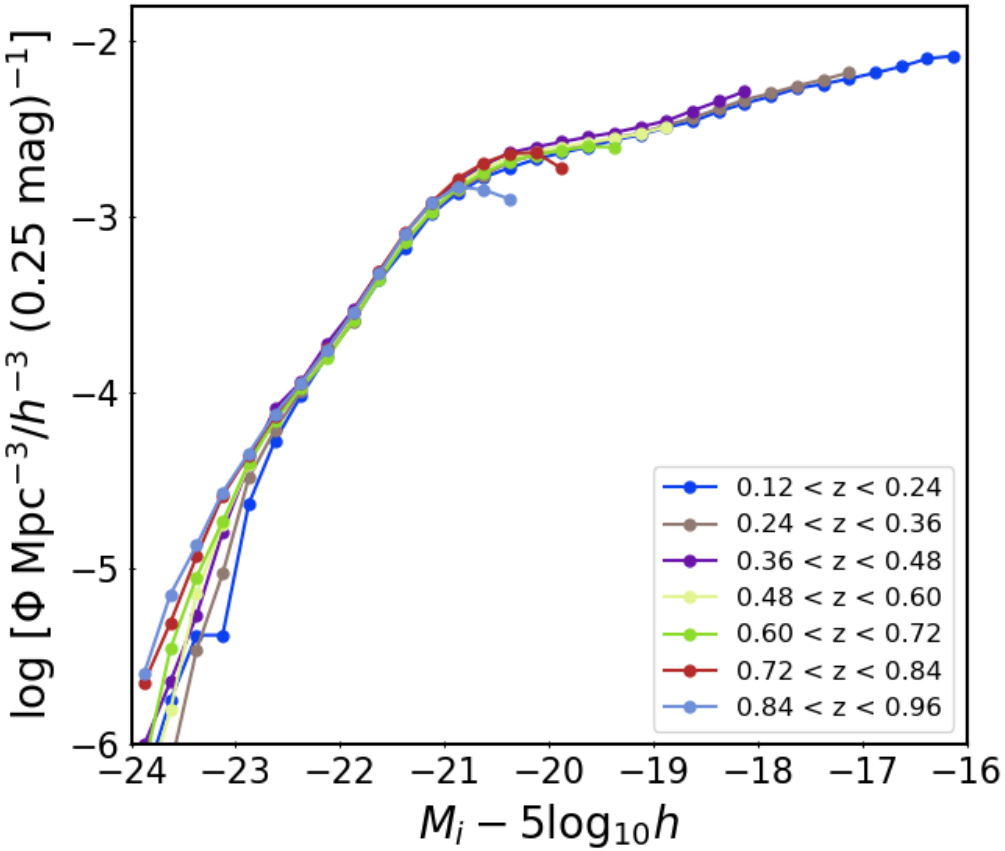
Summary and Conclusion

- Galaxy surveys as zCOSMOS, GAMA, VIPERS and PAUS trace the galaxy evolution at the second half of cosmic history.
- The PAU survey aims to observe photo-z with 0.35% errors. Such uncertainties need to be tested on the mock lightcones.
- A restframe Blue magnitude is defined in PAUS to observe the evolution of the cosmic star formation rate density.
- The luminosity function in the *i-band* is used to select galaxies and obtain the blue-band luminosity function.

Thank you !

PAUS i-band luminosity function





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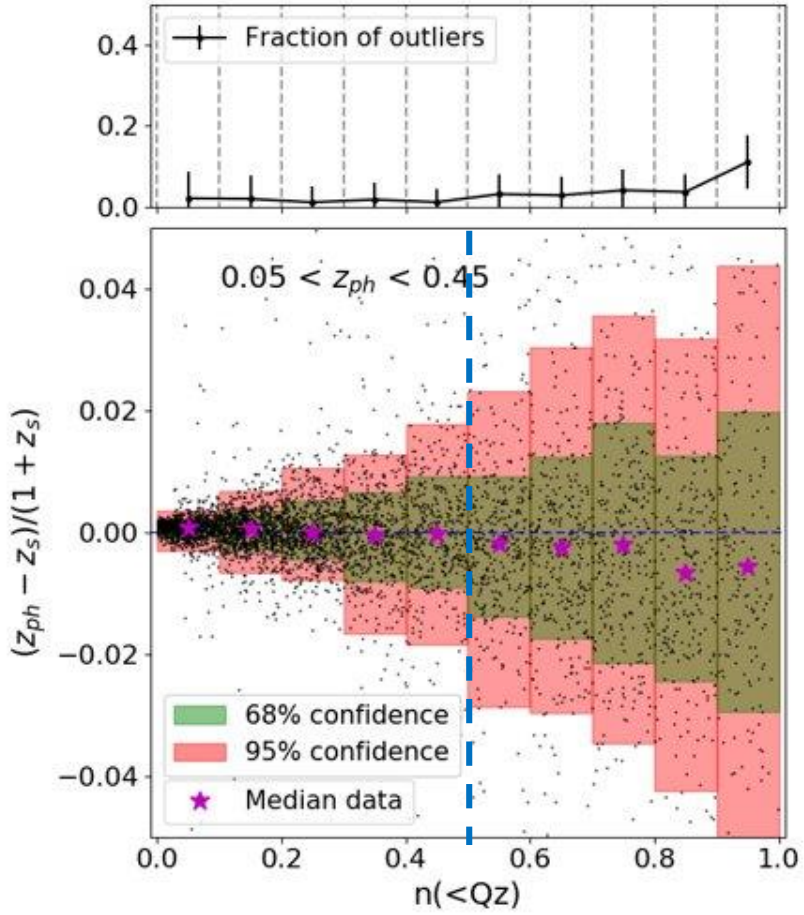
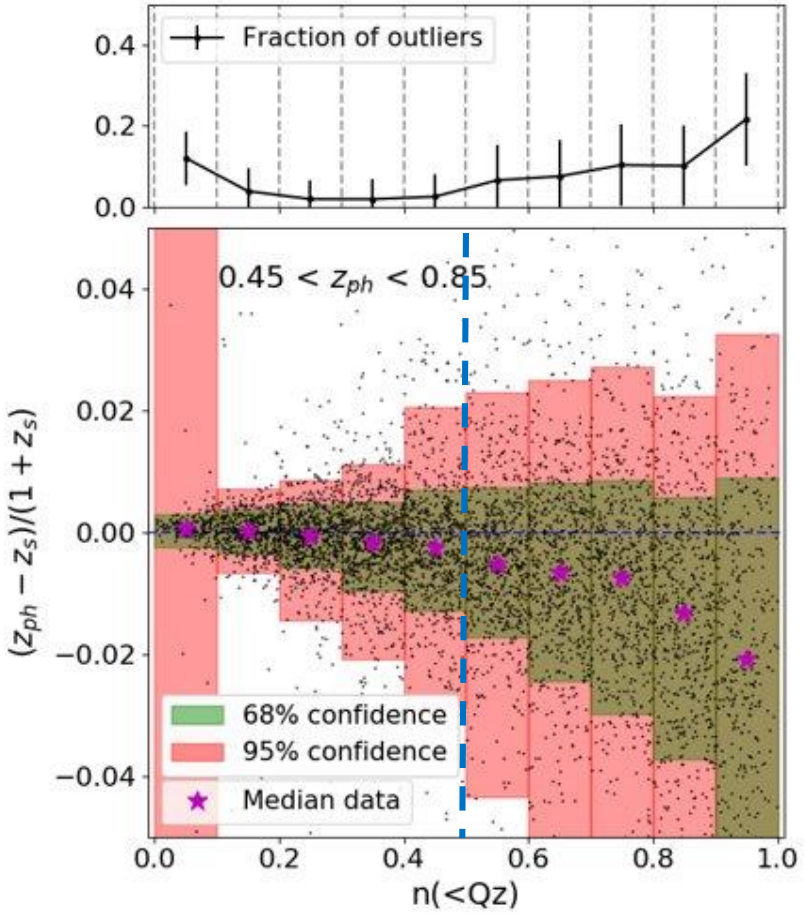
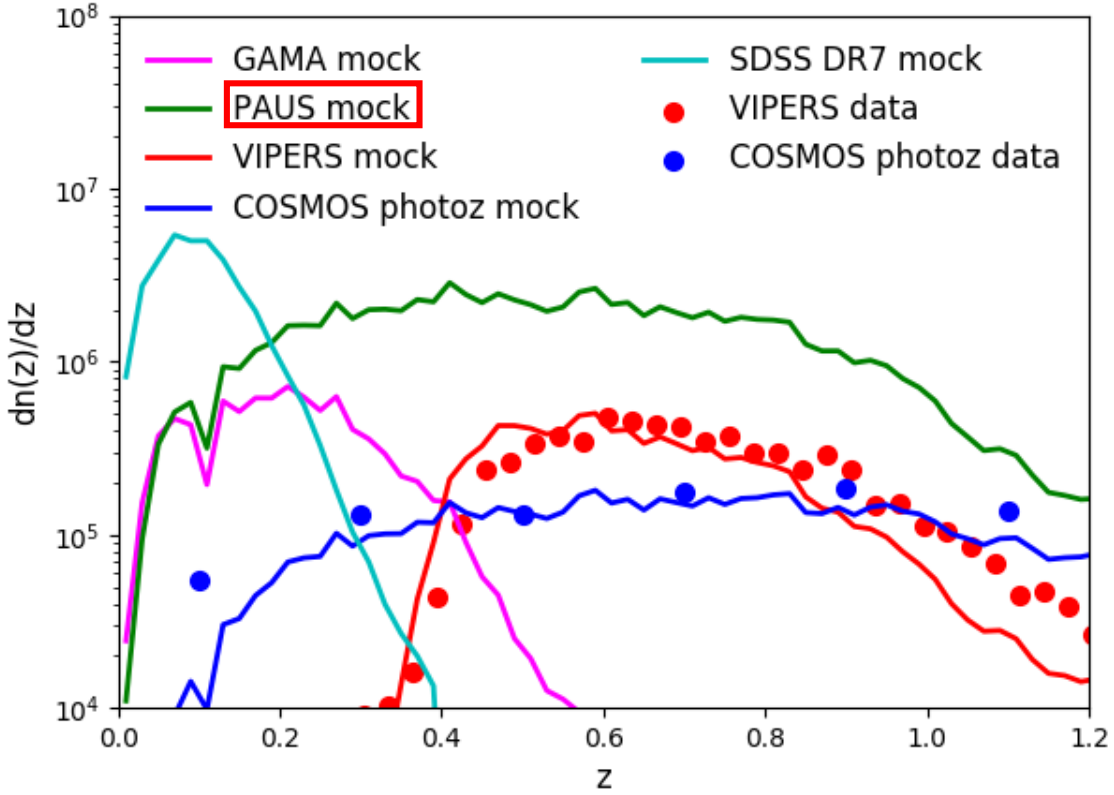




Data: good quality bad quality good quality bad quality

Mock light-cones



Stothert+ (2018)

PAUS mock lightcone