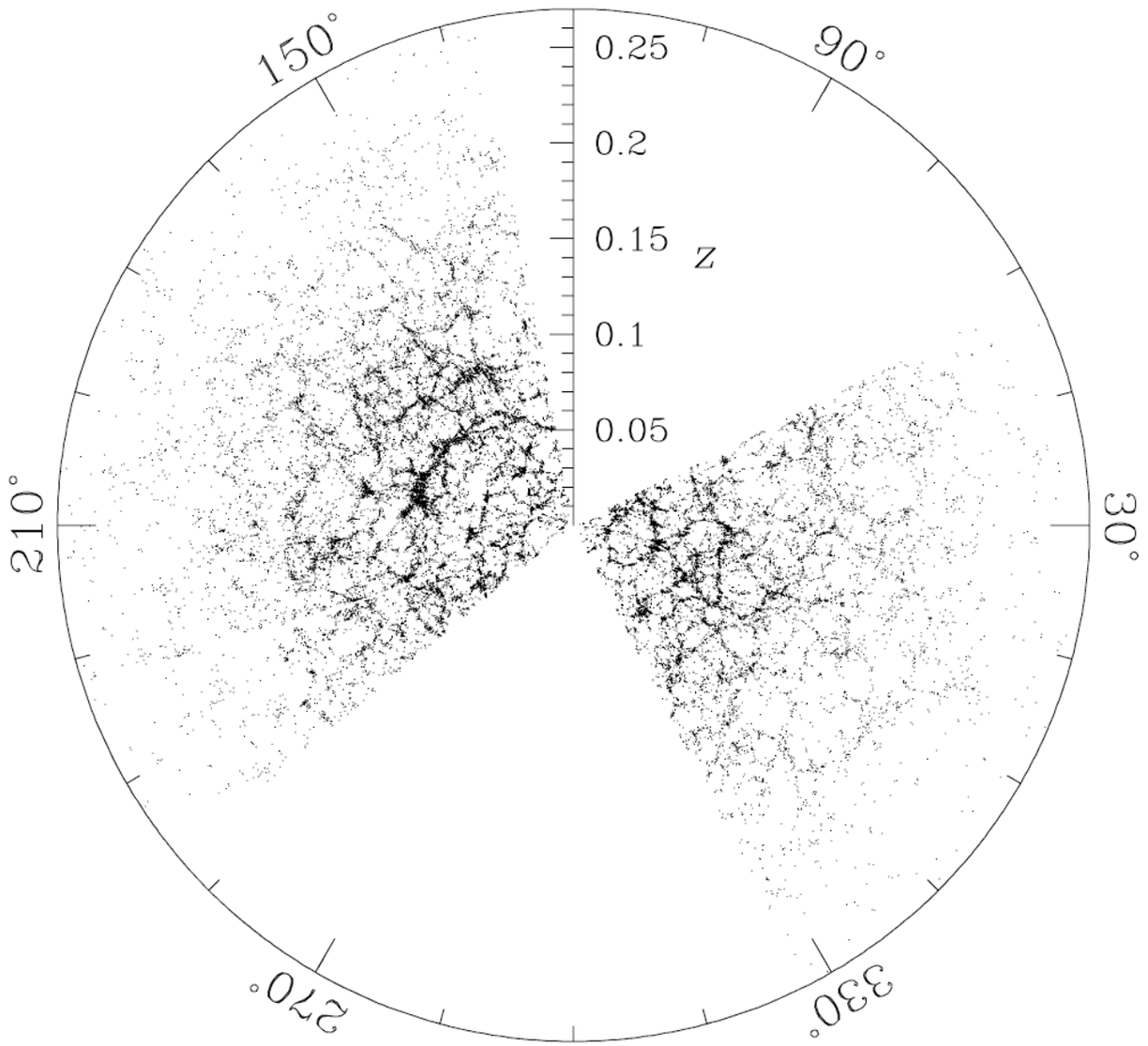
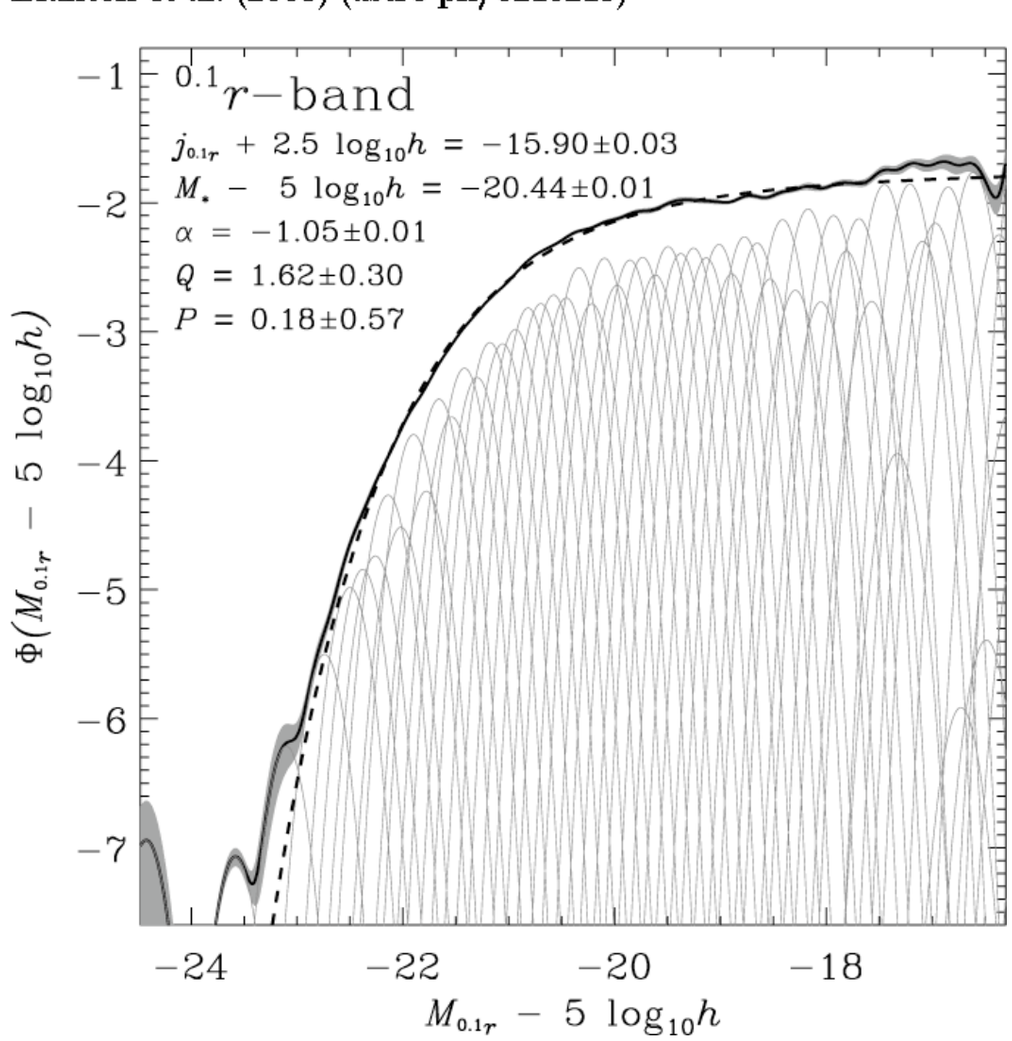
Extra-galactic science

Pieter van Dokkum

SDSS

- SDSS is standard z=0 comparison point





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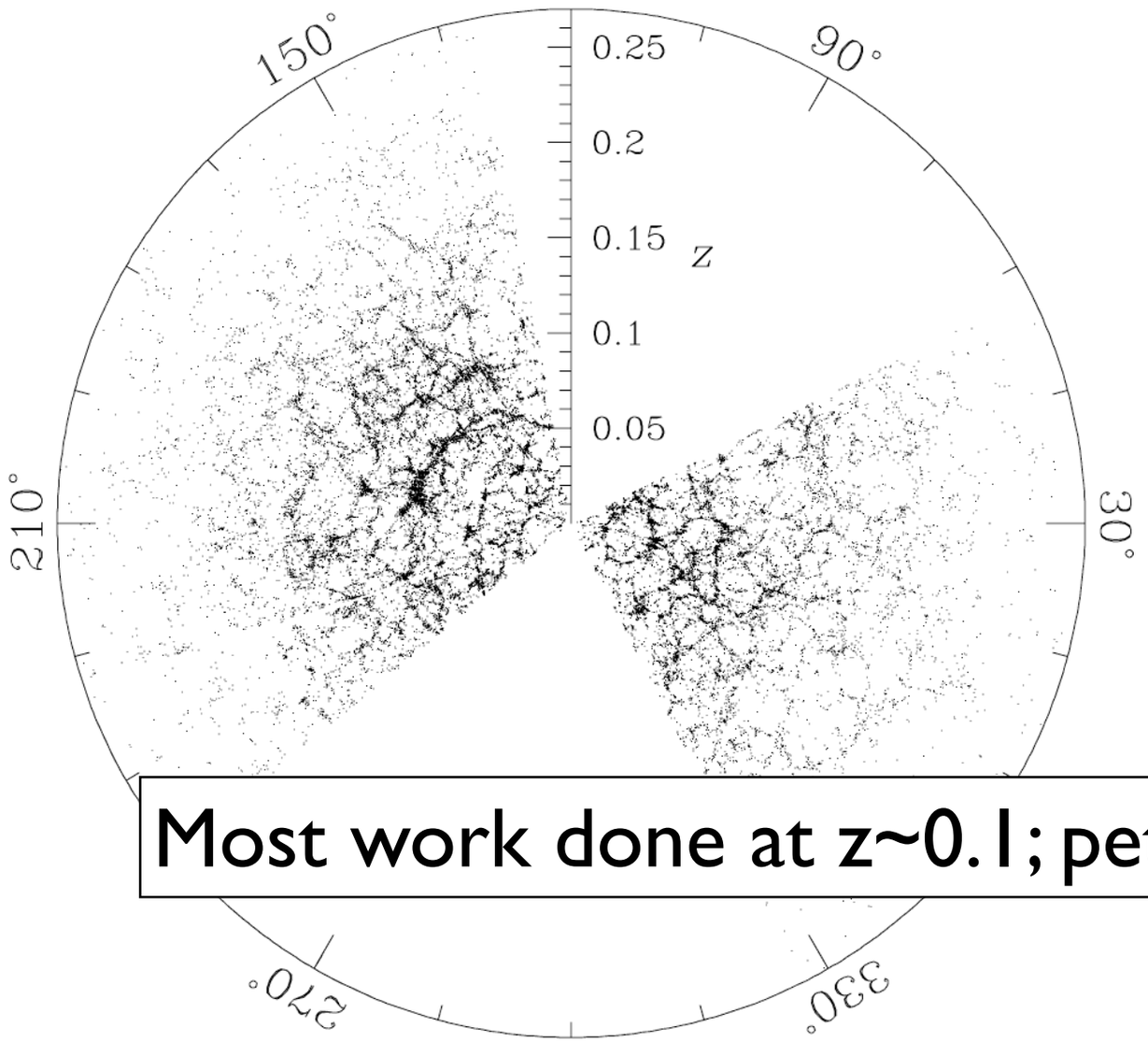
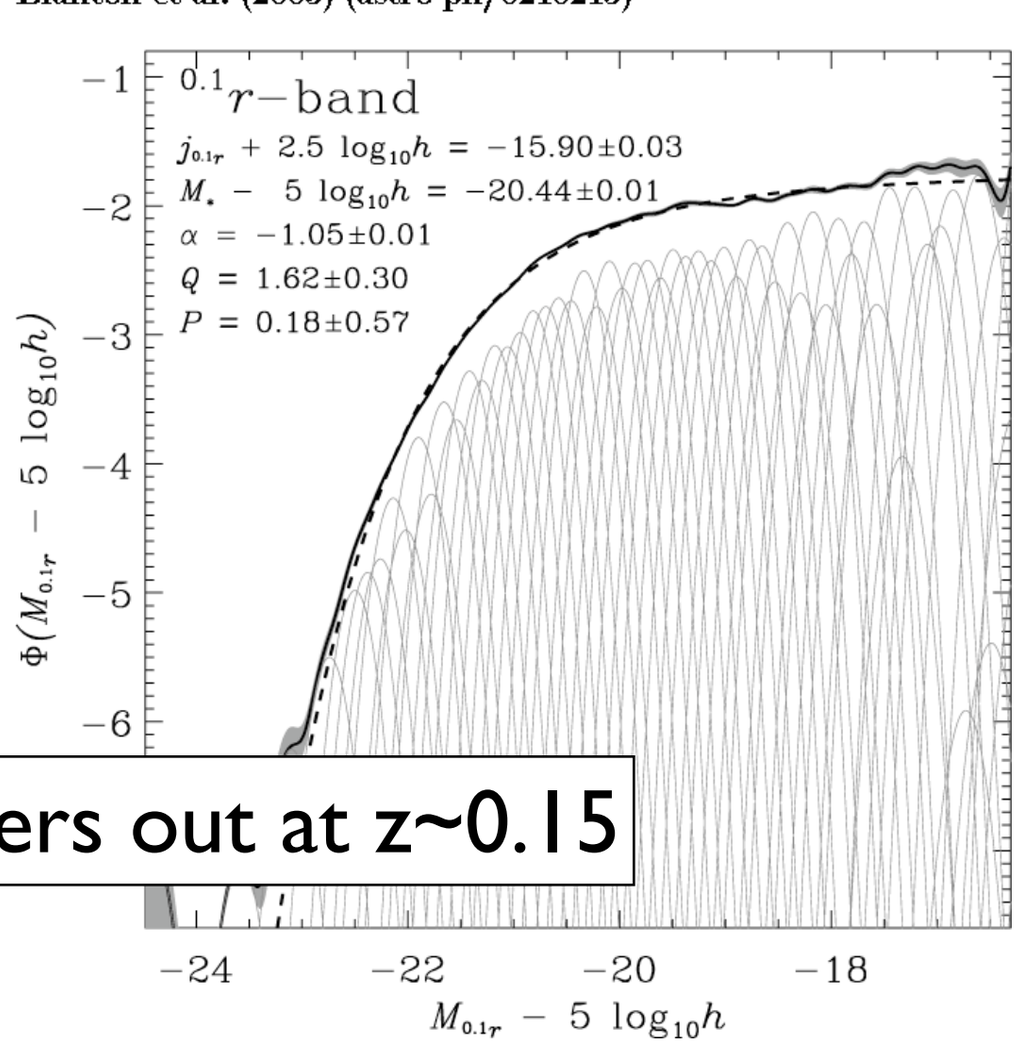
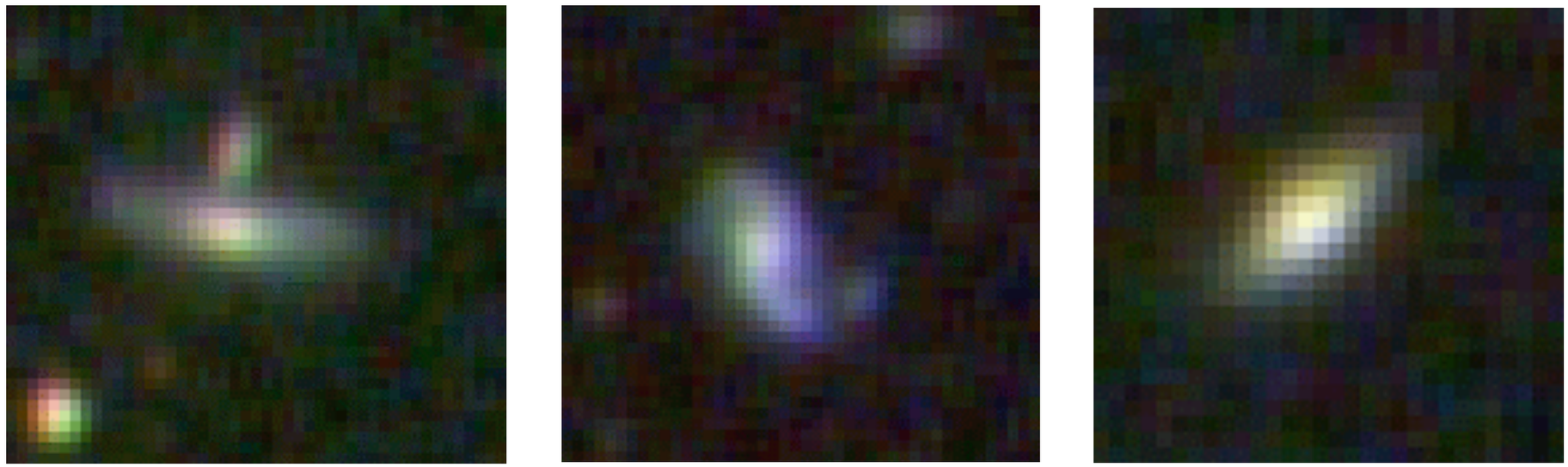




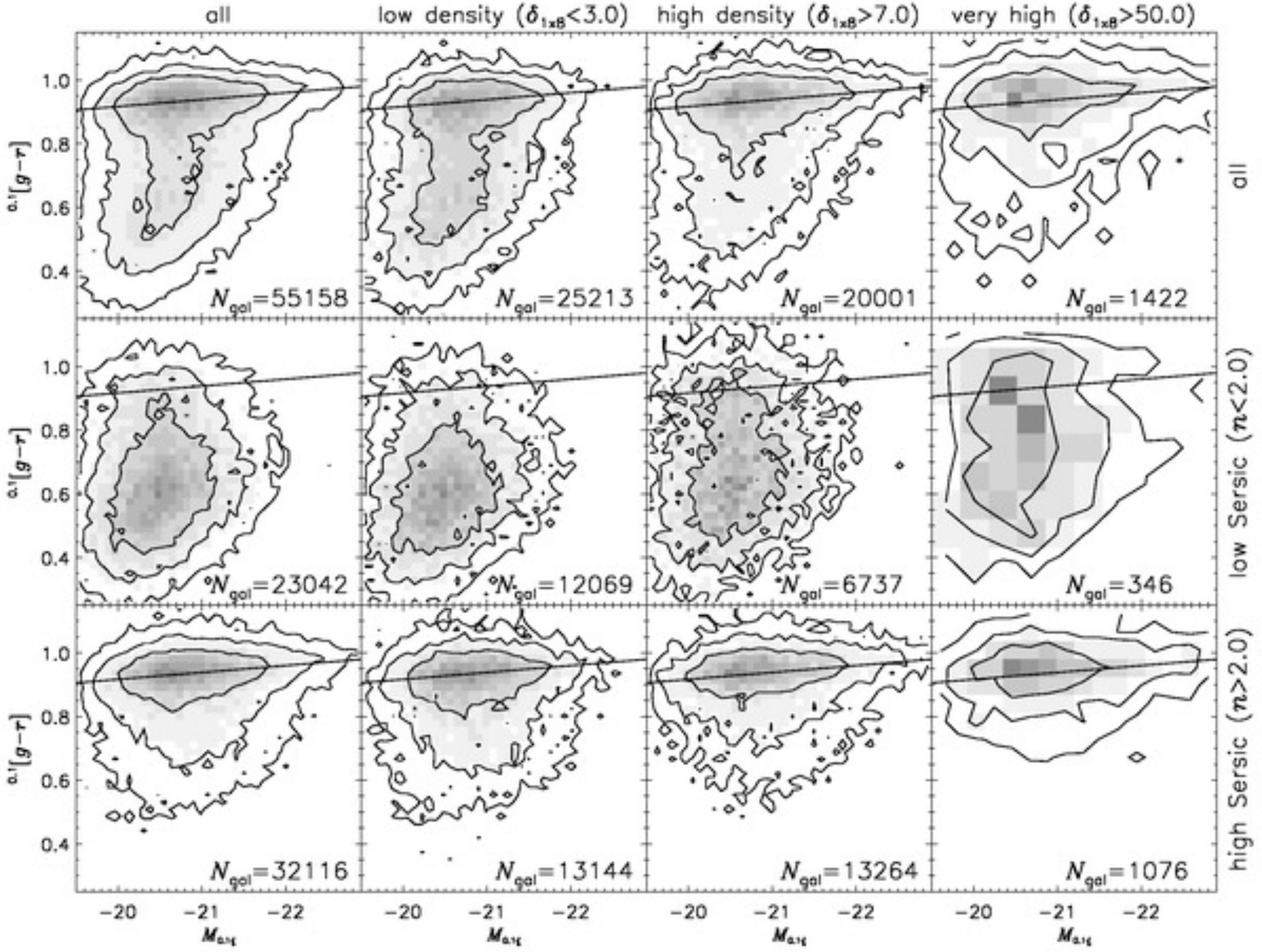
Most work done at z~0.1; peters out at z~0.15

SDSS

- Some random galaxies in SDSS at z=0.1



- Not the best ever, but does not stop people from measuring sizes, Sersic indices, etc



Hogg et al 2003

SDSS basic metrics

- Volume: ~10,000 sq degrees, z<0.1 = 0.1 Gpc^3
- Resolution: 1.3” FWHM, at z~0.1 = 2.5 kpc
- Sampling: 0.4” per pixel, at z~0.1 = 0.7 kpc/pixel
- Depth: 51 sec on 2.5m telescope

SDSS equivalent at 0.5<z<1

- Volume over entire sky = 125 Gpc^3: to get 0.1 Gpc^3 need 0.1/125 x 40,000 = 32 square degrees
- 2.5 kpc resolution: need 0.4”-0.3” at z=0.5-1
- 0.7 kpc sampling: 0.11” - 0.09” pixels at z=0.5-1
- Apparent magnitude difference of standard candle between z=0.1 and z=0.75 is 5.0 mag: need 51 sec x 10,000 x $(2.5/3.6)^2$ x $(0.4/1.3)^2$ = 6.5 hrs

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Very close to “strawman” survey specs !

Expected data

- Some 10,000,000 galaxies with ugriz photometry and well sampled images
- Evolution of galaxies as a function of environment, size, stellar mass, halo mass (from lensing), etc

0.75” seeing, 0.24” pixels

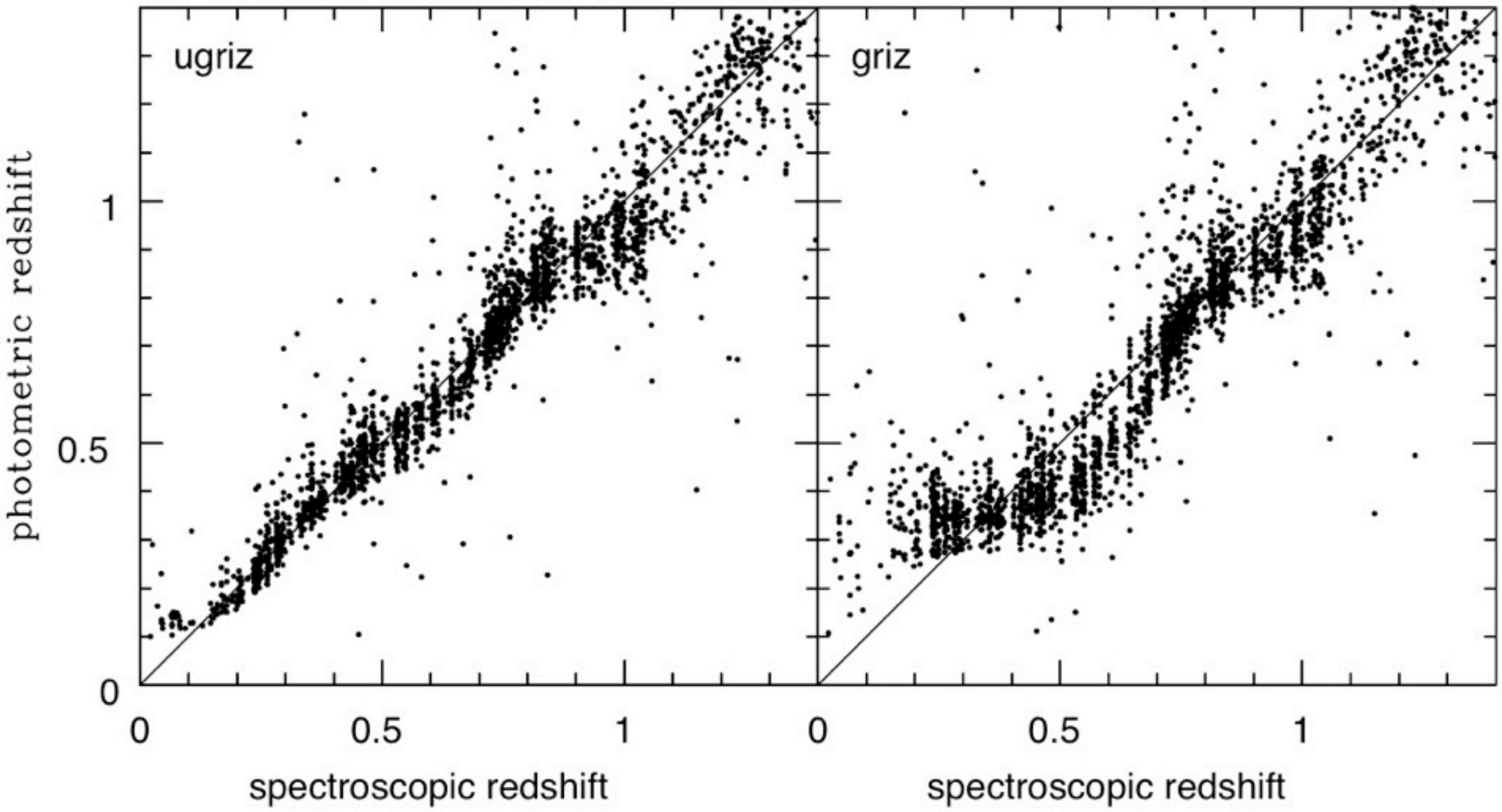
0.35” seeing, 0.10” pixels

What's the catch ?

- Bandpass shifting: need near-IR data for z=1 galaxies to match optical data for z=0 galaxies
- Redshifts: spectroscopy has been crucial part of SDSS's success
- Without redshifts, data utterly useless

Needed

- Need full ugriz coverage for decent photometric redshifts - ideally also coverage in near-IR, UV, etc



Open questions

- Filters: default is griz, but ugriz gives much better photo z's (and enables work on LBGs, QSOs)
- Depth: SDSS did same integration time in all bands, but could be optimized (perhaps)
- Area: what is optimal in range 20-40 sq deg ?
- Fields ....

Field considerations

- Many little ones or a few big ones ?
- Optimize for follow-up, or allow fields away from equator and/or clumped at some RA ?
- What are most crucial ancillary data ?
  - near-IR ? (VISTA will likely be the most relevant)
  - spectroscopy ? (nothing really available [yet])
  - space-based ? (Spitzer, Herschel, whatnot)

Field considerations

- Many little ones or a few big ones ?
- Optimize for follow-up, or allow fields away from equator and/or clumped at some R.A. ?
- Potential to define "default" ~30 sq deg survey regions ... let's do this right !
  - near-IR ? (VISTA will likely be the most relevant)
  - spectroscopy ? (nothing really available [yet])
  - space-based ? (Spitzer, Herschel, whatnot)