

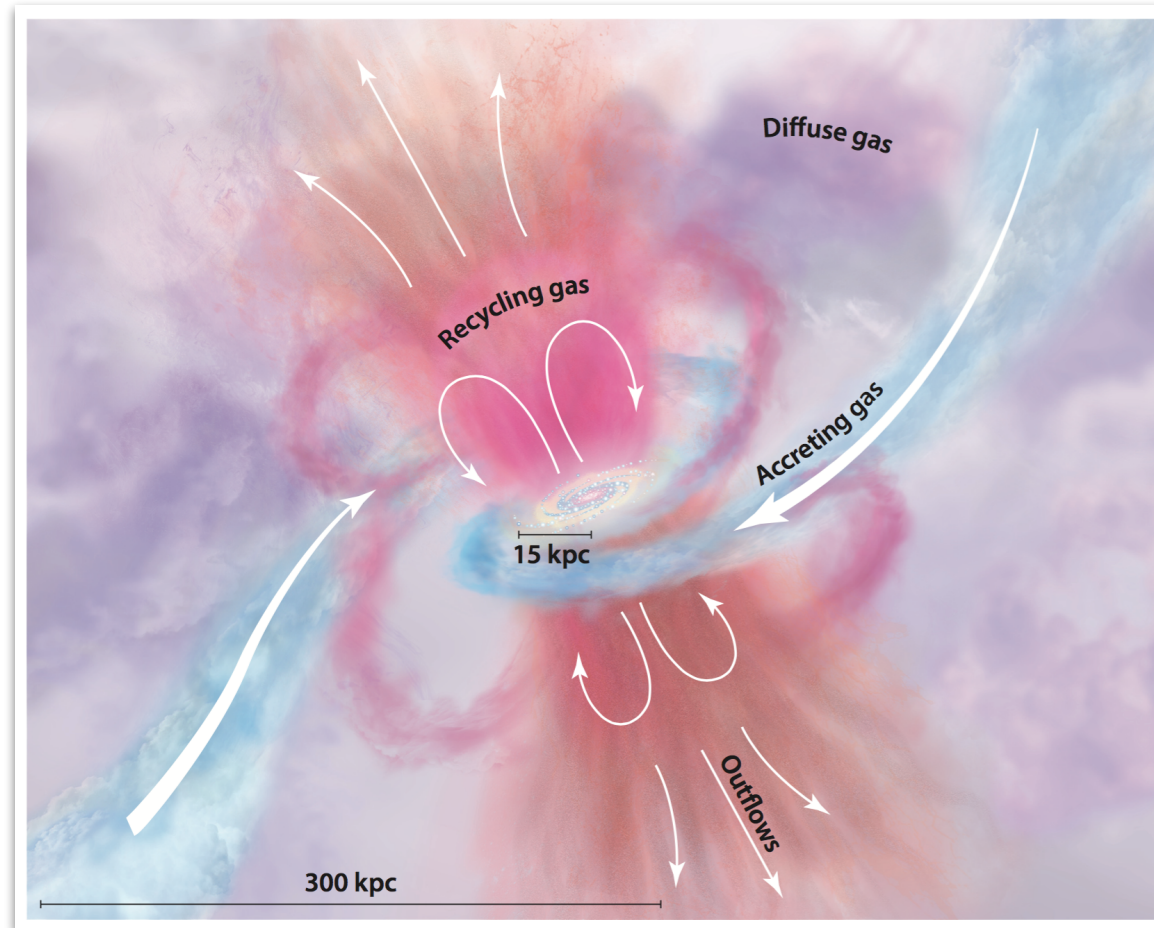
HSC Project 13

Statistical study of the galaxy-MgII absorber relation with the Subaru HSC-Wide survey

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CGM: Complex structure

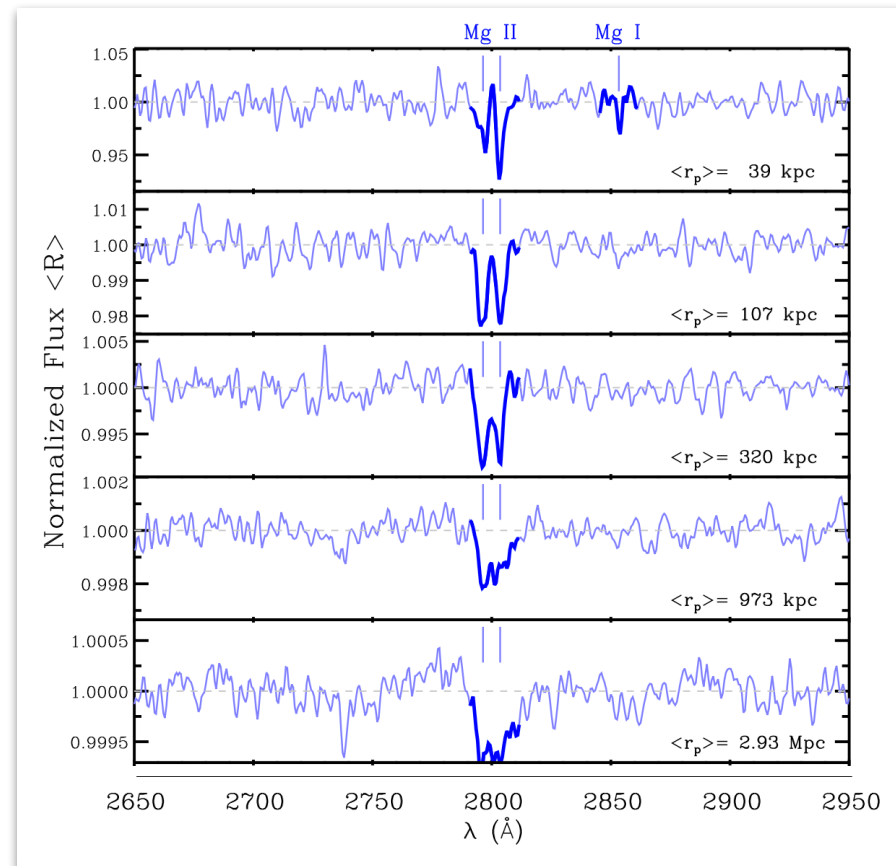


Jason Tumlinson et al. 2017

Goal: Reveal CGM structure observationally.

MgII absorber systems

Normalized SDSS QSO spectra



Guangtun Zhu, Brice Menard et al. 2013

- Doublet & Strong absorption feature
- Rest-frame wavelength
 $= 2796, 2803 \text{ \AA}$
➔ redshifted into optical wavelength if:
 $0.35 \lesssim z_{\text{abs}} \lesssim 2.3$
- Trace low temperature ($\sim 10^4 \text{ K}$) & high density gas

Previous study

Lan et al. 2014 w/ SDSS galaxies & SDSS QSOs

$z \sim 0.5$, bright galaxies ($18 < r < 22$)

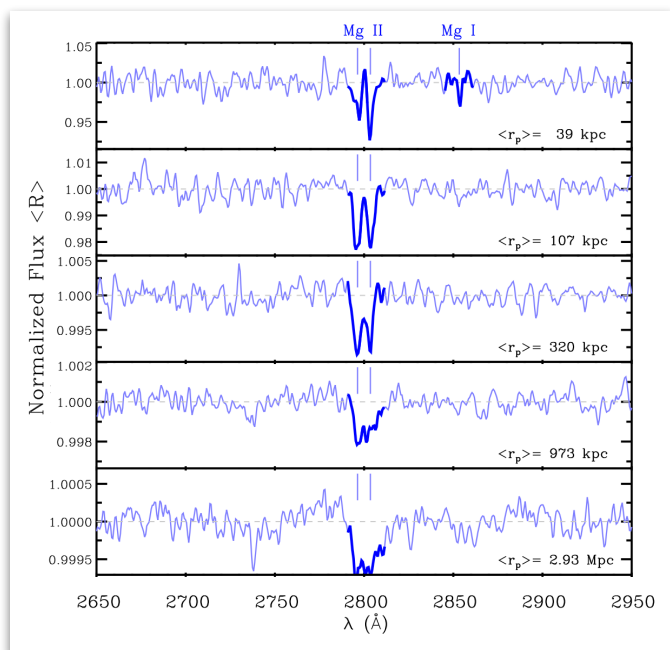
- MgII absorbers are associated w/ both blue and red galaxies.
- Distribution of MgII becomes clumpy toward outer region of galactic haloes.

Questions

- Are MgII absorbers associated w/ blue/red galaxies at **$z > 0.5$** ?
- Which are MgII absorbers strongly correlated w/ **bright or faint galaxies**?
- Does MgII distribution **evolve w/ redshift**?

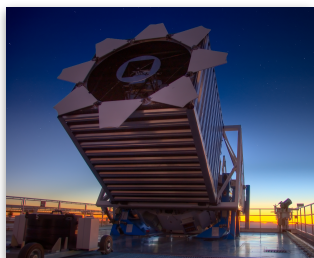
Data

MgII absorber SDSS QSO spectra



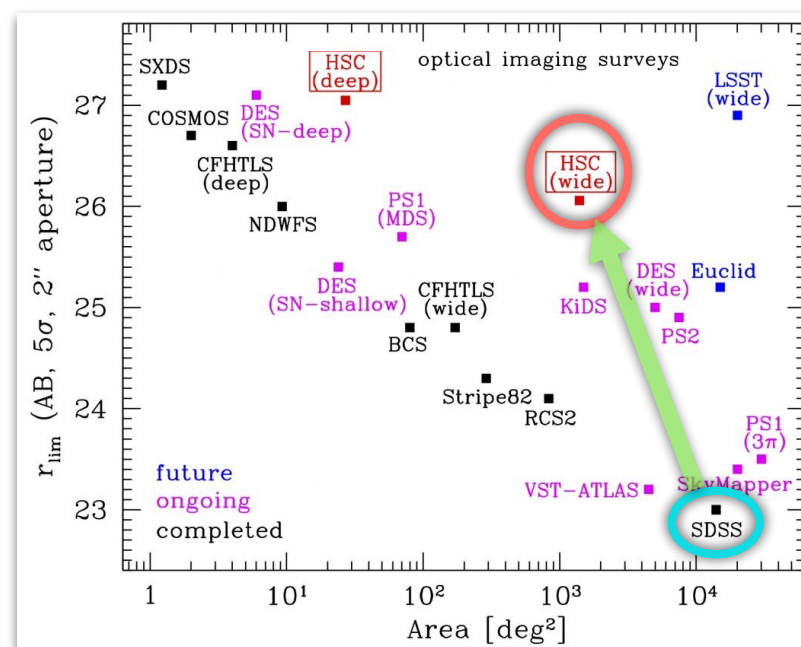
Guangtun Zhu, Brice Menard et al. 2013

- ~43,000 MgII abs (DR7&9)



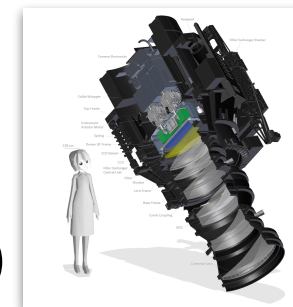
- $W_0 > 0.4 \text{ \AA}$
- $0.4 < z_{abs} < 2.0$ (93%)

Galaxy HSC-Wide survey



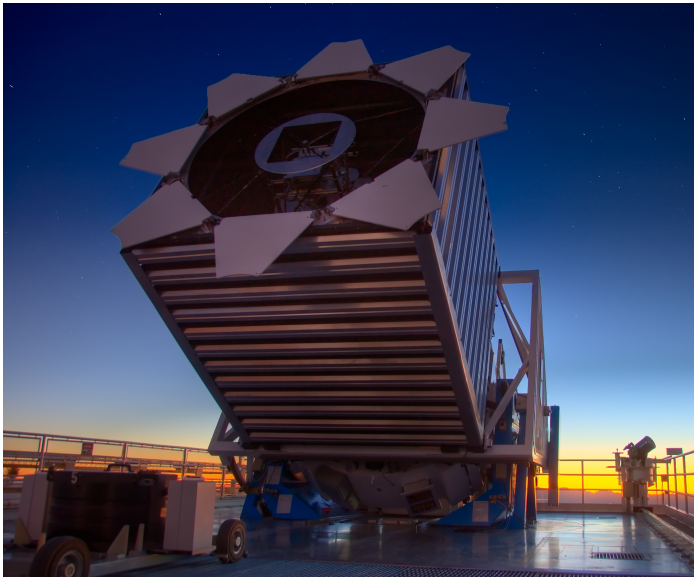
(<http://hsc.mtk.nao.ac.jp/ssp/science/weak-lensing-cosmology/>)

- ~200 deg^2 , ~19M galaxies
- $m_z \leq 24$ mag,
 $\sigma_{m_z} \leq 0.1$
- $z_{photo} < 1.6$ (91%)



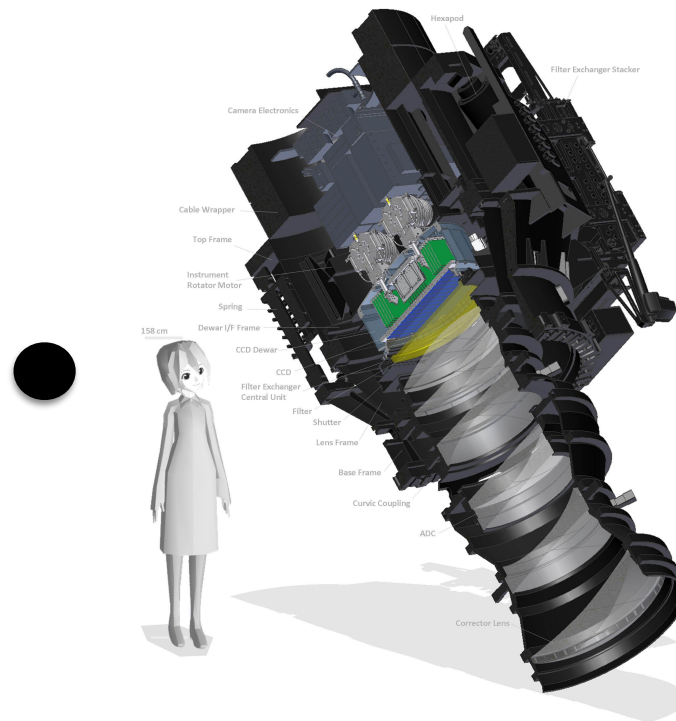
Cross correlation

SDSS MglI absorber systems



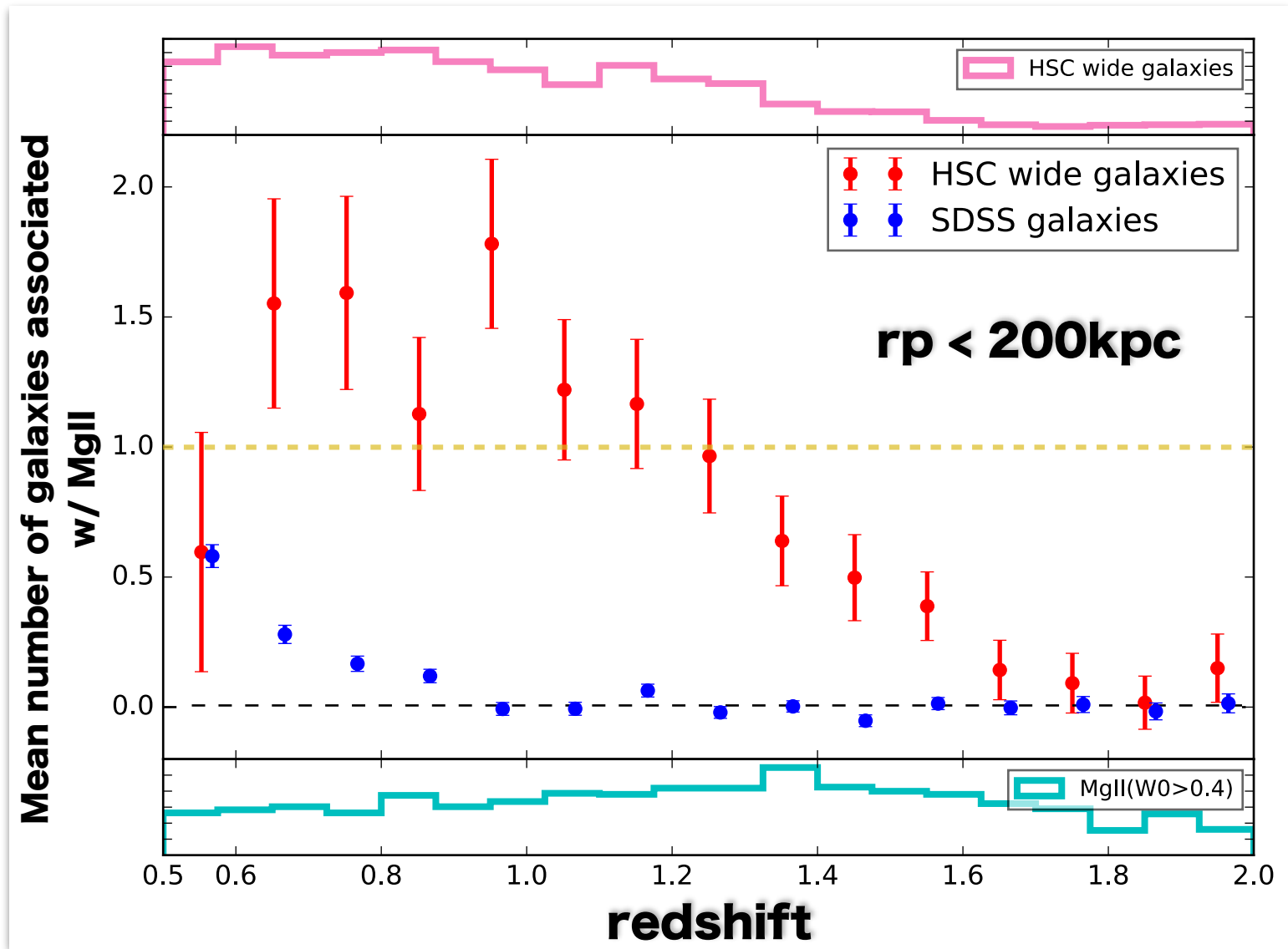
~1,300 MglI abs

HSC-Wide galaxy catalog

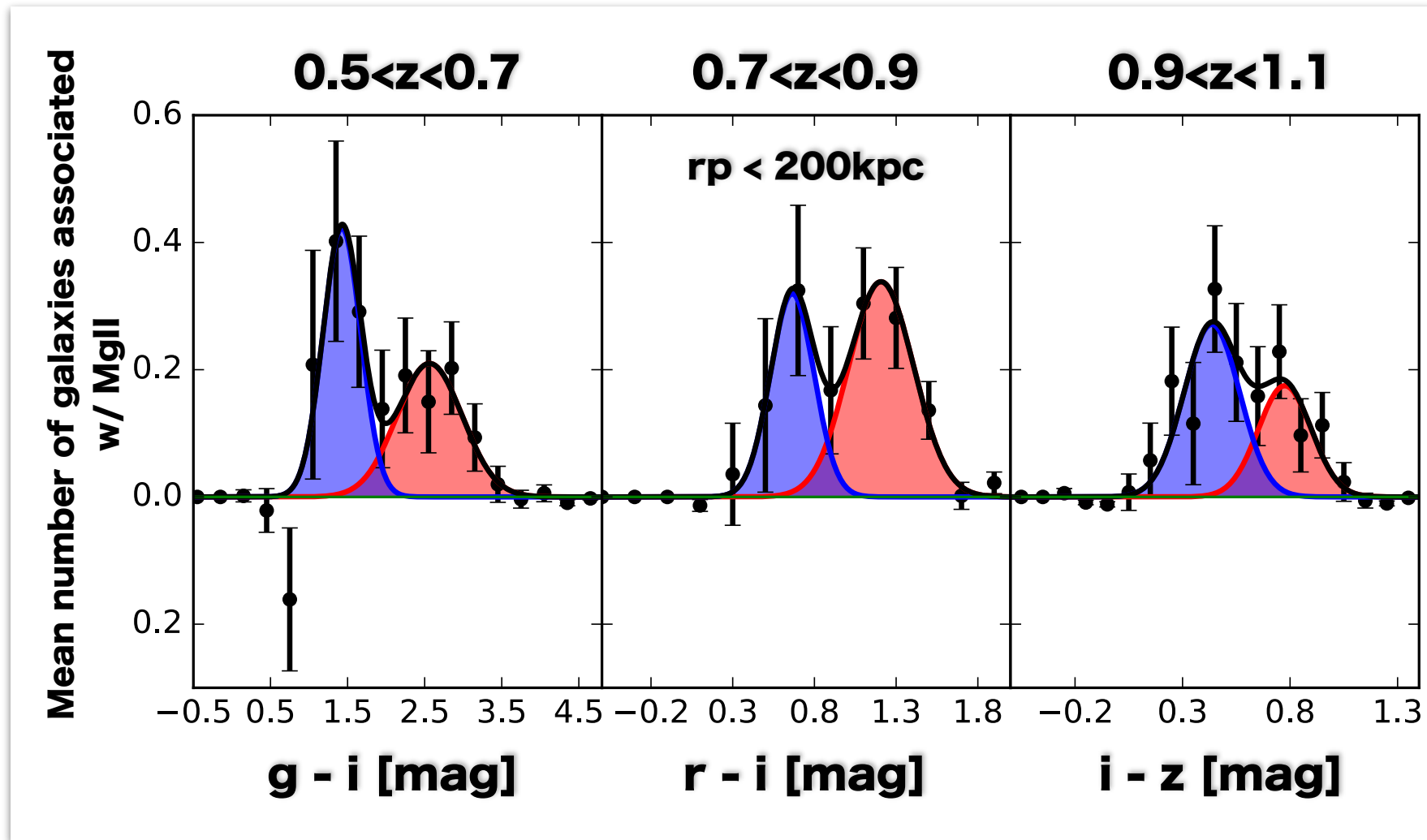


~19M galaxies

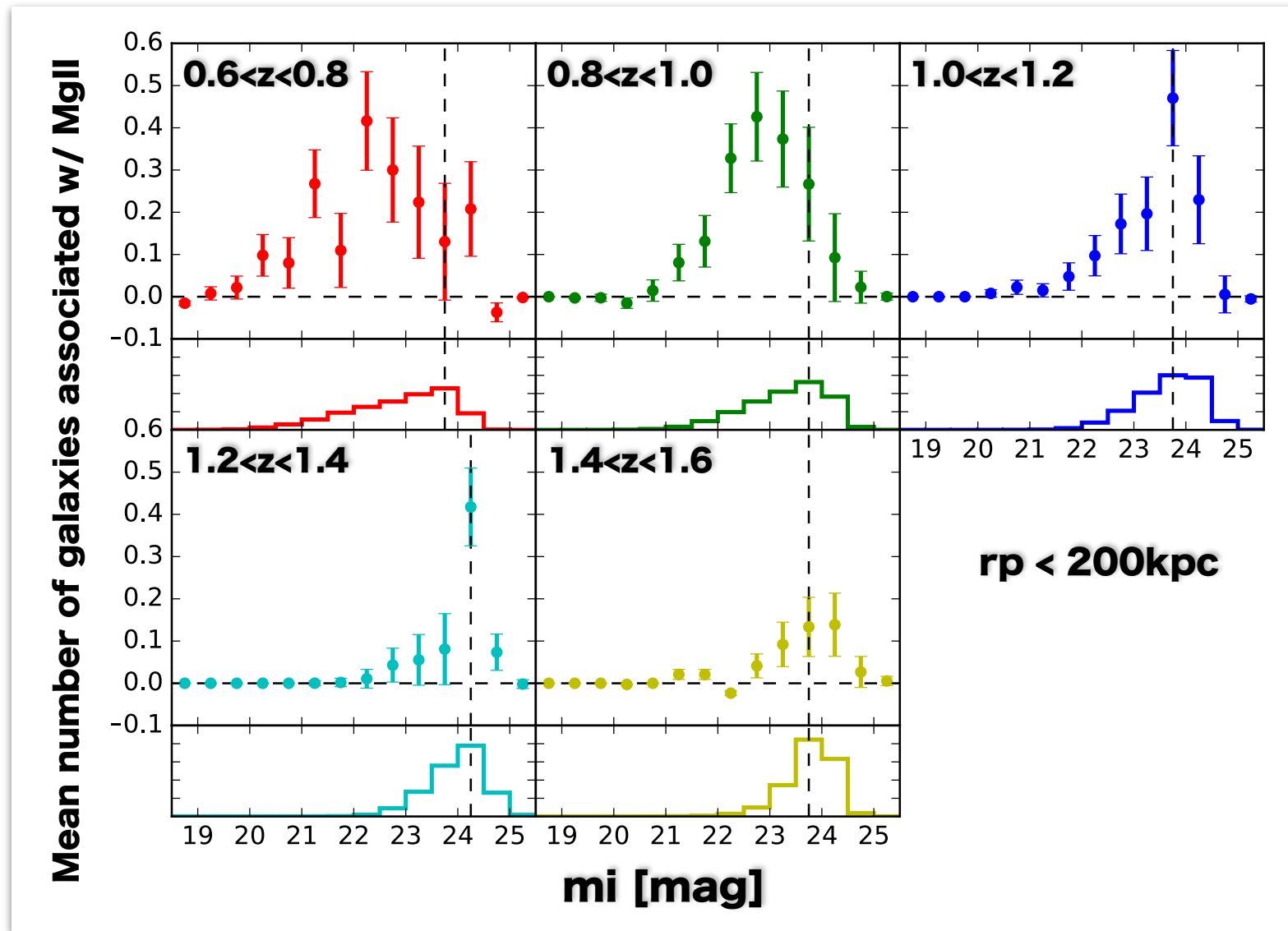
Cross correlation Result



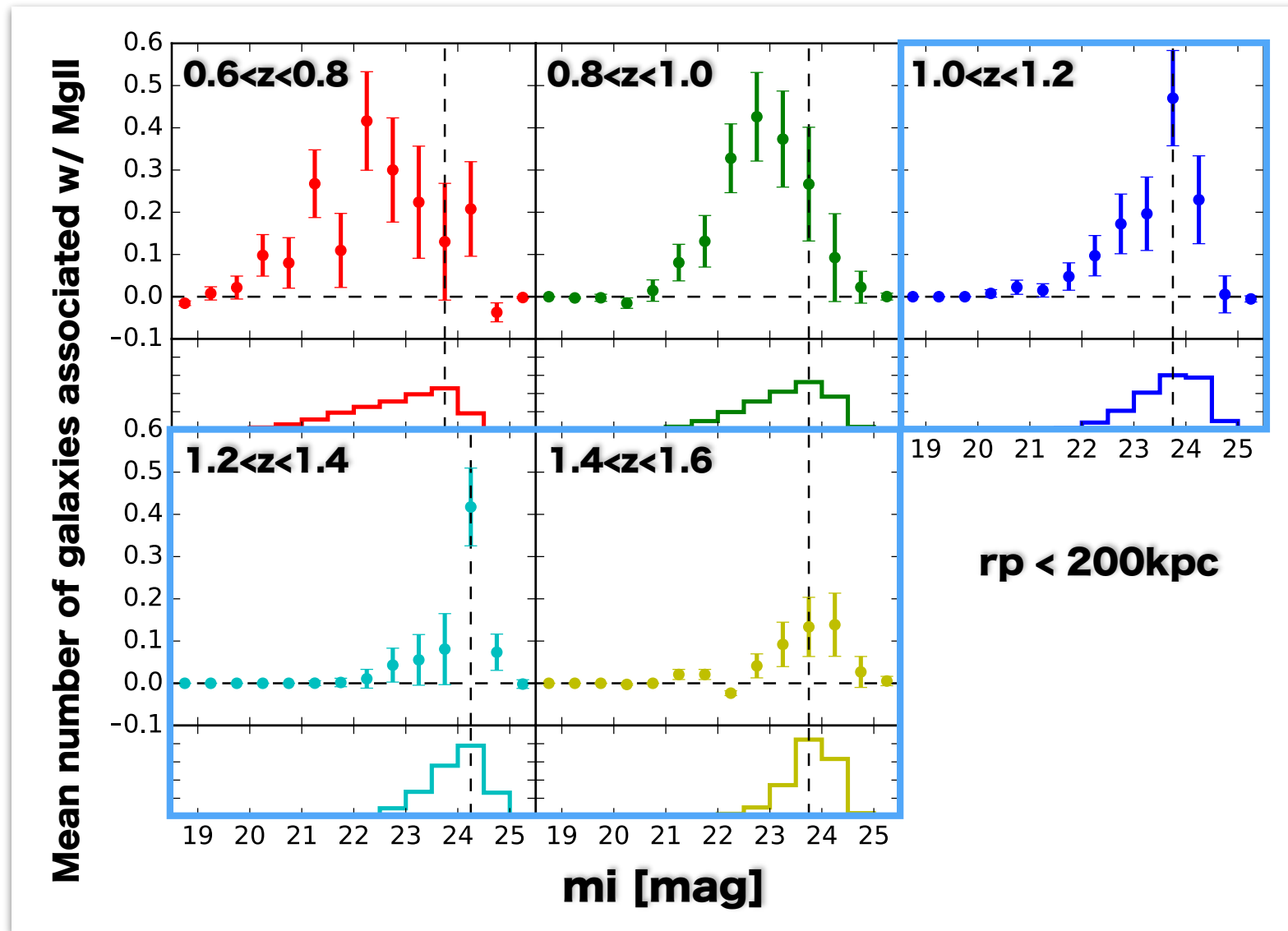
Are MgII associated w/ both blue & red galaxies?



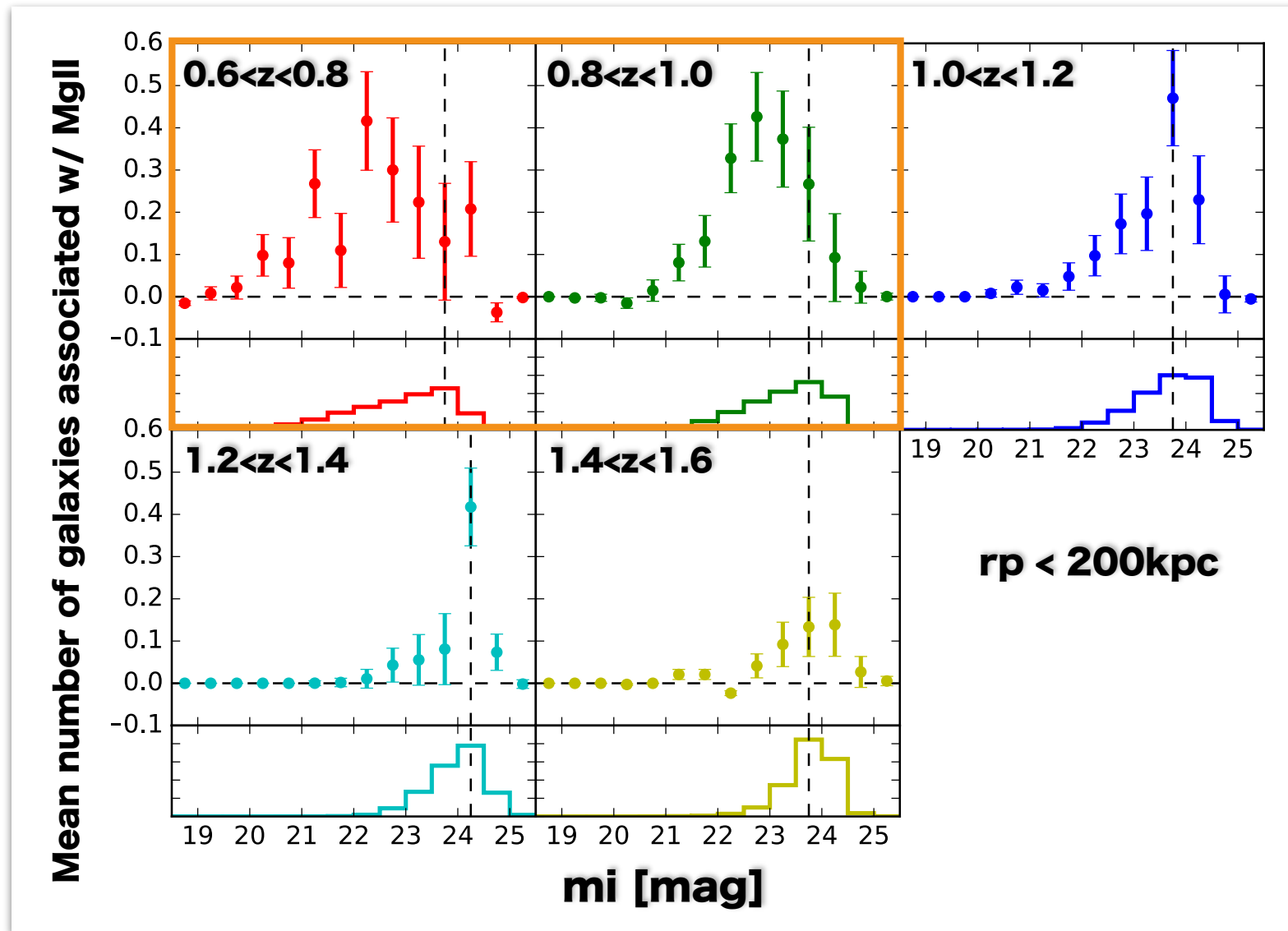
Which are MglIs strongly correlated w/, bright or faint galaxies?



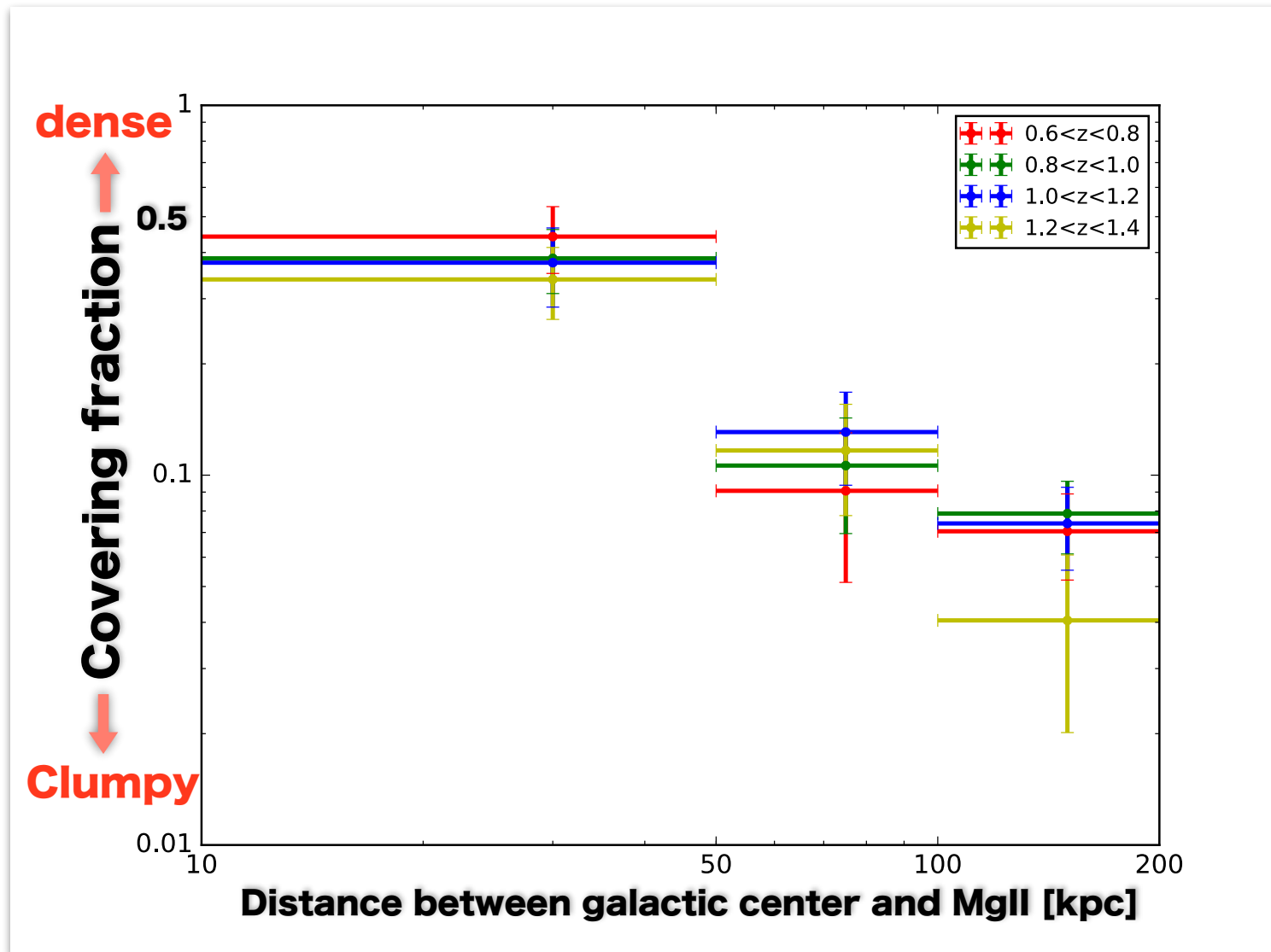
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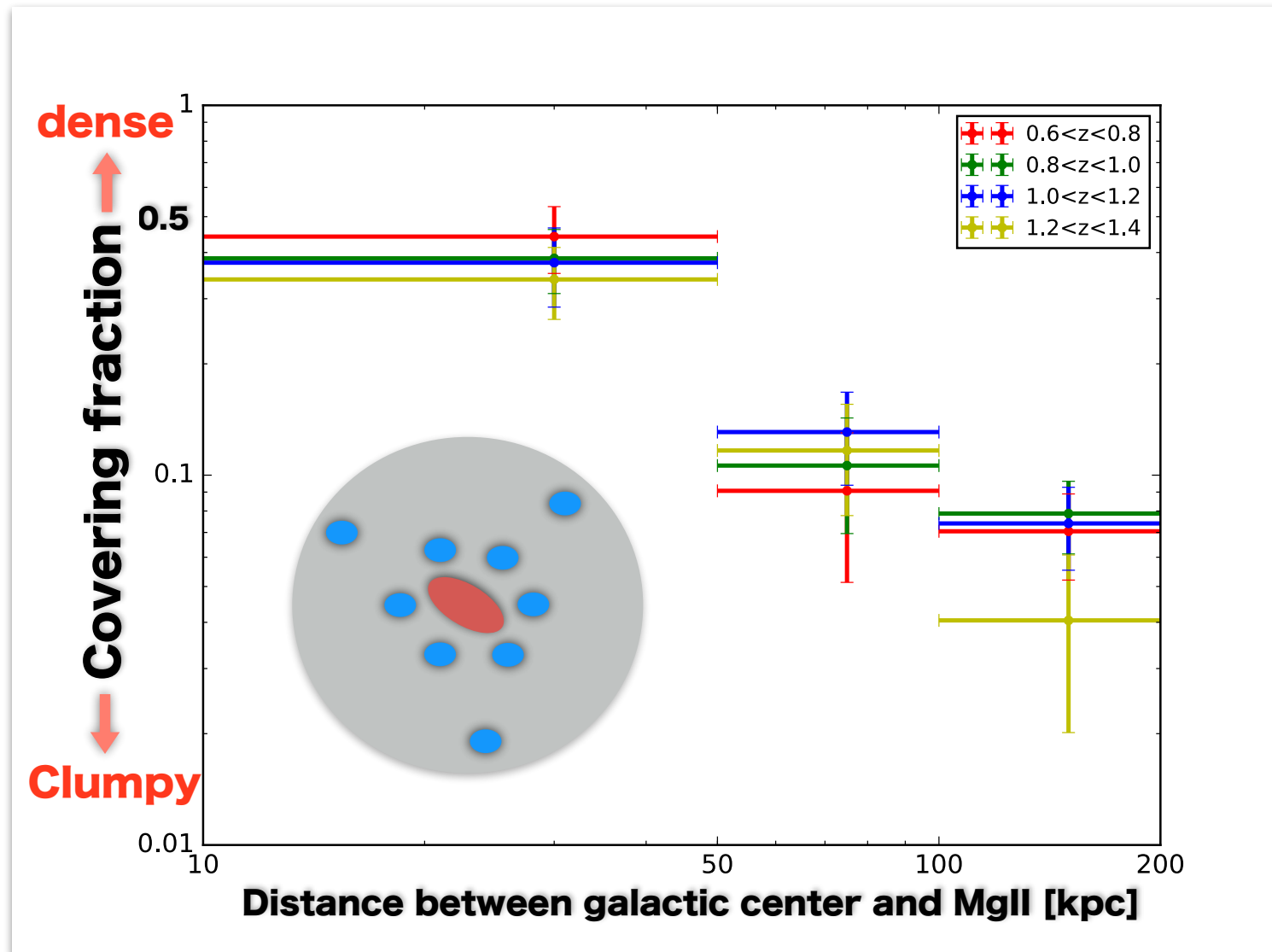
Which are MglIs strongly correlated w/, bright or faint galaxies?



Does MglI distribution evolve w/ redshift?



Does MglI distribution evolve w/ redshift?



Summary

- **Are MgII absorbers associated w/ both blue and red galaxies?**
- **Which are MgII absorbers strongly correlated w/, bright or faint galaxies?**
- **Does MgII distribution evolve w/ redshift?**

Summary

- Are MgII absorbers associated w/ both blue and red galaxies?

Yes, at $0.5 < z < 1.1$.

- Which are MgII absorbers strongly correlated w/, bright or faint galaxies?

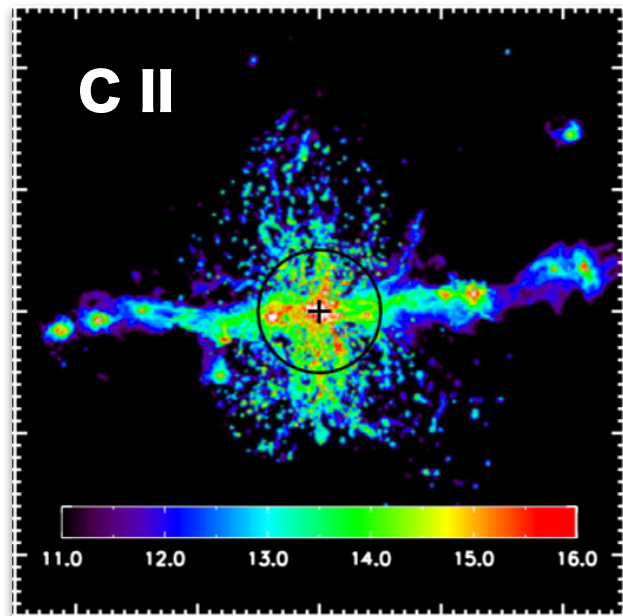
More strongly correlated w/ bright ones at $0.6 < z < 1.0$. At $z > 1.0$, the correlation w/ bright ones was at least detected.

- Does MgII distribution evolve w/ redshift?

No, within error bars at $0.6 < z < 1.2$.

Discussion & Future work

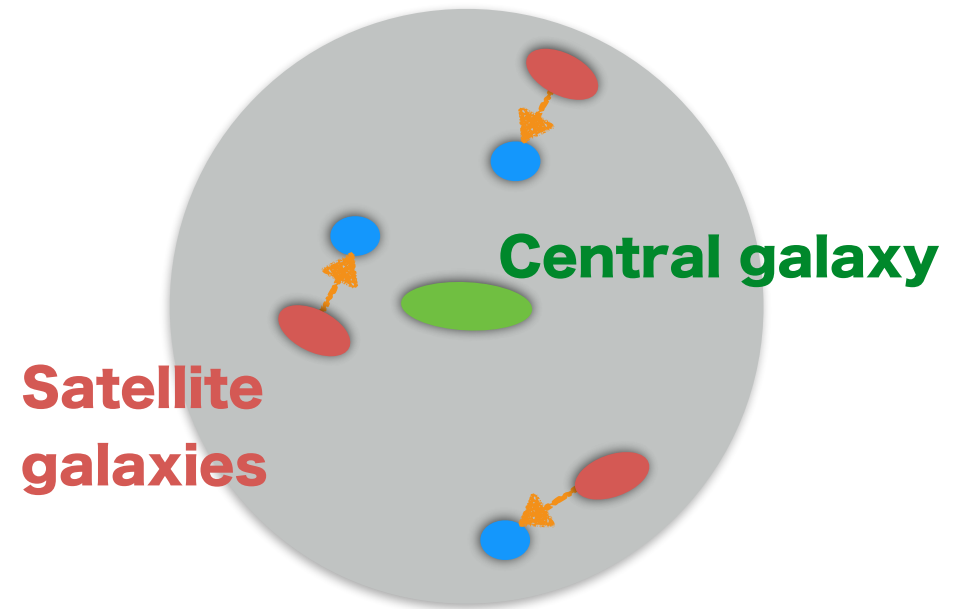
Outflow origin?



Shen et al. 2013

Bipolar distribution

Satellite galaxy origin?



→ Future Work

- Azimuthal angle dependence of MgII distribution around star-forming galaxies.

Summary of this talk

- We calculated galaxy-MgII cross-correlation w/ HSC-Wide galaxies and SDSS QSO absorbers.
- The non-zero signals are found at $z \sim 0.5-1.5$.
- We found that:
 - Both blue/red galaxies have MgII within 200kpc.
 - MgIIs are more strongly correlated w/ brighter galaxies.
 - Covering fraction doesn't evolve w/ redshift within errorbars at $0.6 < z < 1.2$.
- Our results can be explained by either the outflow or the satellite galaxy origin.