The IGM/CGM & galaxies at $z \lesssim 1.0$: environment & AGN

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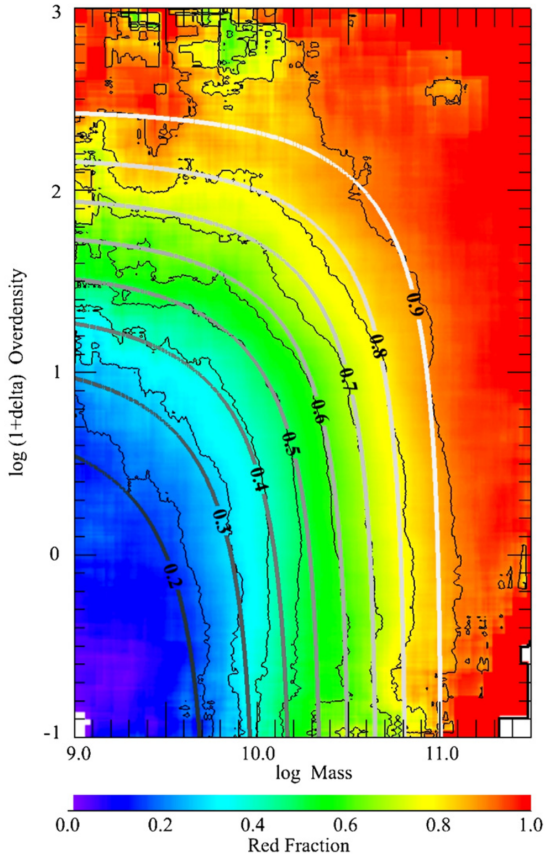
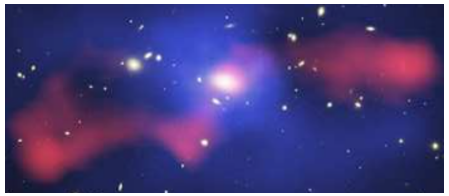
Galaxy evolution: mass, environment, and AGN. CGM?

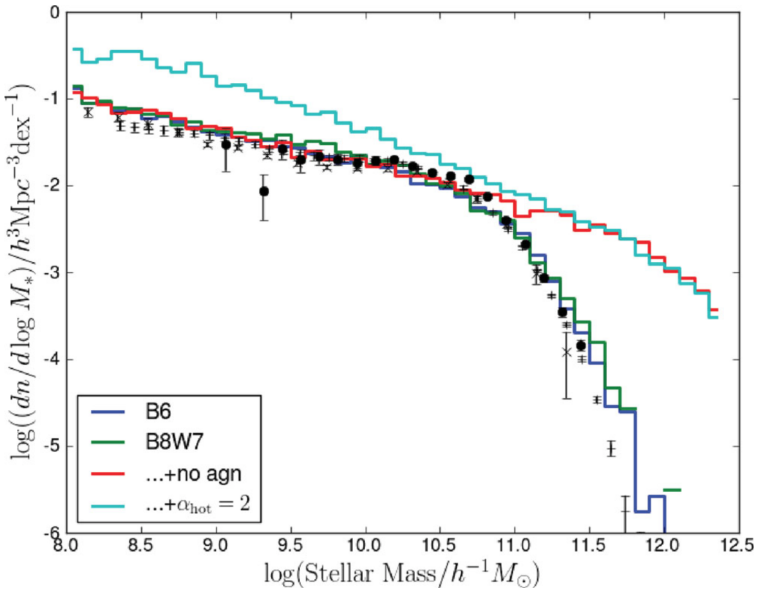
Red fraction versus mass & environment



Peng et al. 2010

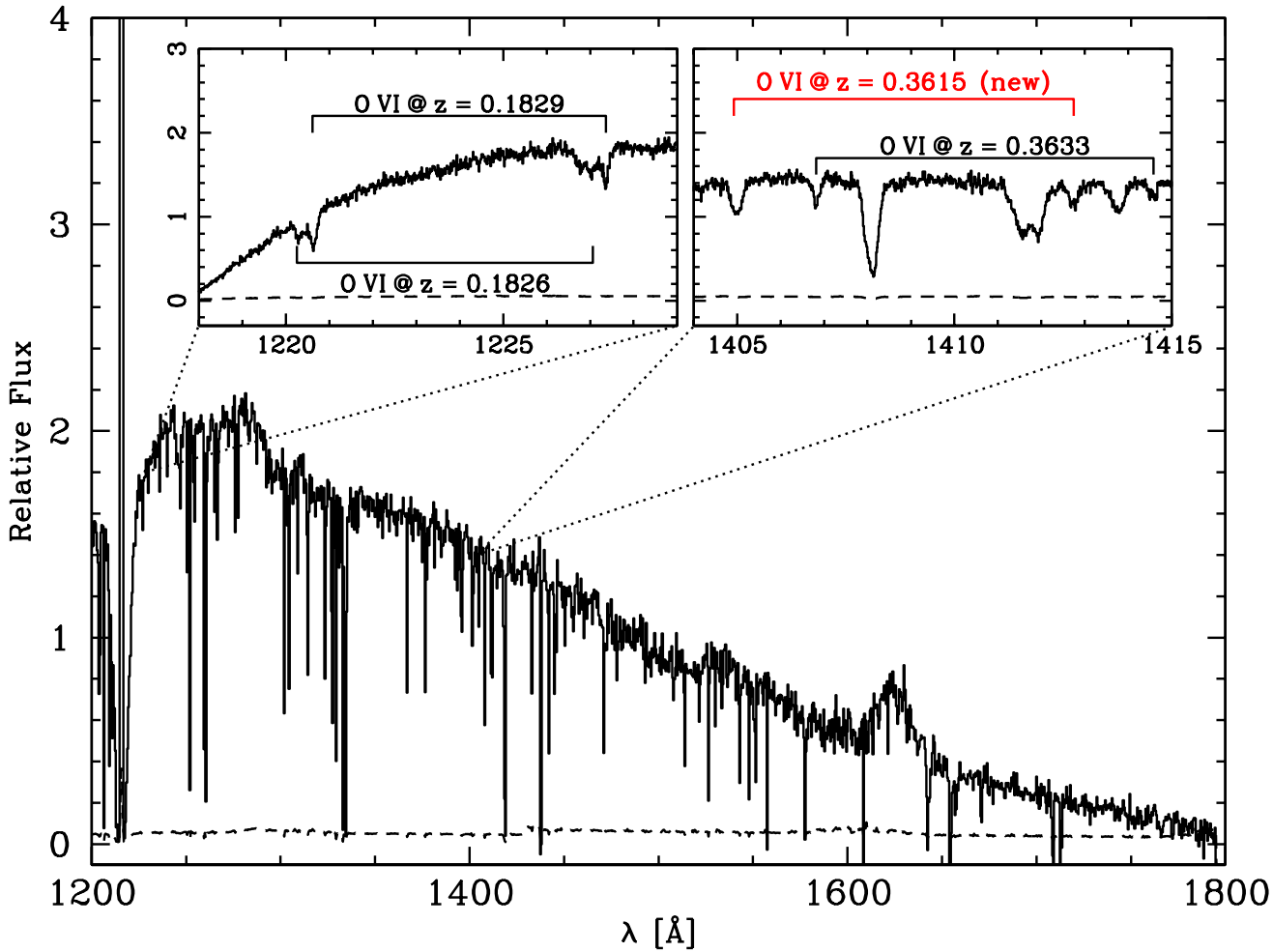
AGN feedback





McNamara et al. 2009 & Bower et al. 2012

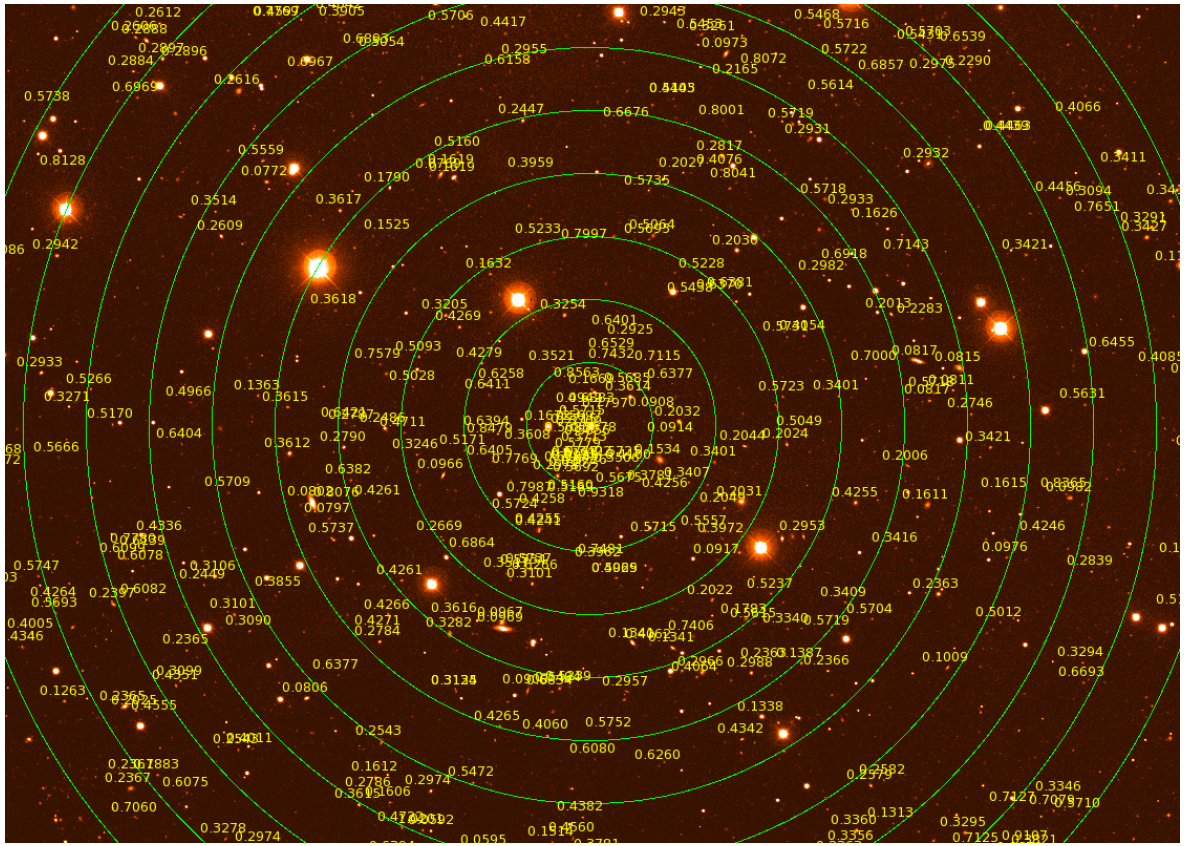
COS archive is great. Complement with galaxy surveys!



PKS 0405-123

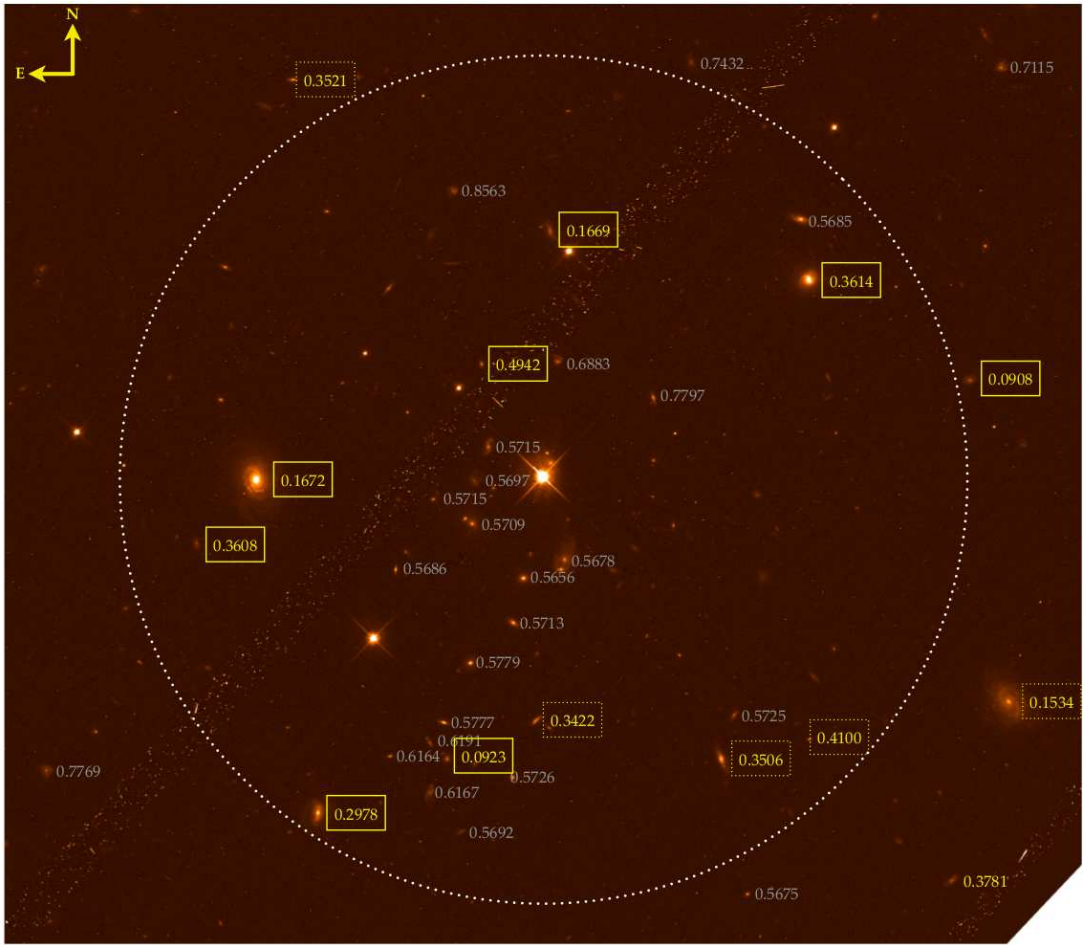
The IGM & galaxies at $z \lesssim 0.5$: IMACS + COS

- Conducting absorption-blind surveys of galaxies of $r < 23$ & $\theta < 10'$ (2.7 Mpc & 0.05 L_* at $z = 0.3$) in COS fields.



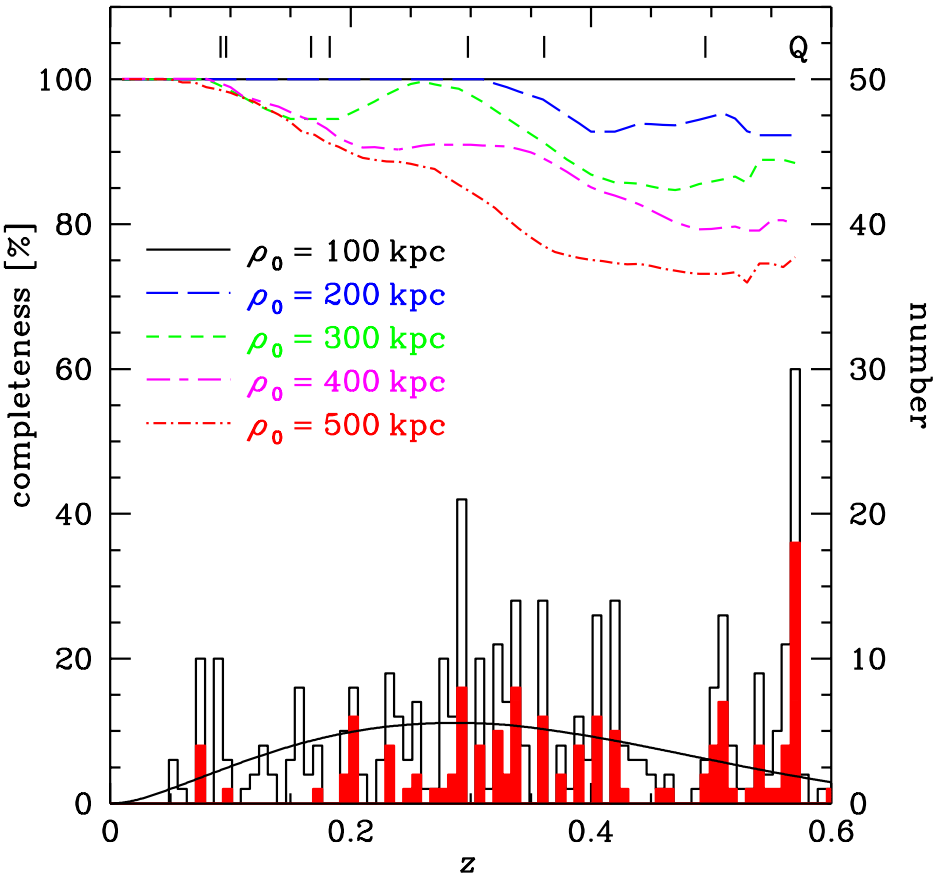
$r < 23$ galaxies close to the sightline: PKS 0405-123

- $\approx$ 1000 galaxies with spectroscopic redshifts per field



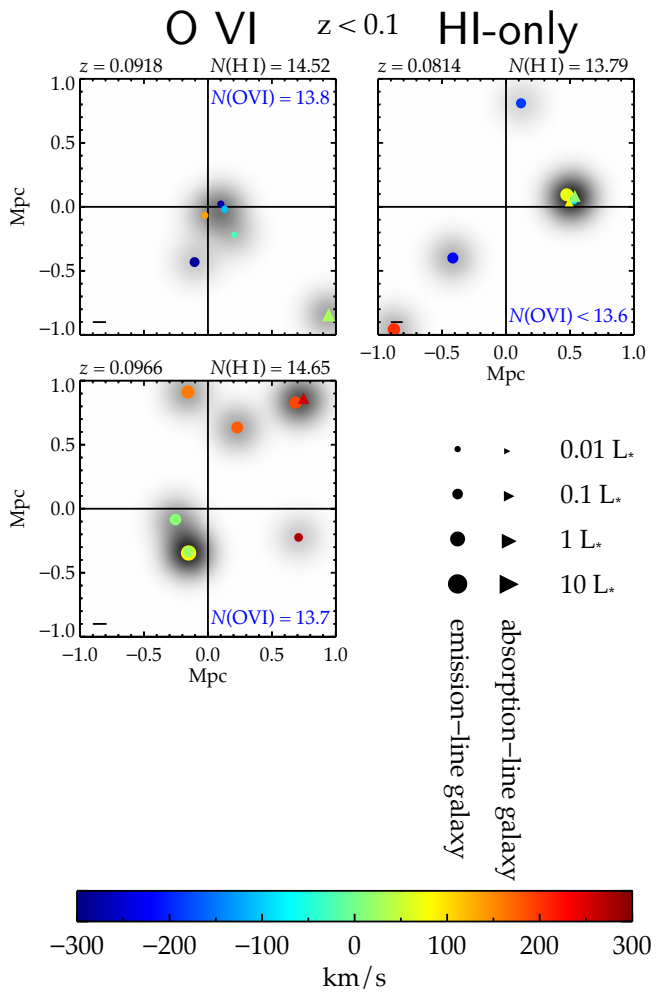
High completeness achieved: e.g. PKS 0405-123

- High completeness over large redshift path lengths



$L > 0.1\,L_*$

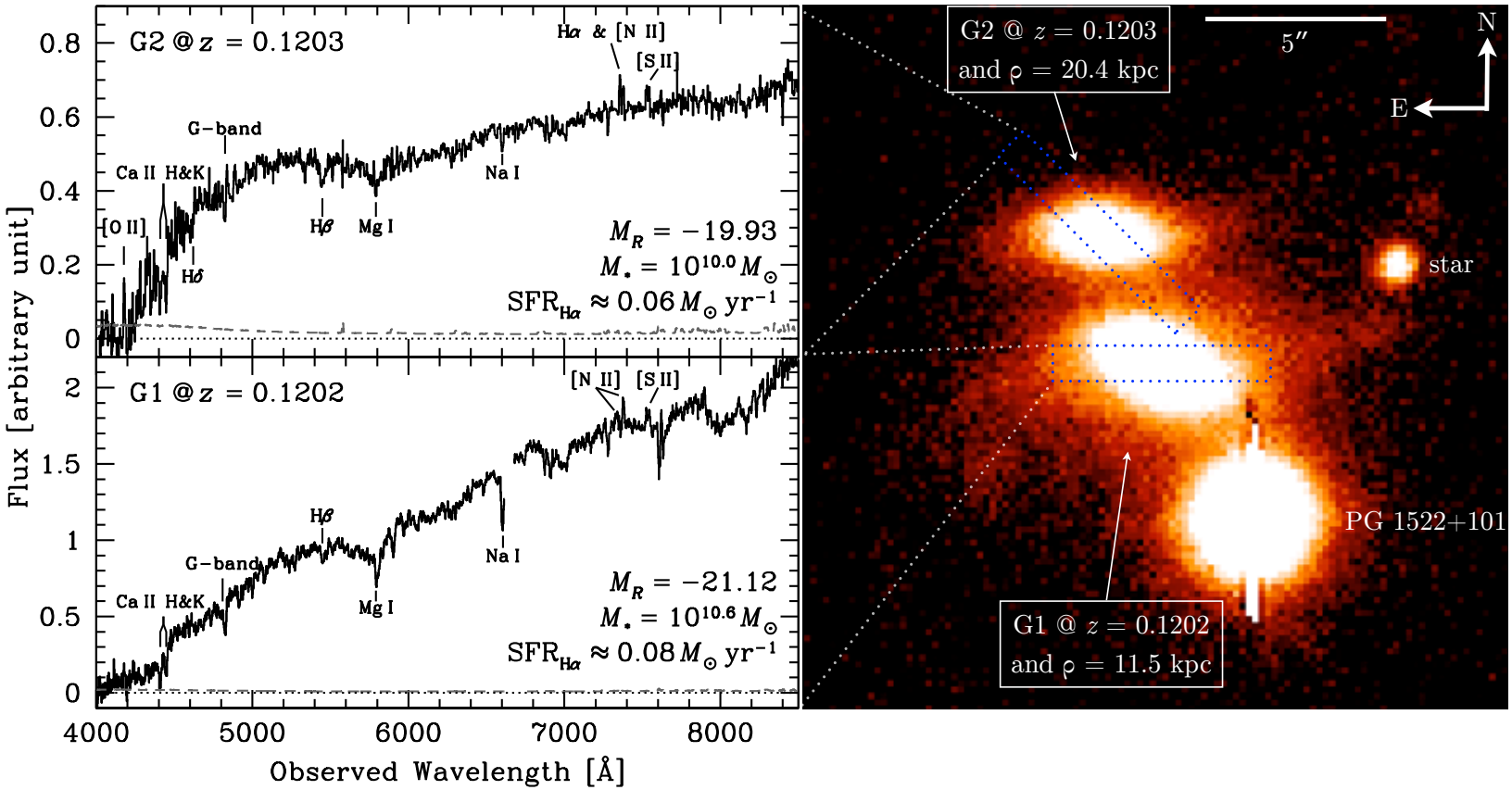
High ionization: gas-galaxy association are ambiguous



- Working on characterizing complex systems
- In the mean time, our first results on CGM/IGM and environment...

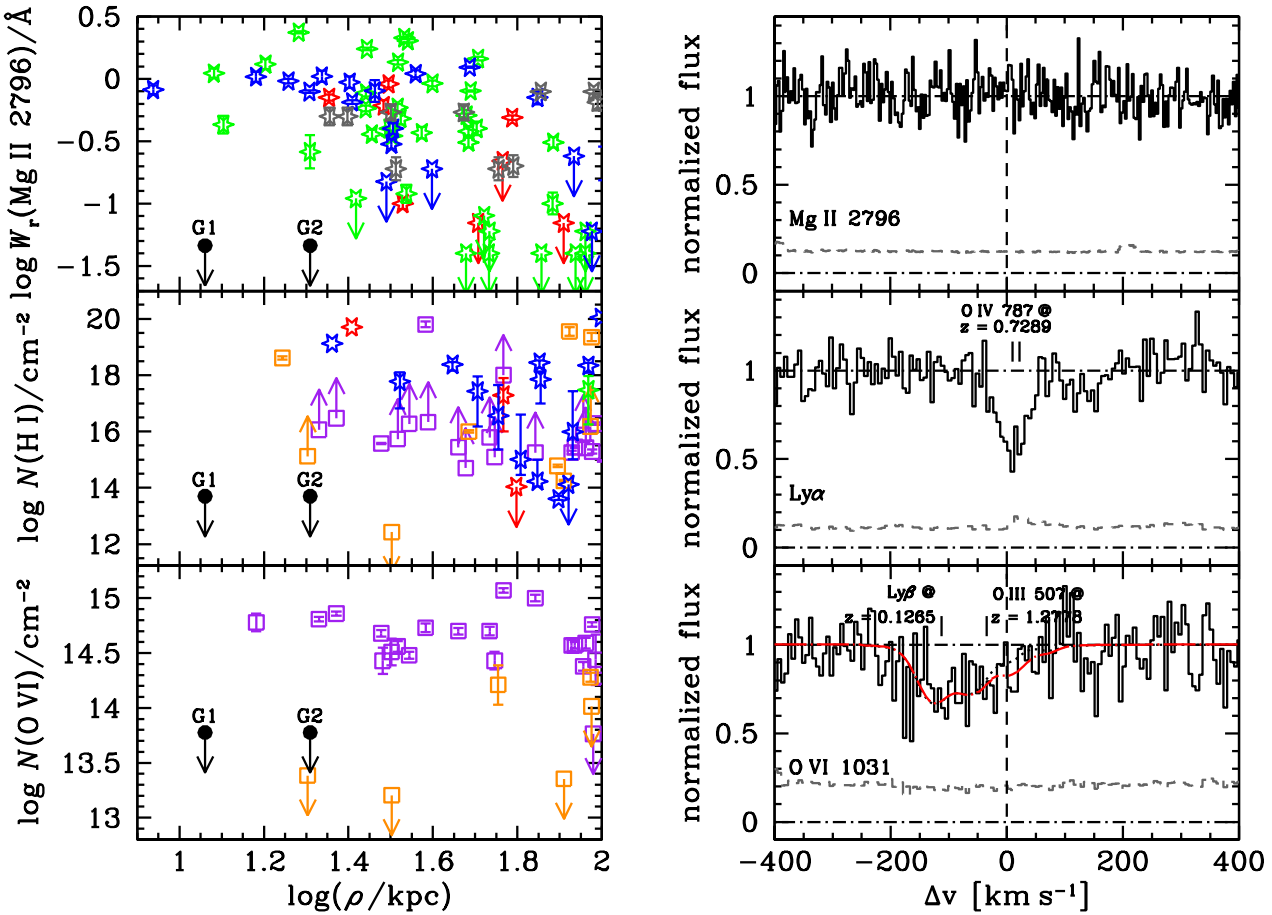
Johnson, Chen, & Mulchaey 2013 (MNRAS 434, 1765)

An interacting galaxy pair



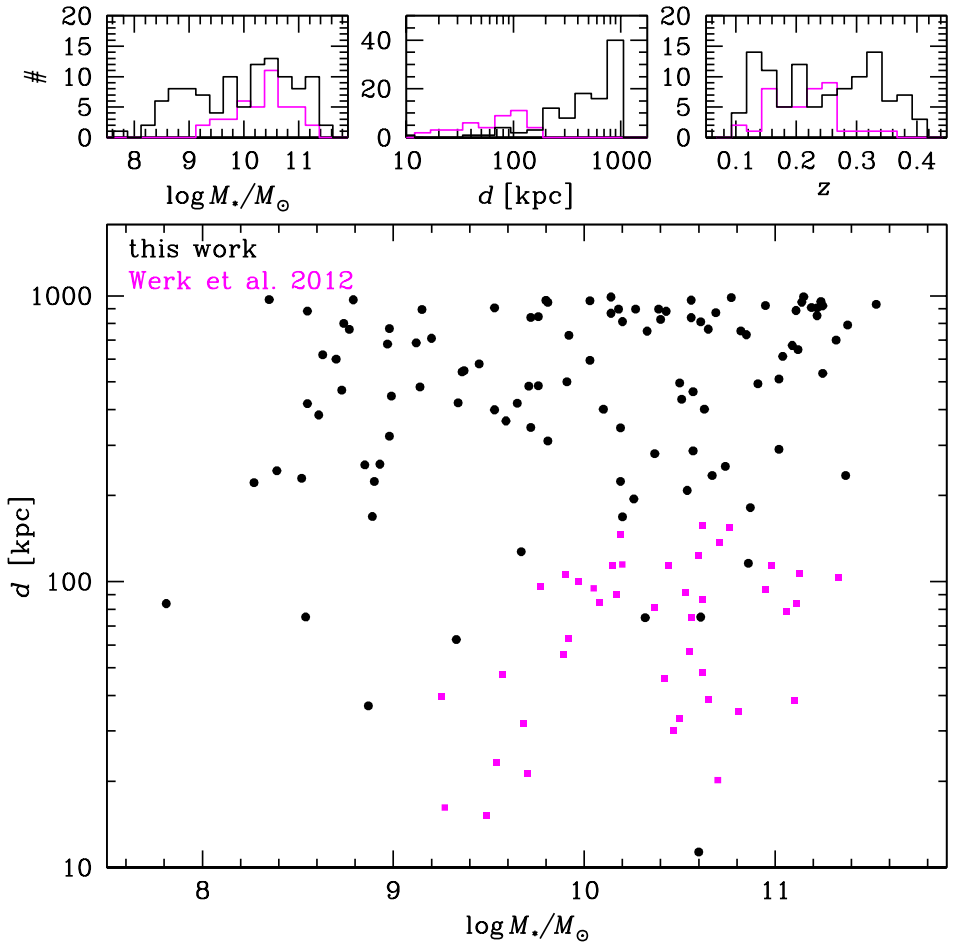
Johnson et al. 2014 (MNRAS 438 4)

Little to no gas observed in absorption for interacting pair



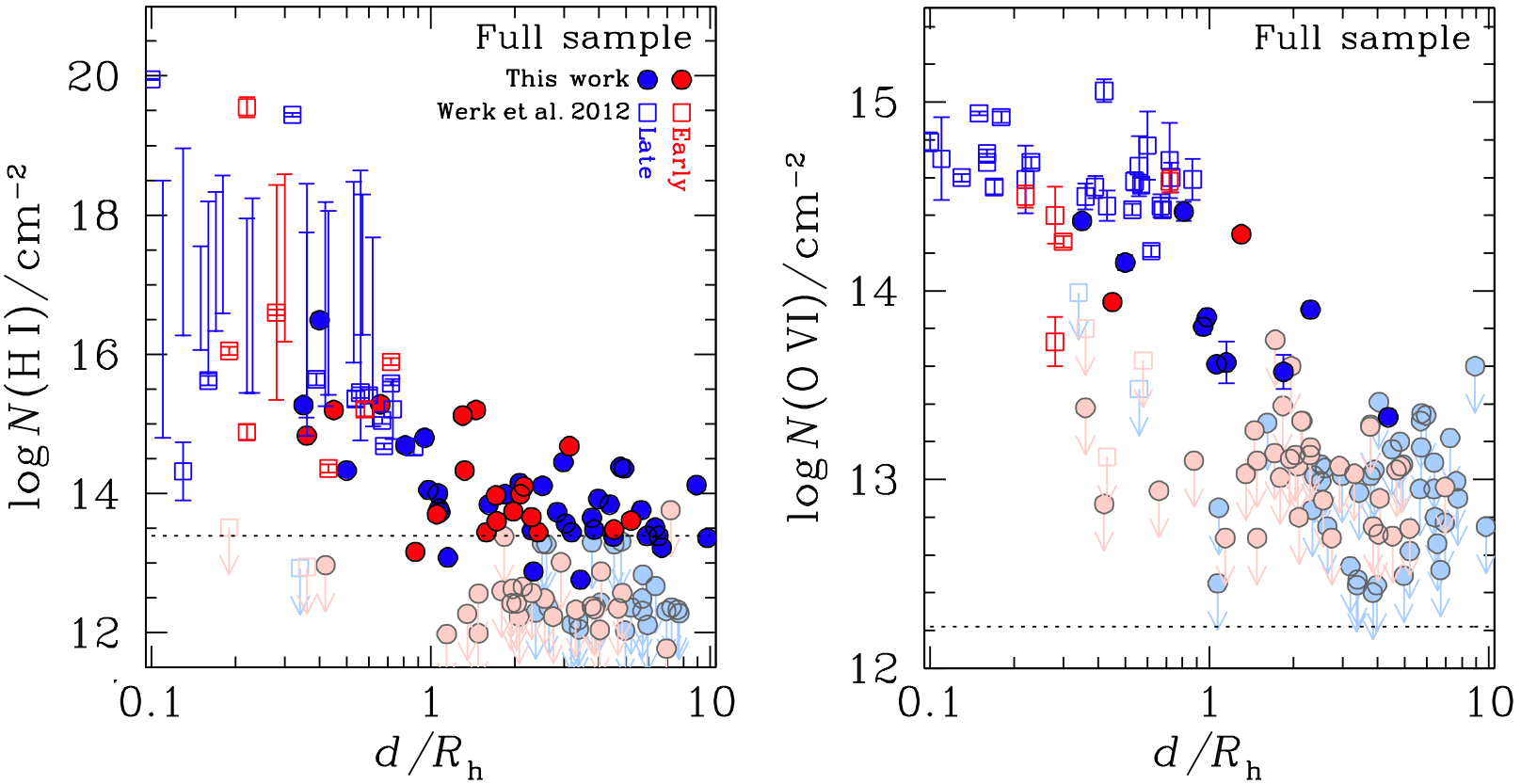
Gas has been heated or stripped during interaction?

Does environment matter?: view with 4 sightlines



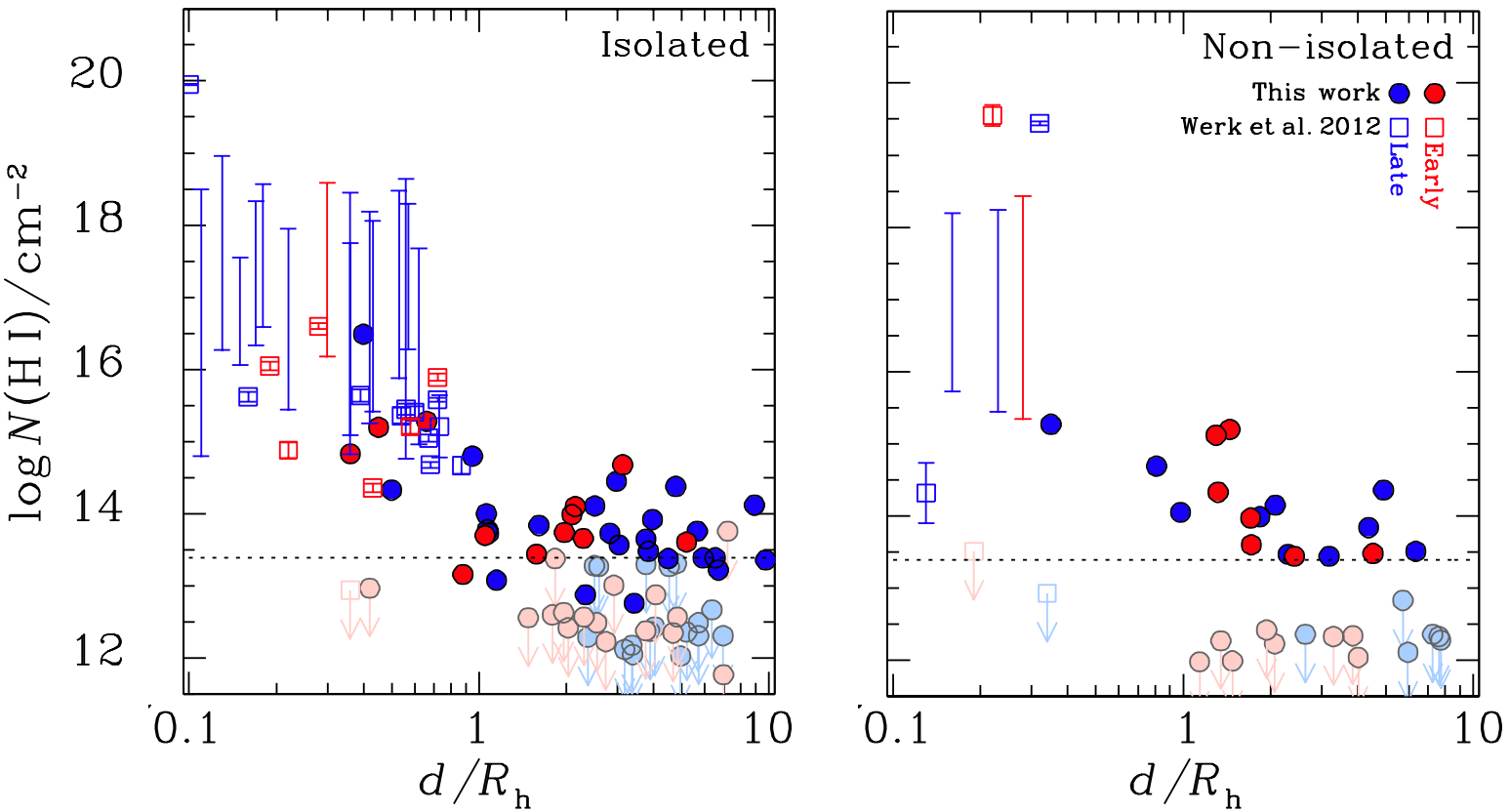
Johnson, Chen, & Mulchaey 2015 (MNRAS 449 3)

Full sample in H I & O VI



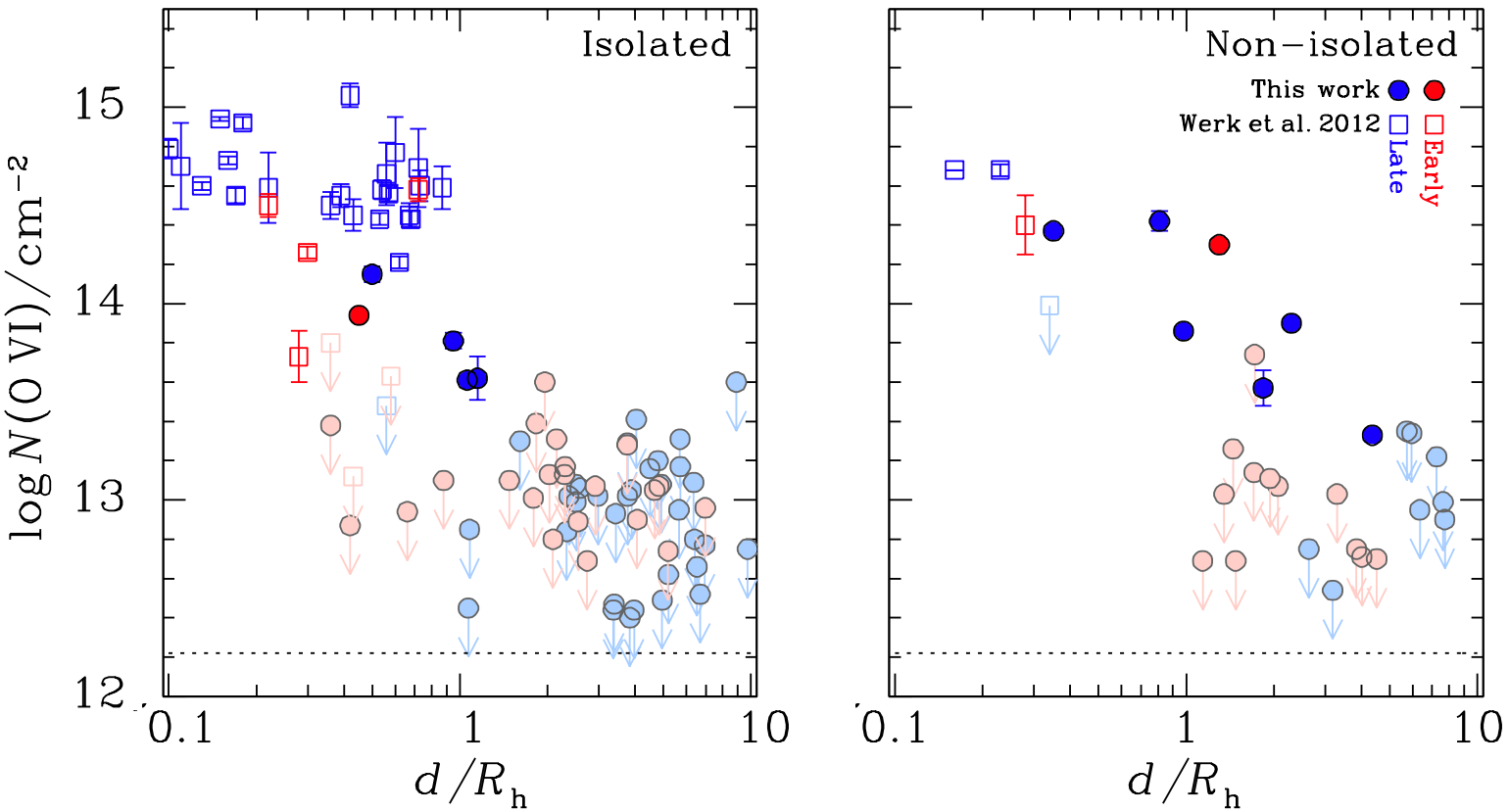
Johnson, Chen, & Mulchaey 2015 (MNRAS 449 3)

Does environment matter?: H I



Johnson, Chen, & Mulchaey 2015 (MNRAS 449 3)

CGM dependence on environment

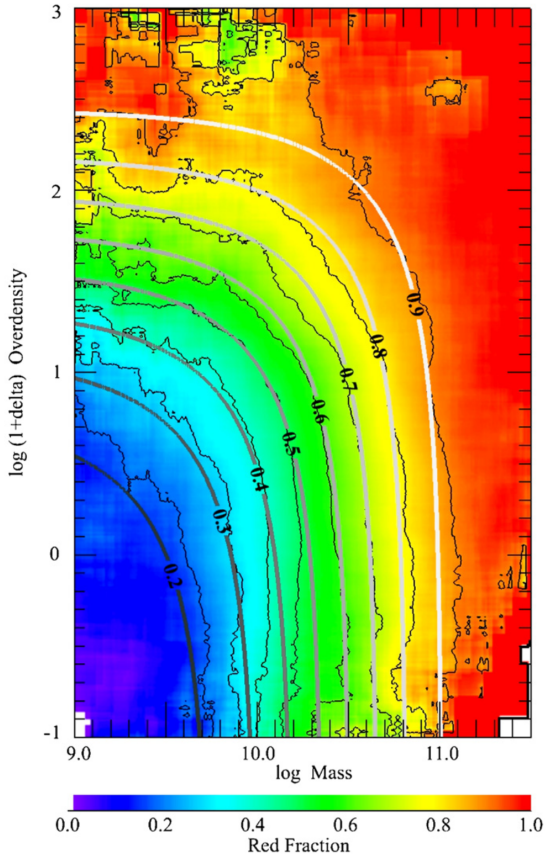


Enriched halo gas stripped by nearby neighbors?

Johnson, Chen, & Mulchaey 2015 (MNRAS 449 3)

Drivers of galaxy evolution: mass, environment, and AGN

Red fraction versus mass & environment



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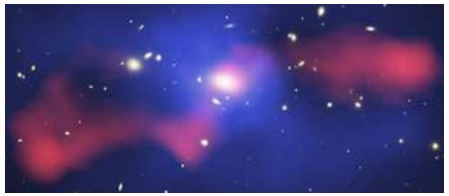
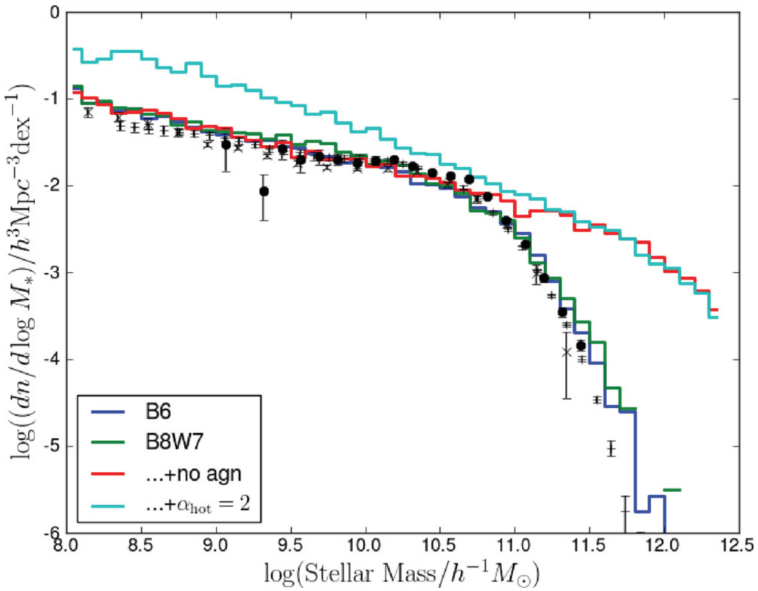
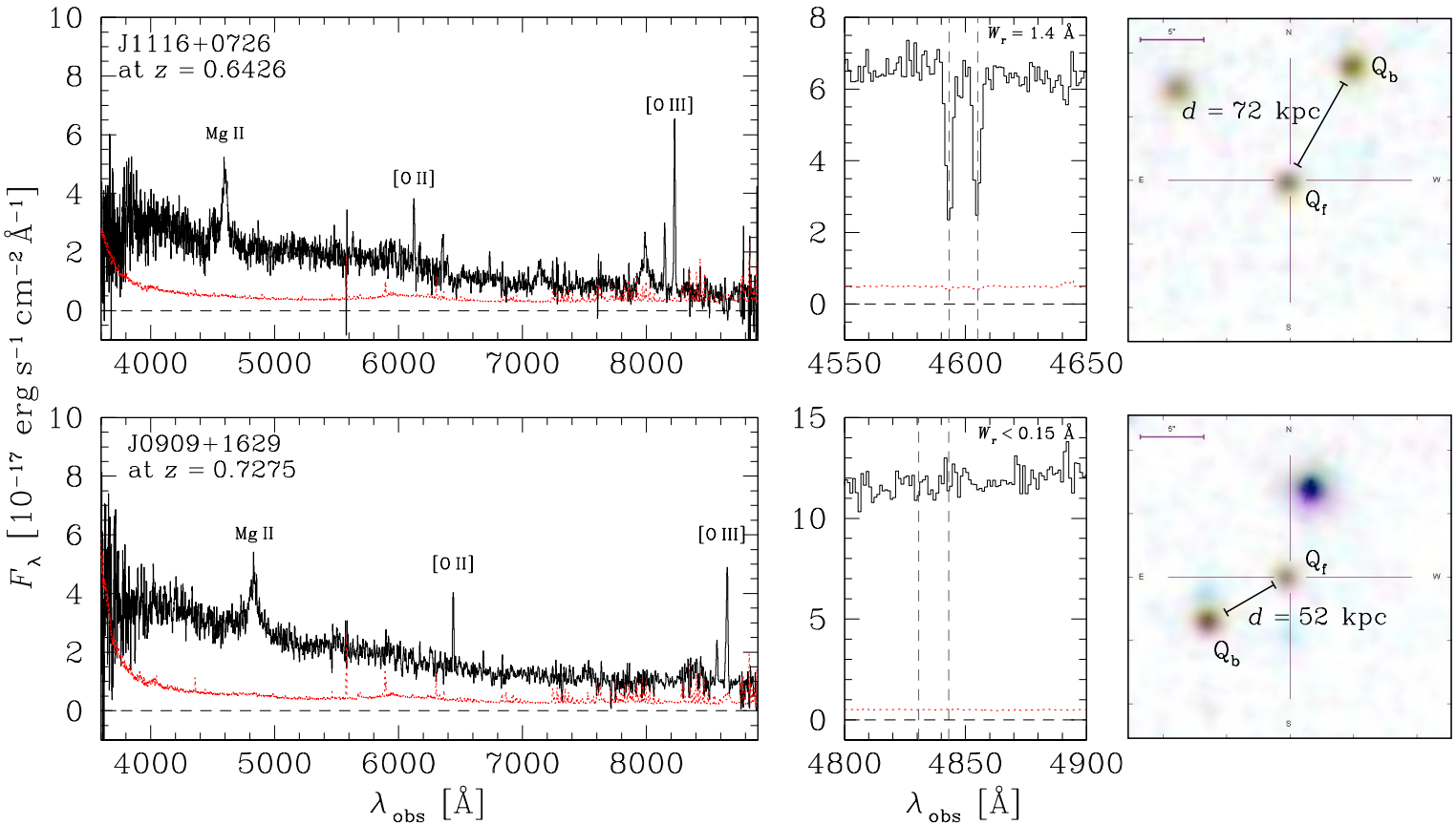




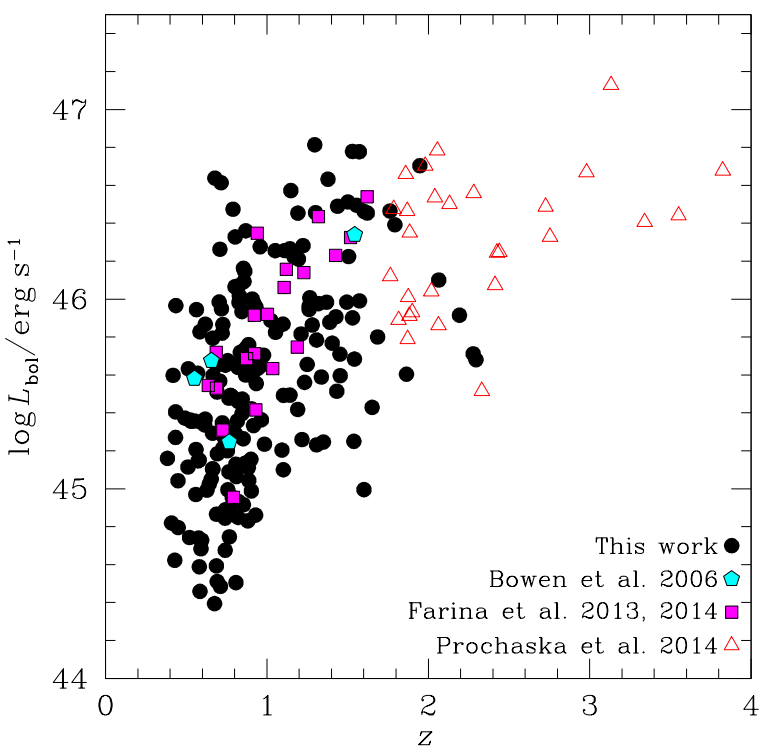
McNamara et al. 2009 & Bower et al. 2012

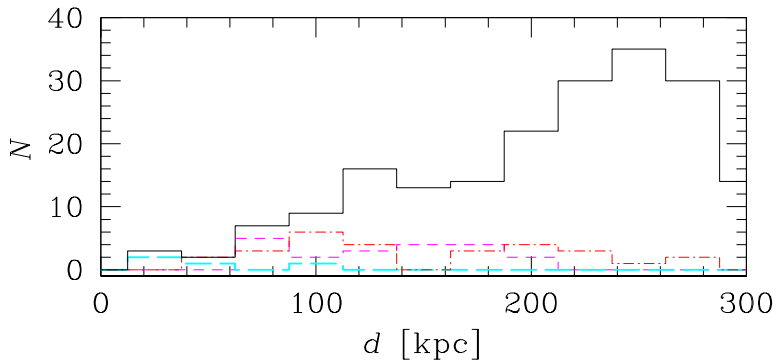
Quasars in Mg II absorption

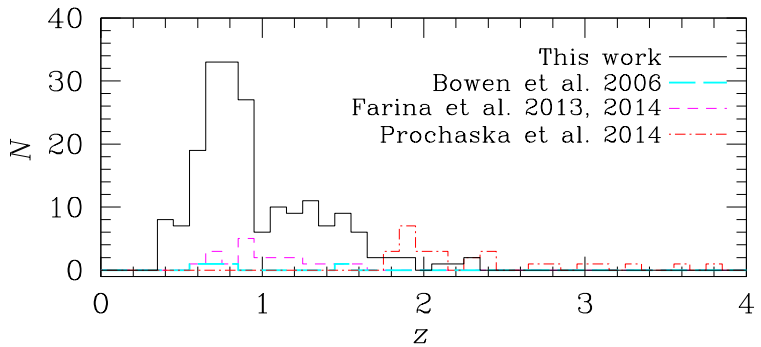


Johnson, Chen, & Mulchaey 2015 (MNRAS, submitted)

A large sample of quasars with constraints on halo gas from background quasars

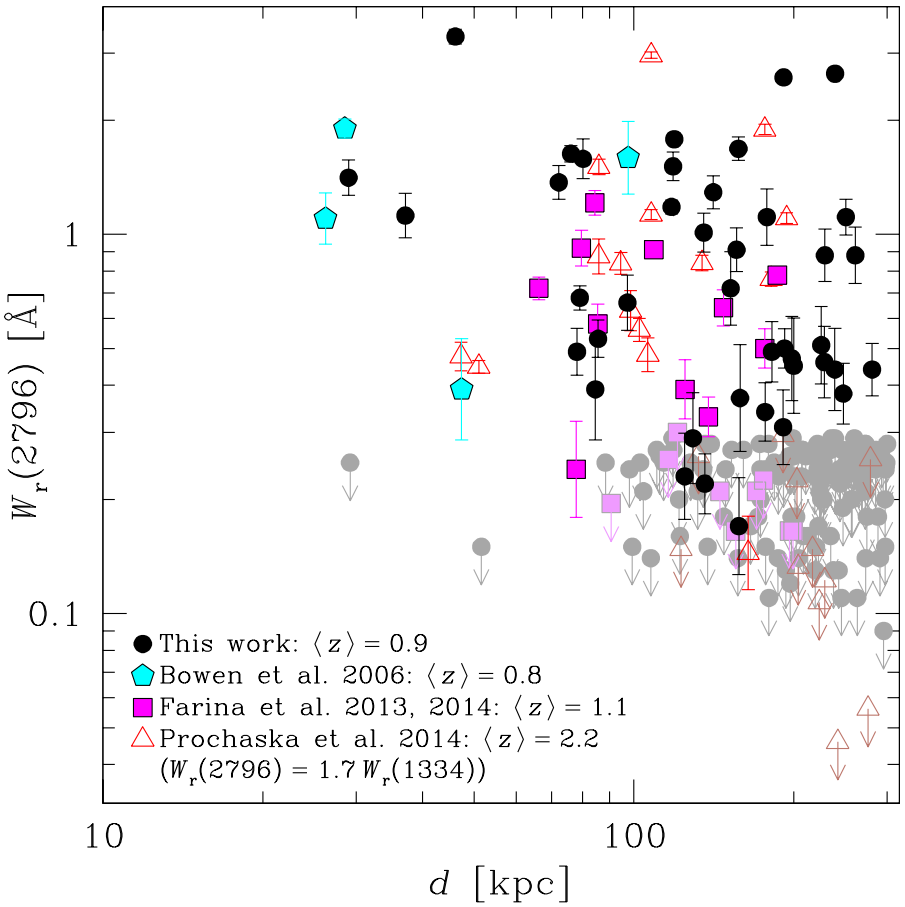






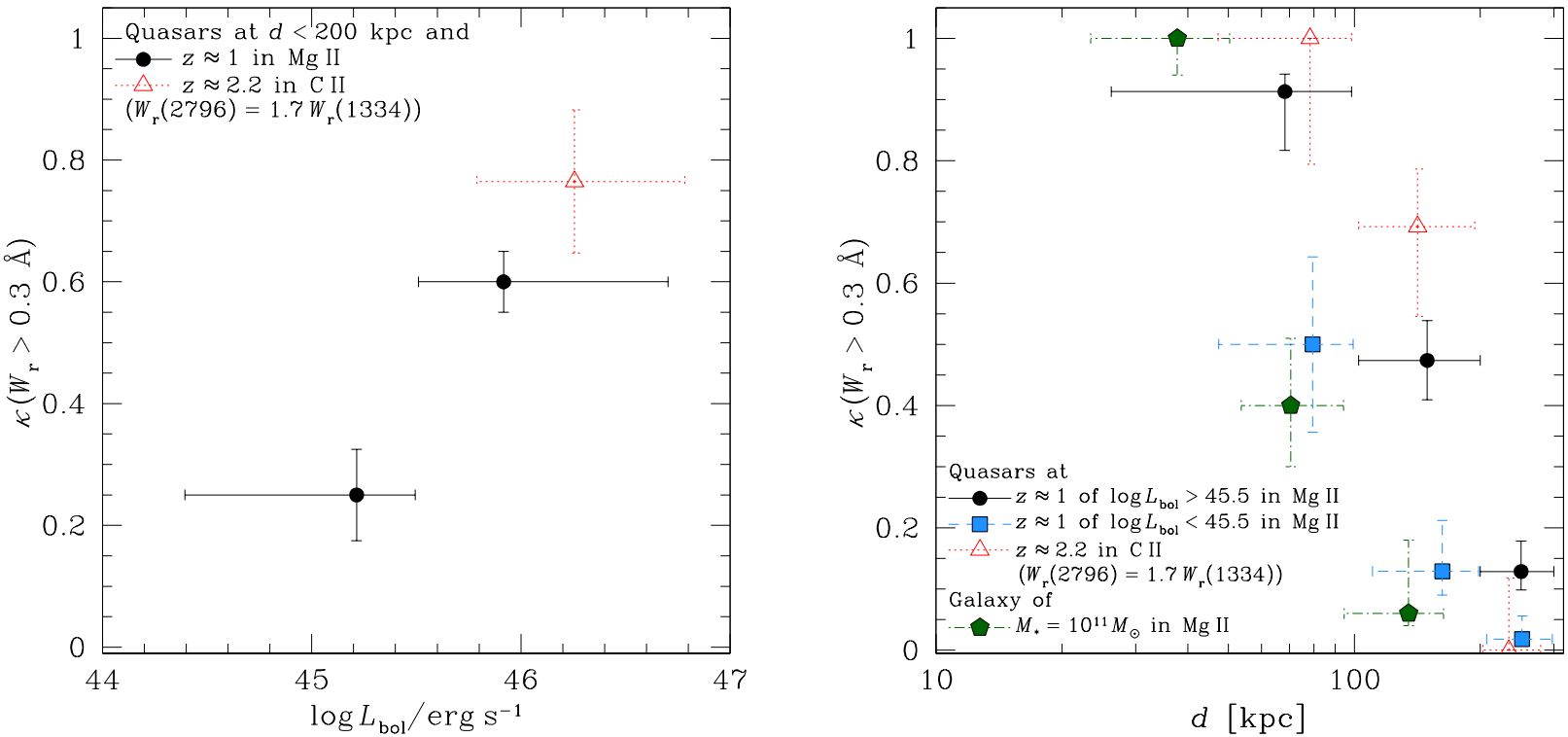
Johnson, Chen, & Mulchaey 2015 (MNRAS, submitted)

Equivalent width versus distance



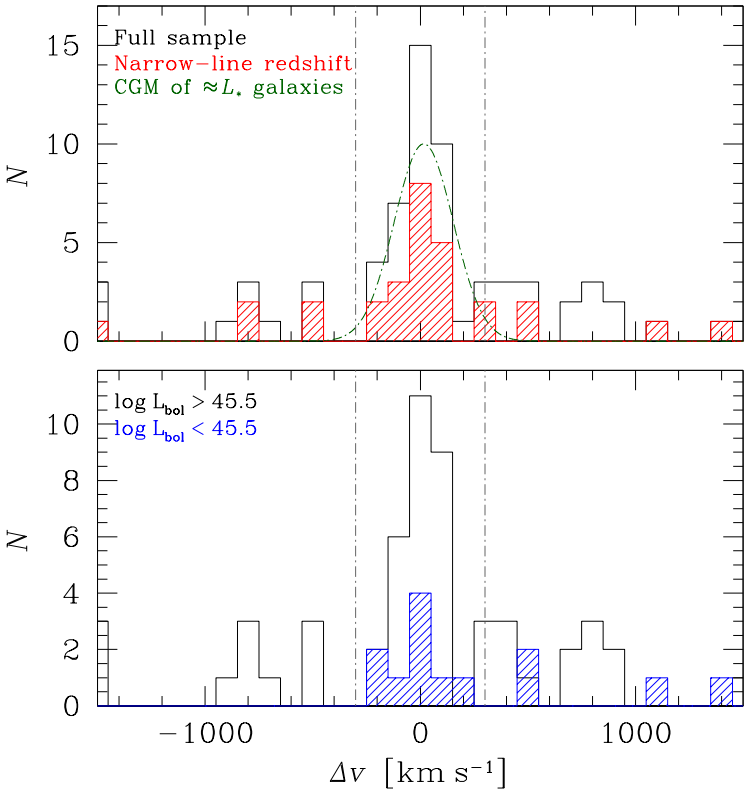
Johnson, Chen, & Mulchaey 2015 (MNRAS, submitted)

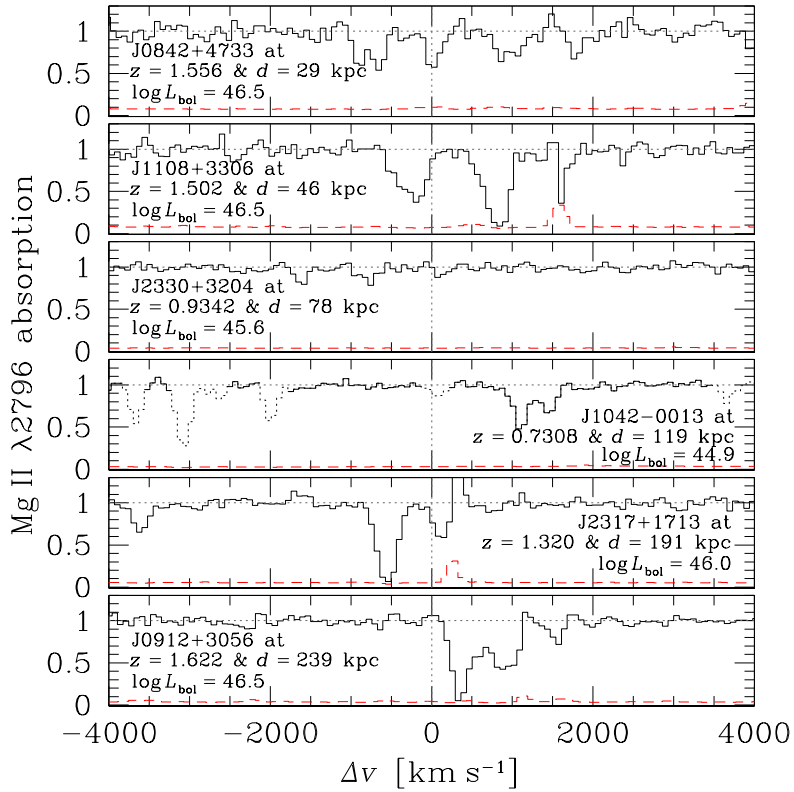
Luminosity dependent covering fraction



Johnson, Chen, & Mulchaey 2015 (MNRAS, submitted)

Extreme kinematics!

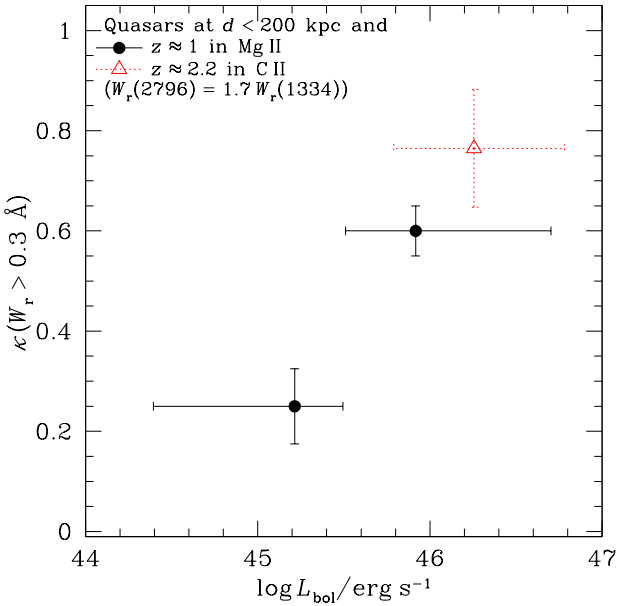


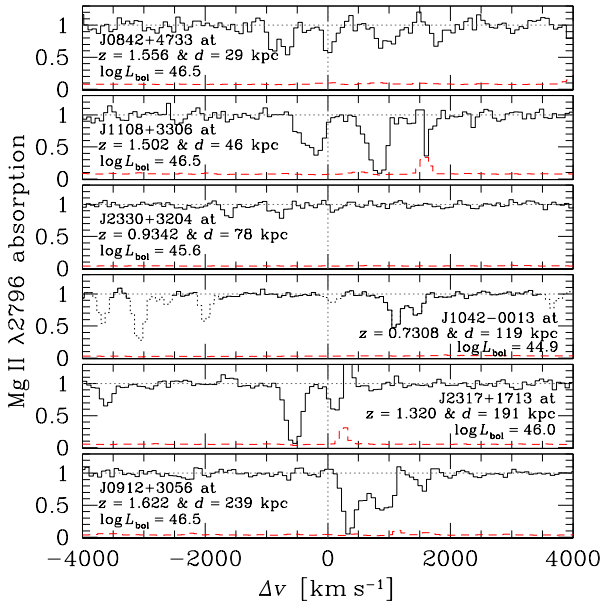


Johnson, Chen, & Mulchaey 2015 (MNRAS, submitted)

What is going on?

- ~~Mass-luminosity scaling?~~: ruled out by clustering & doesn't explain kinematics
- Remnants from mergers thought to trigger luminous quasars?: perhaps, but such large fraction of systems at large velocity?
- Outflows?: possible, but Mg II is low ionization state...





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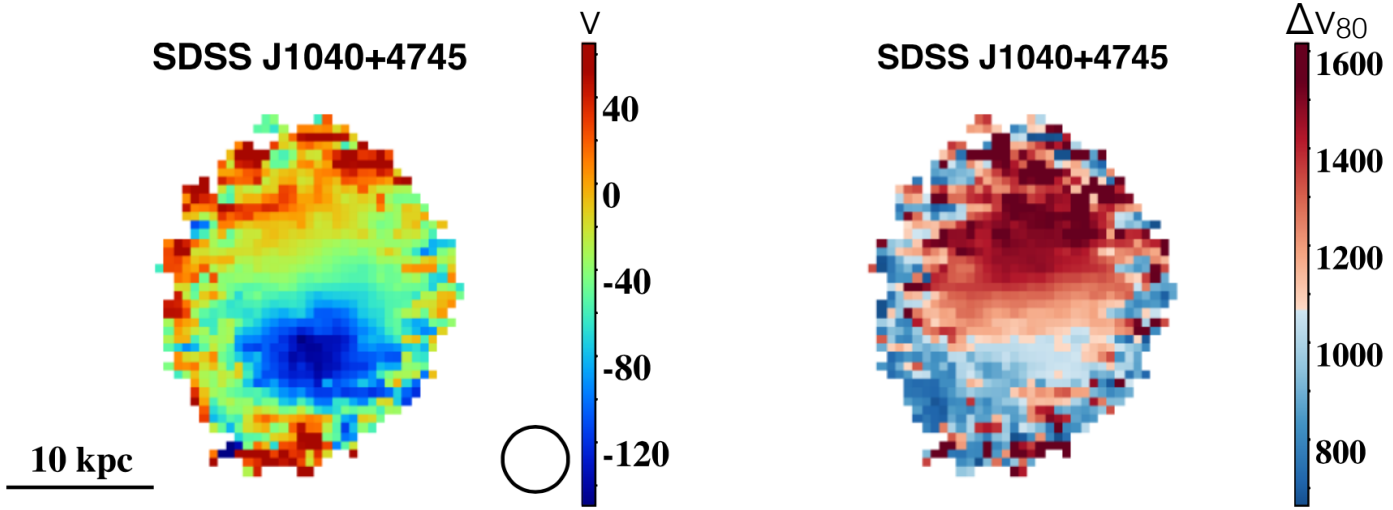
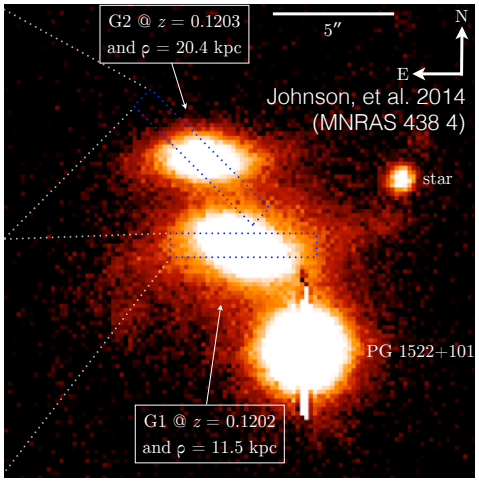
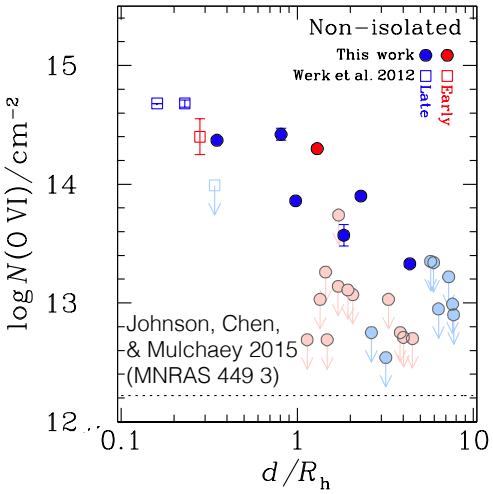


Liu et al. 2013a, b

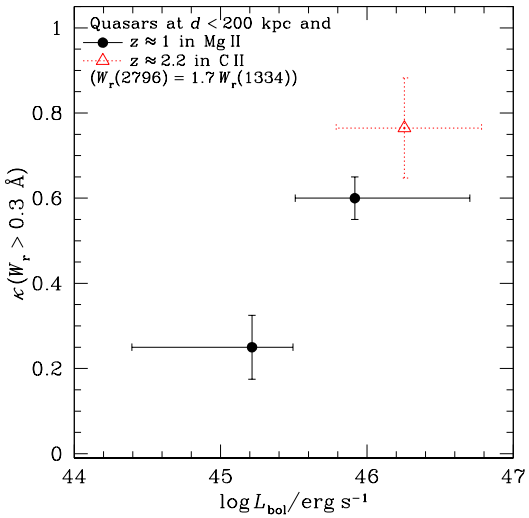
Money plots



Strong interactions can strip or heat CGM



Larger scale environment important too



Quasars have highly unusual CGM: outflows?