Connecting the CGM and galaxy properties with large surveys

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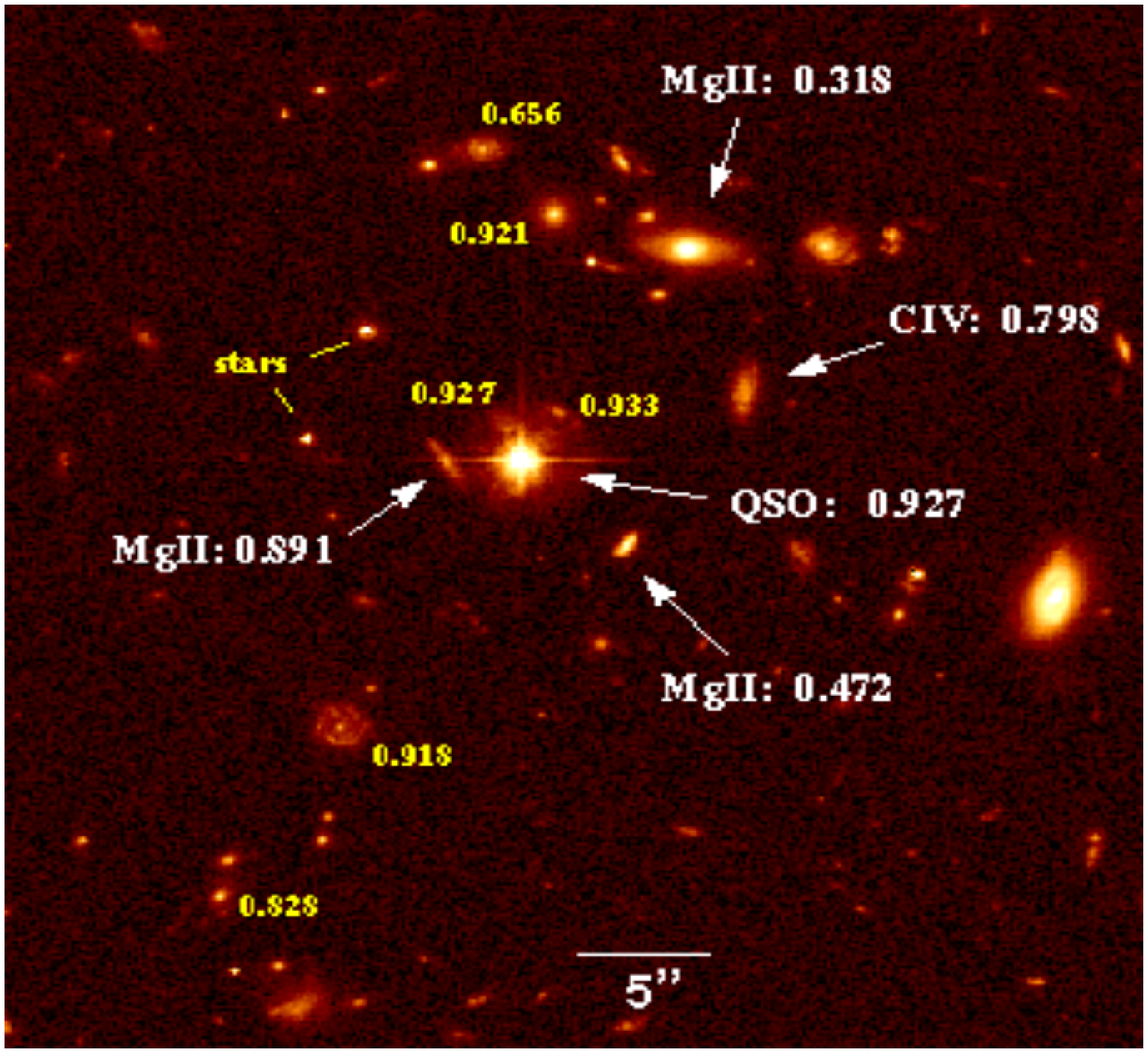
Searching for galaxy - absorber pairs

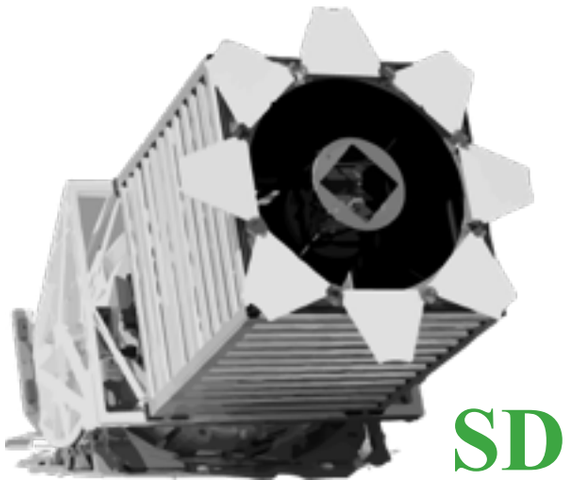


1969	0	Bahcall & Spizter
1986	1	Bergeron
1995-2010	50	Steidel et al. Churchill et al. Chen et al.
2013	200	Nielsen et al.

Steidel et al. (1997)

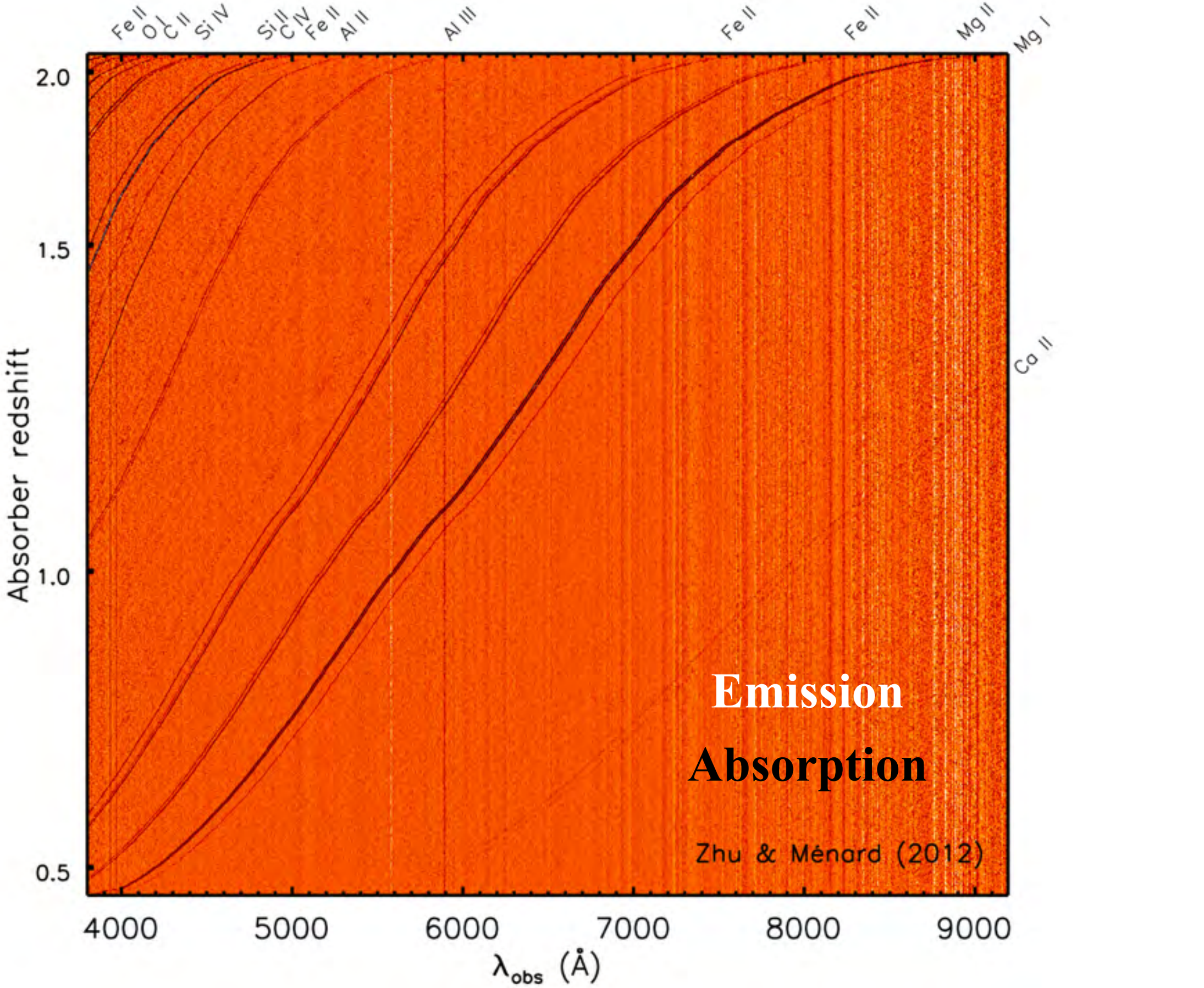
Is there cool gas around both types of galaxies?

Do the properties of the cool CGM depend on the galaxy properties?

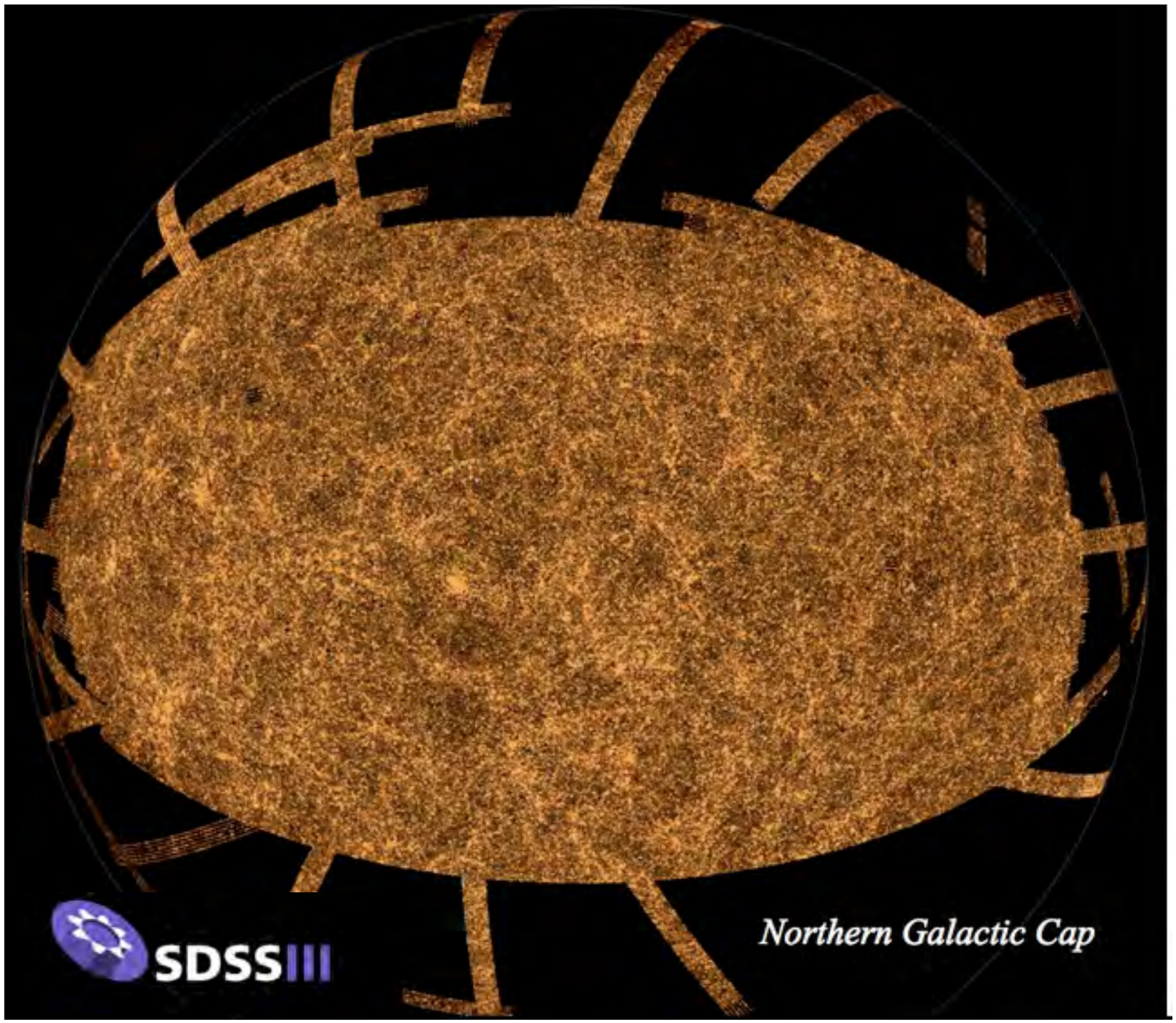


SDSS

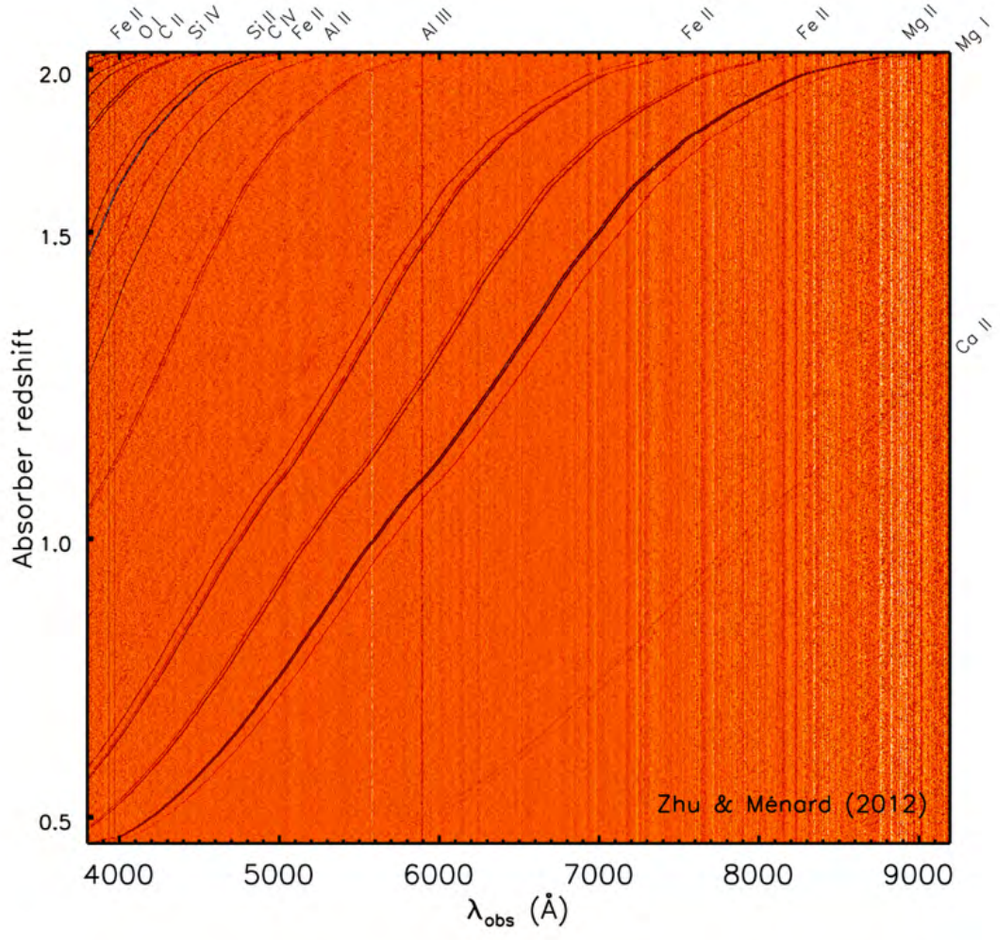
100,000 MgII absorbers **Publicly available**

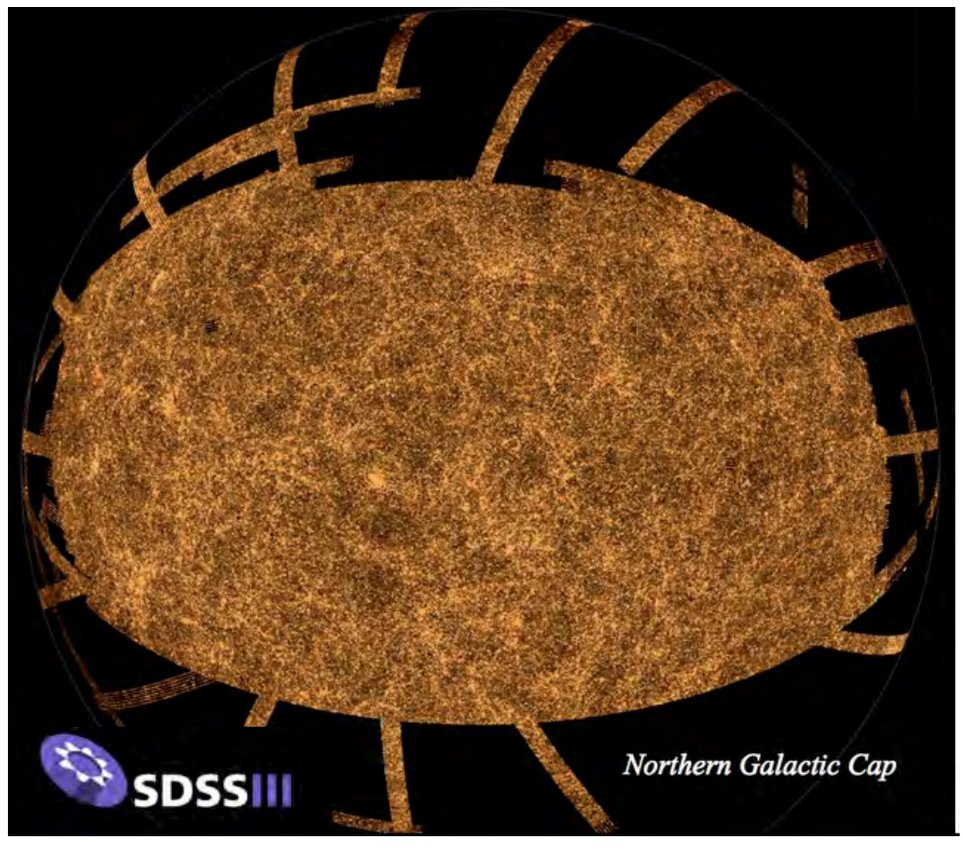


Millions of photometric galaxies



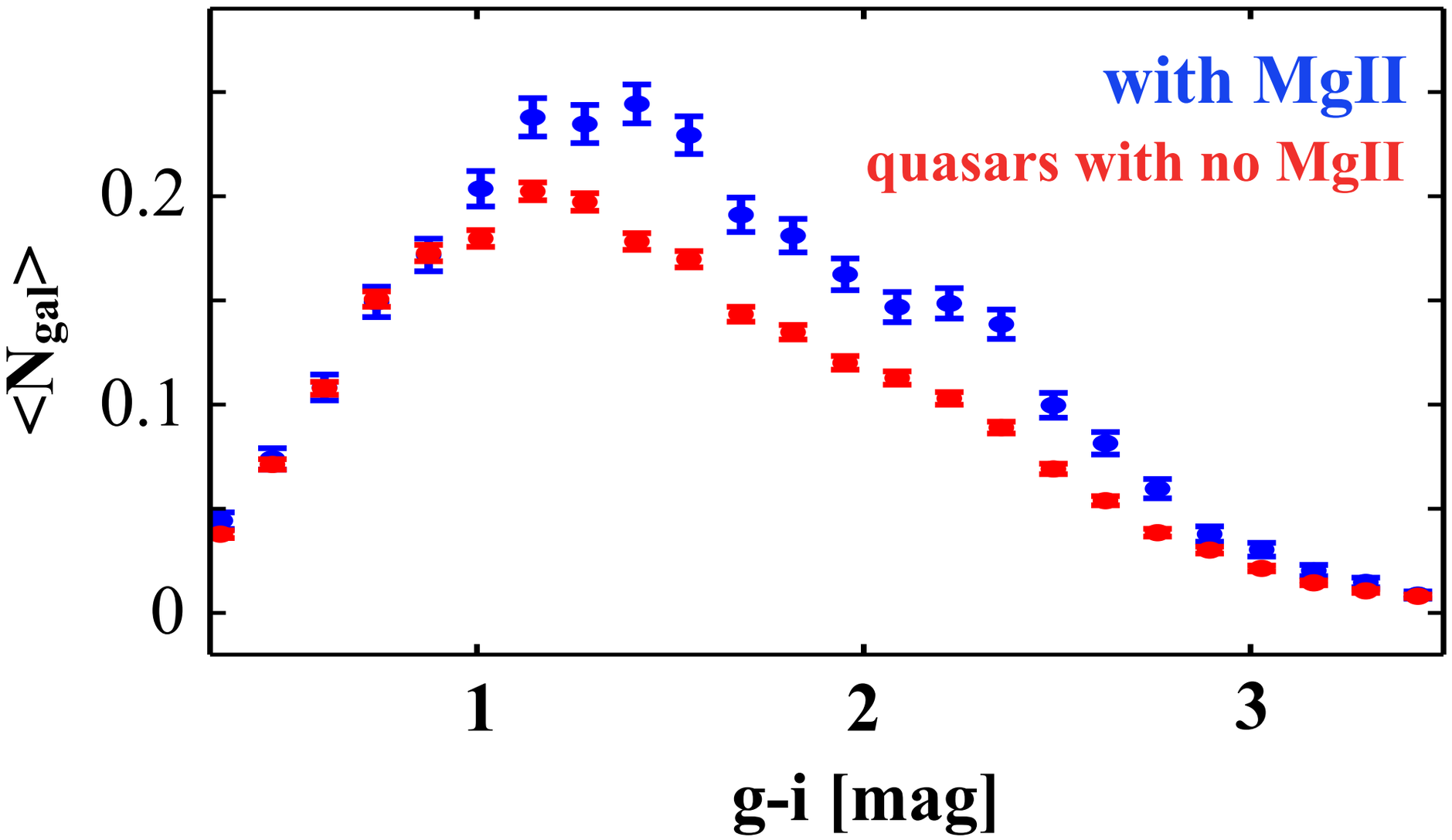
$$\langle \delta_{\mathrm{MgII}} \cdot \delta \mathrm{N}_{\mathrm{gal}} \rangle$$





Focus on ~3,000 absorbers at z~0.5

Galaxy number count around MgII absorbers



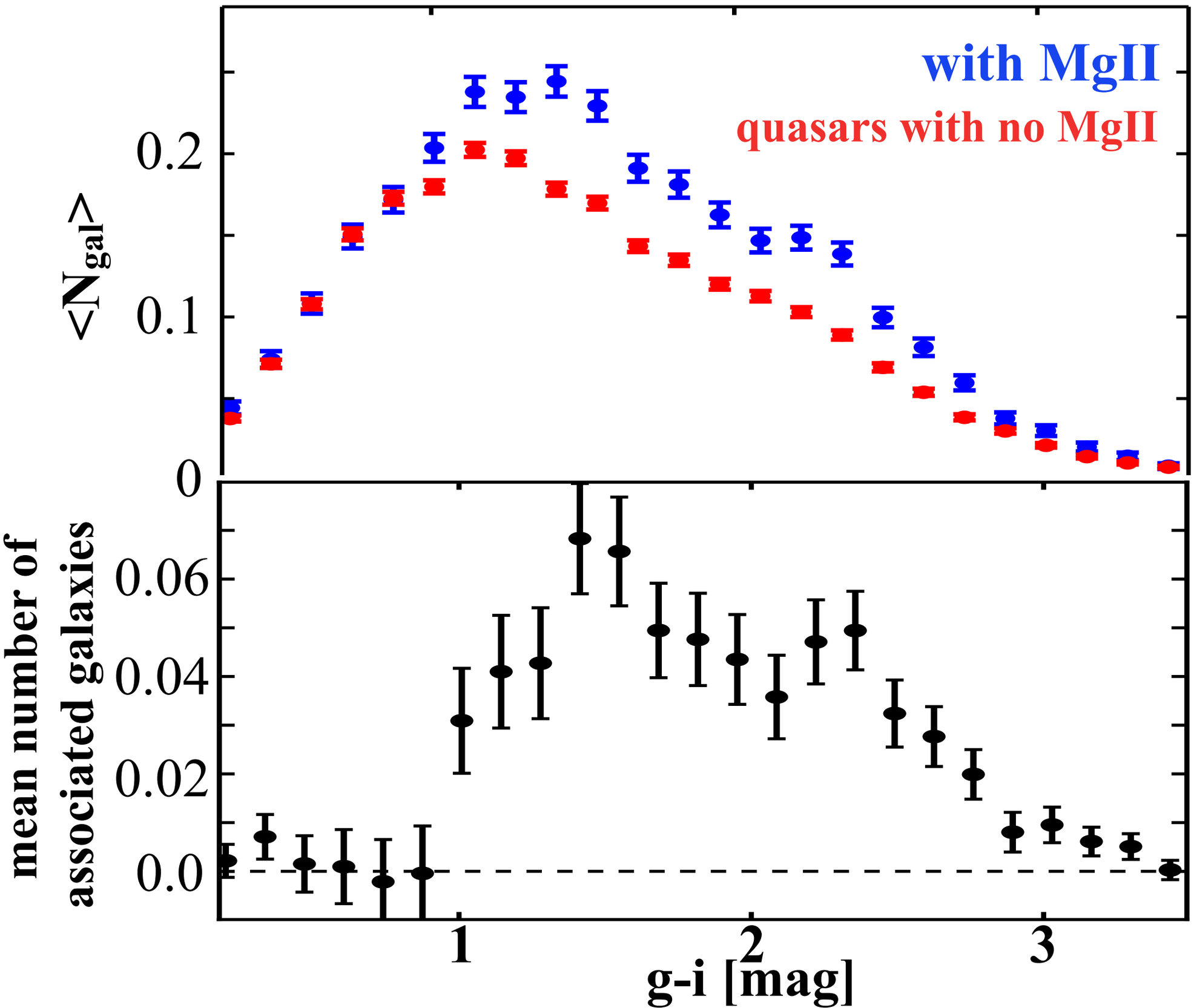
randomly-distributed background galaxies

+

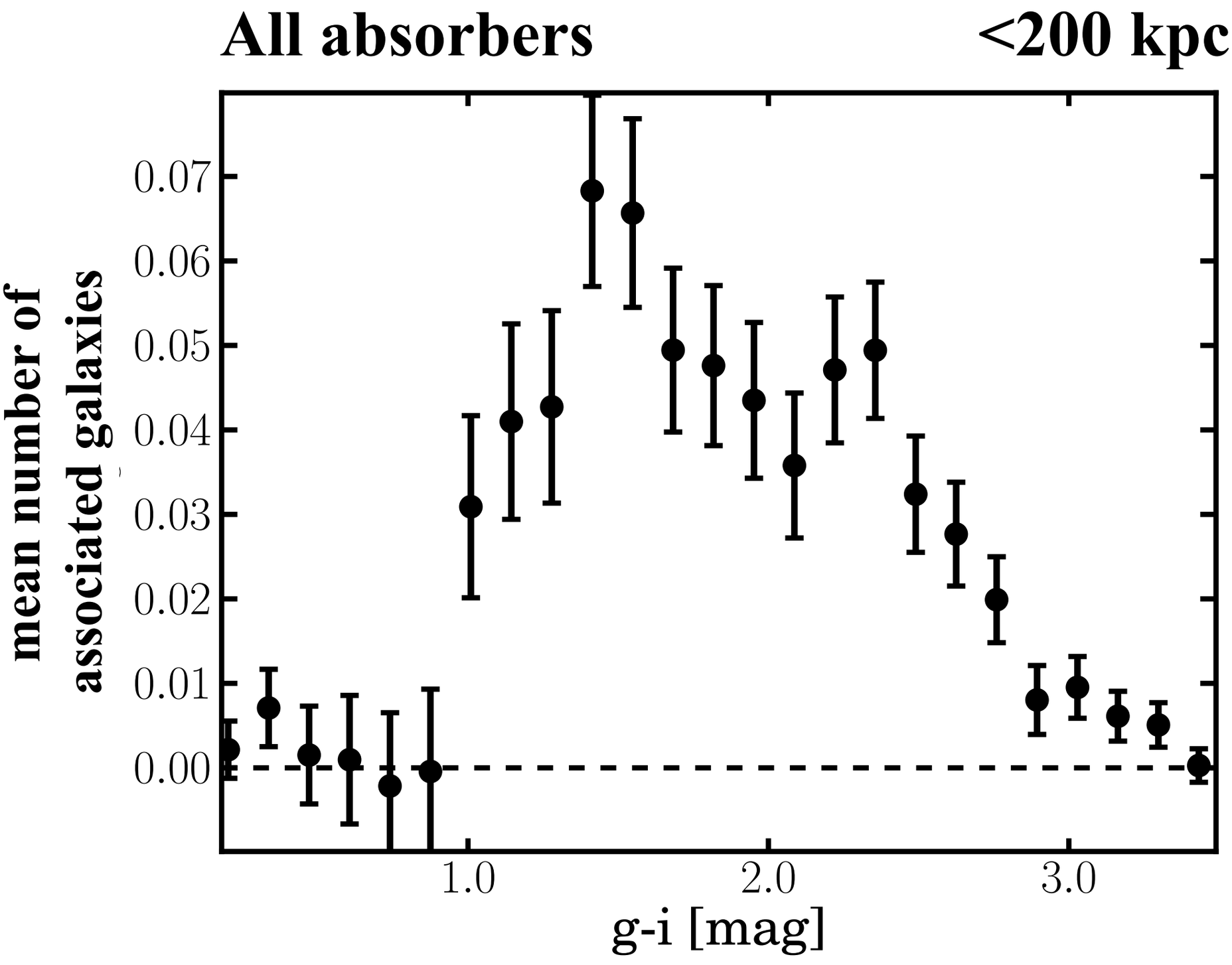
galaxies associated with MgII

randomly-distributed background galaxies

Galaxy number count around MgII absorbers

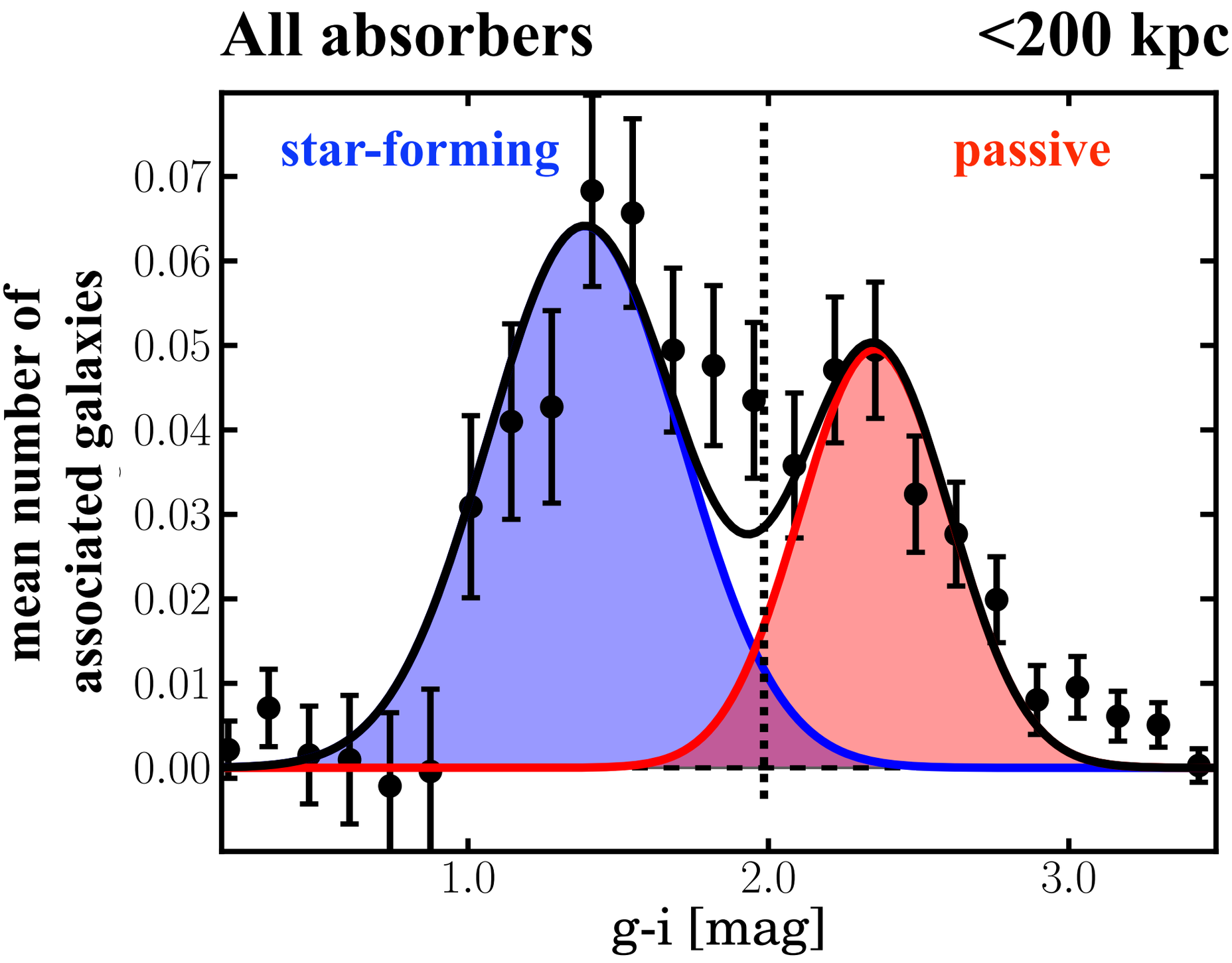


The color distribution of galaxies associated with absorbers

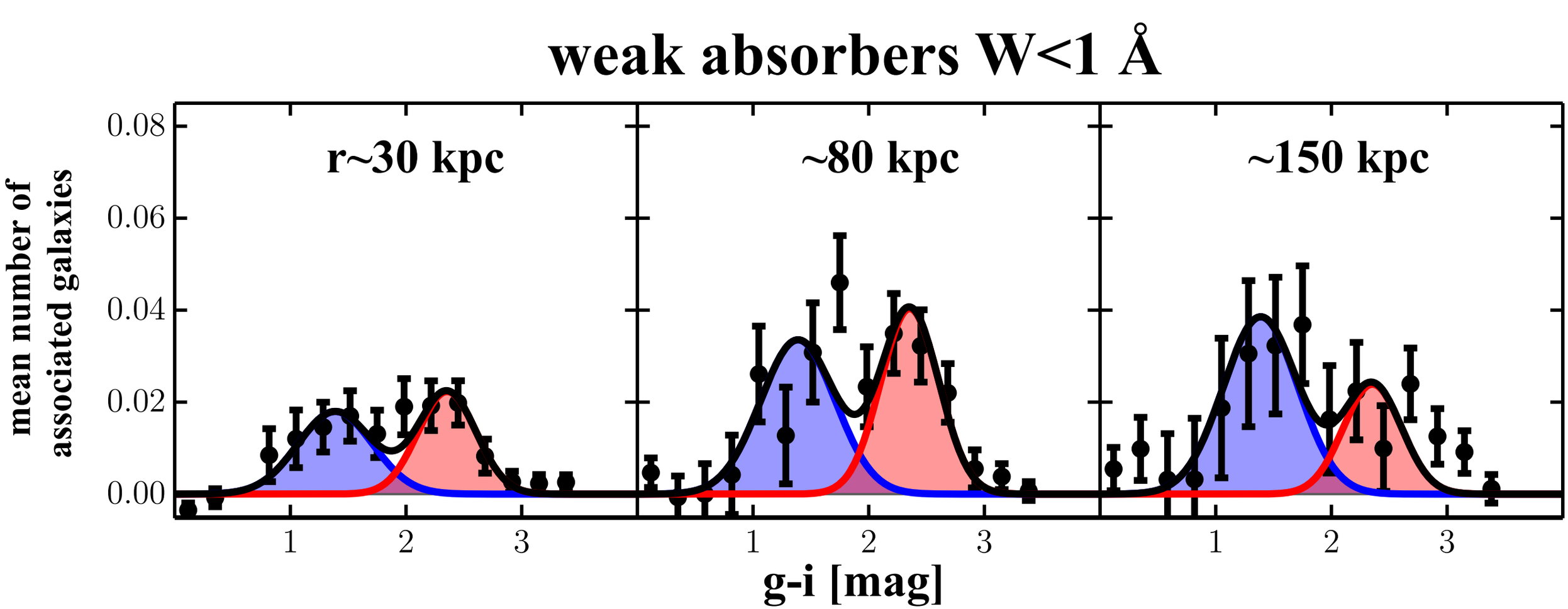


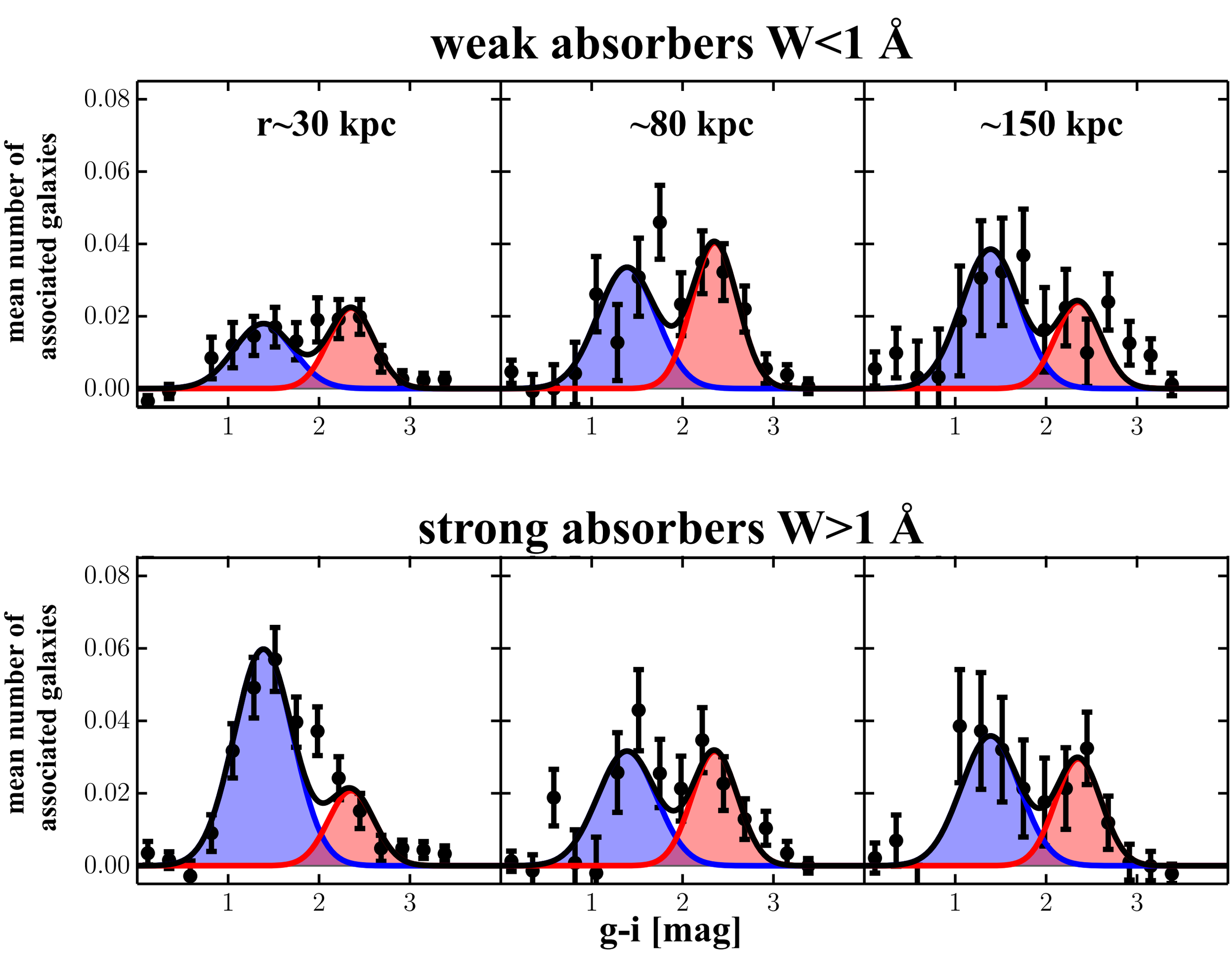
~2,000 galaxy-absorber pairs statistically.

The color distribution of galaxies associated with absorbers



Cool gas is around both
star-forming and **passive** galaxies.


weak absorbers W<1 Å
r~30 kpc
~80 kpc
~150 kpc
mean number of associated galaxies
0.08
0.06
0.04
0.02
0.00
1
2
3
g-i [mag]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0.02
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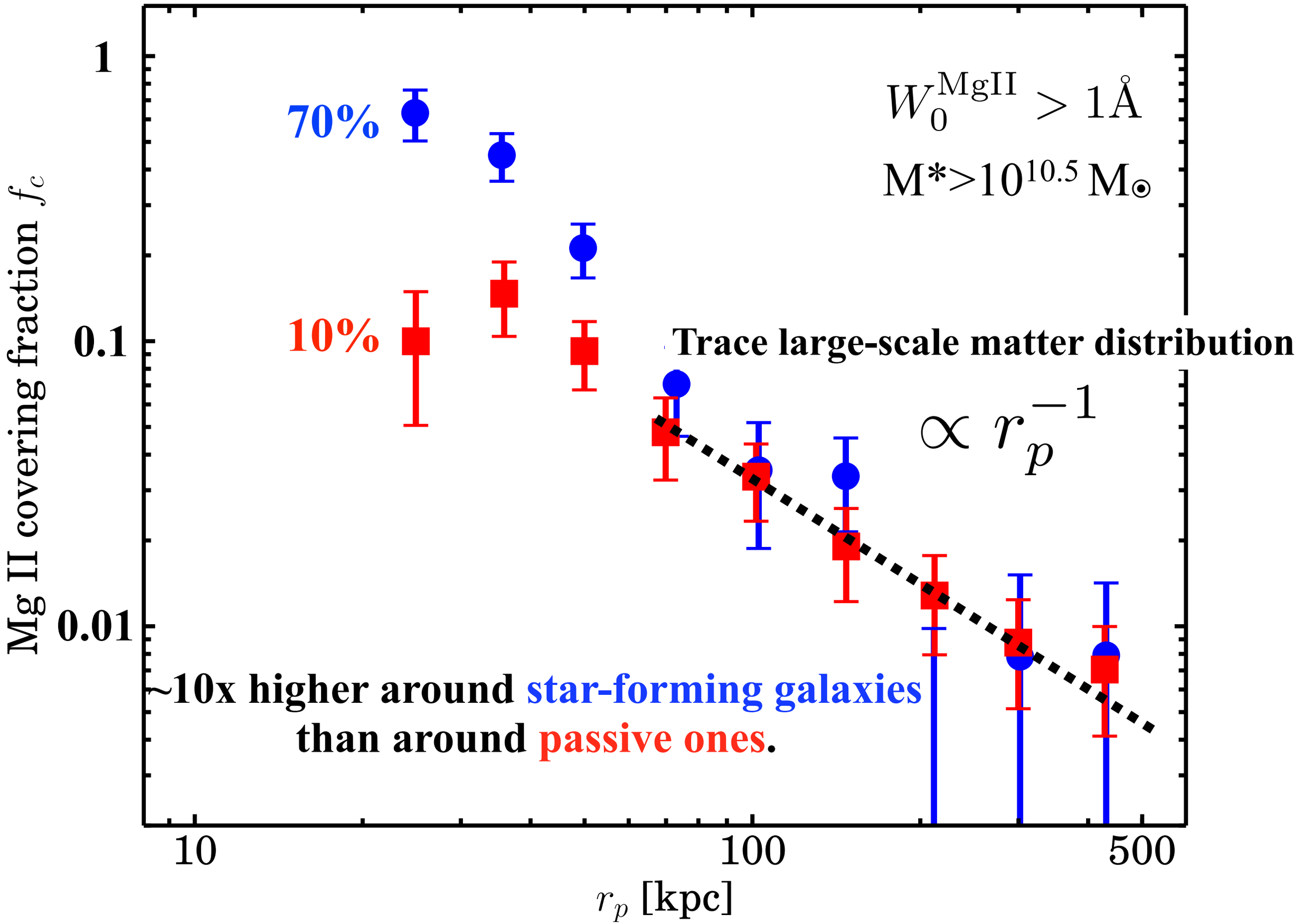
1
2
3
g-i [mag]

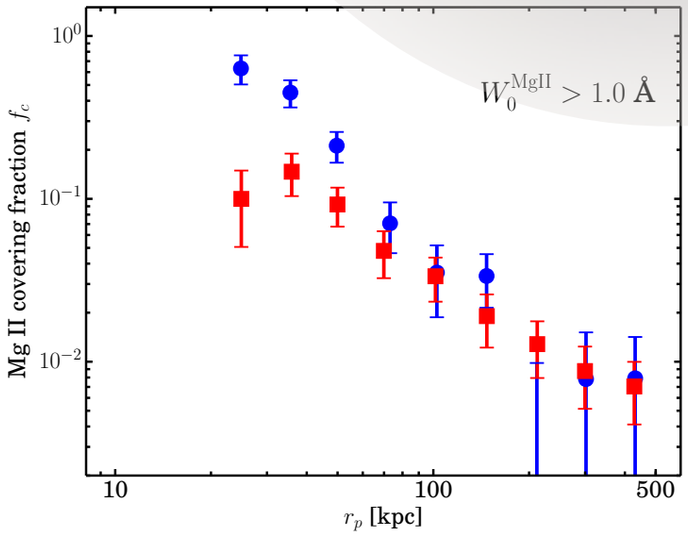
Mg II covering fraction



Cool gas around galaxies

Star-forming galaxies

Passive galaxies

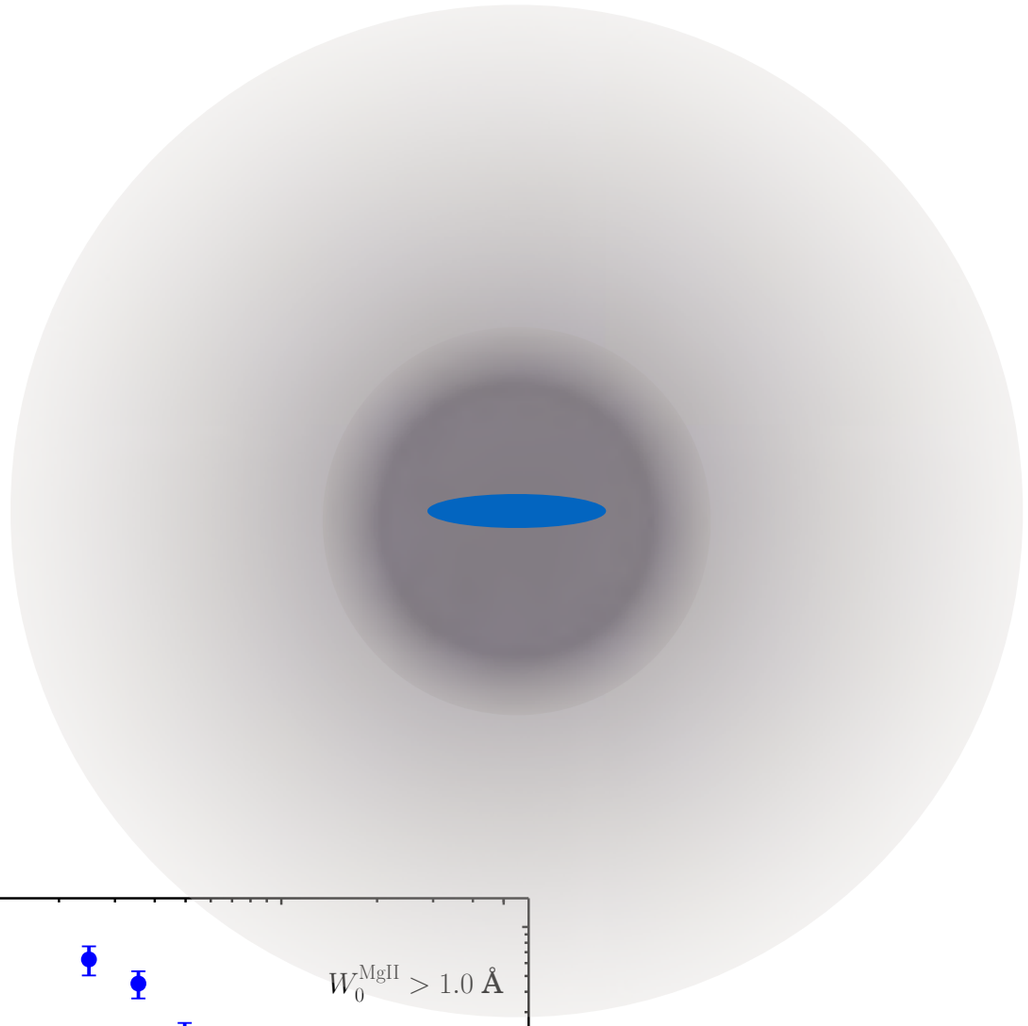


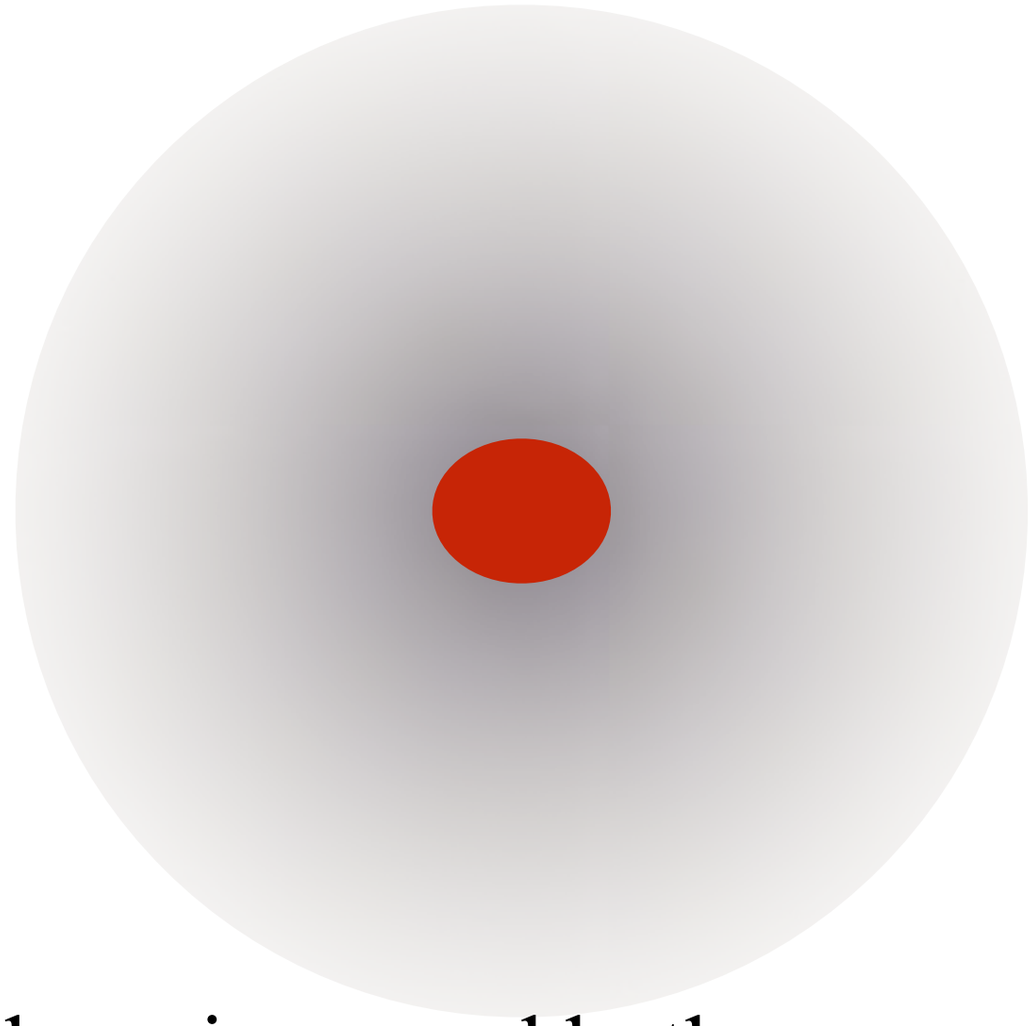
Cool gas is around both
star-forming galaxies and passive galaxies.

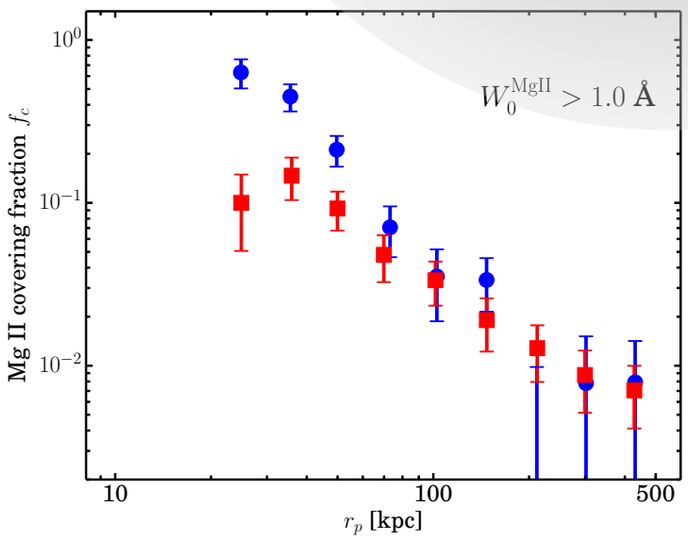
Cool gas around galaxies

Star-forming galaxies

Passive galaxies





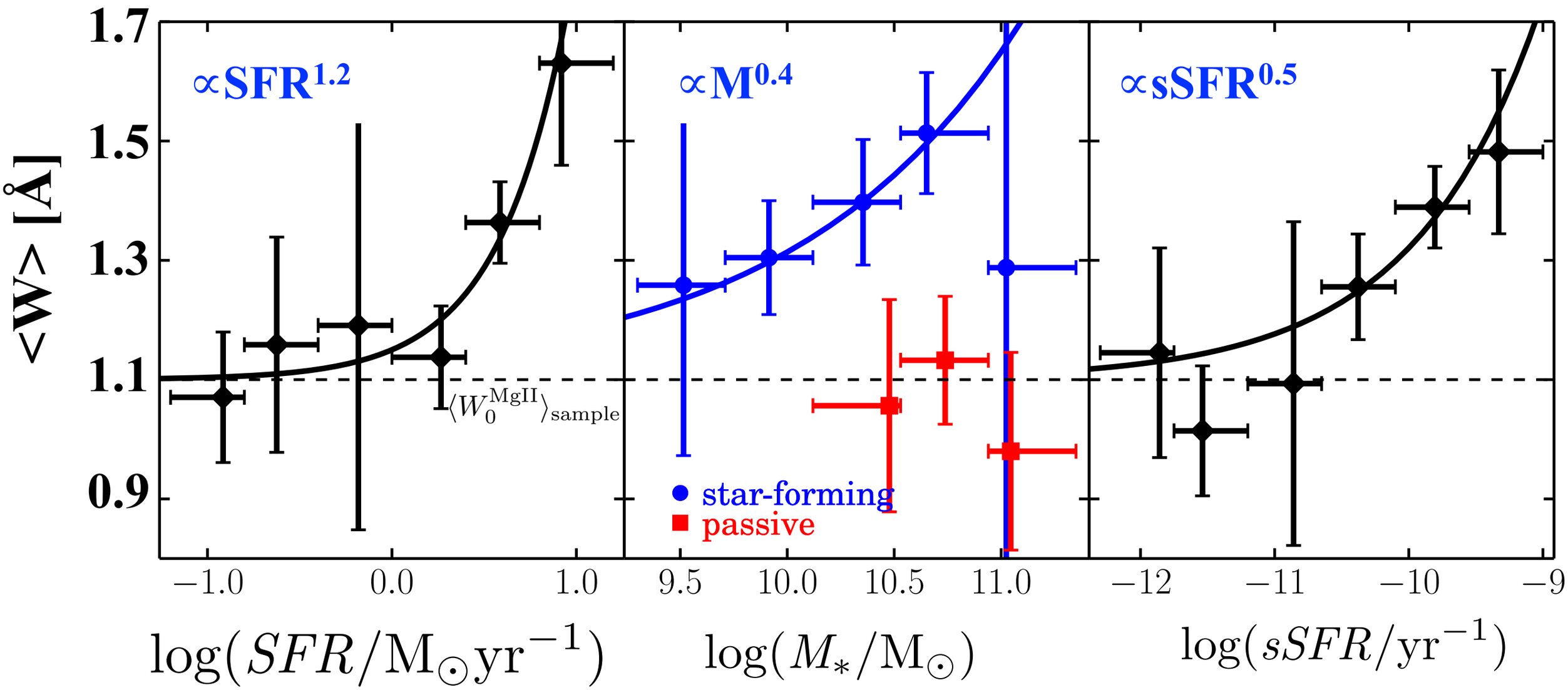


Cool gas is around both
star-forming galaxies and passive galaxies.

Excess absorption
around star-forming galaxies within 50 kpc.

The mean absorption as a function of galaxy properties

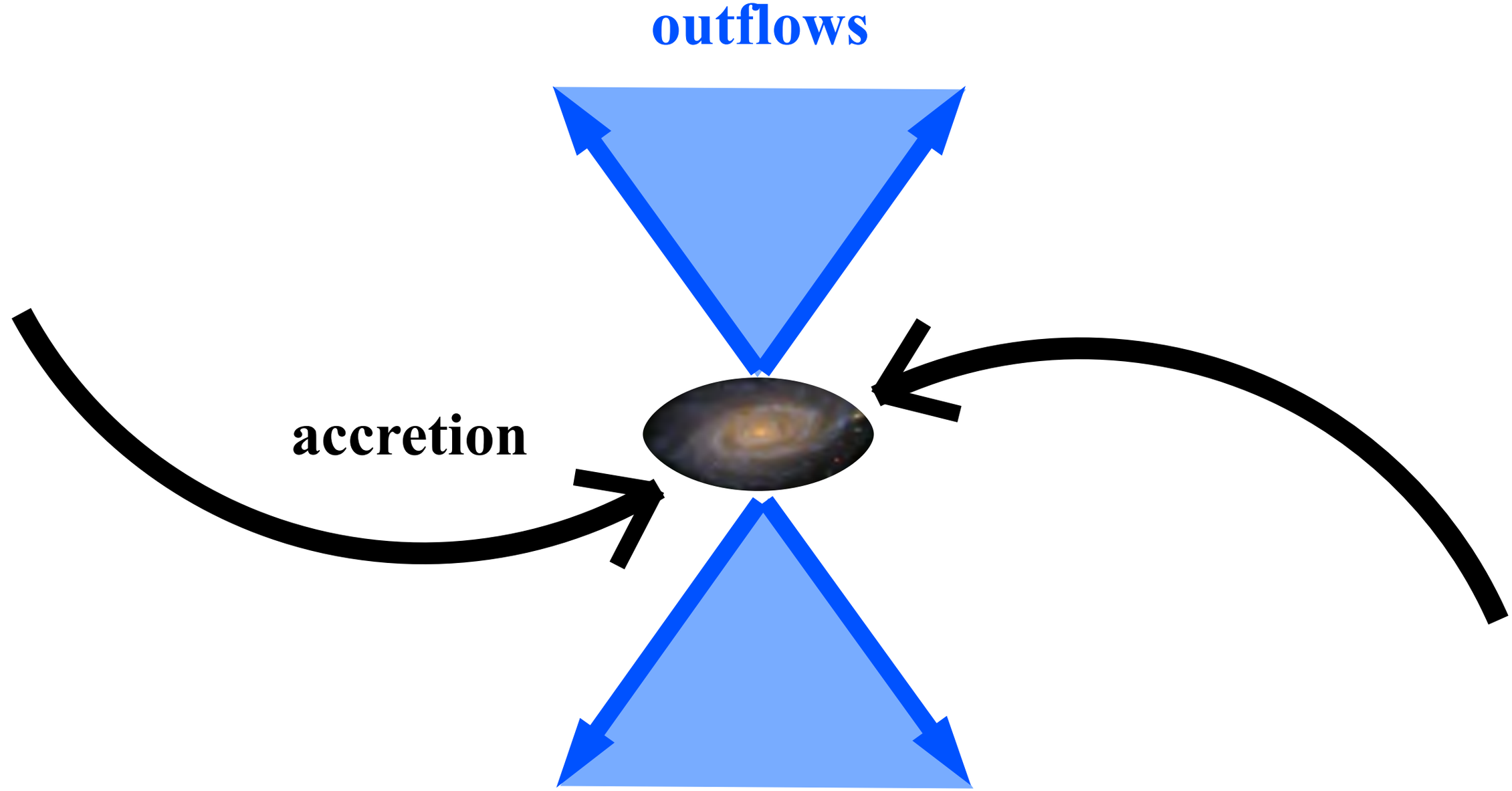
< 50 kpc



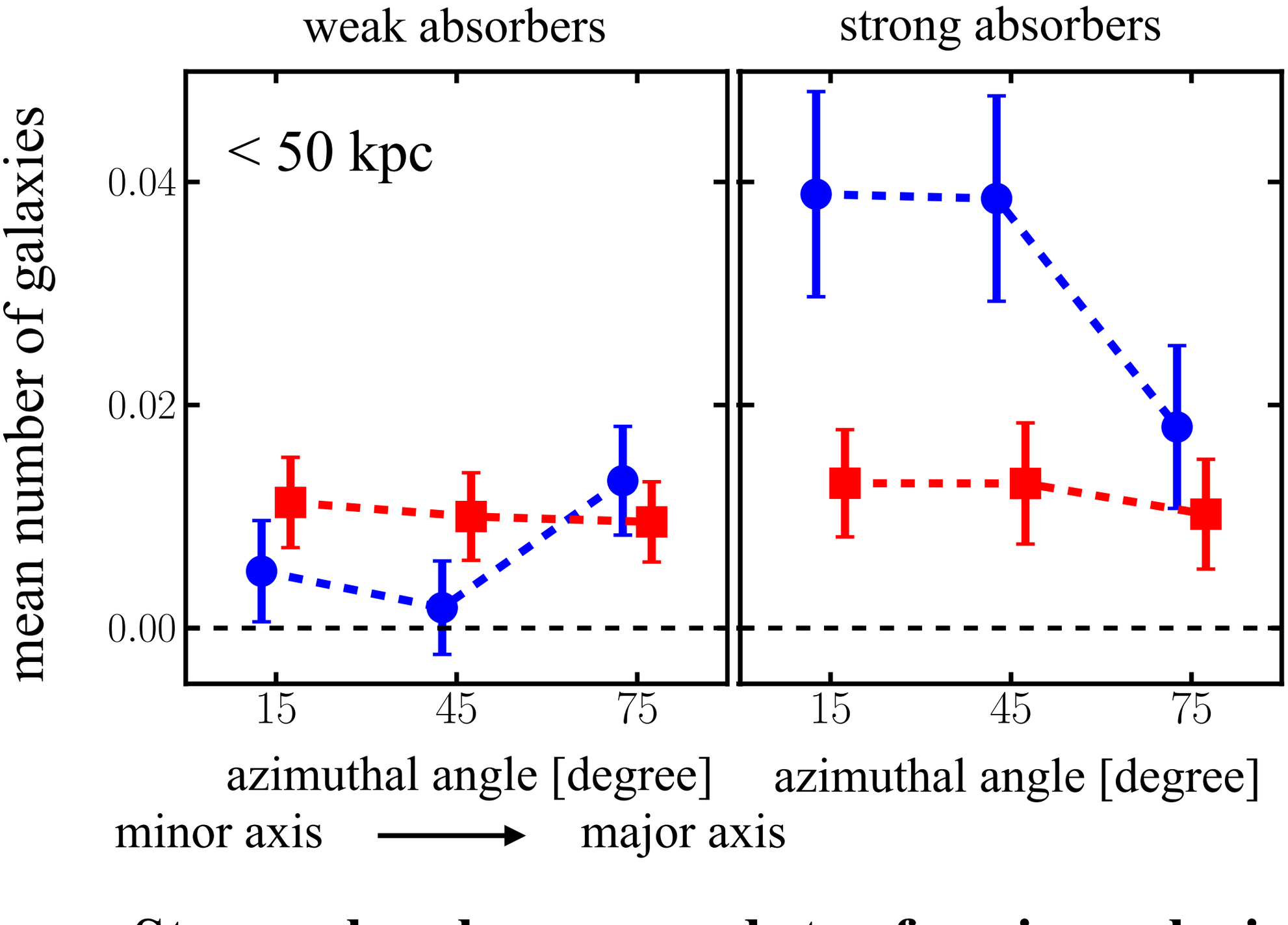
The scaling relations between absorption and galaxy properties

The cool circumgalactic gas (r~50 kpc) knows about galaxy properties (r~5 kpc).

Signatures of gas flows in the circumgalactic medium



Azimuthal Angle Dependence edge-on galaxies

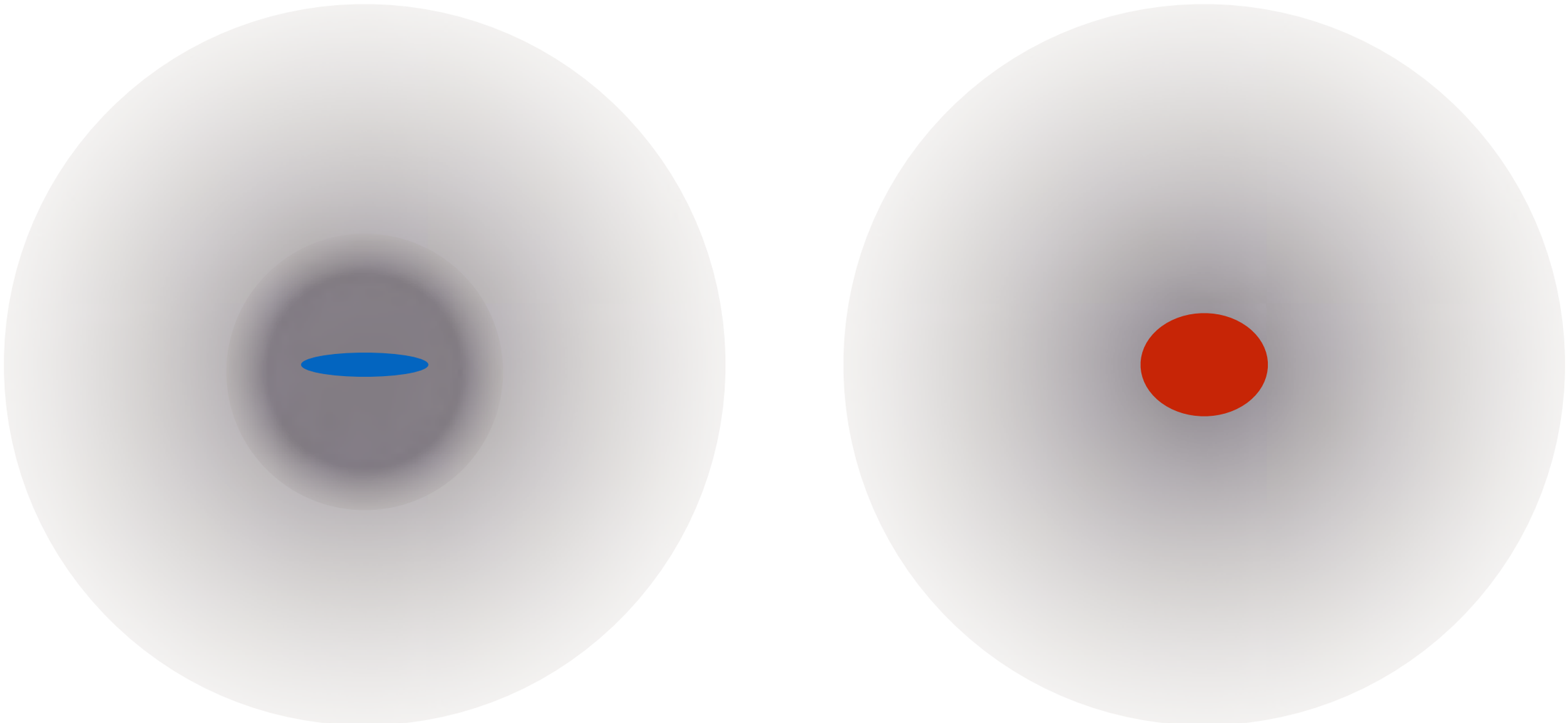


Strong absorbers around star-forming galaxies tend to trace outflowing gas.

Cool gas around galaxies

Star-forming galaxies

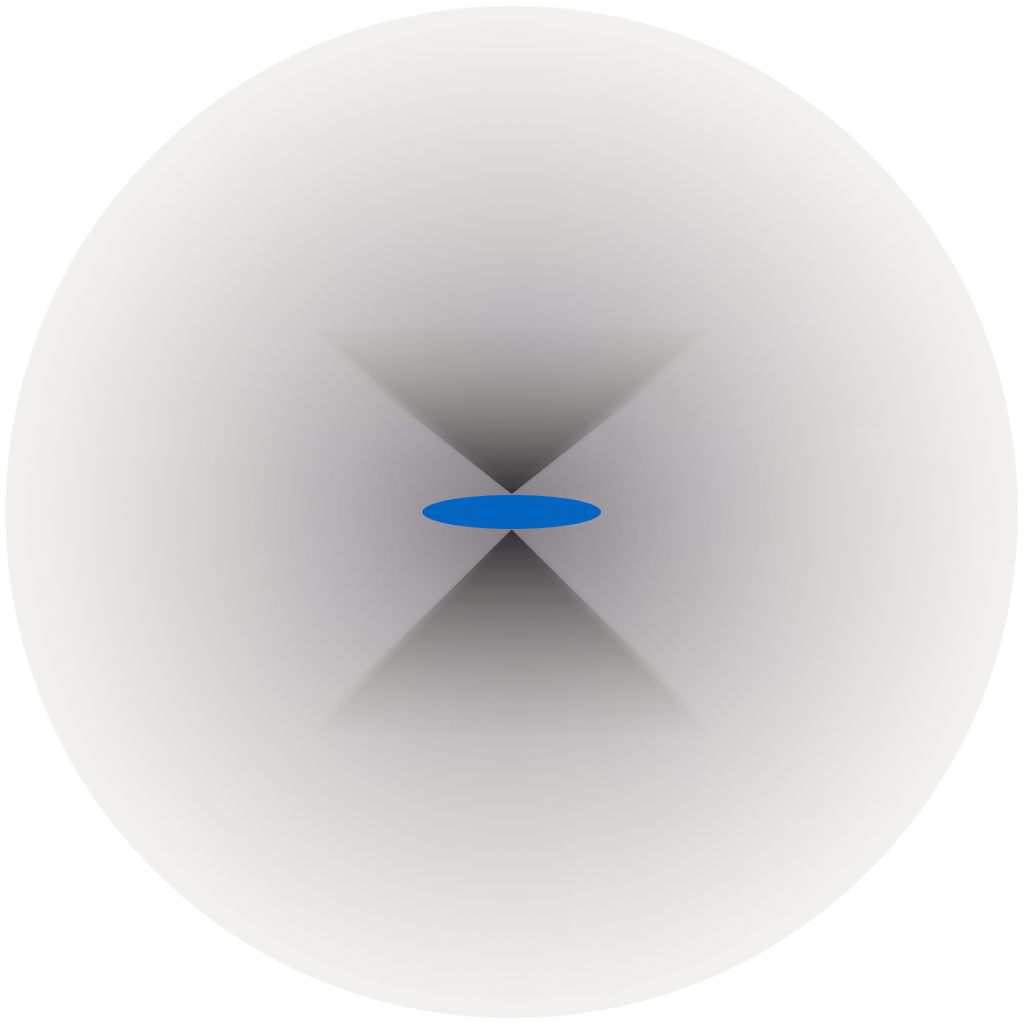
Passive galaxies



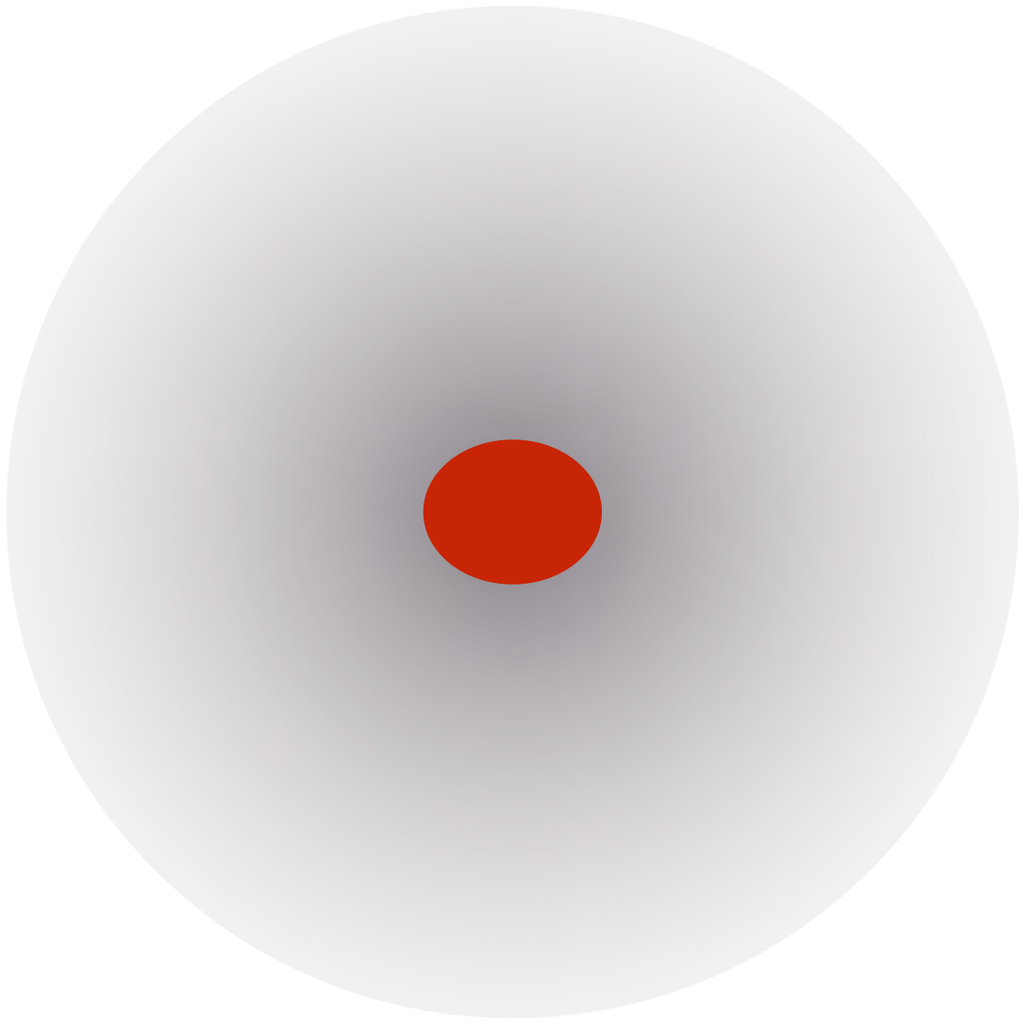
Excess absorption
around star-forming galaxies within 50 kpc.

Cool gas around galaxies

Star-forming galaxies

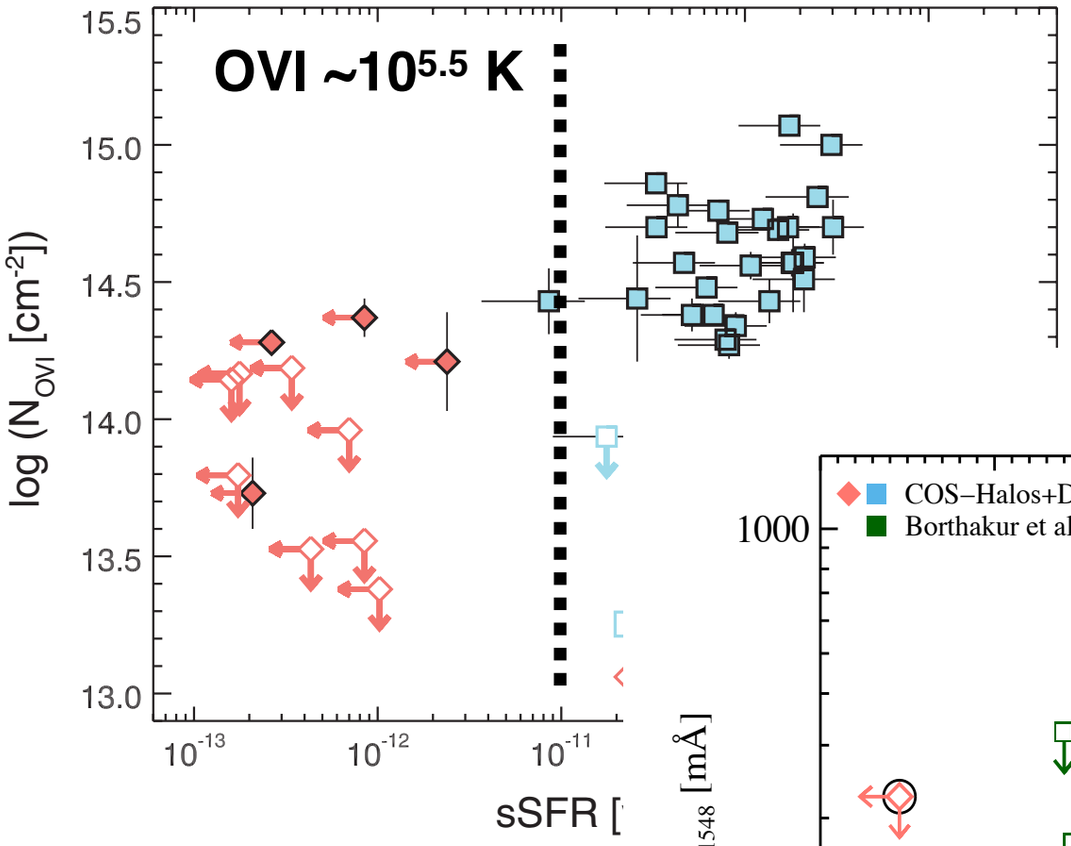


Passive galaxies

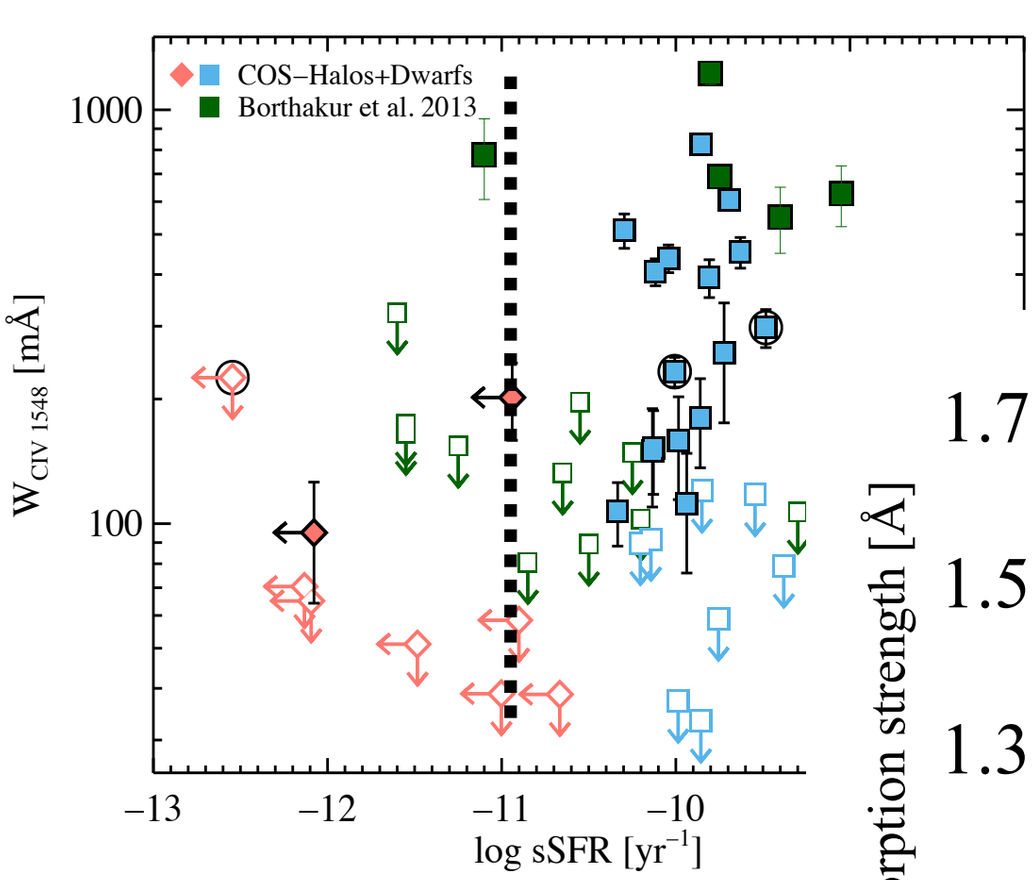


Excess absorption
around star-forming galaxies within 50 kpc.

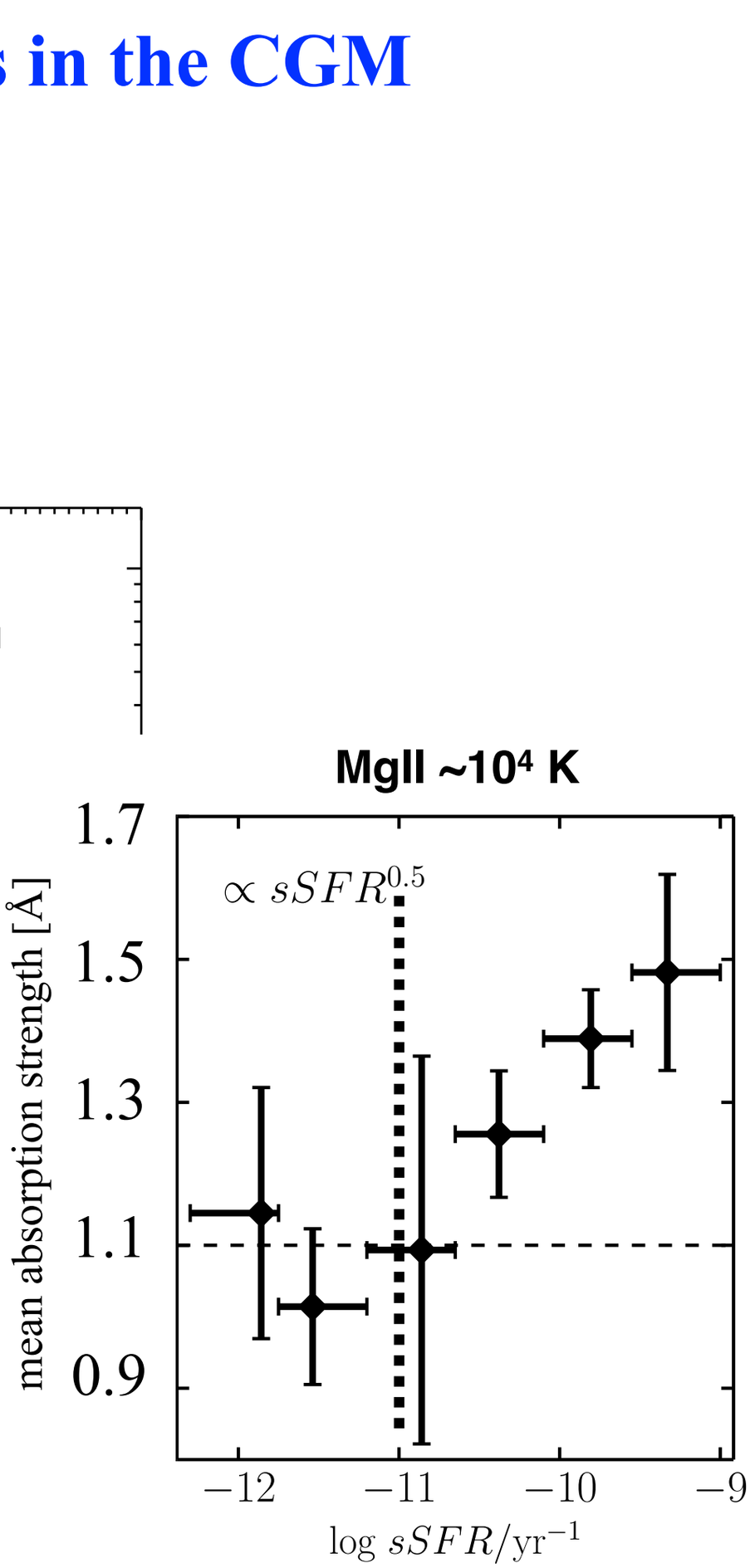
The dichotomy of galaxy types in the CGM



Tumlinson & COS-

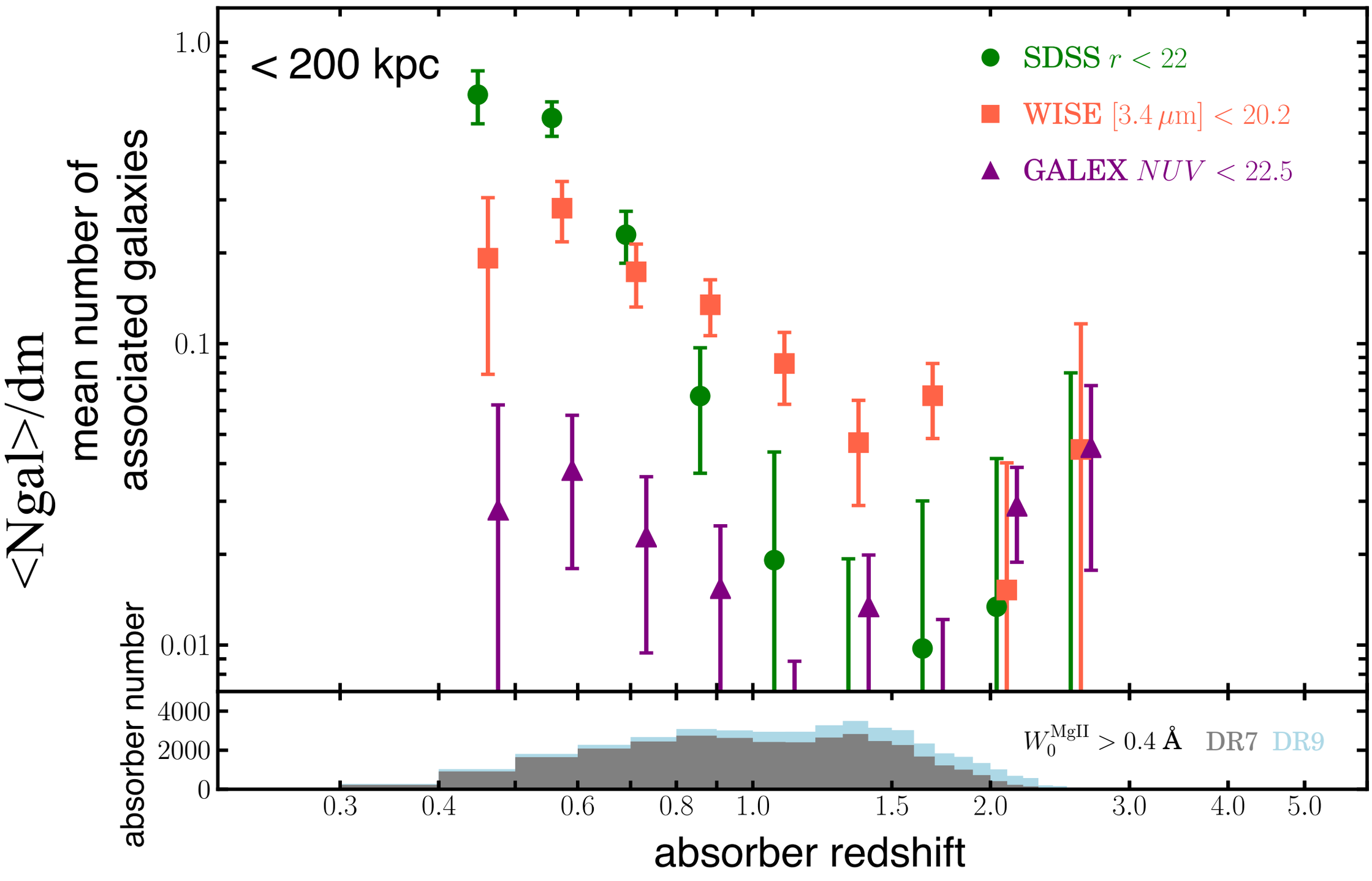


Bordoloi & COS-Halo tea
Borthakur et al. 201

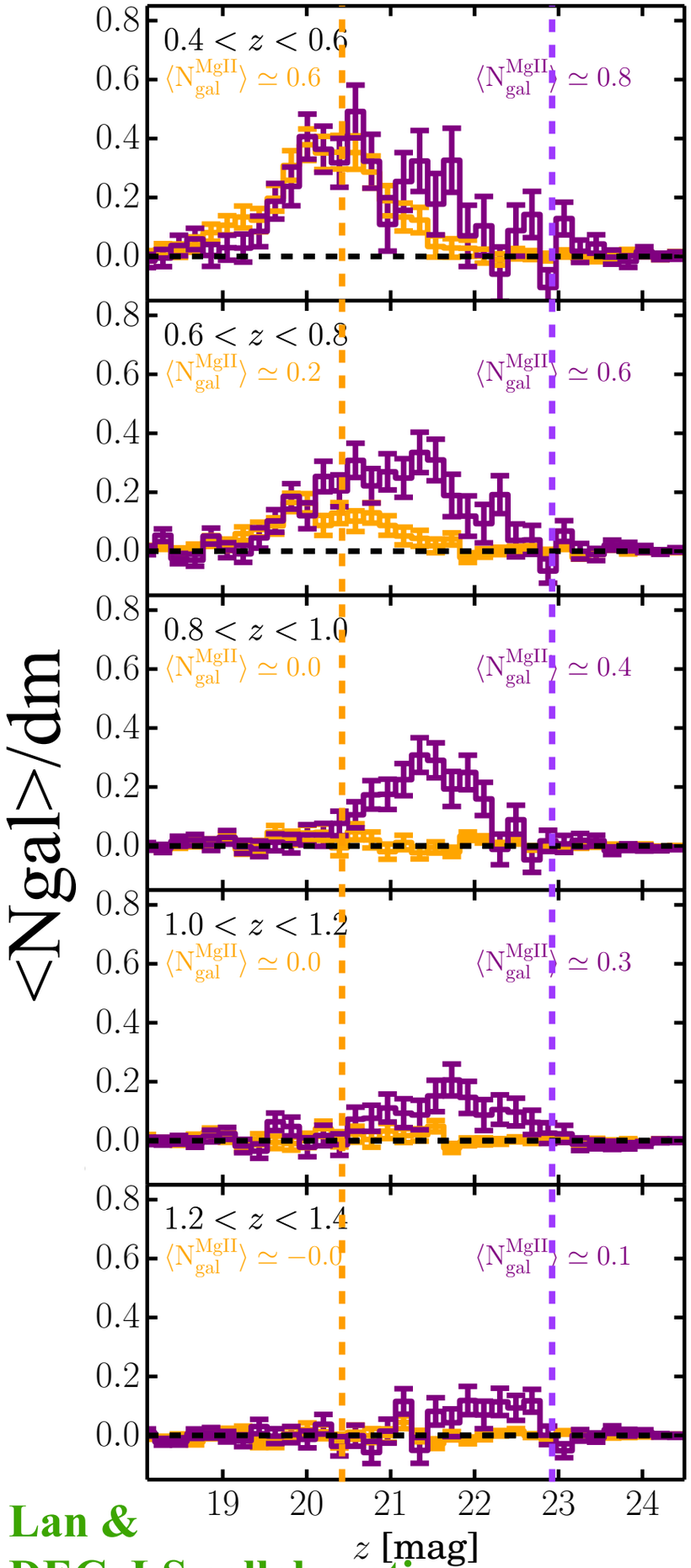


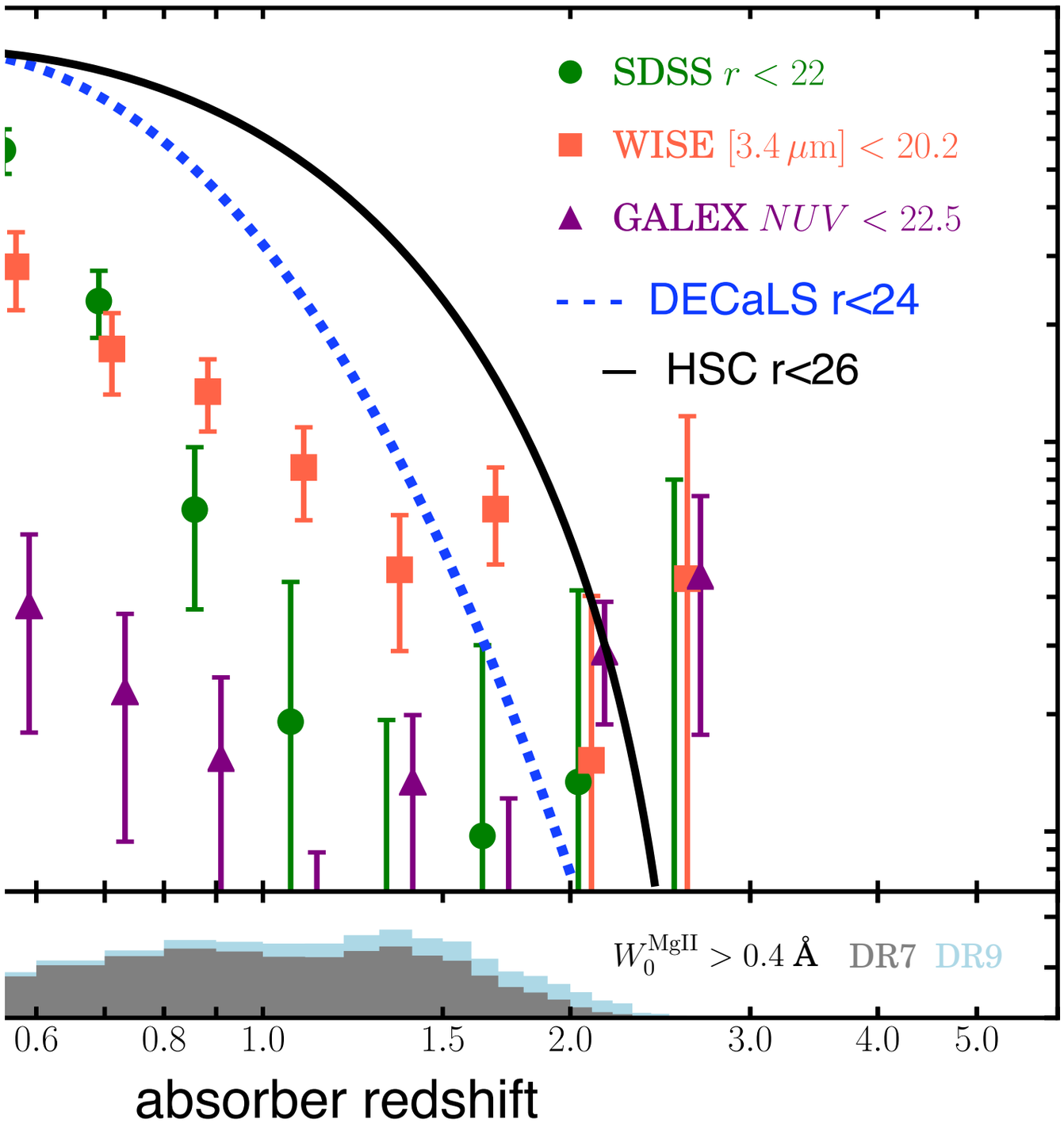
How large imaging surveys can help before PFS?

Connecting the CGM and galaxy properties with large surveys



and galaxy properties with large surveys



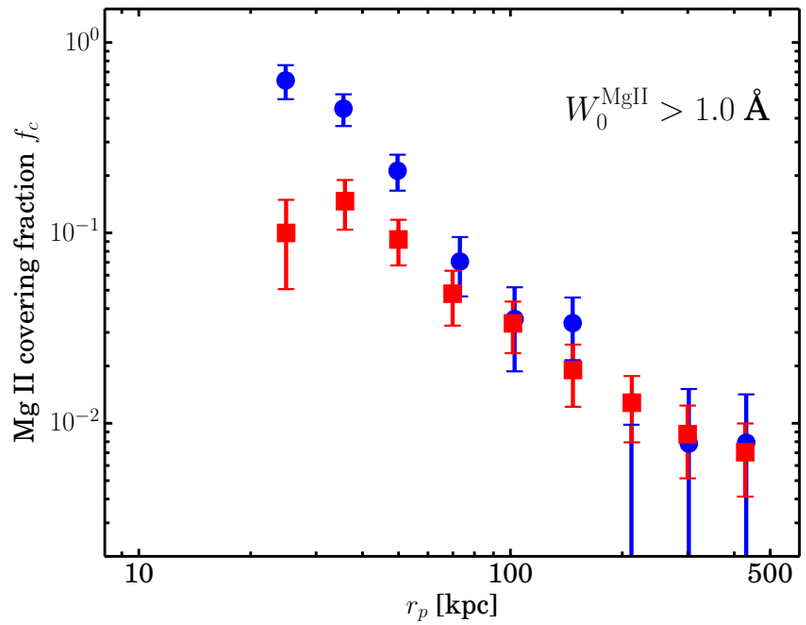


Lan &
DECaLS collaboration

Probing galaxies and CGM relation through cosmic time!

Is there cool gas around both types of galaxies?

Yes, there is cool gas around all galaxies.



Do the properties of the cool CGM depend on the galaxy properties?

Yes, there is more MgII absorption around star-forming galaxies.

Scaling relations between gas and galaxies.