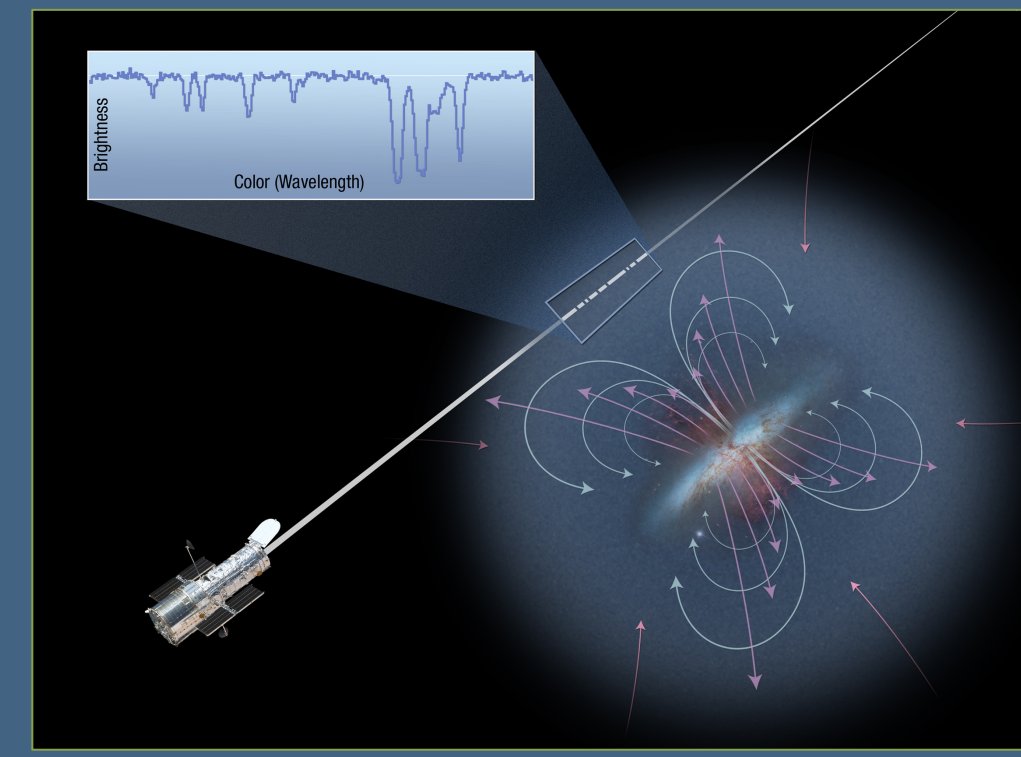


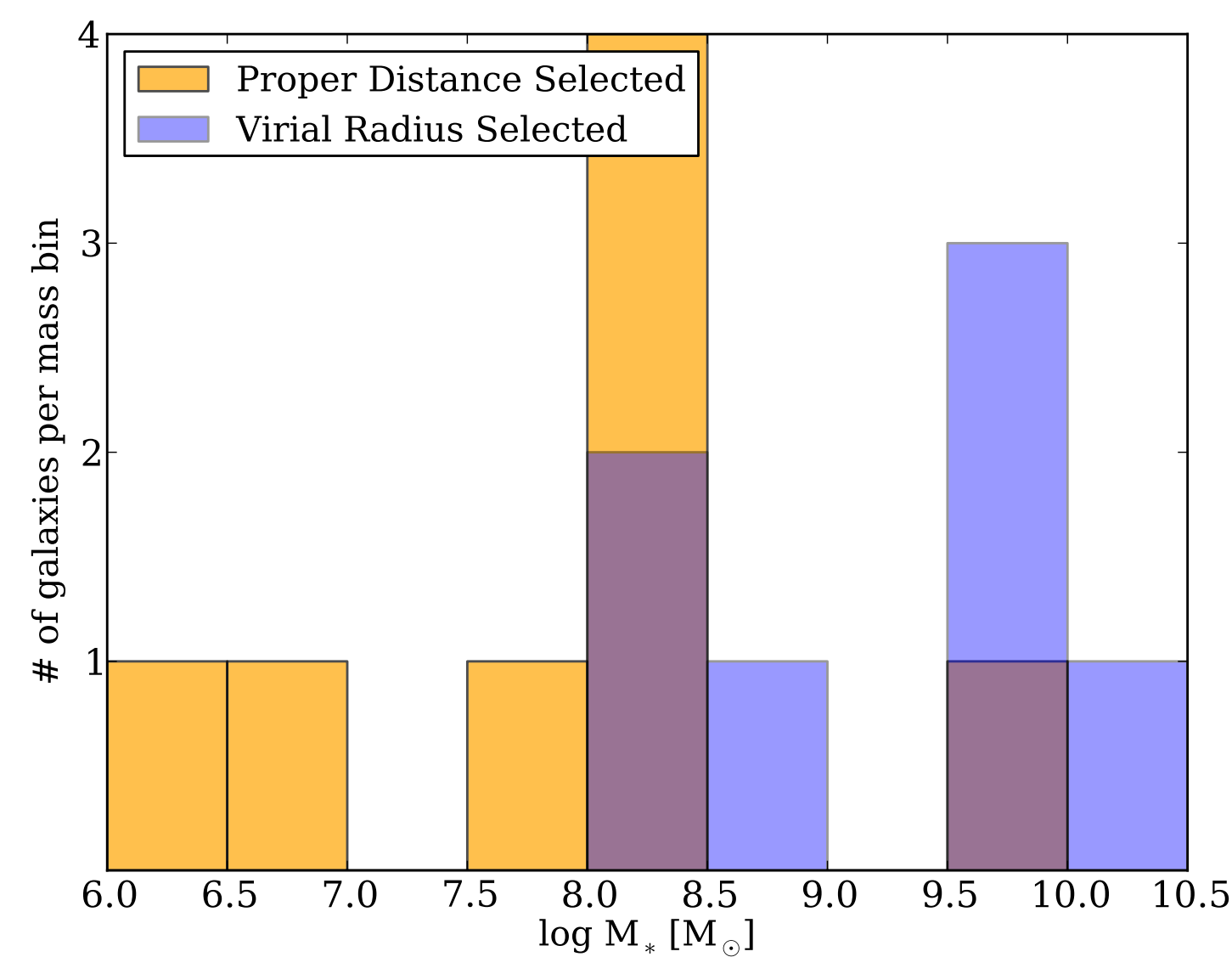
# A Deep Search for Galaxies Associated With Very Low-redshift C IV Absorbers: Connections with Dwarf Galaxies and Environment



## C IV Absorbers and Individual Galaxies

We have conducted a *blind survey* of C IV absorbers at  $z < 0.16$  using HST/COS data and have leveraged public survey data from SDSS, etc., to study the metal enriched circumgalactic medium (CGM) in the nearby universe. At  $z < 0.015$ , the galaxy survey data are spectroscopically complete to  $\sim 0.02 L^*$  galaxies (similar to the SMC).

Fig 1. We select C IV-associated galaxies in two ways: 1) the closest galaxy in proper distance to the sightline (orange) and 2) the closest in terms of galaxy virial radius (purple). The proper distance selection preferentially chooses lower mass galaxies, whereas the virial radius selection chooses more massive galaxies.



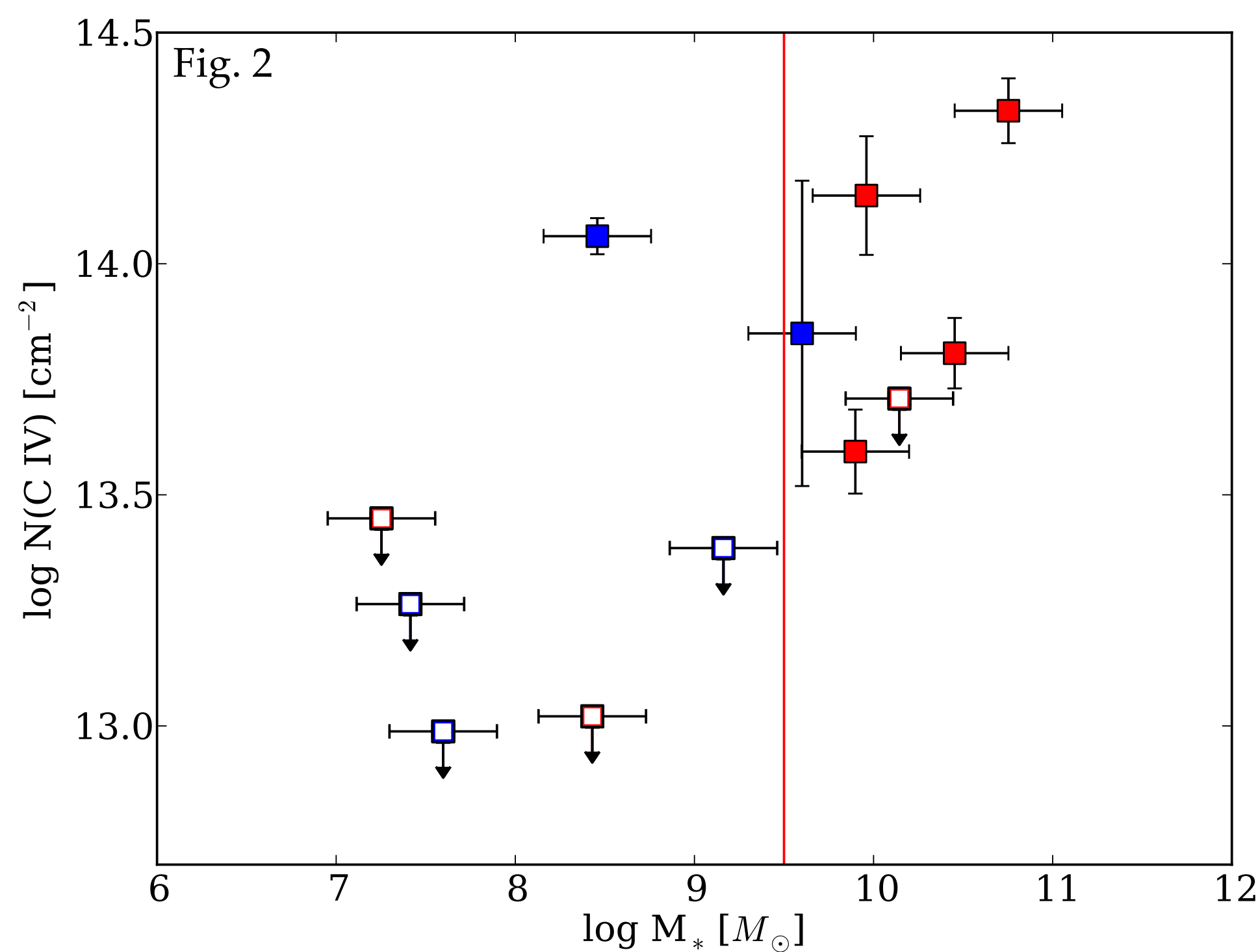
However, the CGM is patchy to the C IV-traced gas (Bordoloi et al., 2014; Liang & Chen, 2014) even as the association can be ambiguous as shown in Fig. 1. Our data (Fig. 2) suggest **host galaxy mass plays a role**.

Fig. 2 shows galaxies having their CGM pierced by a QSO sightline within  $1 R_{\text{vir}}$ . Symbol color denotes star-formation activity, per Peng et al. (2010) color criterion.

The C IV detection fraction depends on galaxy mass:

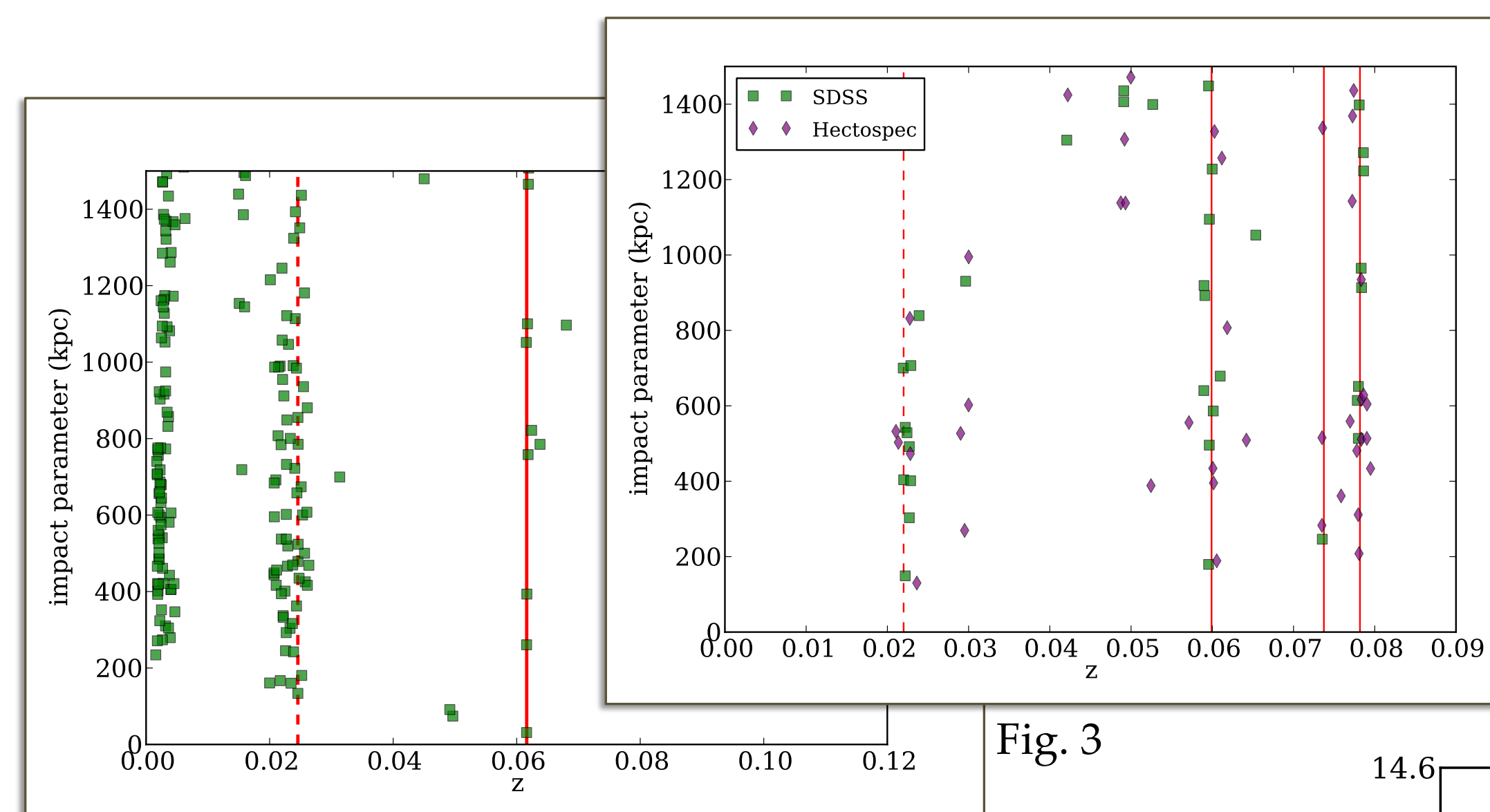
$$M_* > 10^{9.5} M_{\text{sun}}: 83^{+10}_{-20} \%$$

$$M_* < 10^{9.5} M_{\text{sun}}: 17^{+20}_{-10} \%$$



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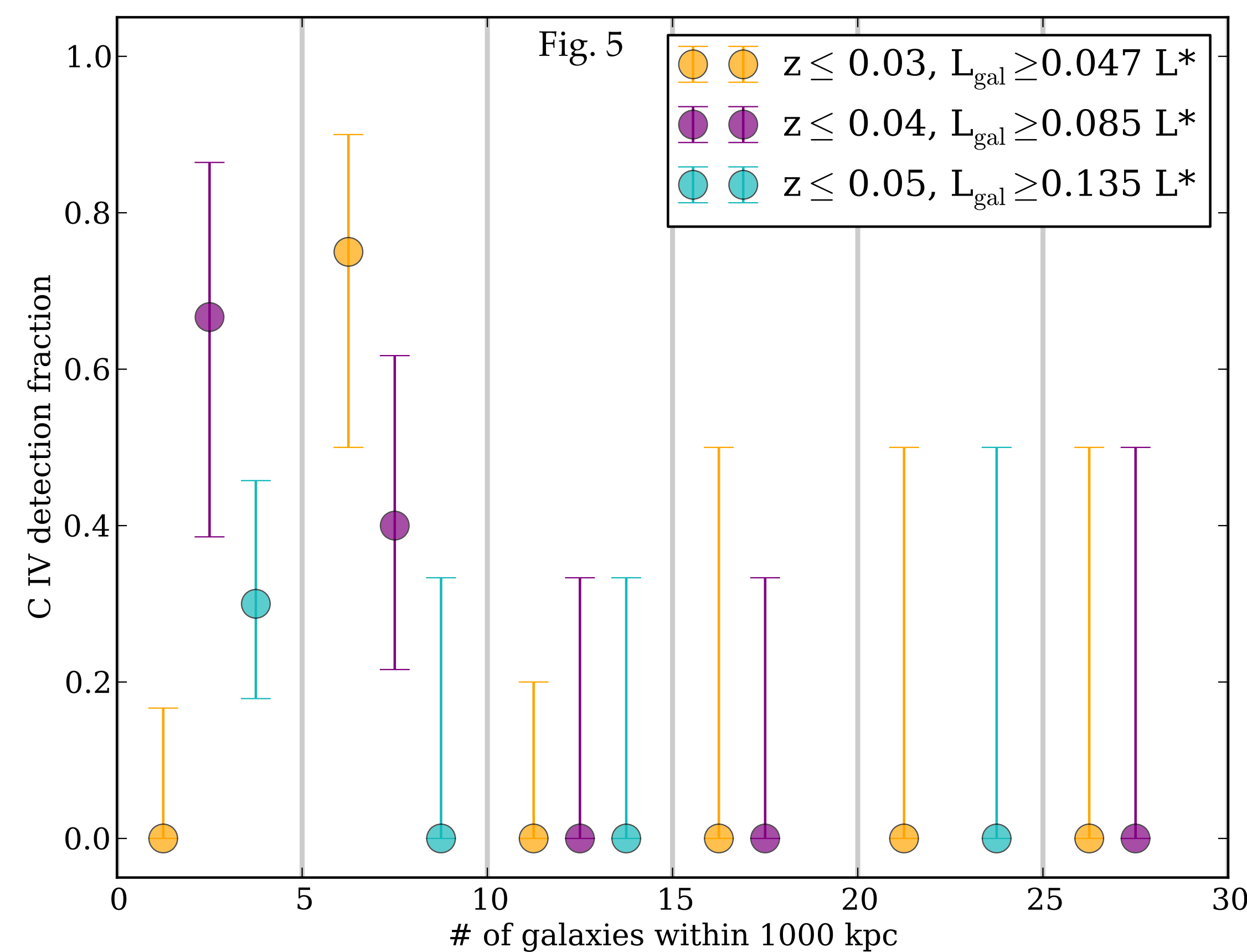
## C IV Absorbers Live Around Galaxies; Galaxies Live Around (and Influence) One Another



We assess the **dependence of the C IV detection rate on galaxy environment** by counting the galaxies (of some tracer luminosity) within 1 Mpc at redshifts where a galaxy falls within 150 kpc of a sightline.

Fig. 4 shows the result for  $L = 0.085 L^*$  tracers at  $z < 0.04$ . Open and closed symbols denote detections and nondetections, respectively. Larger symbol sizes indicate smaller impact parameters for the nearest galaxy ( $R_{\text{max}} = 150$  kpc).

**We do not detect C IV at galaxy densities  $\geq 9 \text{ Mpc}^{-1}$ .**



The QSO sightlines pierce the CGM of many galaxies at close proximity along the line of sight. **These galaxies often reside in larger scale environments.**

Fig. 3 shows the galaxies out to 1500 kpc around two sightlines. Solid lines and dashed lines denote redshifts where C IV is detected and is not detected, respectively.

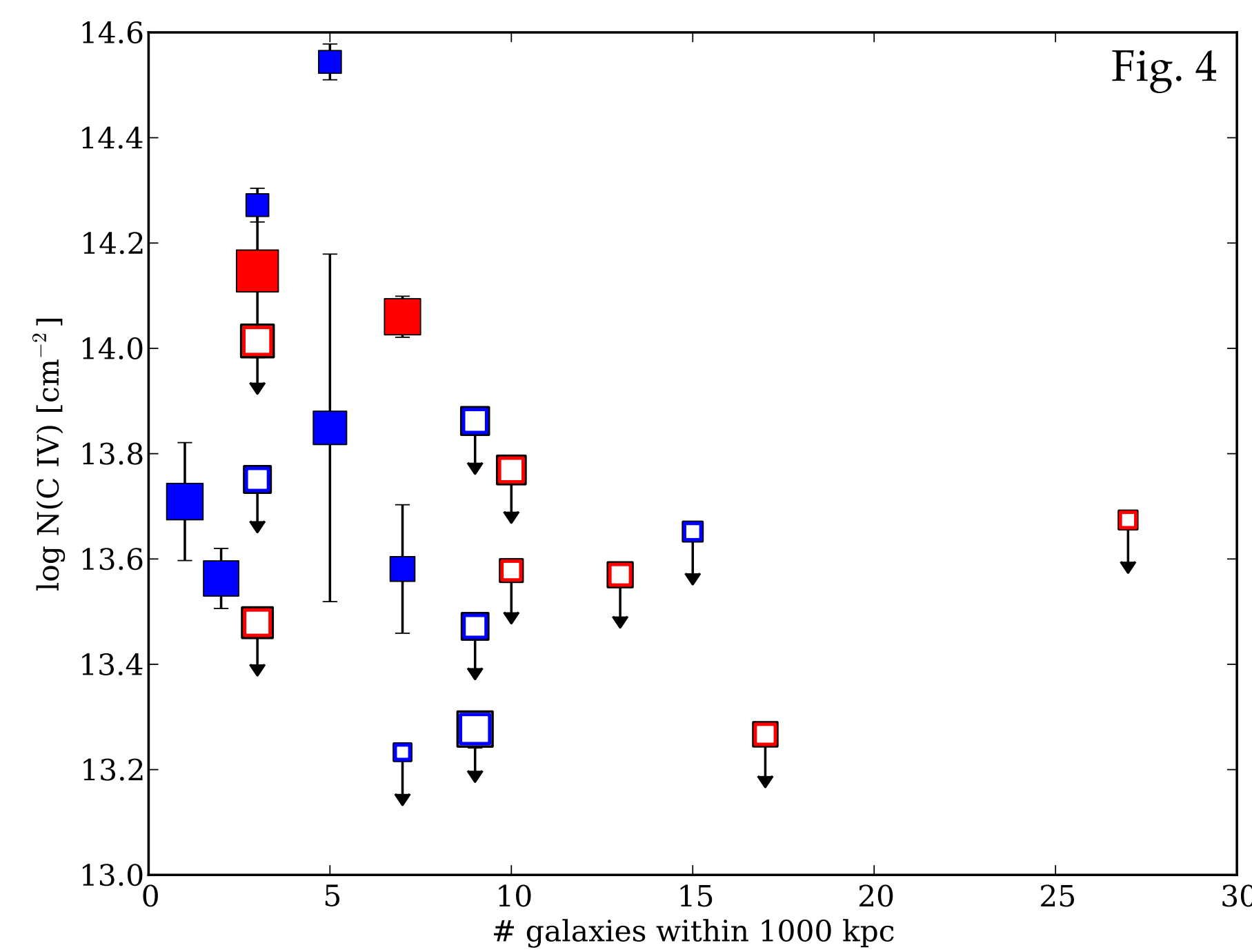
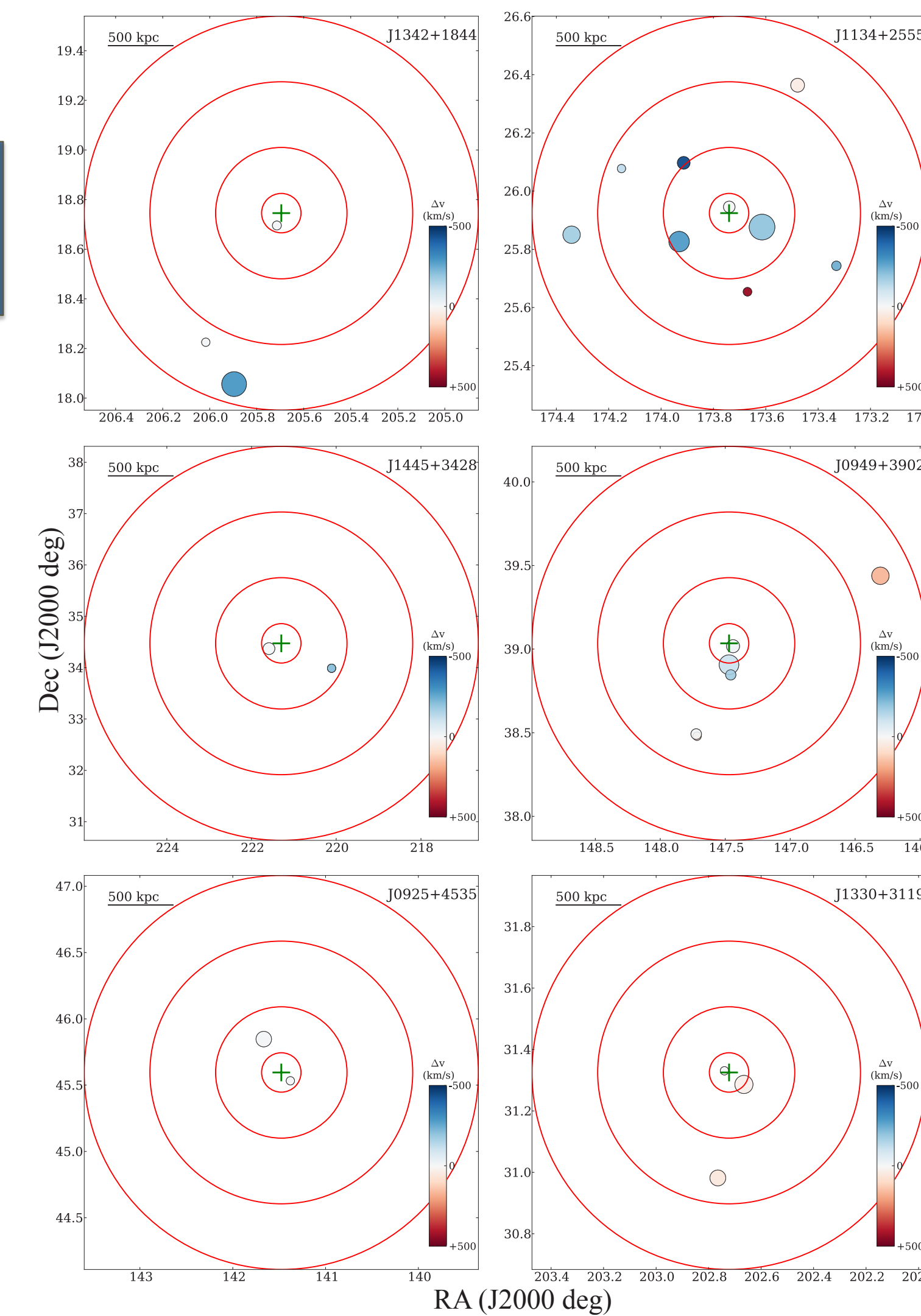


Fig. 5 shows the C IV detection rate at increasing galaxy density for tracers of varying luminosity indicated in the legend. Purple markers reflect the results from Fig. 4.

**The C IV detection rate in the CGM dramatically decreases in denser environments.**

These results suggest that the environmental processes that eventually quench the star formation and transform the morphologies of galaxies are already evident in their gaseous halos.

## Environments with C IV Detections



## Environments with Nondetections

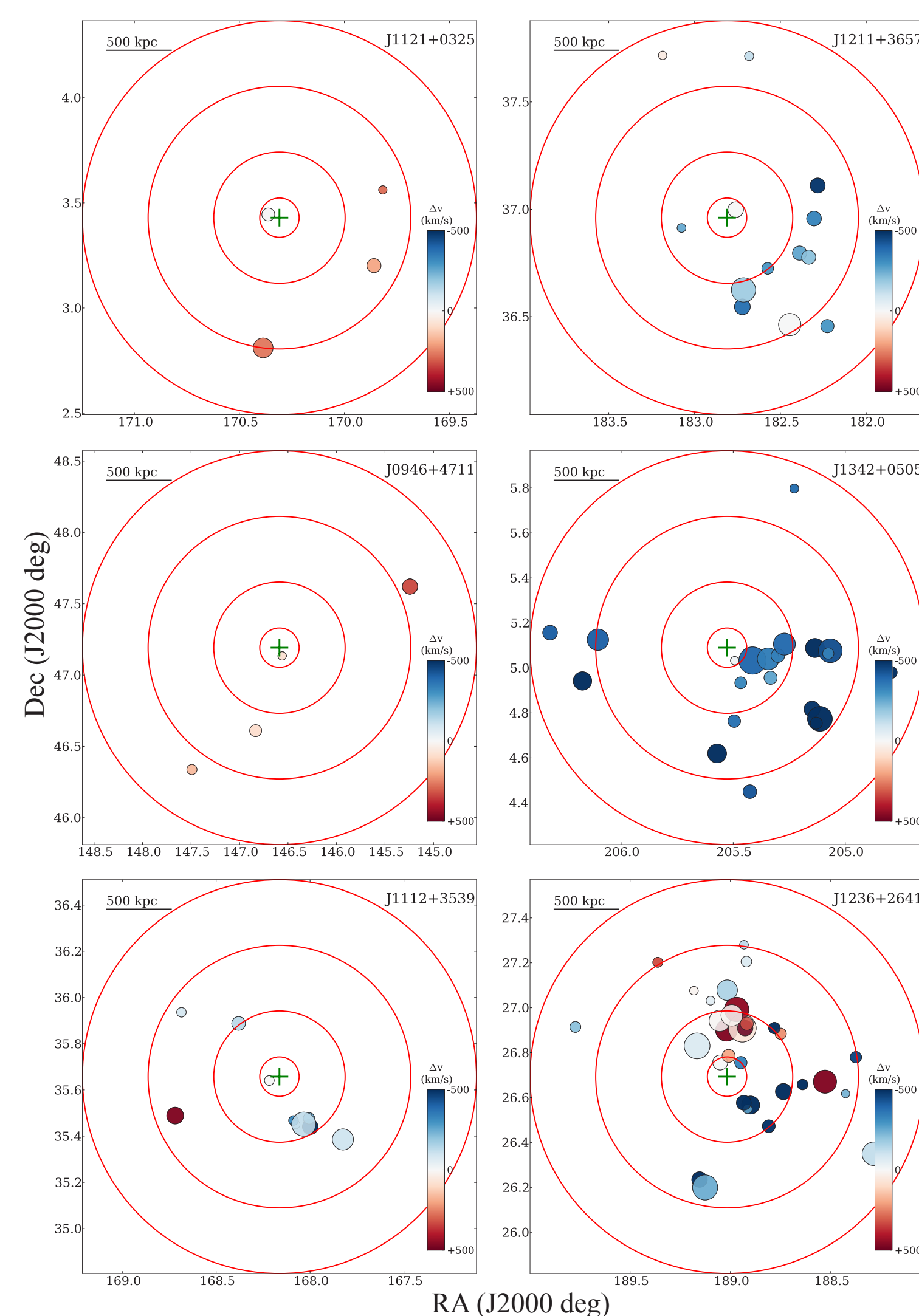


Fig 6. Maps of galaxies within 1500 kpc of QSO sightlines for certain detections (upper) and nondetections (lower) from Fig. 4. Symbol size and color indicate luminosity and velocity difference, respectively.