MUSE - ALMA HALOS

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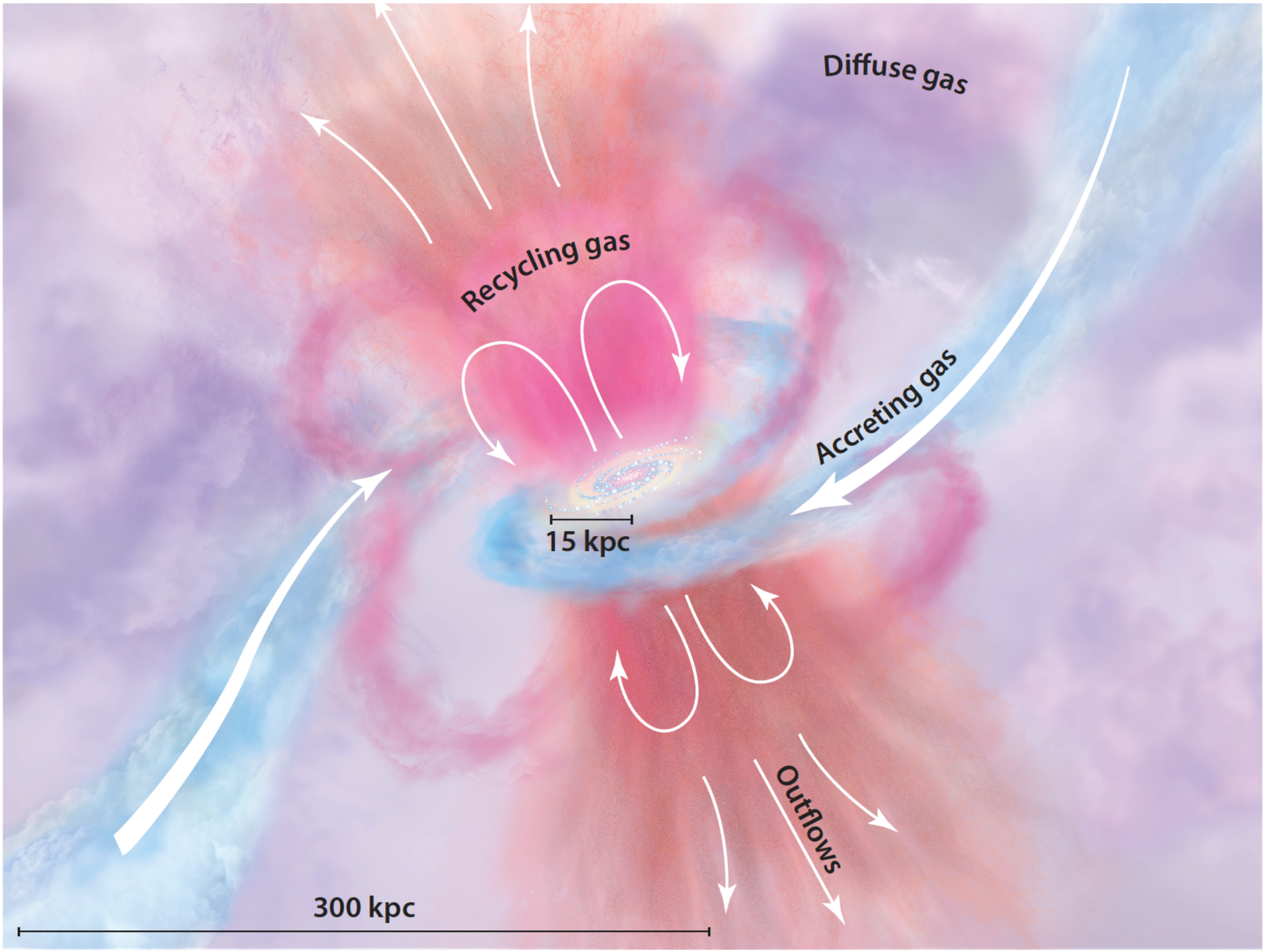
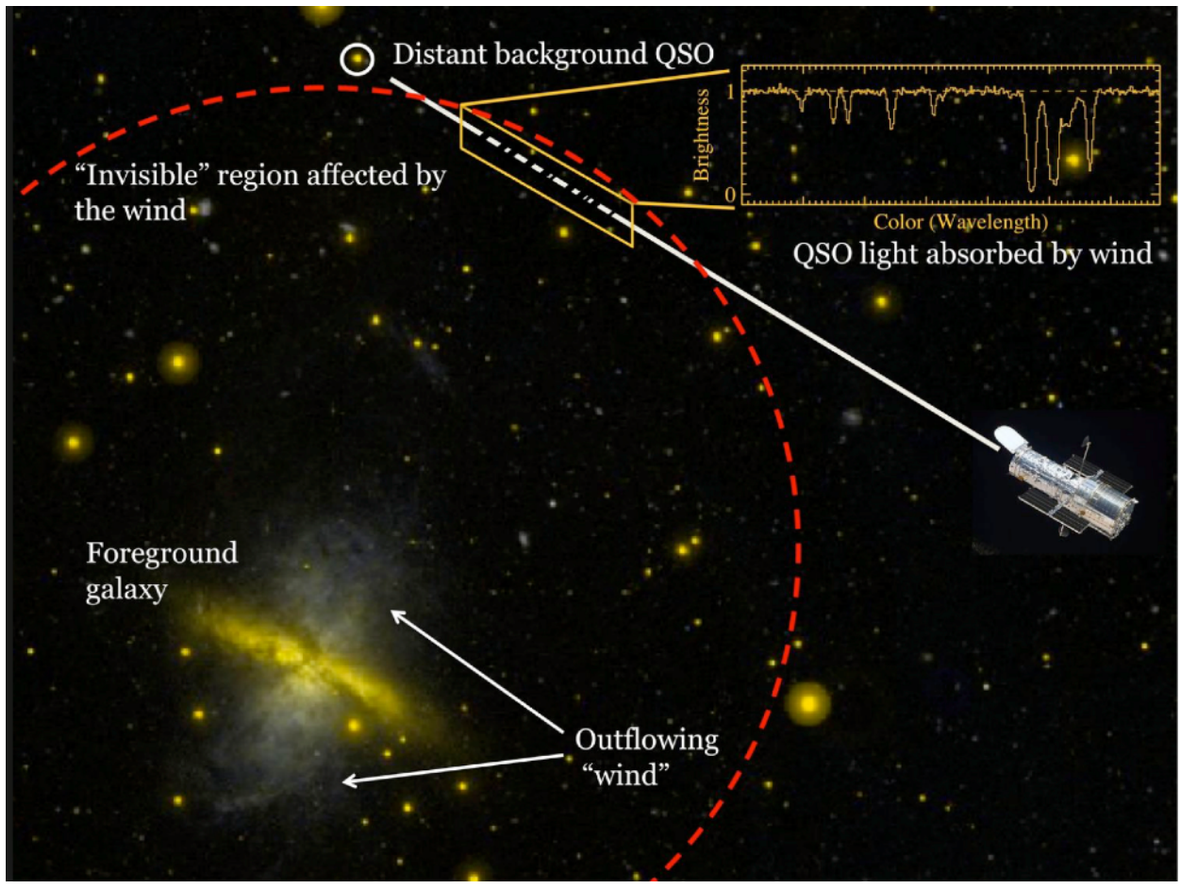
Circum–Galactic Medium



ABSORBING GAS IN GALAXIES HALOES

Most absorbers found in UV spectroscopic surveys with **HST COS** spectrograph



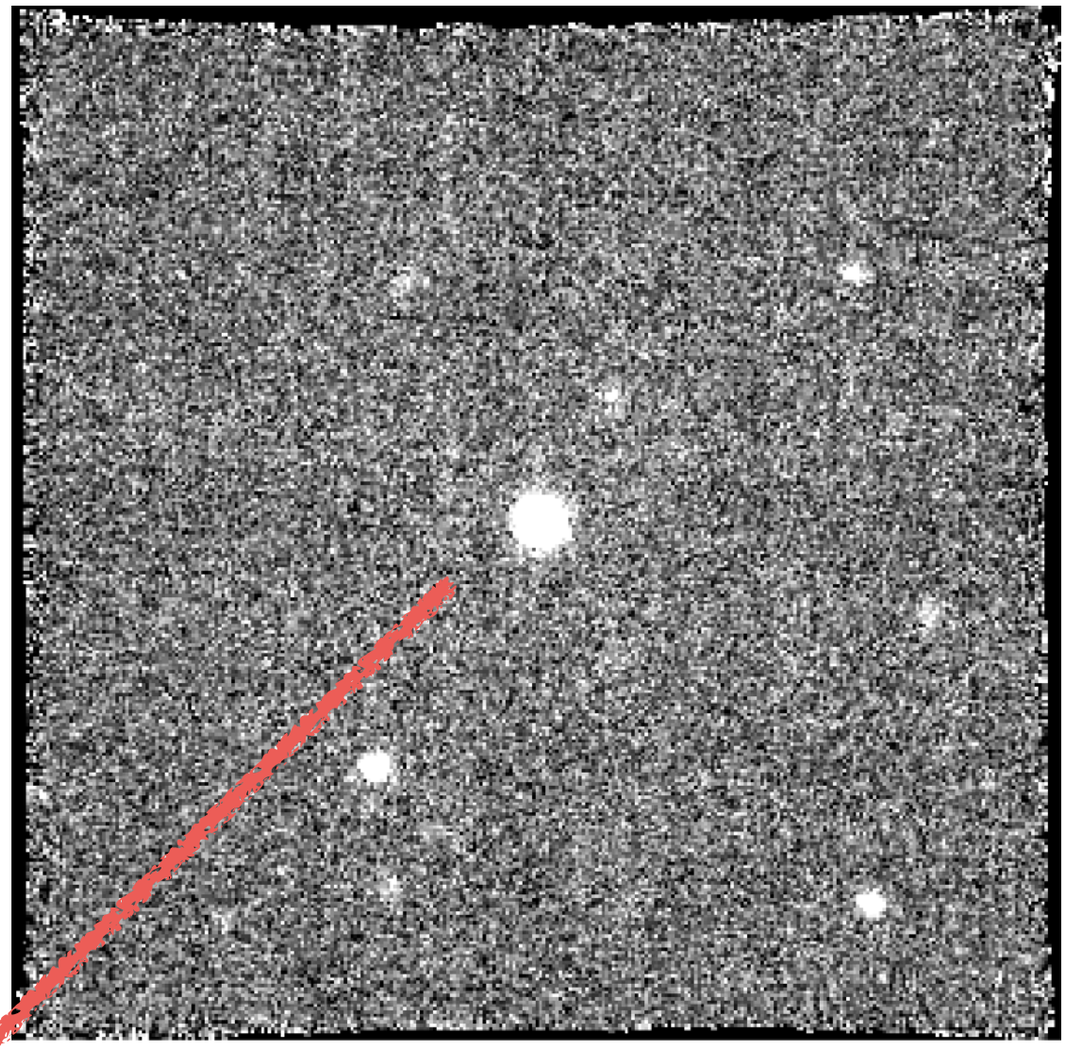
How to find associated galaxy/galaxies?

What are the properties of the associated galaxies?

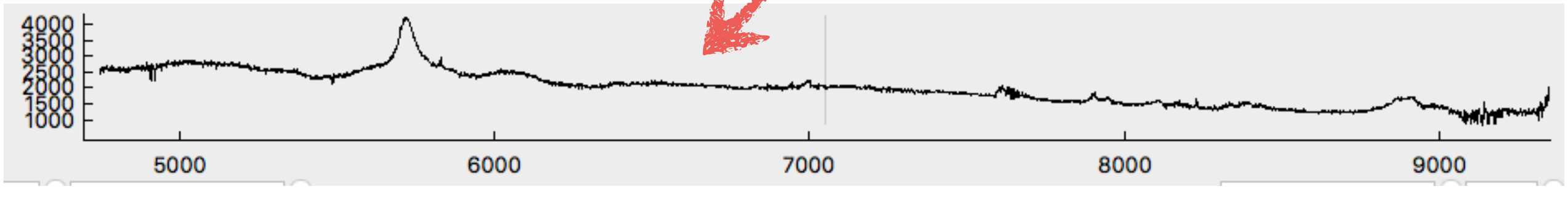
Can we see galaxies interacting with or influenced by CGM gas ?

MUSE - GALAXY HUNTER

- large FOV: reaching **150-200 kpc** at z = 0.5 - 1
- **spectrum of each source**: classification, identification of galaxies at the **redshift of the absorber**
- Possible to identify galaxy at **very low impact parameter**



QSO spectrum



MUSE - GALAXY HUNTER

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- **spectrum of each source** in the FOV: classification, identification of galaxies at the **redshift of the absorber**
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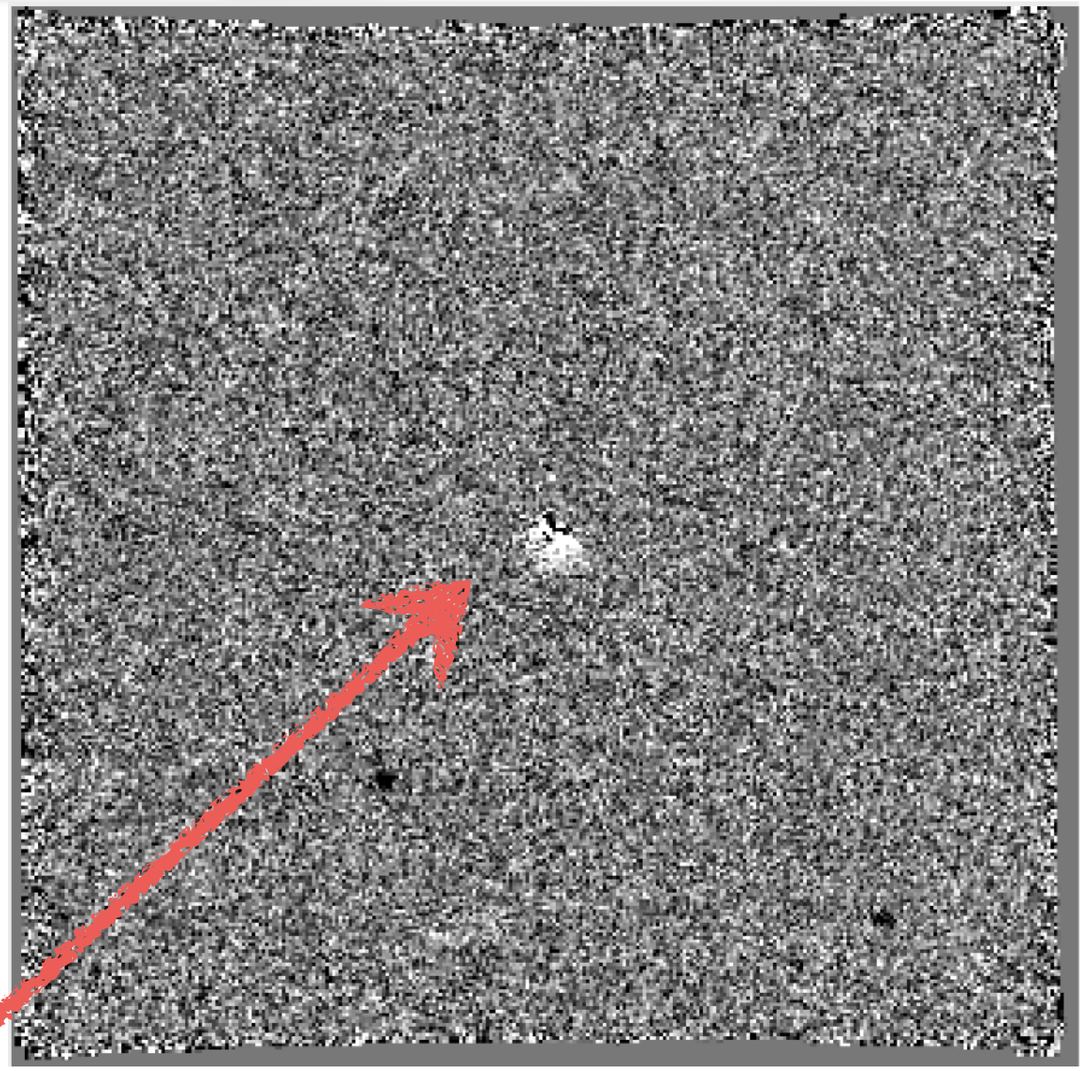
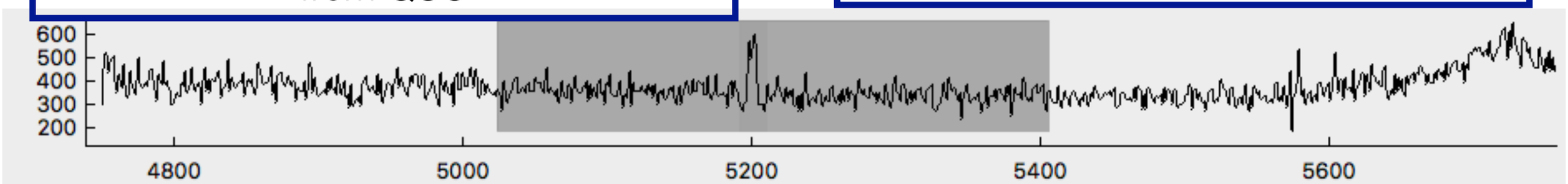


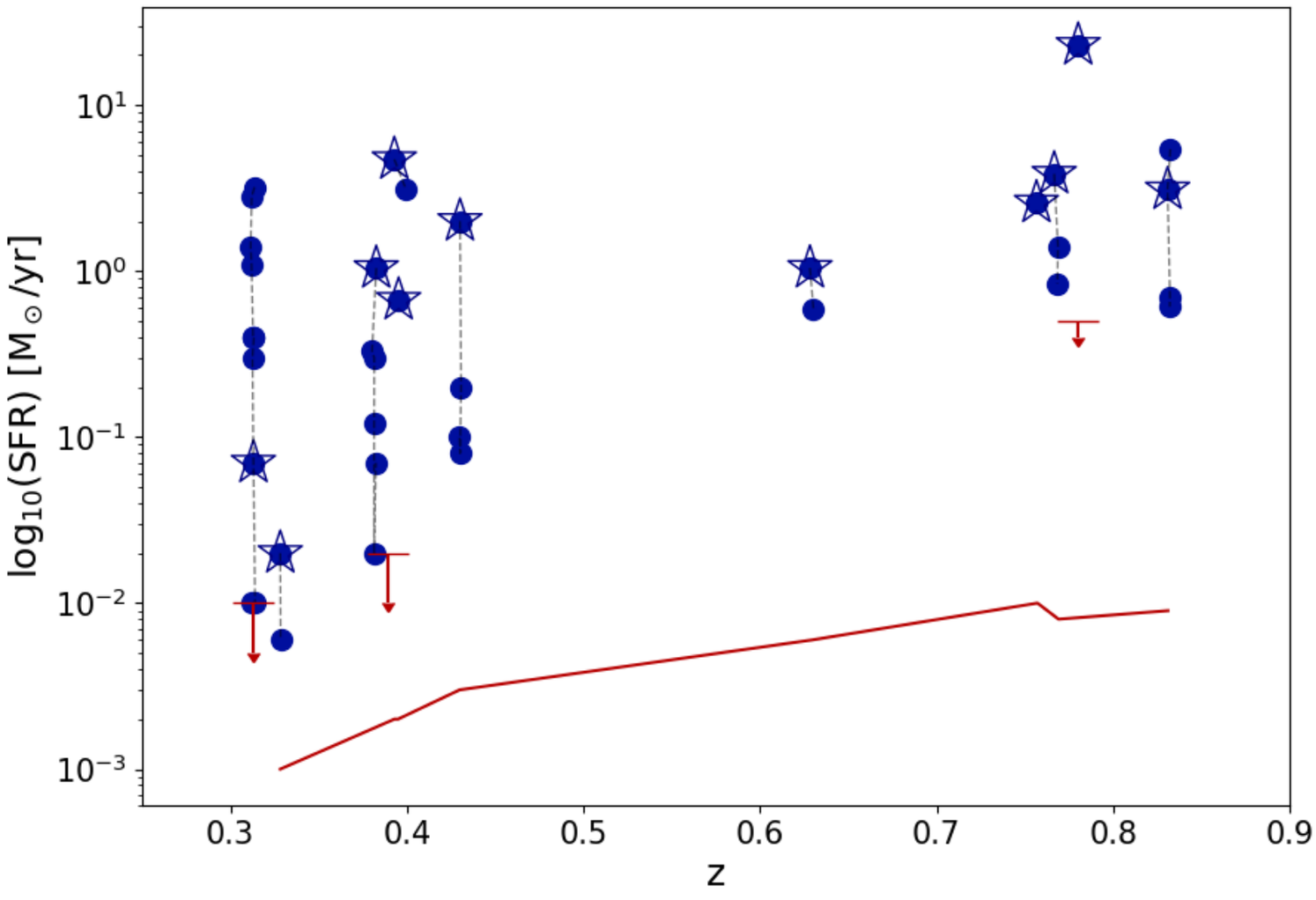
Pseudo narrow-band filer around the z of the absorber

[OII] emission line from galaxy at **1”** from QSO



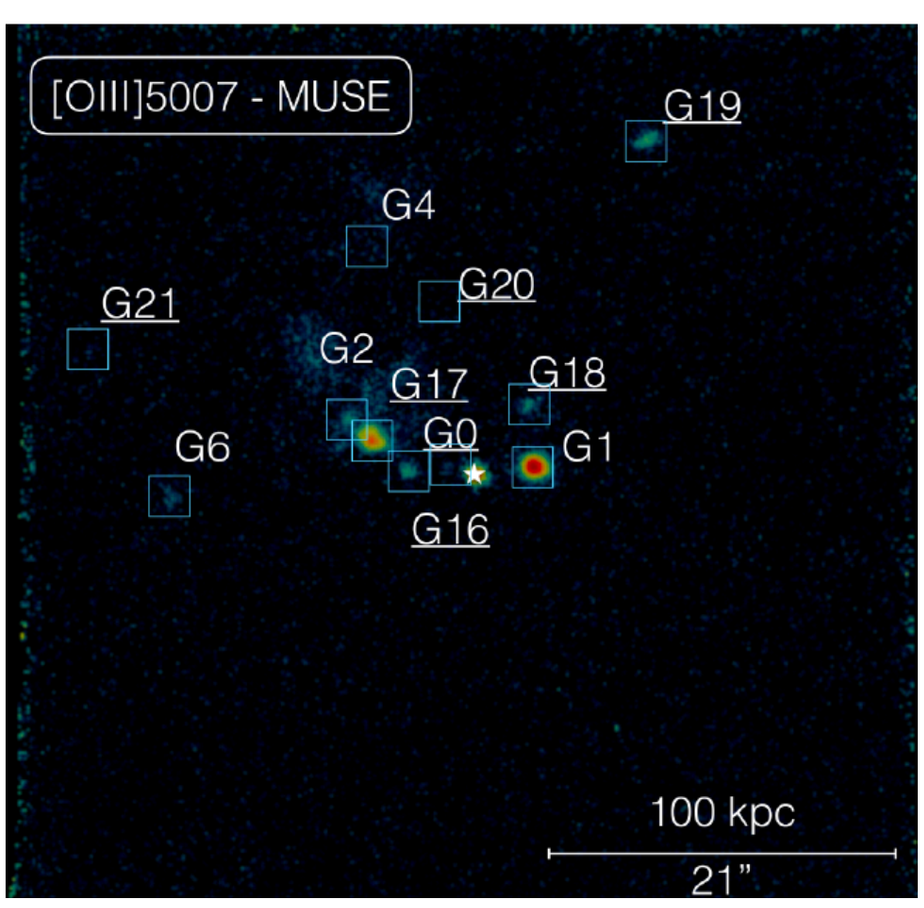
MUSE - GALAXY HUNTER

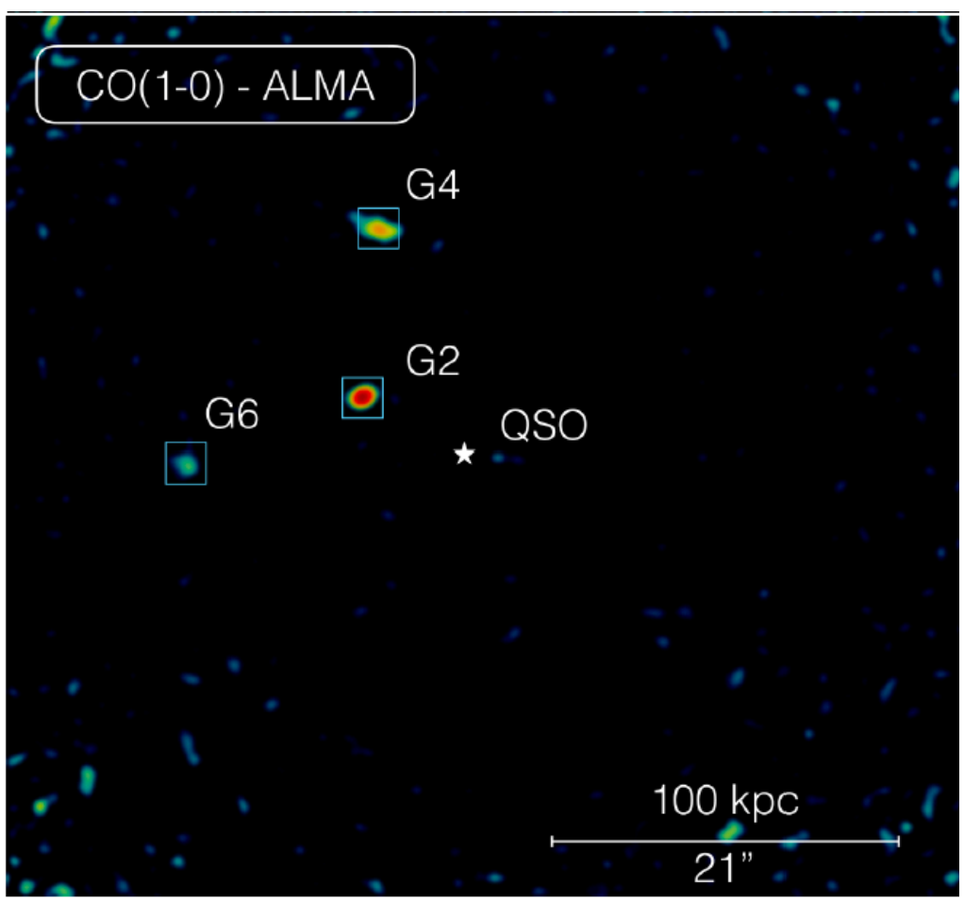
- detecting **quiescent** galaxies
- reaching **low SFR** ~ 0.001 $M_\odot$/yr [OII]
- **93%** success rate identifying the associated galaxies



ALMA - MOLECULAR GAS IN ASSOCIATED GALAXIES

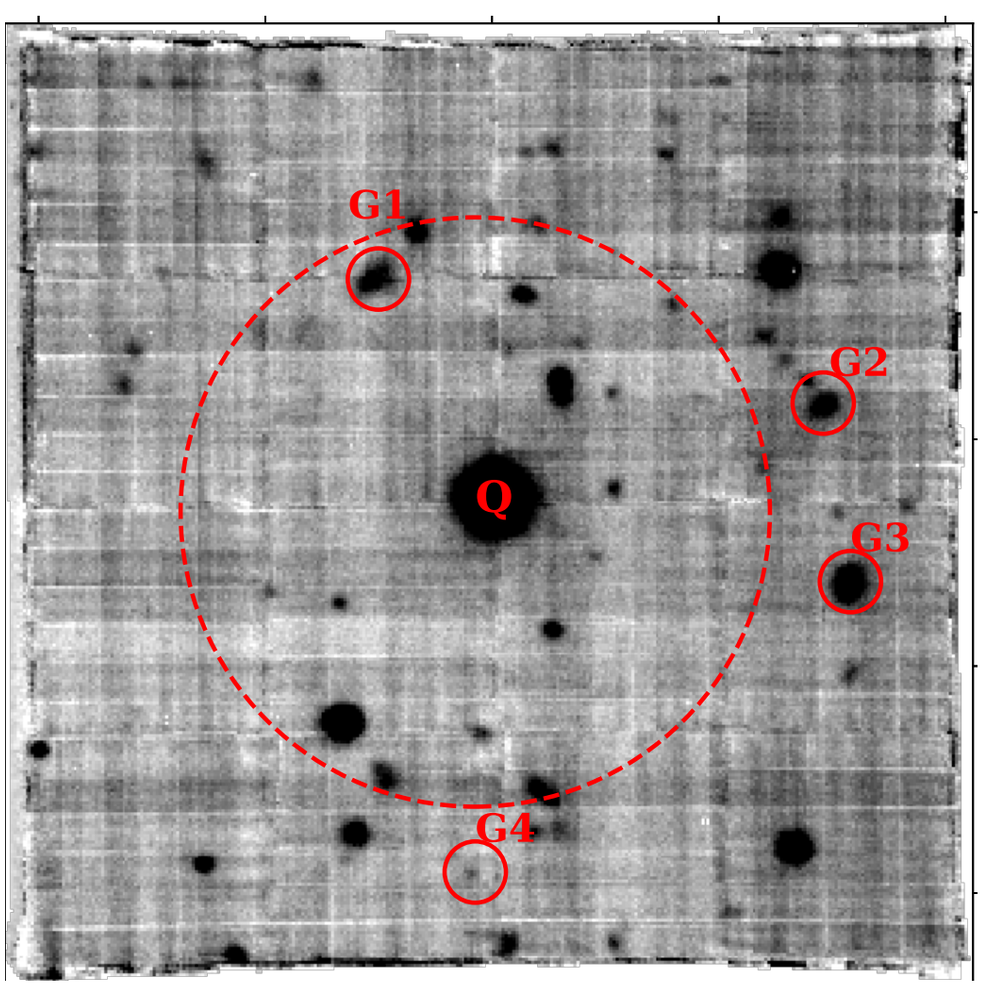
- **ALMA** observations for quasar fields in our sample
  - large molecular masses ($10^{10} M_{\odot}$),
  - low Star Formation efficiencies
  - molecular gas kinematics in line with ionised gas (Ha) (Péroux+19)

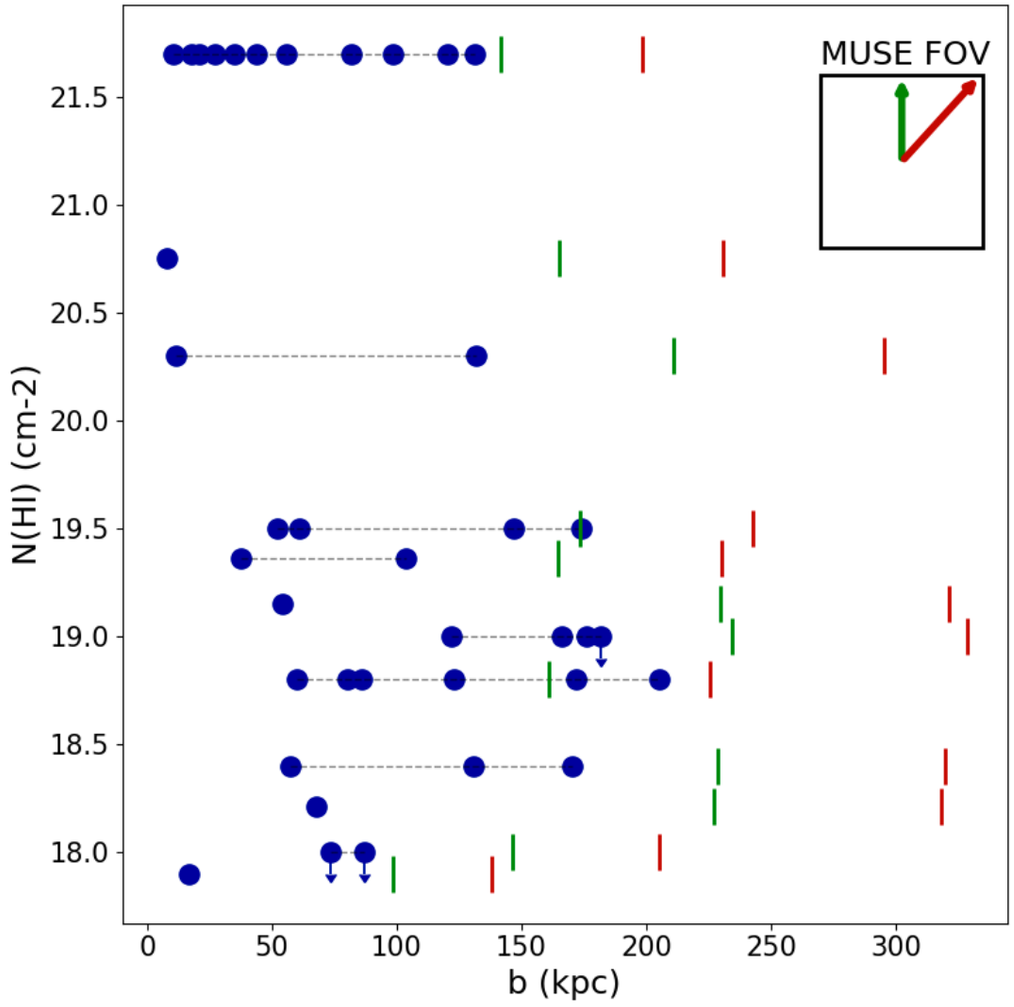




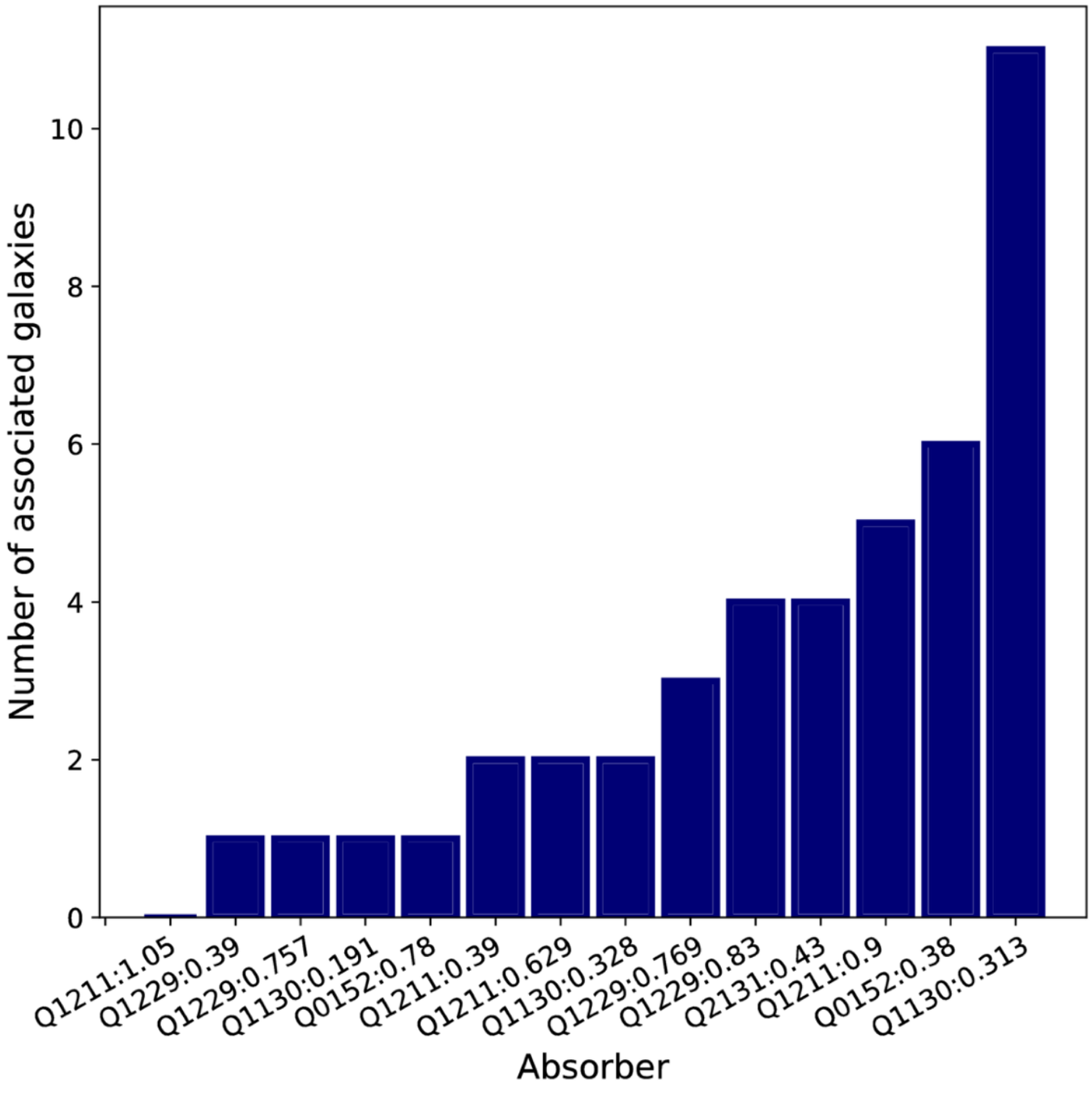
MULTI-WAVELENGTH VIEW OF CGM

- 5 quasar fields:
  MUSE, ALMA, HST, UVES
- **14 absorbers** with
  43 associated galaxies
- all **MgII absorbers**
  log(N(MgII)): 11.5 - 14.5 cm^{-2}
- broad range of N(HI)
  log(N(HI)): 18 - 21.7 cm^{-2}





Associated Galaxies



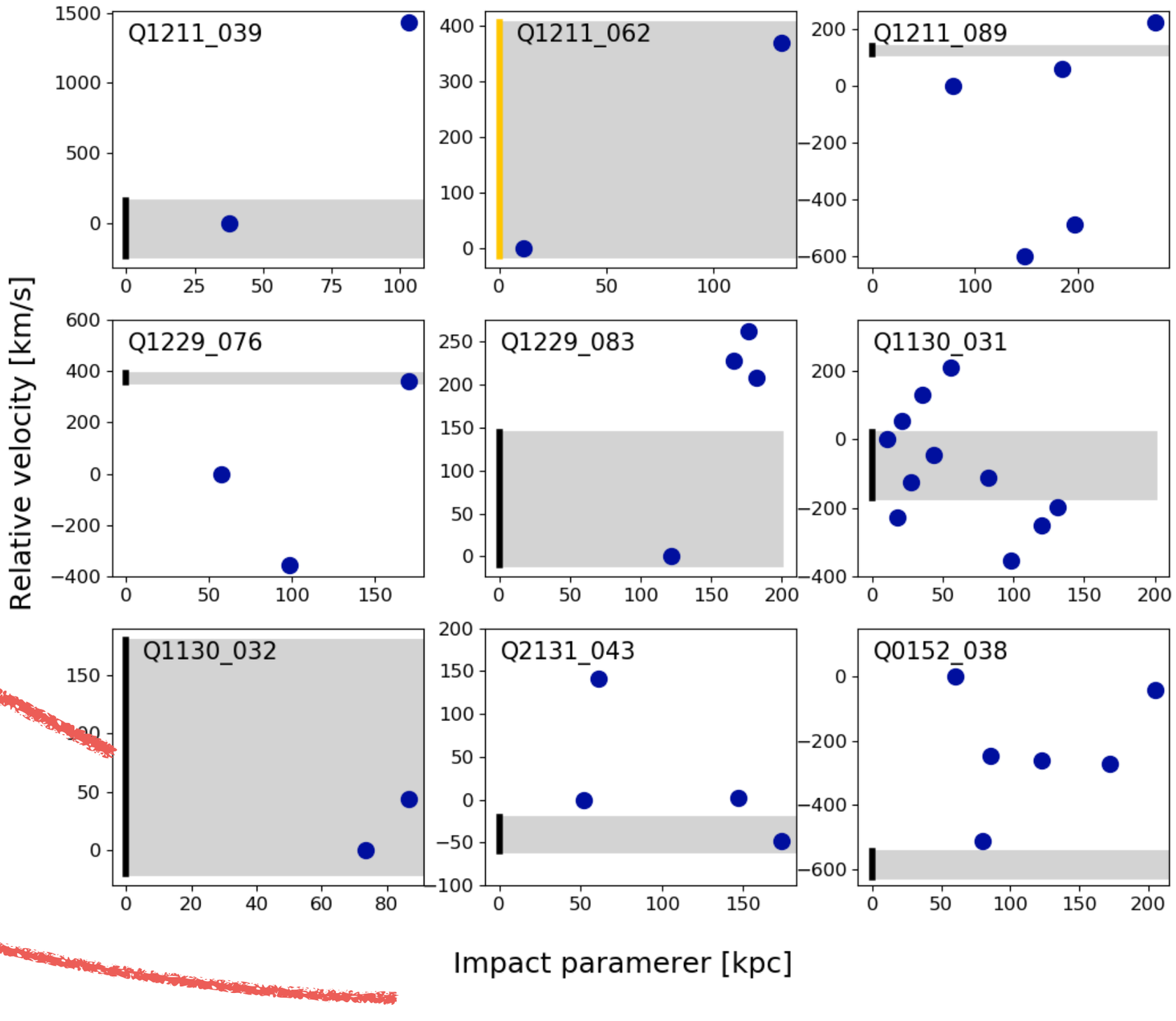
We usually find **more than one galaxy** associated with absorber for **b < 200 kpc**

VELOCITY AND IMPACT PARAMETER

Velocity relative to a galaxy with **smallest** impact parameter

MgII (2796) absorption line velocity **range**

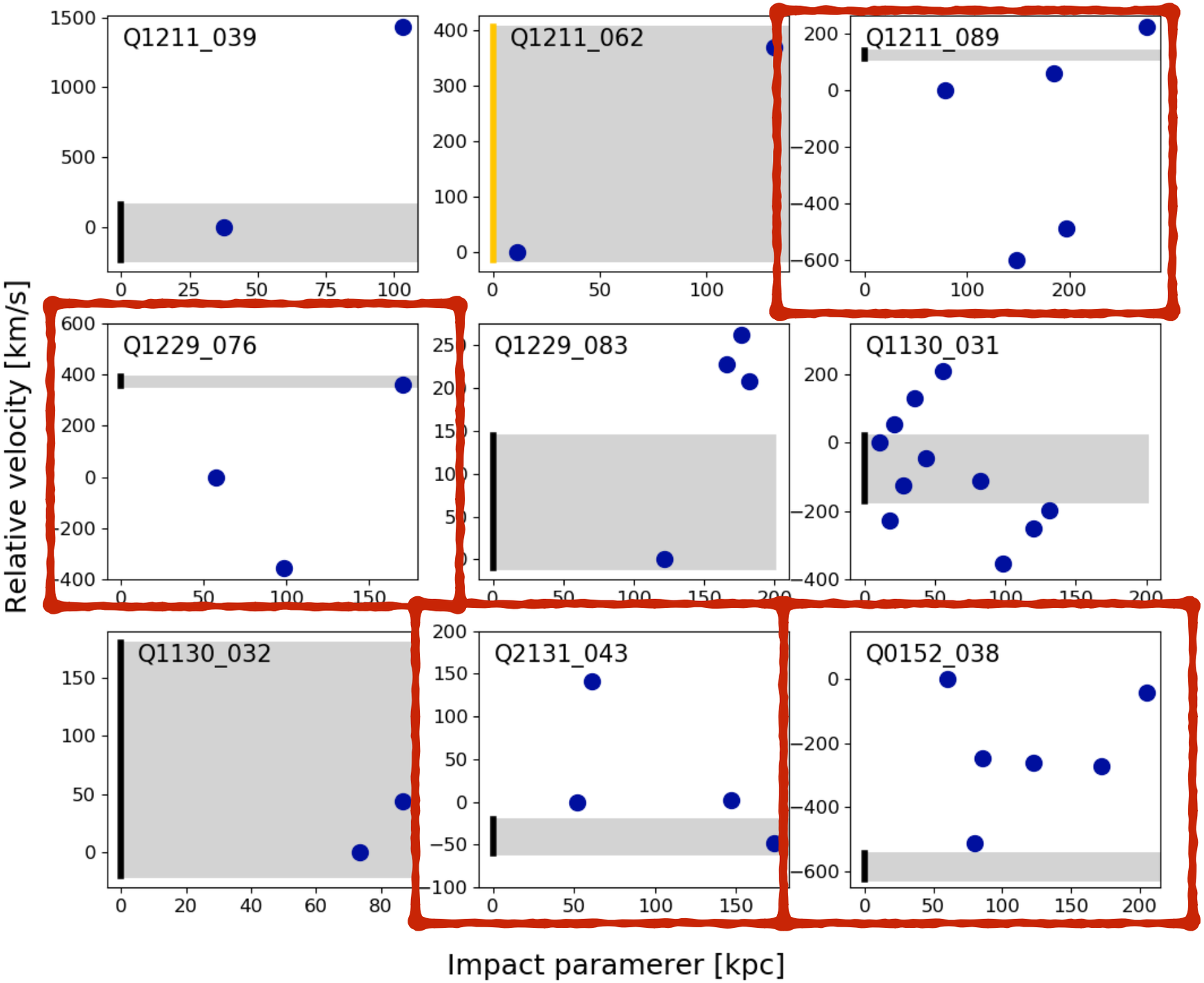
Projected **distance on sky** from QSO sightline



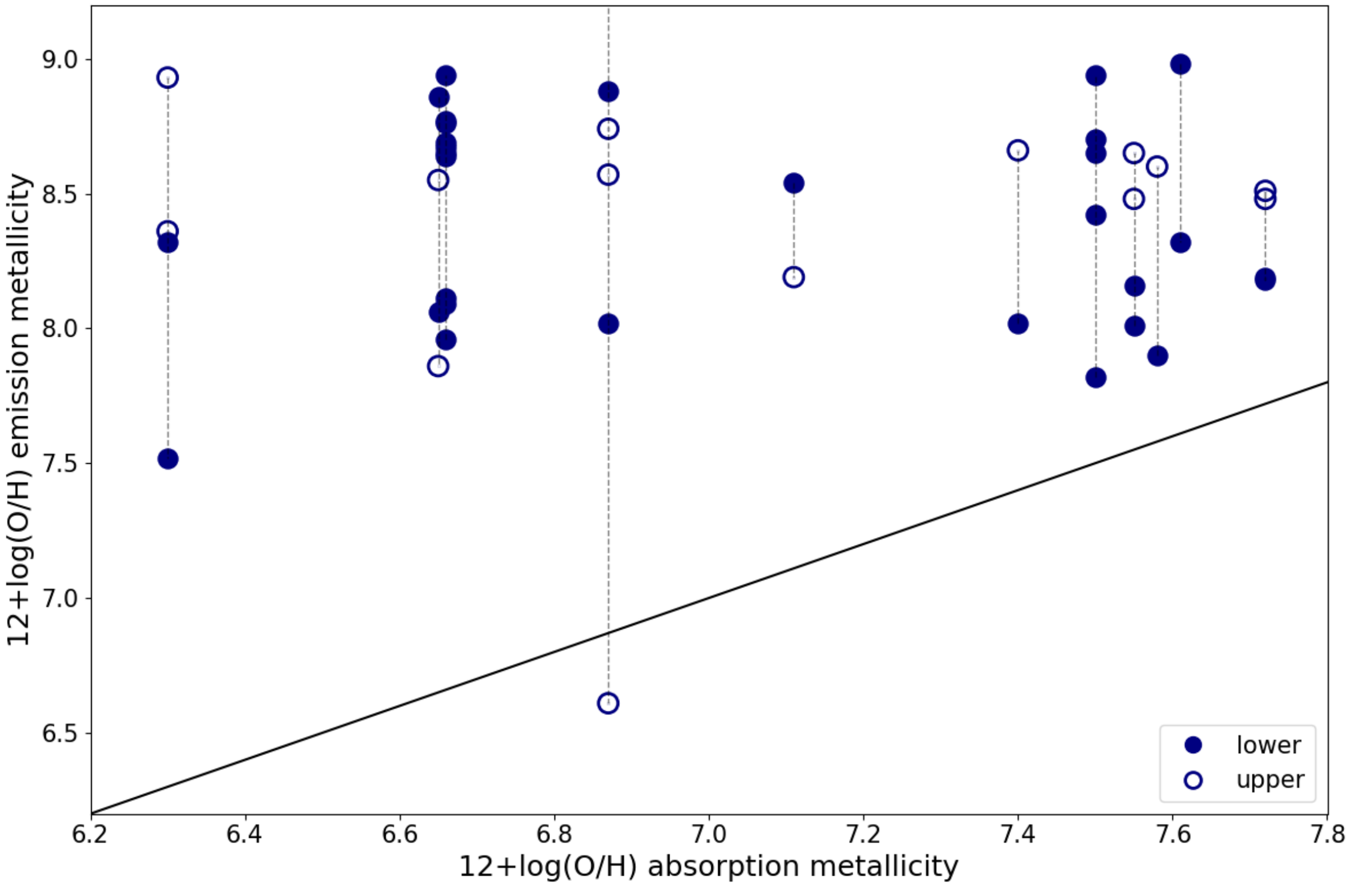
VELOCITY AND IMPACT PARAMETER

Galaxy with **the smallest impact parameter** is **not always** the one **closest** to absorbing gas in **velocity space**

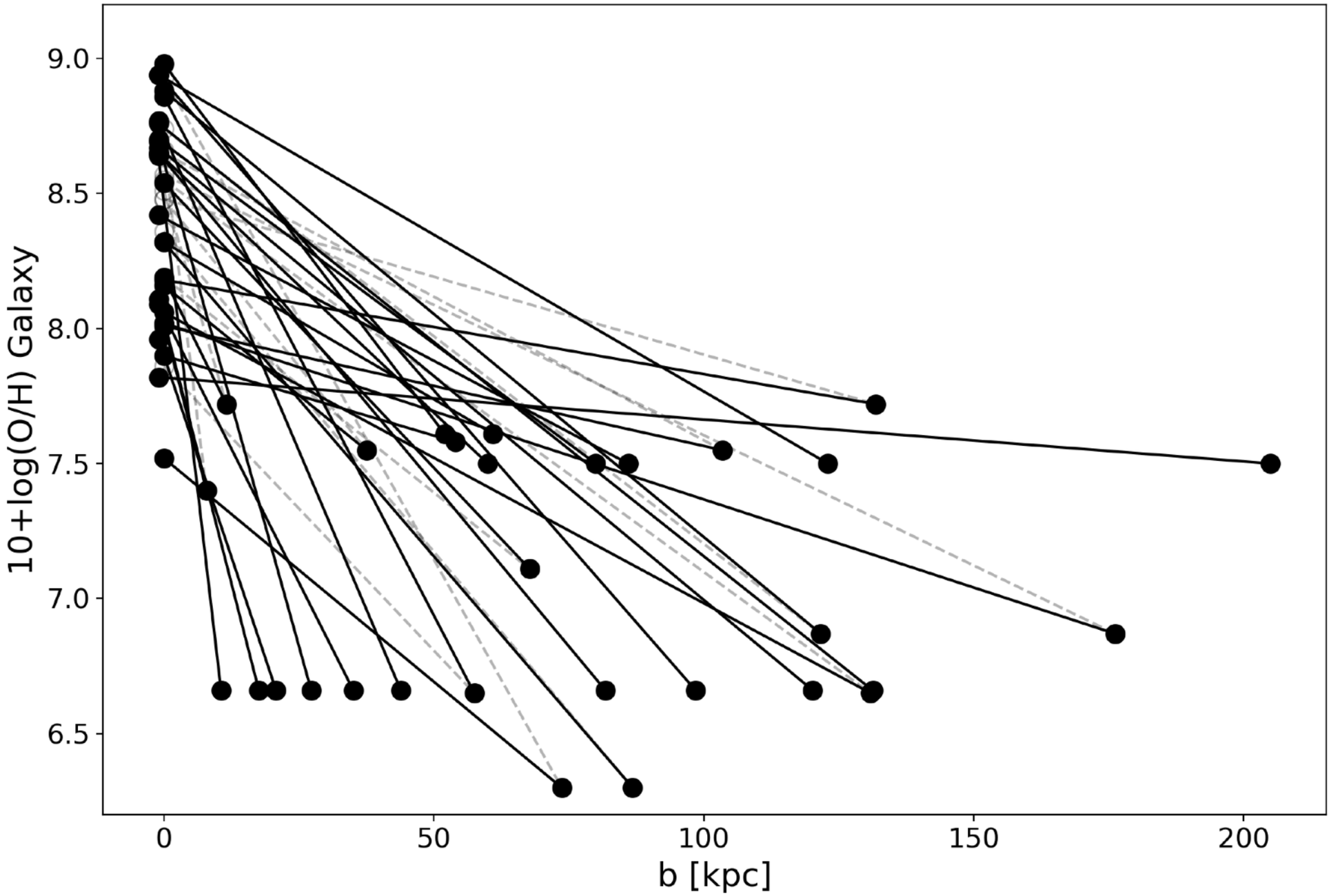
Galaxy rotation?
Need for full kinematics analysis



EMISSION METALLICITIES HIGHER THAN ABSORPTION METALLICITIES



METALLICITY GRADIENTS SLOPE STRONGLY DEPENDENT ON THE CHOSEN GALAXY



CONCLUSIONS

- MUSE - ALMA HALOS: multi-wavelength study of large HI absorber sample

- 93% success rate, absorbers are mostly associated with galaxy overdensities

- The closest object in impact parameter is not necessary closest in velocity space

- Metallicity of the galaxies generally higher than of the absorbing gas

- Combining absorption and emission is a powerful tool to probe multi-phase gas of the CGM regions (Hamanowicz et al. in prep)