THE ROLE OF GALACTIC WINDS USING BACKGROUND QUASARS

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INTRODUCTION

The main questions:

- Why only 5 to 10 percent of the baryons ended in galaxies?
- Why maximal efficiency for L_* galaxies? (see Figure 1)

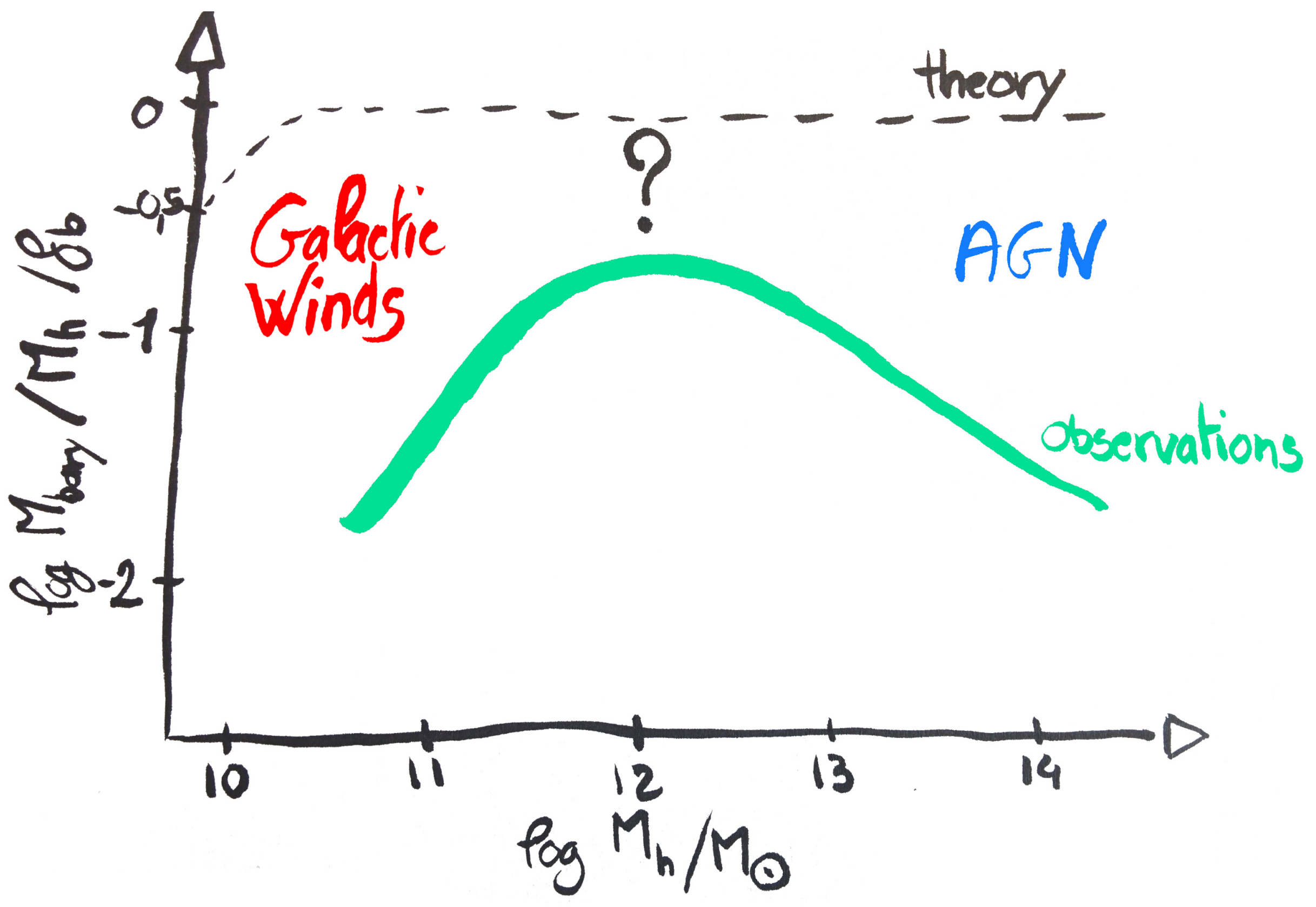
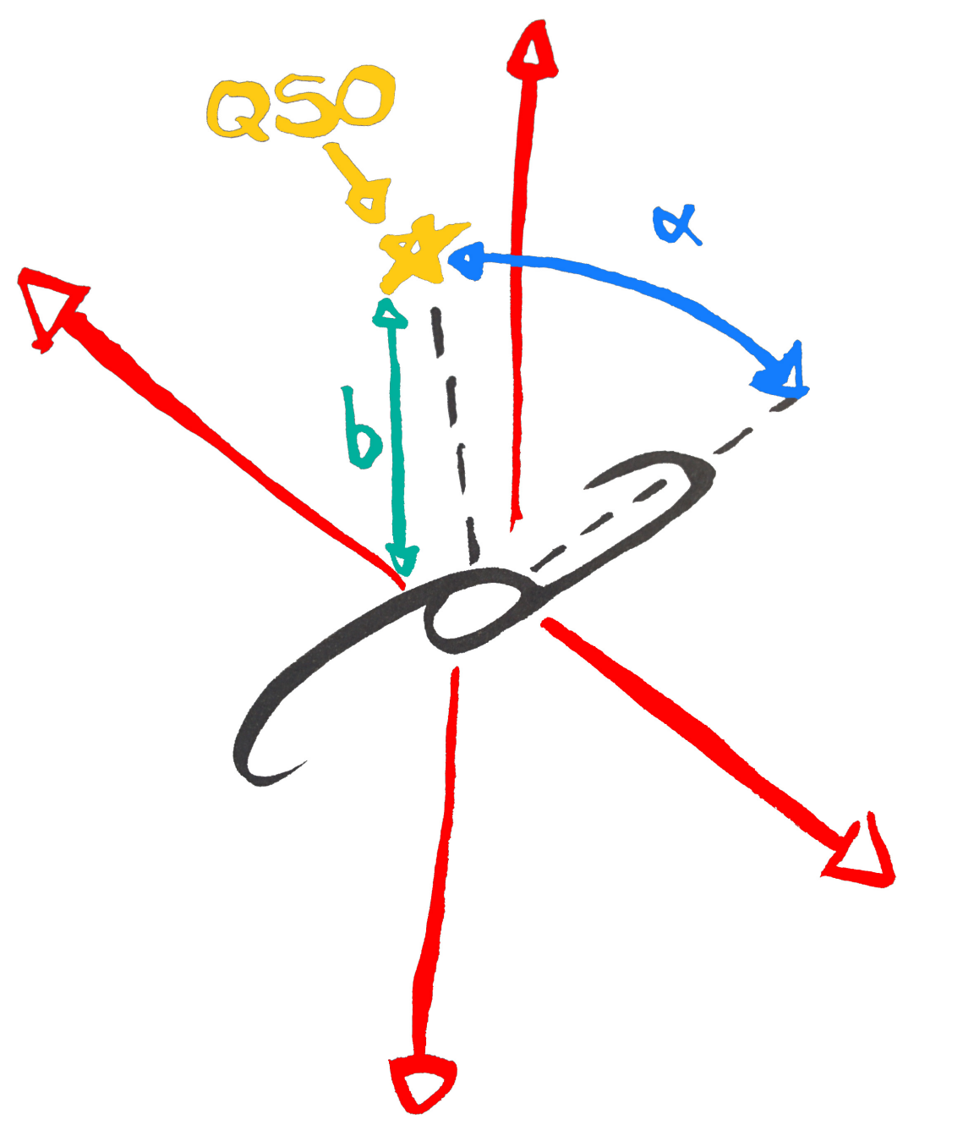


Figure 1: What we cannot explain : cutoff at low and high mass

-> High mass regime ($L > L_*$): Active Galactic Nuclei (AGN).
-> Low mass regime ($L < L_*$): **galactic winds** are invoked.

My work? Trying to constrain galactic wind properties!

Properties of galactic winds are poorly constrained : best estimates for the ejection mass rate ($\dot{M}_{\rm out}$) are uncertain by orders of magnitude.
The main reason : no information about the materials physical localization.
Background quasars (QSOs) method can better constrain galactic wind properties:



When QSO line of sight (LOS) crosses the winds ($\alpha > 60°$), it gives us **3 major ingredients**:

- Gas localization (b on Figure 2).
- Gas column density.
- Wind radial (deprojected) velocity when galaxy inclination is known.

Figure 2: Galaxy feedback processes: galactic winds in red.

The background QSO technique gives us better constrains on the loading factor $\eta \equiv \dot{M}_{\rm out}/{\rm SFR}$. (SFR: Star Formation Rate)

OBSERVATION STRATEGY

1. From SDSS database: select quasar spectra with multiple Mg II absorptions.

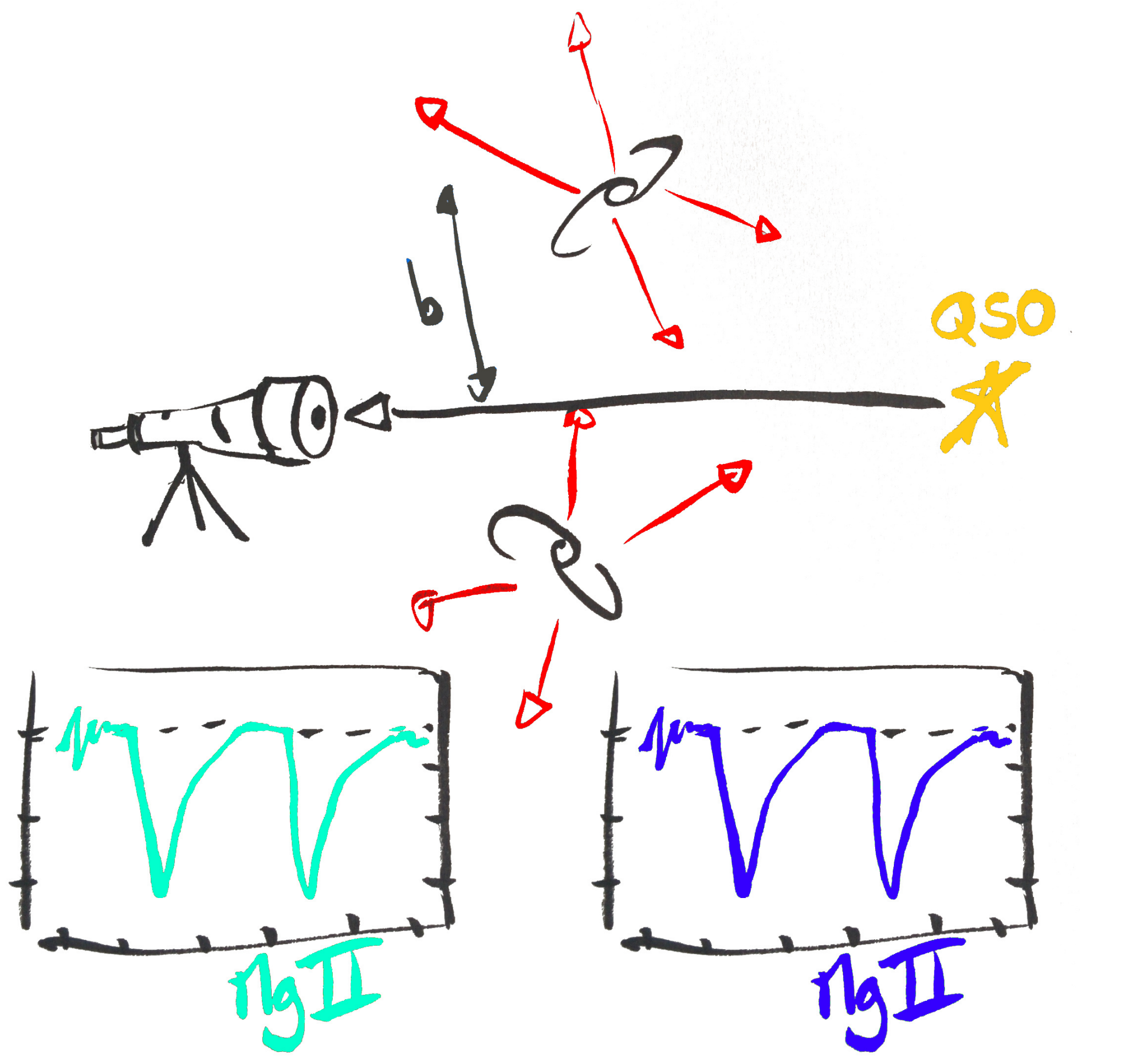


Figure 3: Background QSO crossing multiple outflow materials

2. MUSE: observe selected QSO fields.
3. Detect galaxies: look in MUSE cube for galaxy emission lines around Mg II redshifts.

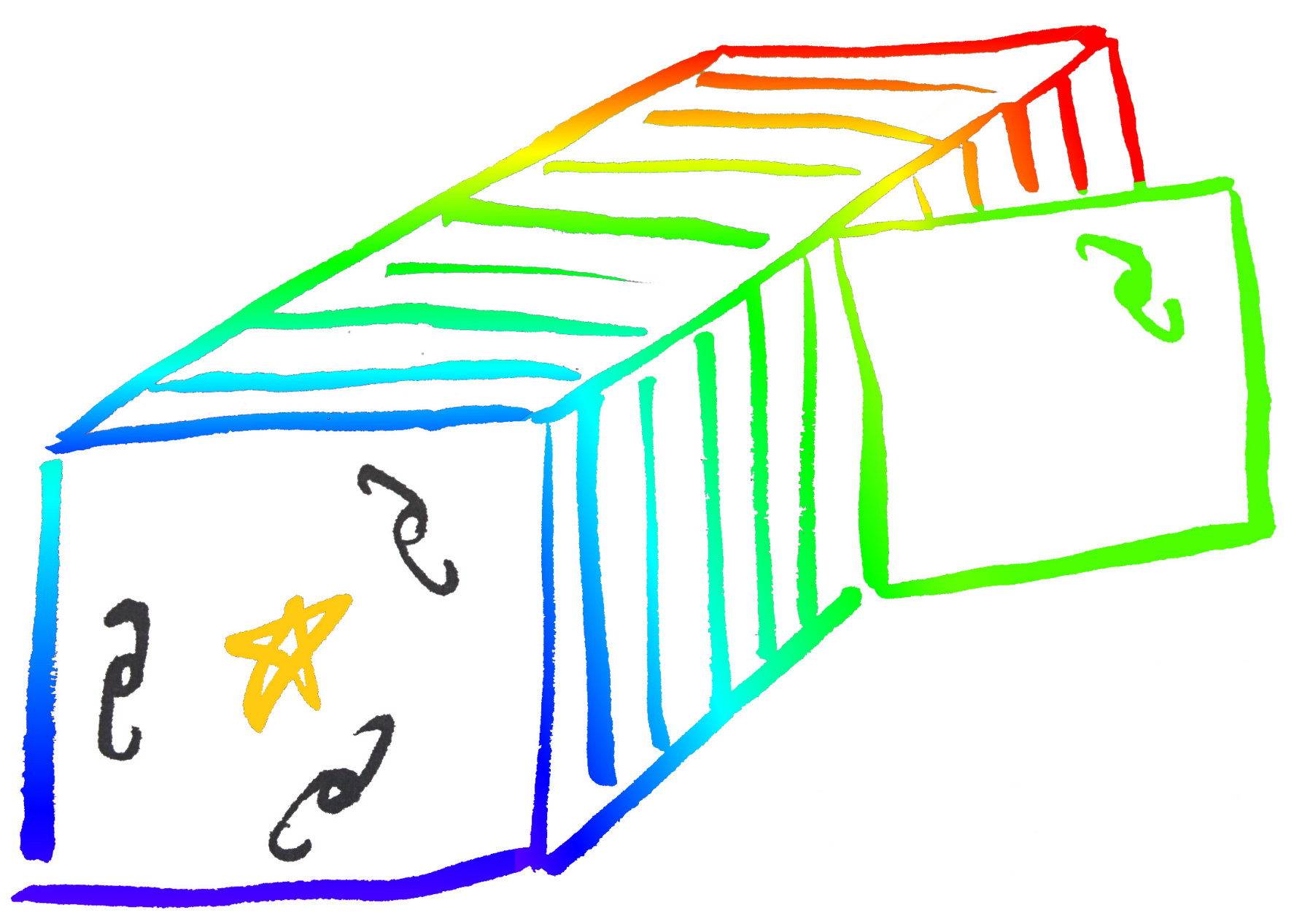


Figure 4: Galaxy detection

4. Reproduce Mg II **profile:** with galaxy geometry -> building wind model.

RESULTS

SINFONI + UVES: SIMPLE

- 3 wind cases.
- Loading factors $\eta \sim 1-2$.

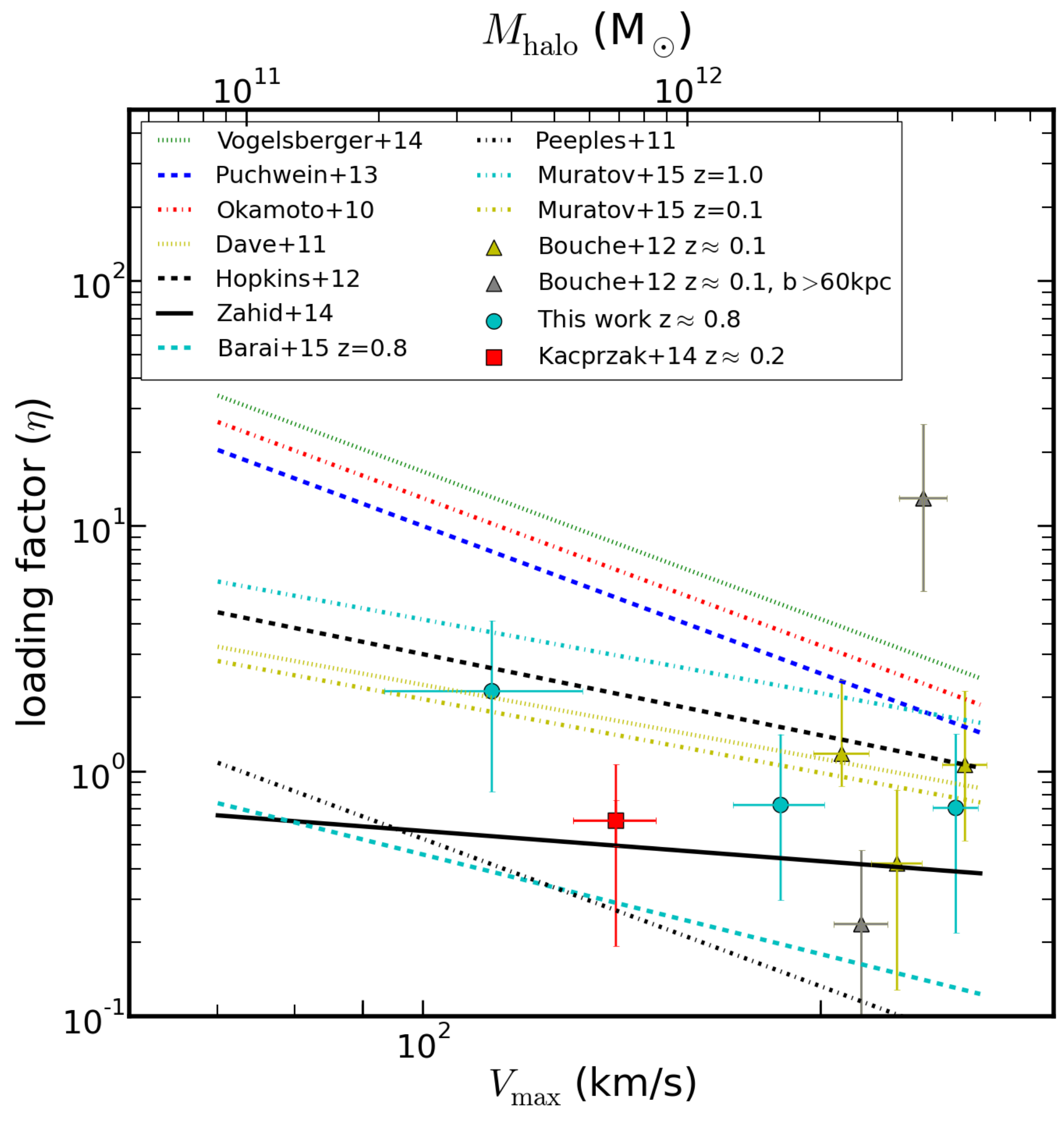
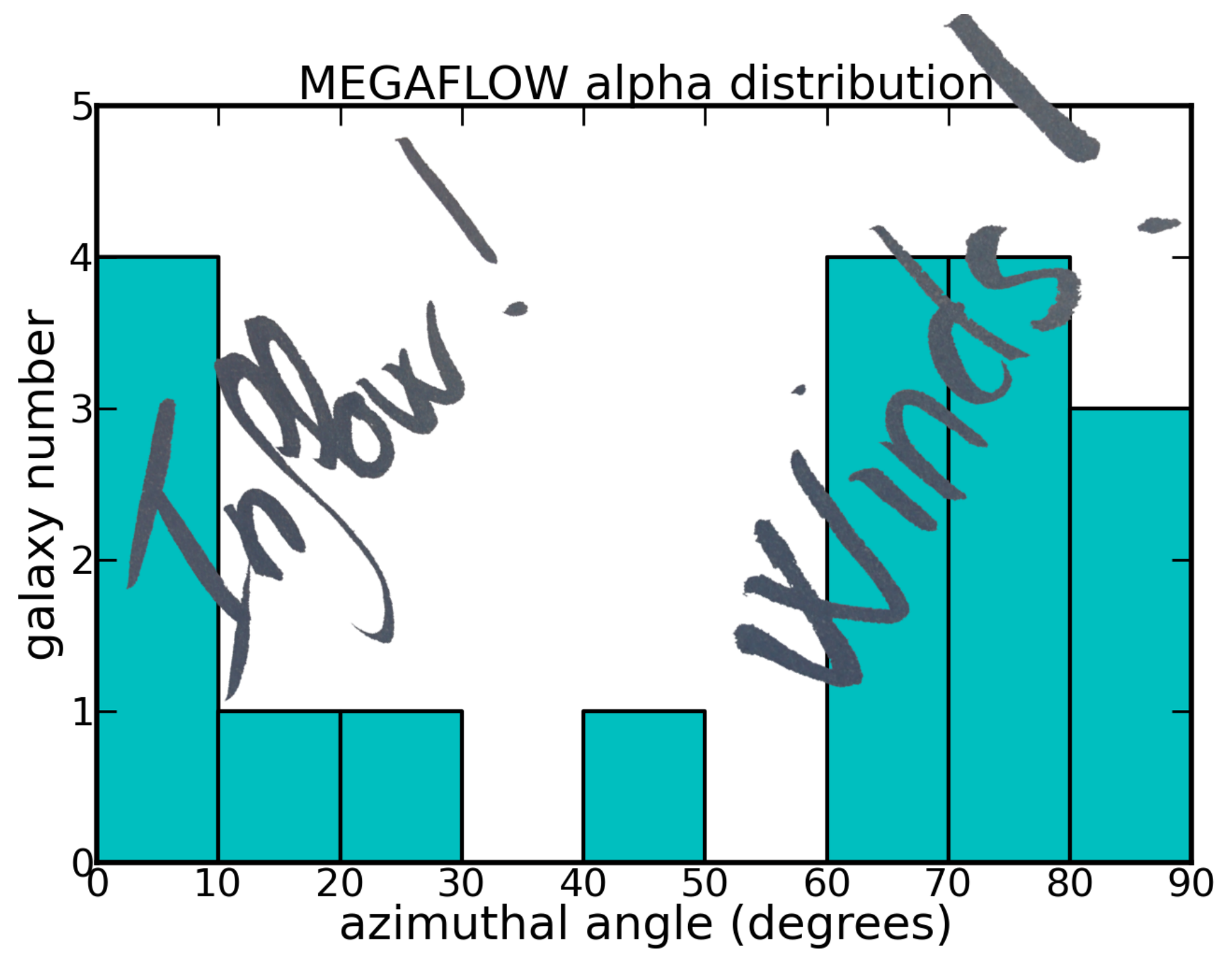


Figure 5: loading factor as a function of Vmax from Schroetter et al. (2015).

ALL MUSE PROGRAM: MEGAFLOW

- Detection of 77% of expected galaxies.
- 7 QSO fields.
- 19 galaxies out of 25.
- 11 wind cases.



MUSE + UVES

- 4 wind cases.
- Still early results.
- Schroetter et al. in prep.

CONCLUSION

Does winds escape galaxy halo?

- It seems not!

How far do they go?

- More than 100 kpc (see Figure 6).

How much mass loading?

- Around 2×SFR.
- Soon 11 more cases...

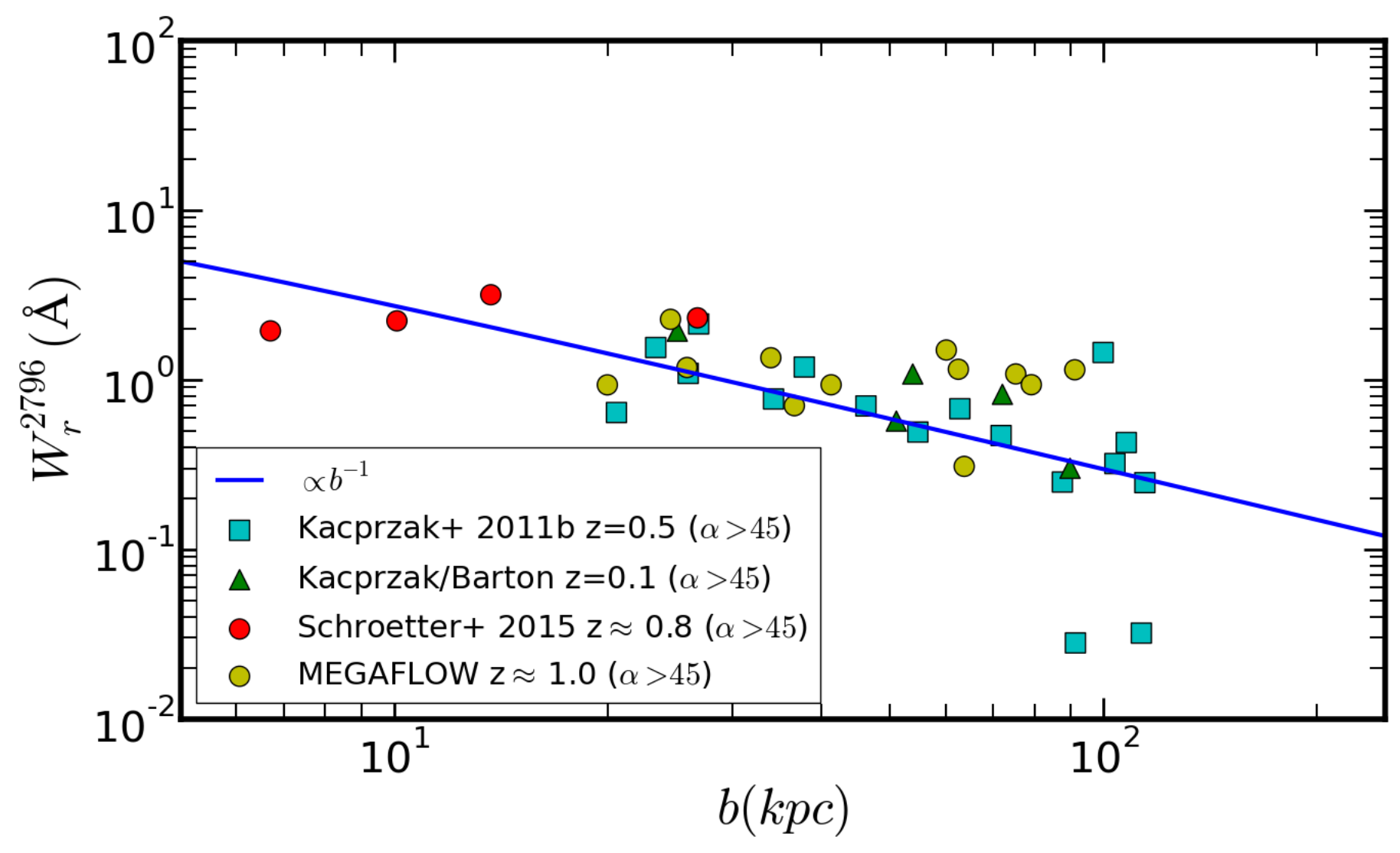


Figure 6: Rest equivalent width as a function of impact parameter b.

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