

The UV-Slopes of the Faintest, High-Redshift Galaxies with GLIMPSE

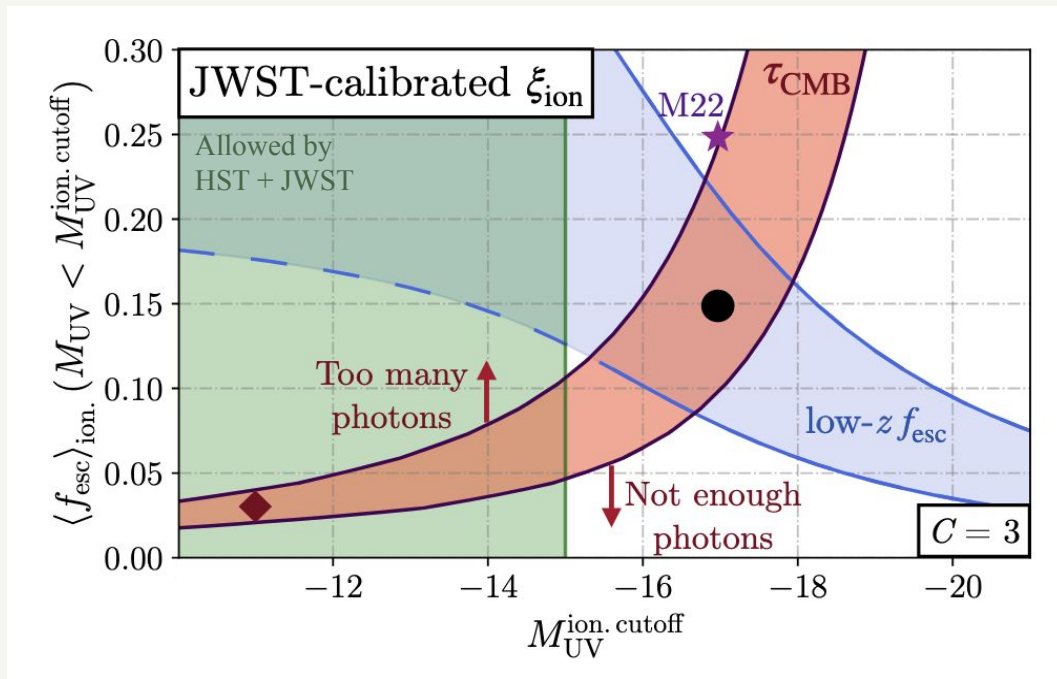
Michelle Jecmen, John Chisholm, Vasily Kokorev, and
the GLIMPSE team

1st year graduate student
University of Texas at Austin



JWST → early galaxies efficiently produce ionizing photons

Extrapolating trends of bright galaxies to fainter galaxies, reionization models no longer match observations

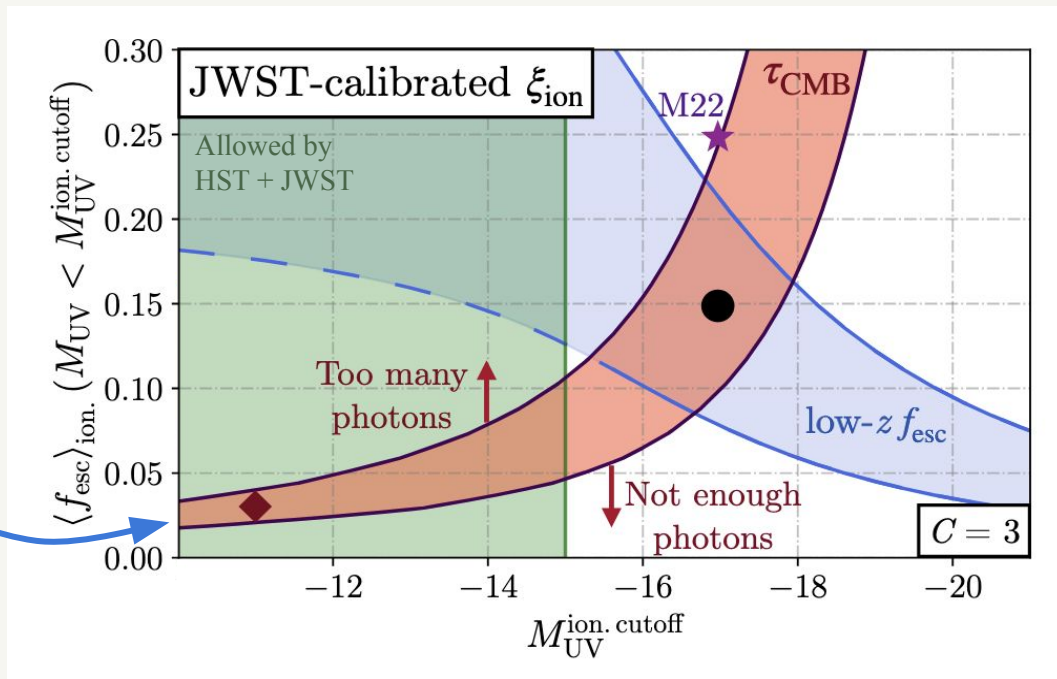


JWST → early galaxies efficiently produce ionizing photons

Extrapolating trends of bright galaxies to fainter galaxies, reionization models no longer match observations

One possible solution:

f_{esc} is overestimated



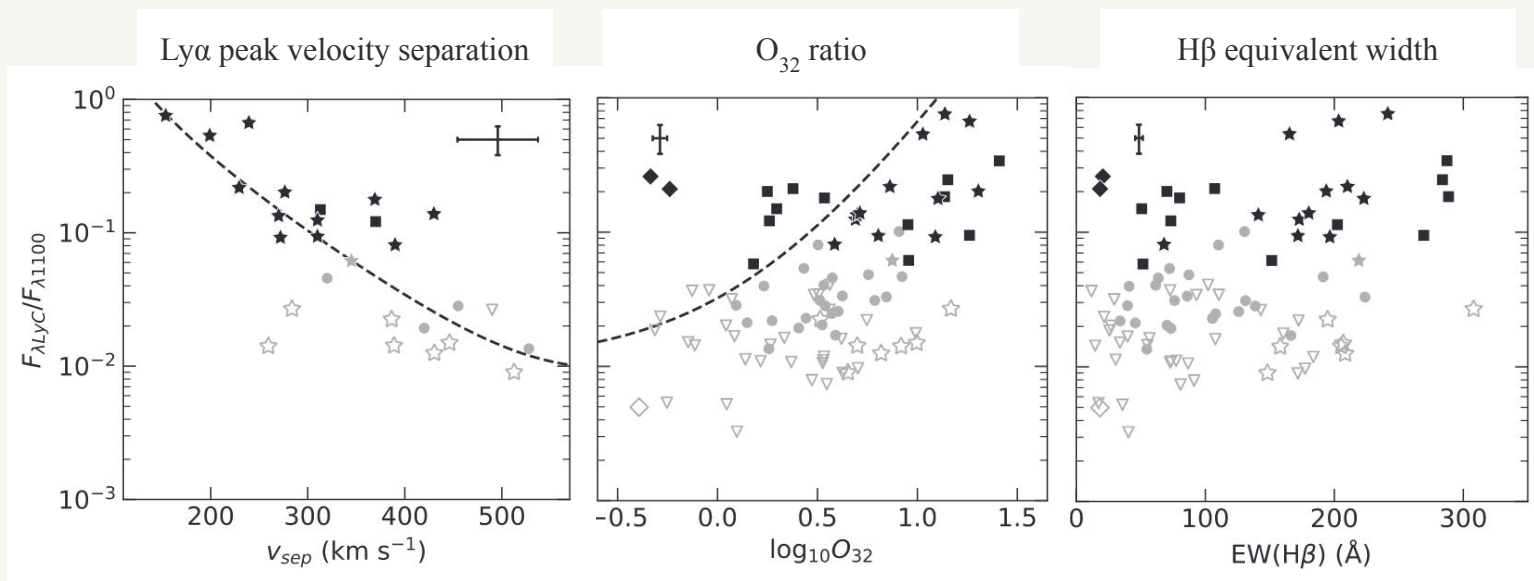
Important to understand f_{esc} from faint galaxies

Direct observation impossible at $z \gtrsim 5$ due to IGM absorption

Important to understand f_{esc} from faint galaxies

Direct observation impossible at $z \gtrsim 5$ due to IGM absorption

Indirect tracers: $\text{Ly}\alpha$ v_{sep} , O_{32} , $\text{H}\beta$ EW, UV continuum slope

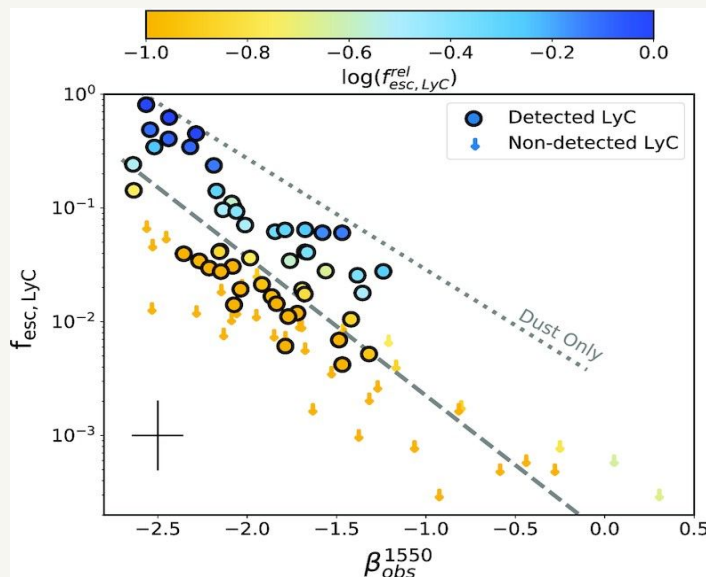


Flury et al.
2022

Important to understand f_{esc} from faint galaxies

Direct observation impossible at $z \gtrsim 5$ due to IGM absorption

Indirect tracers: $\text{Ly}\alpha$ v_{sep} , O_{32} , $\text{H}\beta$ EW, UV continuum slope

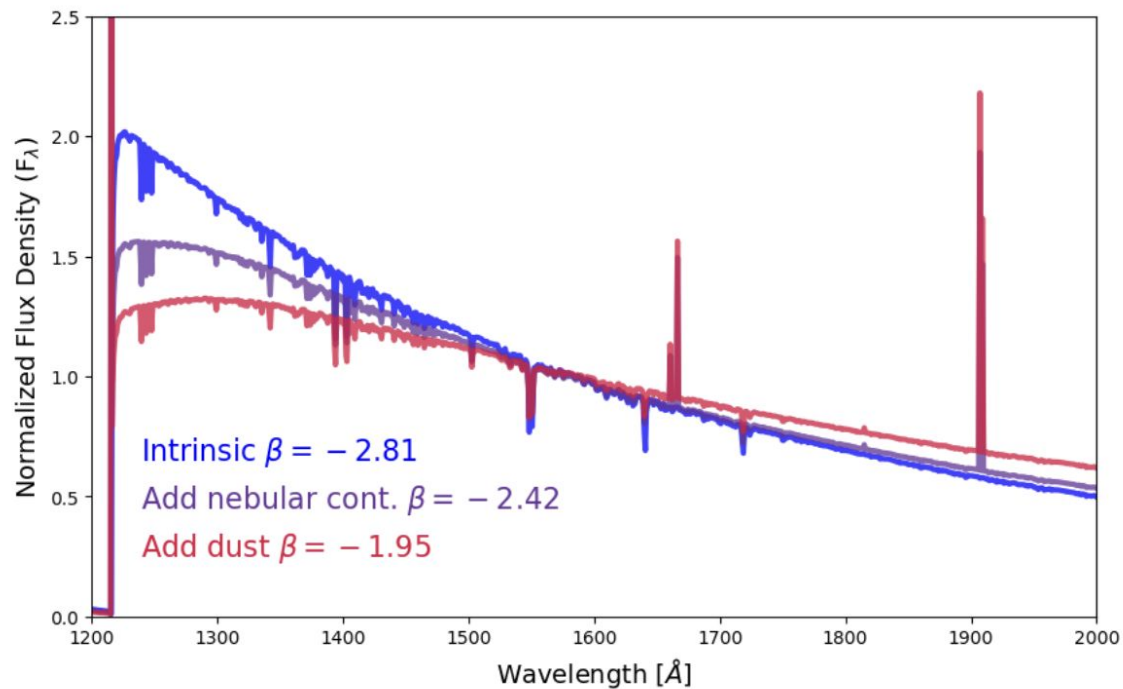


Empirical relation
from LzLCS

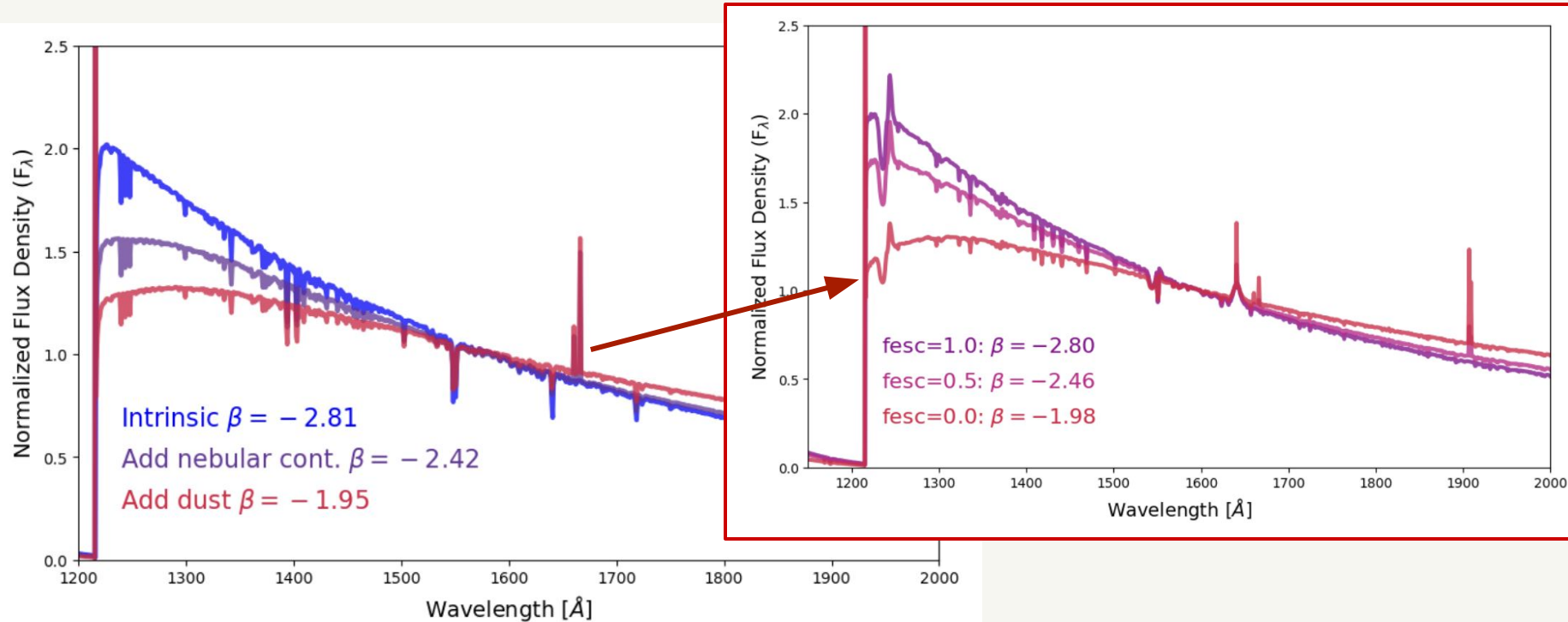
but consistent with
 f_{esc} from Mg II at $z > 7$
(Gazagnes et al. 2024)

Chisholm et al.
2022

UV-continuum slopes



UV-continuum slopes





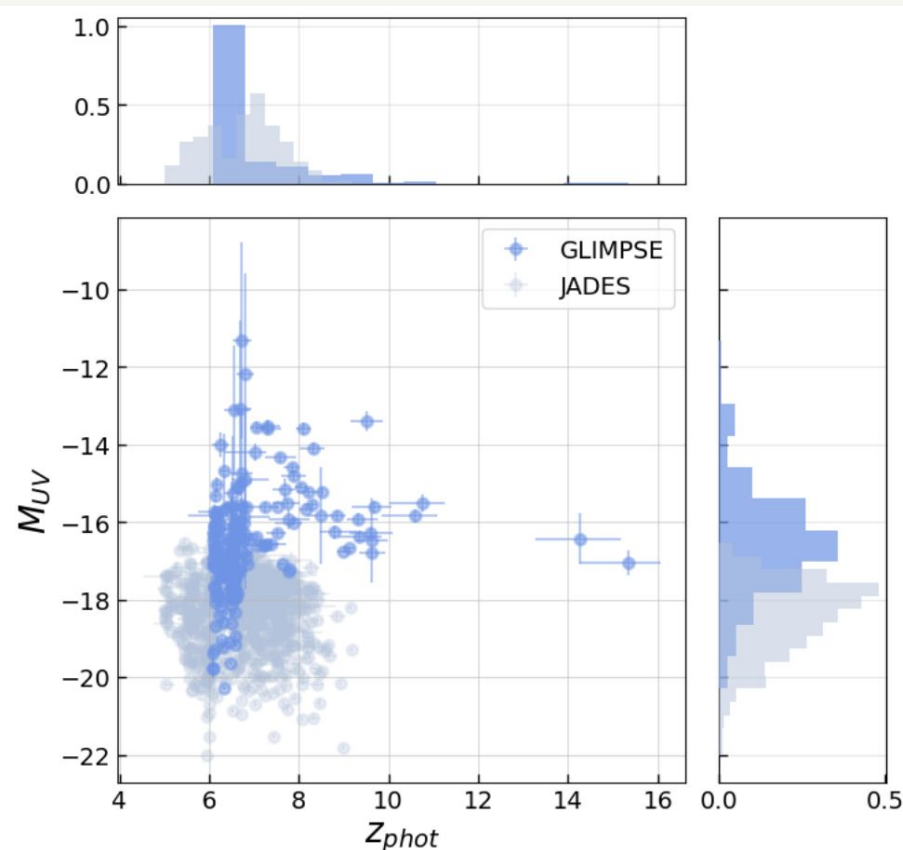


Strong gravitational lensing & ultra-deep imaging

→ probe the faintest galaxies

120 hours across 9 NIRCcam filters:

F090W, F115W, F150W, F200W,
F277W, F356W, **F410M**, F444W,
F480M



Obtain β from power-law fitting

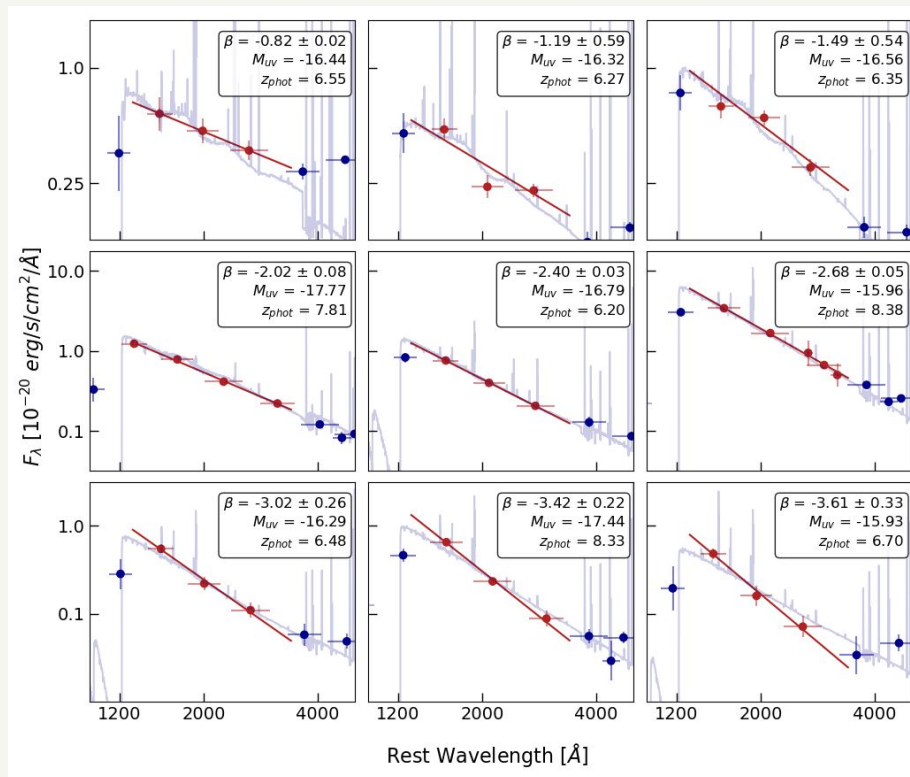
In UV, $F_{\lambda} \propto \lambda^{\beta}$

1. Photometry

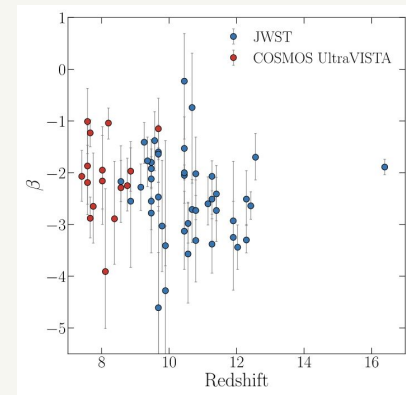
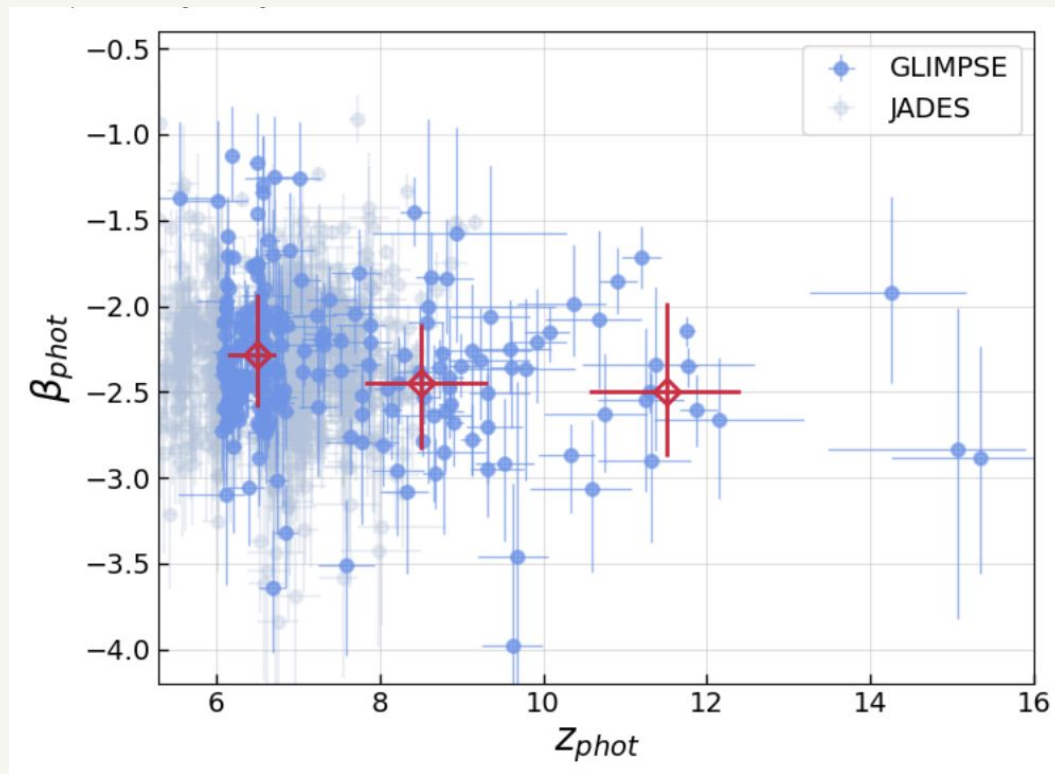
$$1350\text{\AA} \leq \lambda \leq 3400\text{\AA}$$

2. Bagpipes SED

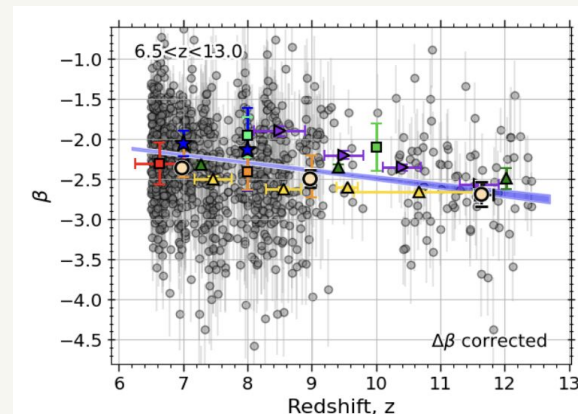
$$1350\text{\AA} \leq \lambda \leq 1800\text{\AA}$$



Beta decreases with redshift

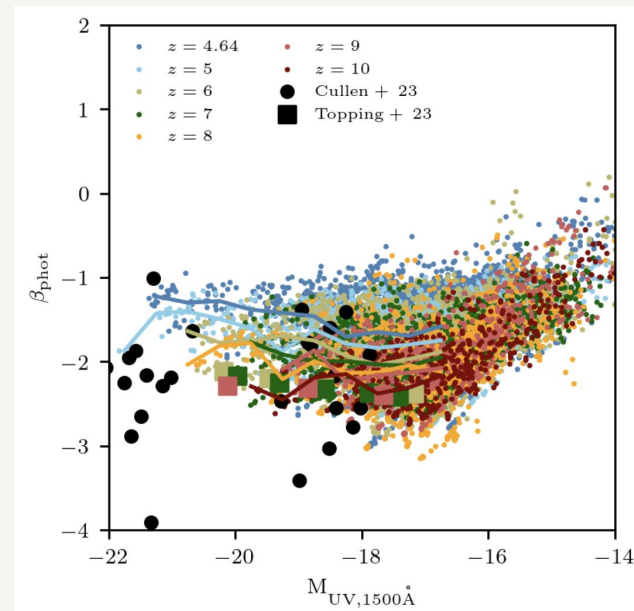
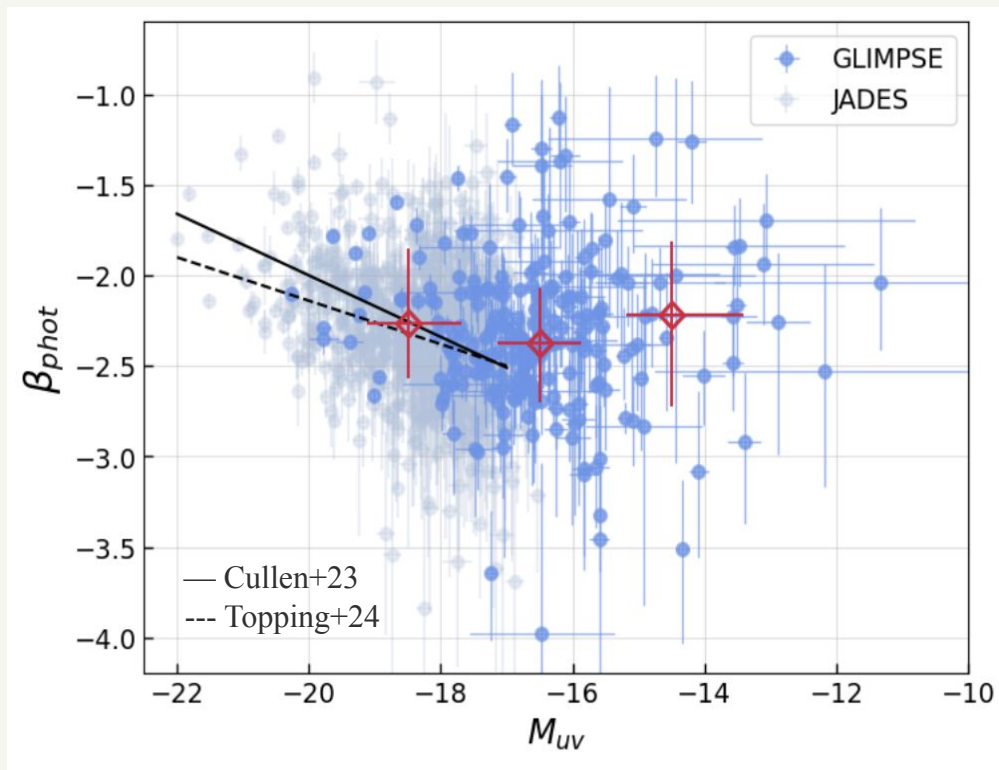


Cullen et al. 2023



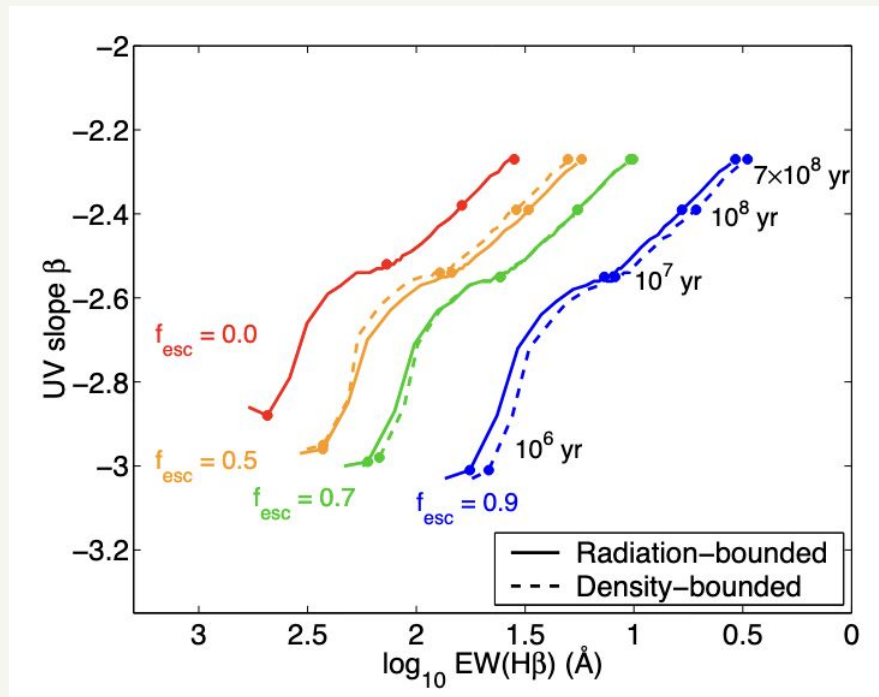
Austin et al. 2024

Beta stops decreasing towards fainter galaxies

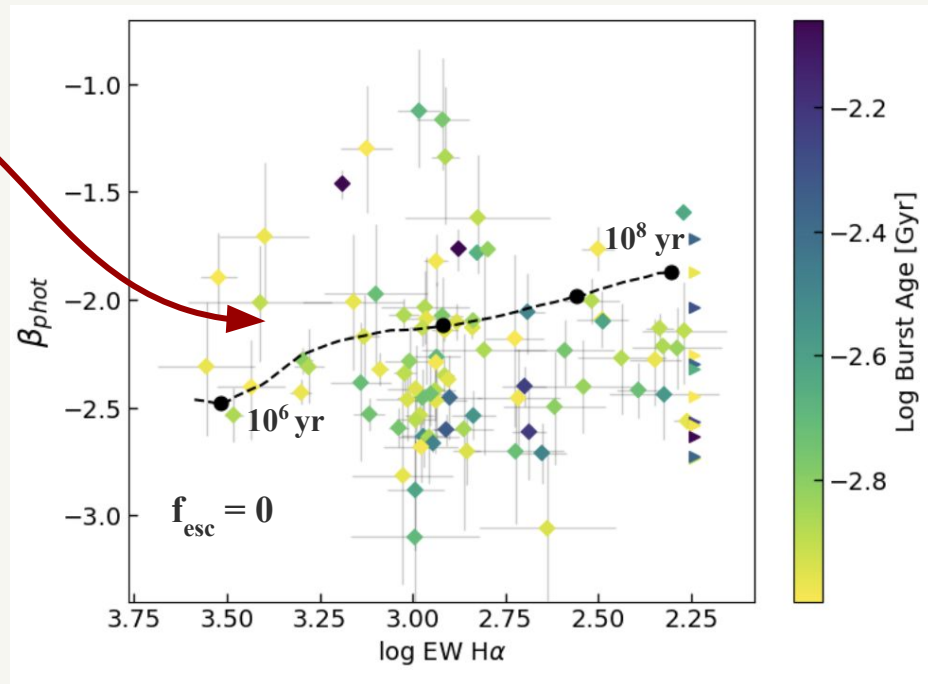
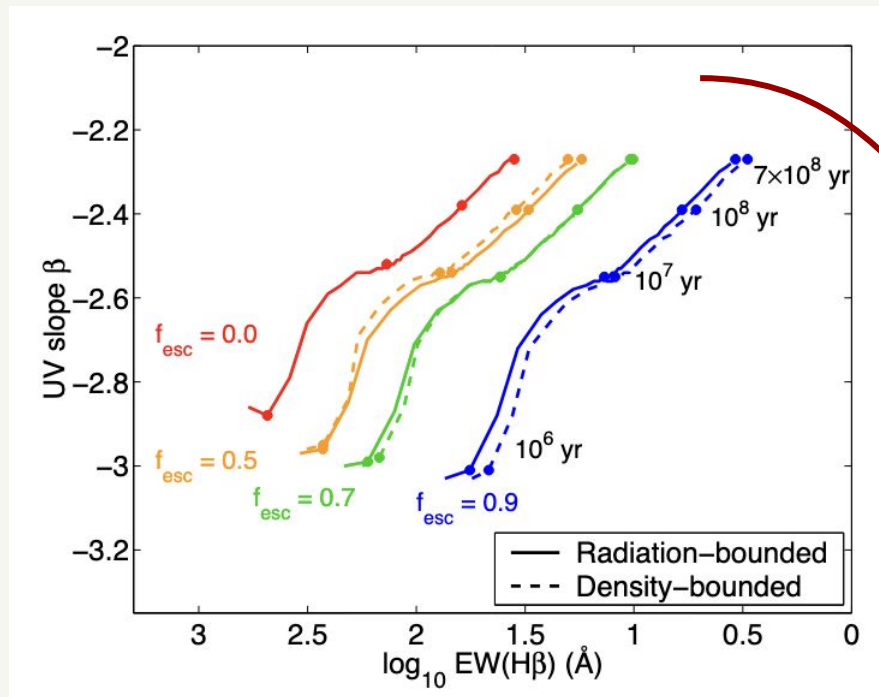


SPHINX Simulation - Katz et al. 2023

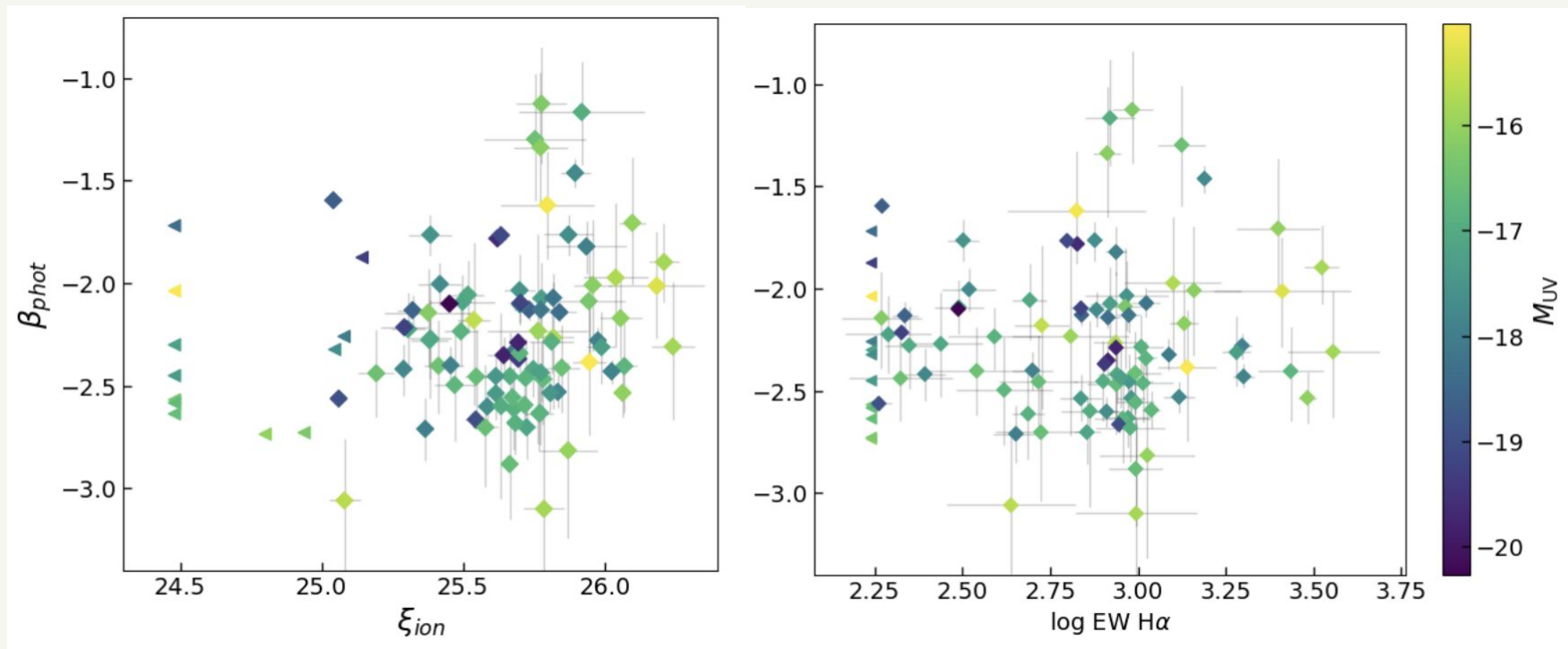
$z \sim 6$ subset, $H\alpha$ equivalent widths



$z \sim 6$ subset, $H\alpha$ equivalent widths



$z \sim 6$ subset, $H\alpha$ equivalent widths



Extremely blue sources

~ 10 galaxies with $\beta < -3.0$

SEDs not able to reproduce these very blue slopes

Extremely blue sources

~ 10 galaxies with $\beta < -3.0$

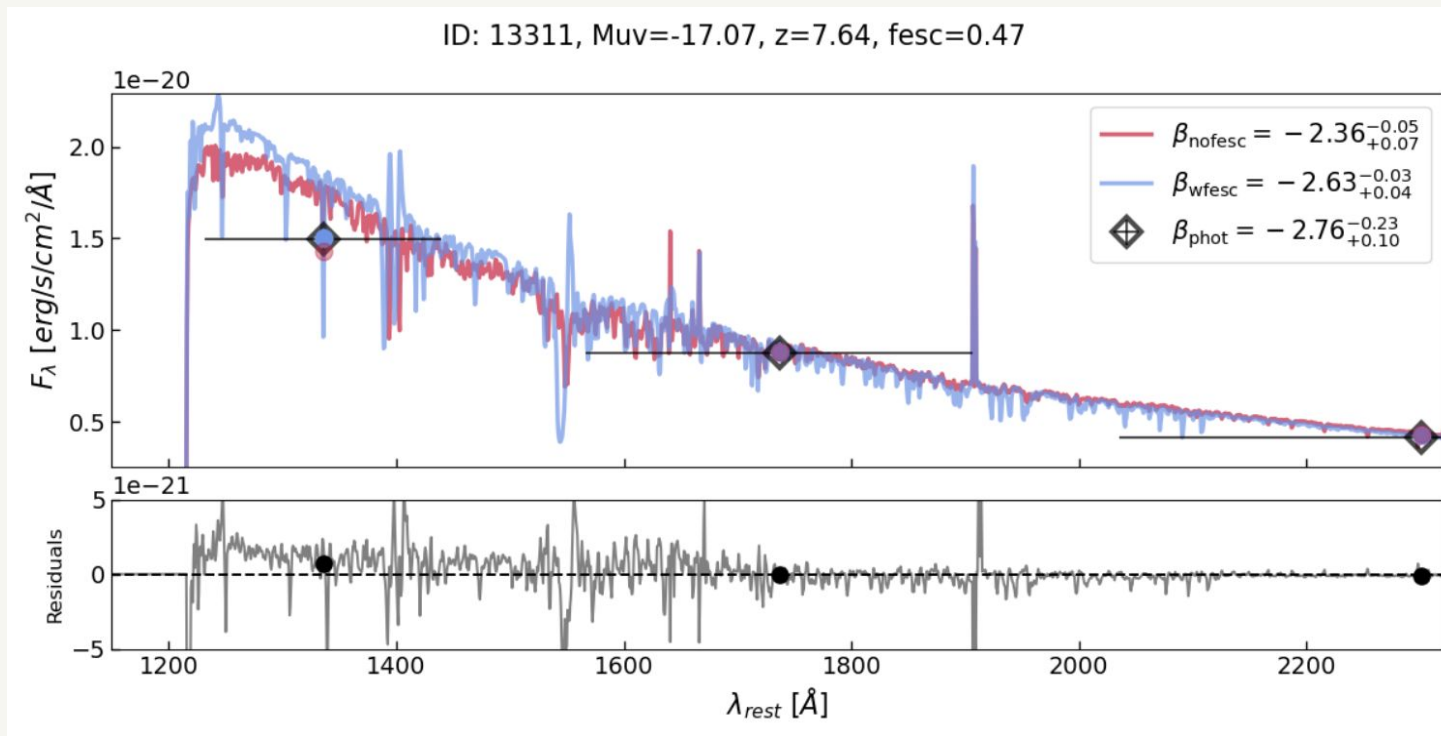
SEDs not able to reproduce these very blue slopes

Bagpipes implementation allowing f_{esc} to vary

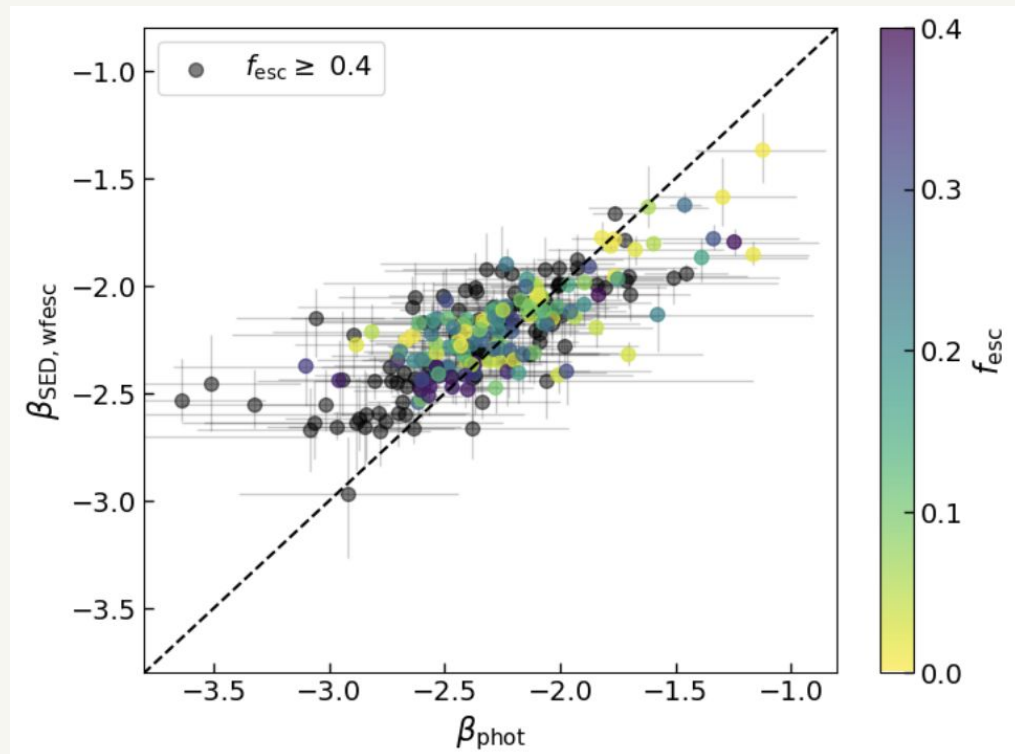
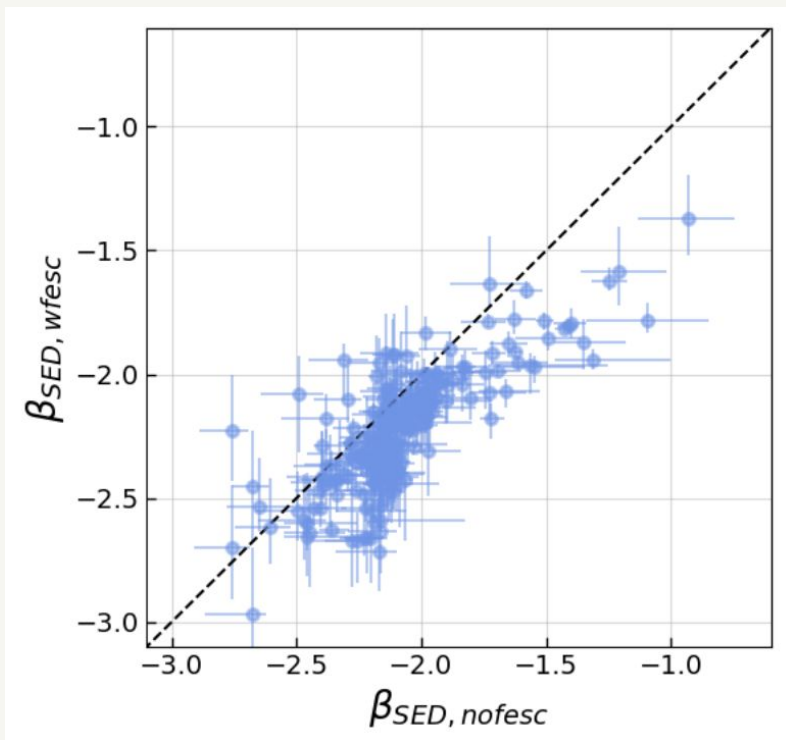
- Picket fence model for LyC escape
- Emma Giovinazzo talk Thursday



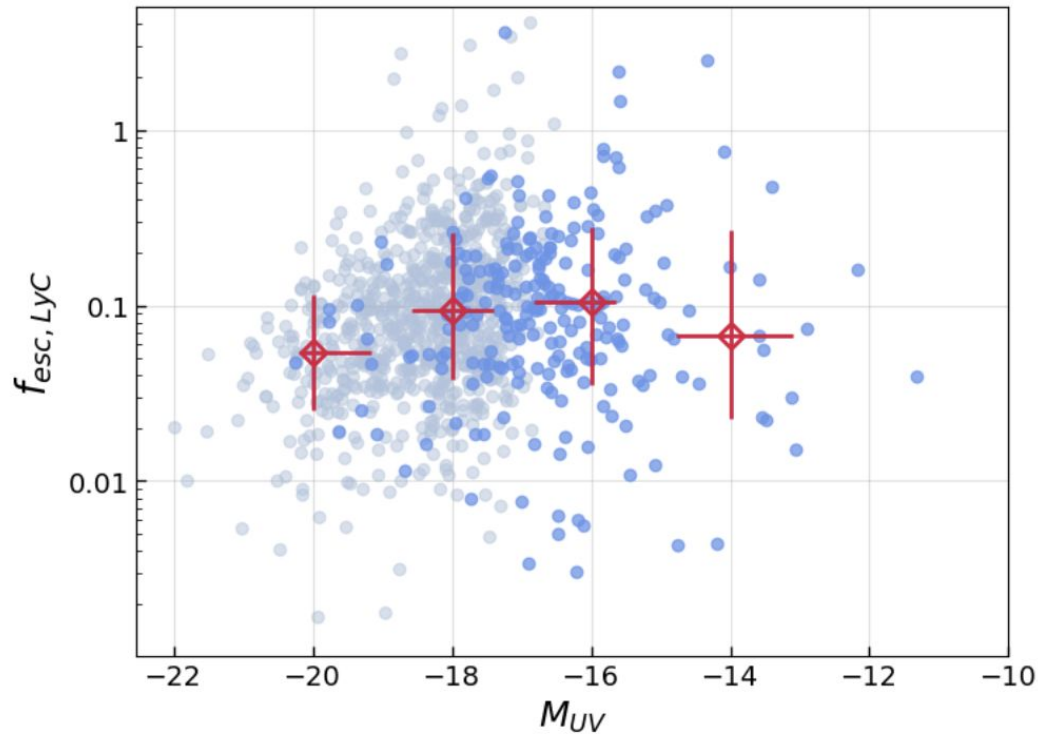
Extremely blue sources



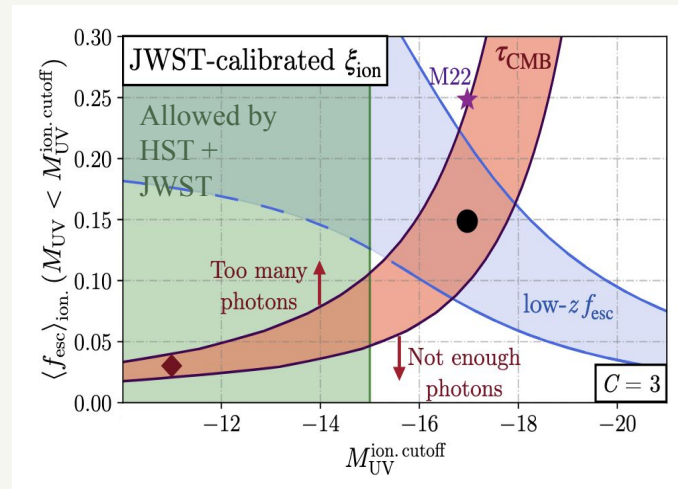
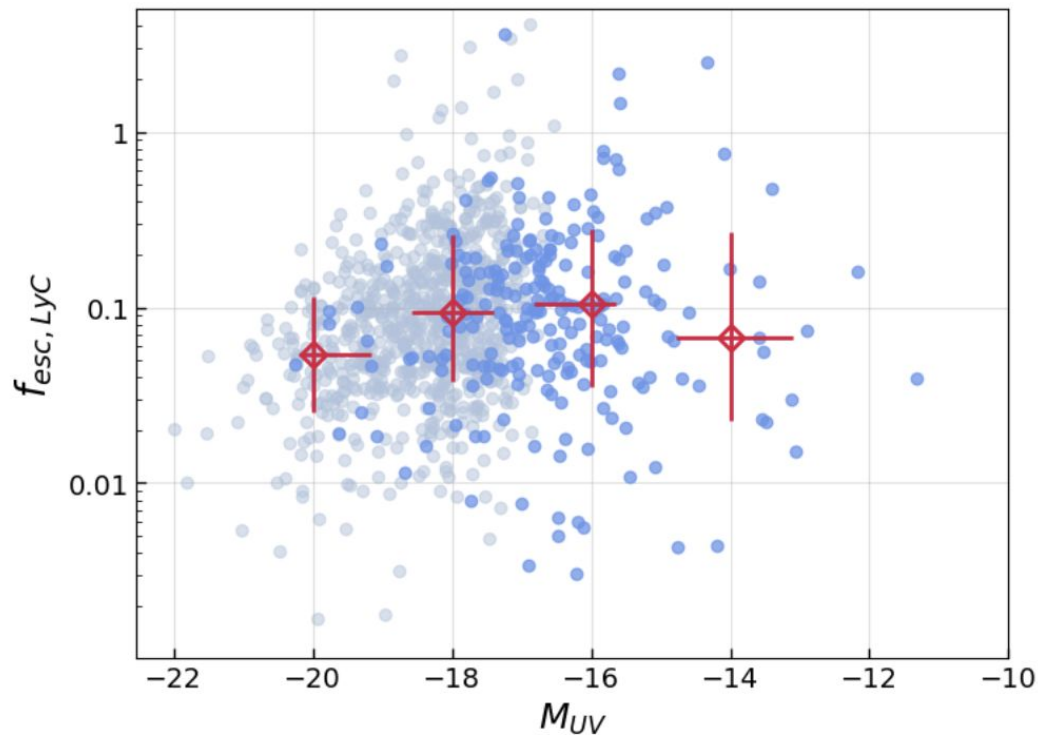
Extremely blue sources



$f_{\text{esc}} - M_{\text{UV}}$ relation



$f_{\text{esc}} - M_{\text{UV}}$ relation



Muñoz et al. 2024

Key takeaways

- Need to determine f_{esc} from **faint**, high- z galaxies
 - UV-continuum slope (β)
 - Compare photometric and SED power-law fits
- Findings suggest β decreases with redshift
 - β stops decreasing toward faintest galaxies
 - Faint galaxies **don't** have the highest LyC escape fractions
- Broad results – observational bias, scatter, assumptions
- Getting ~40hrs Nirspec G395M spectra in July! (PI: Seiji Fujimoto)
 - Look at additional tracers of $f_{\text{esc, LyC}}$

