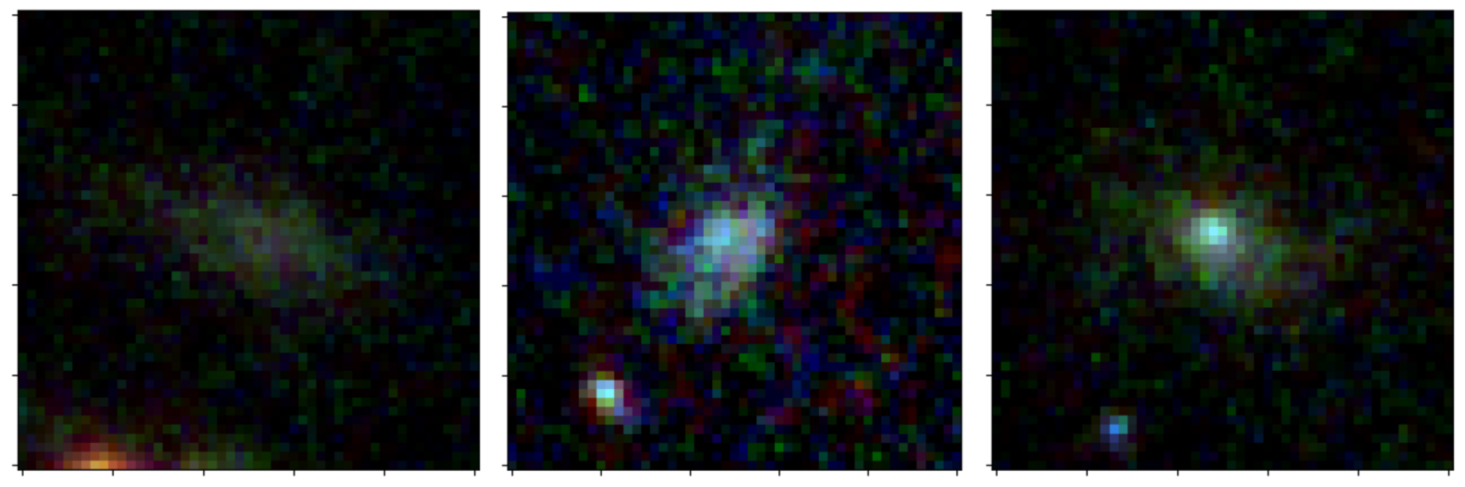

Low Surface Brightness Objects z~0.4-0.8 in GOODS-S

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[1]Steward Observatory, University of Arizona

Astronomy & Steward Observatory

JADES JWST ADVANCED DEEP EXTRAGALACTIC SURVEY

What Are LSBs?

- Objects fainter than sky background
- Historically undetected and underrepresented in surveys
- Usually defined by a cut in surface brightness around >24 mag arcsec^{-2}
- Goal is to look for faint and extended objects (example: Malin 1)

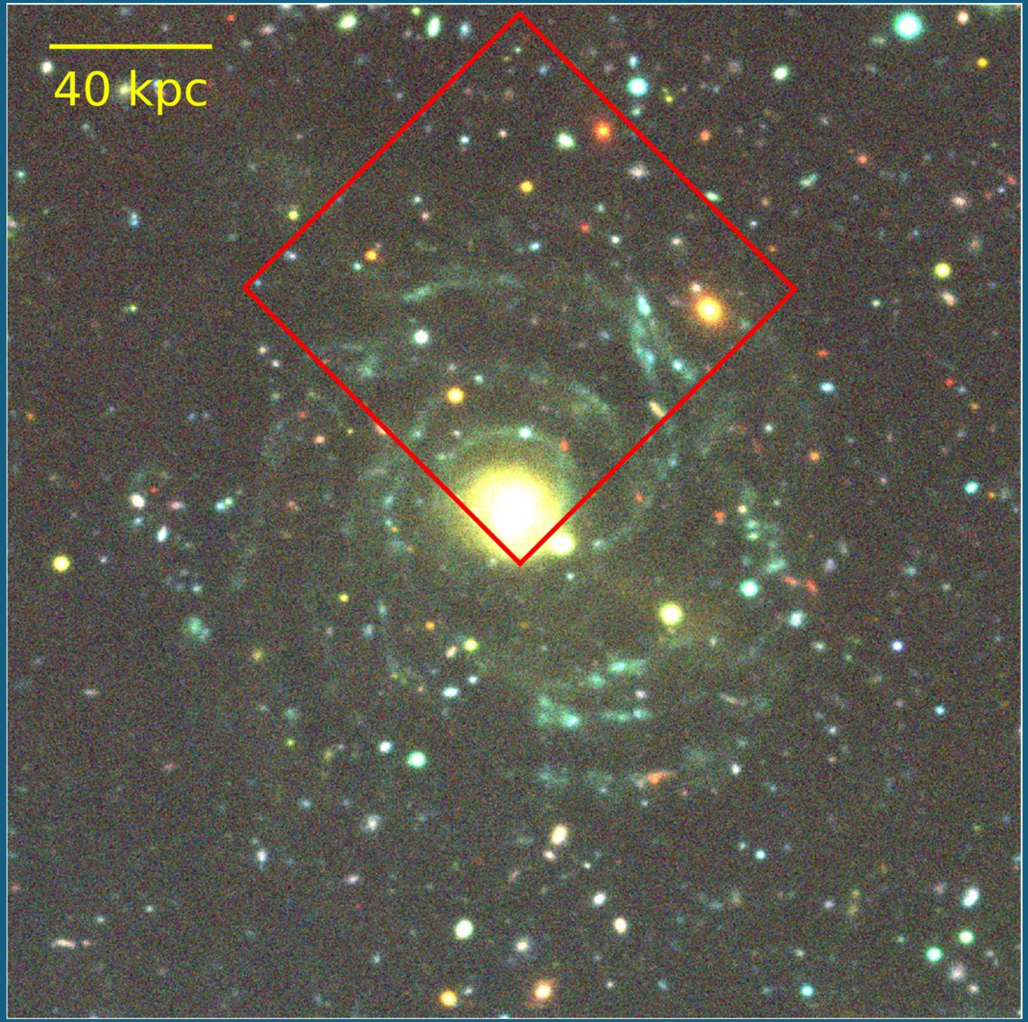


Image credit: Junais et al. (2024)

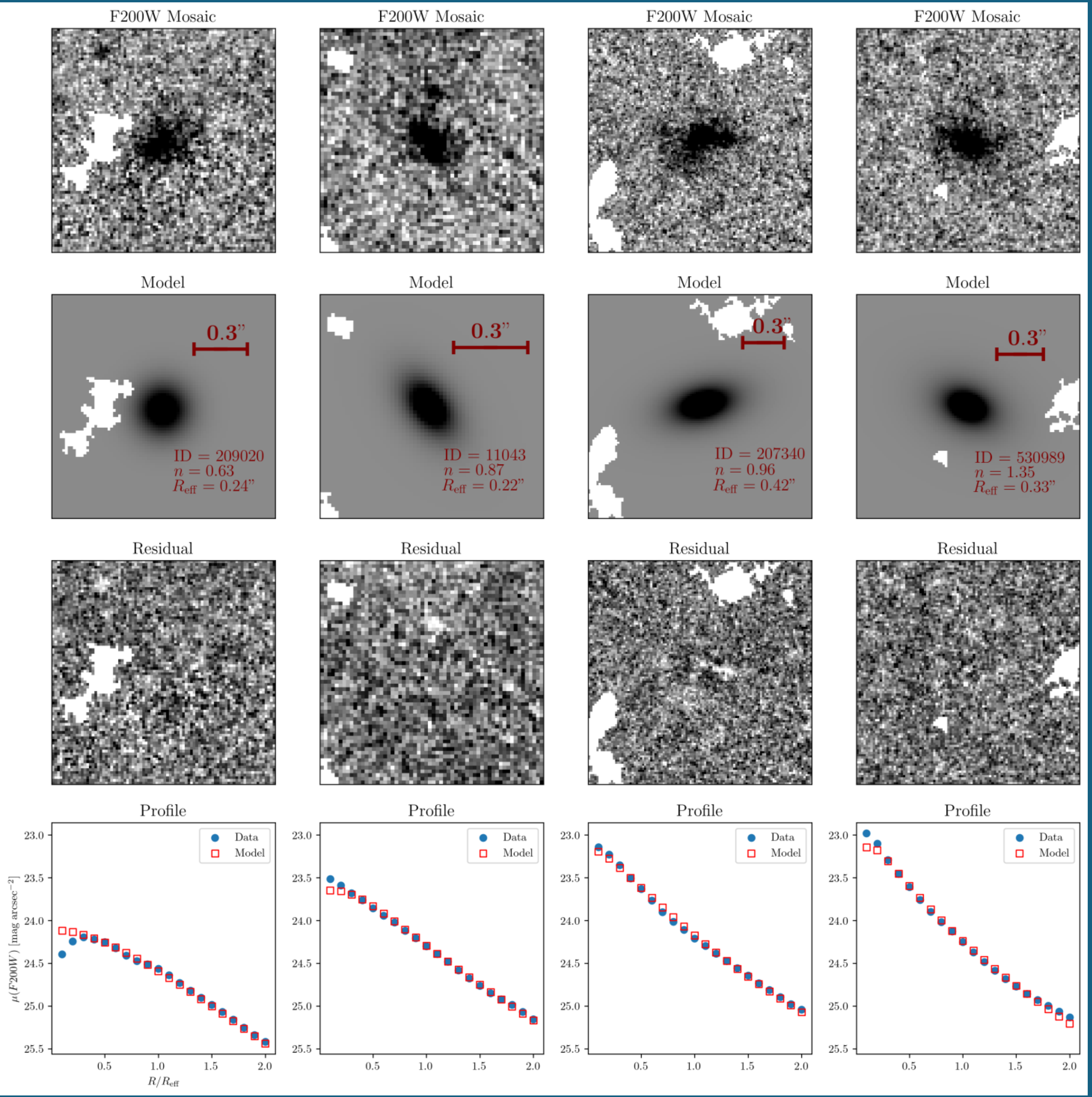
Why Are LSBs Important?

- LSBs represent a sizeable fraction of the galaxy population (30%~60%)
- Provide opportunities to test cosmological models
- Broaden our understanding of galaxy formation
- Previous studies of LSBs focus on local universe ($z < 0.15$)
- JWST/NIRCam allows us to look at LSBs further than this to study their evolution past $z \sim 0.15$

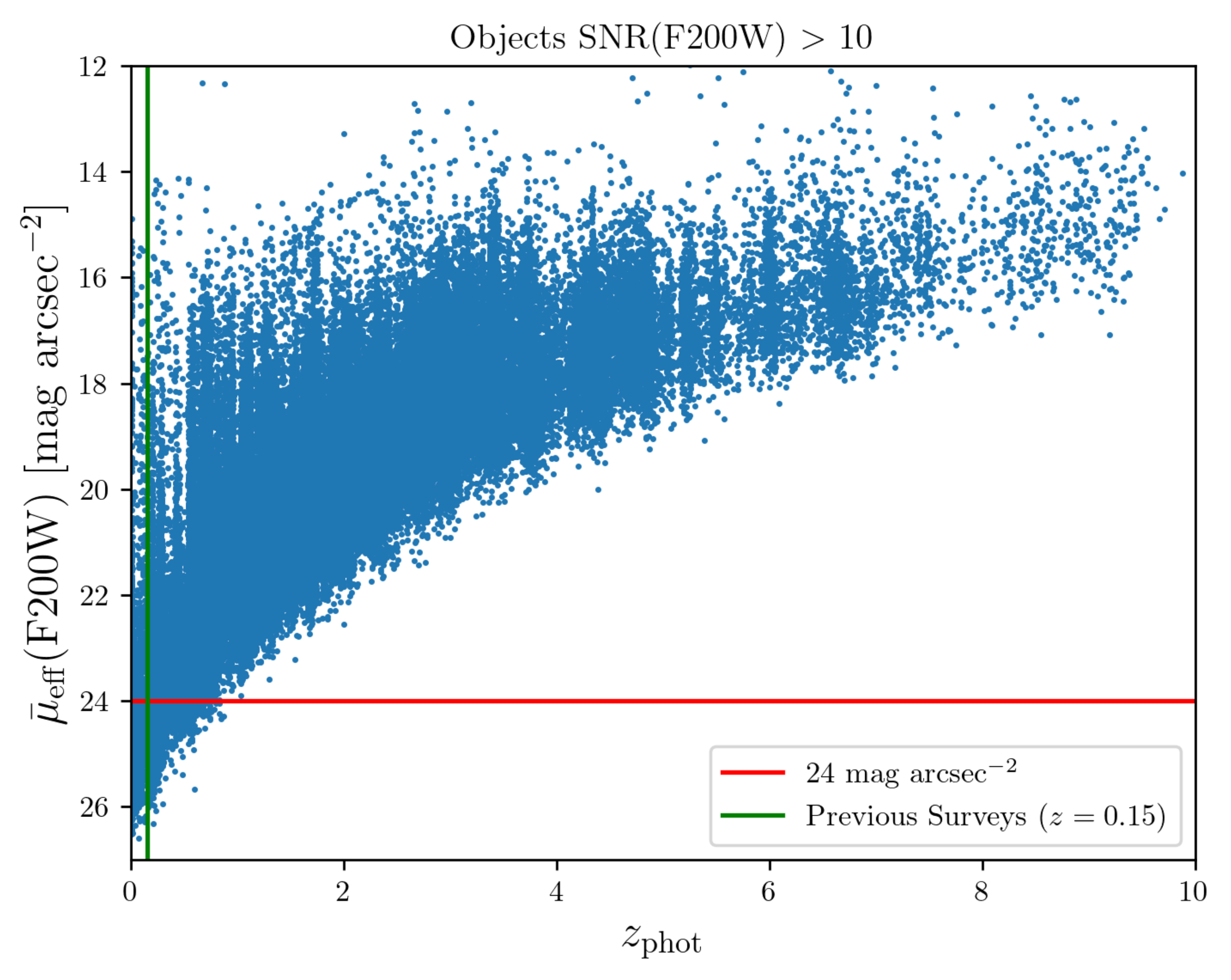
Outline of Selection Process

1. To ensure NIRCam coverage, require SNR>10 in F200W
2. Calculate mean effective surface brightness with pyimfit, require >24 mag arcsec^{-2}
3. Use EAZY photometric redshifts to require $z > 0.4$
4. To get extended objects, require effective radius > 0.17 arcsec
5. Visually inspect objects to remove false positives

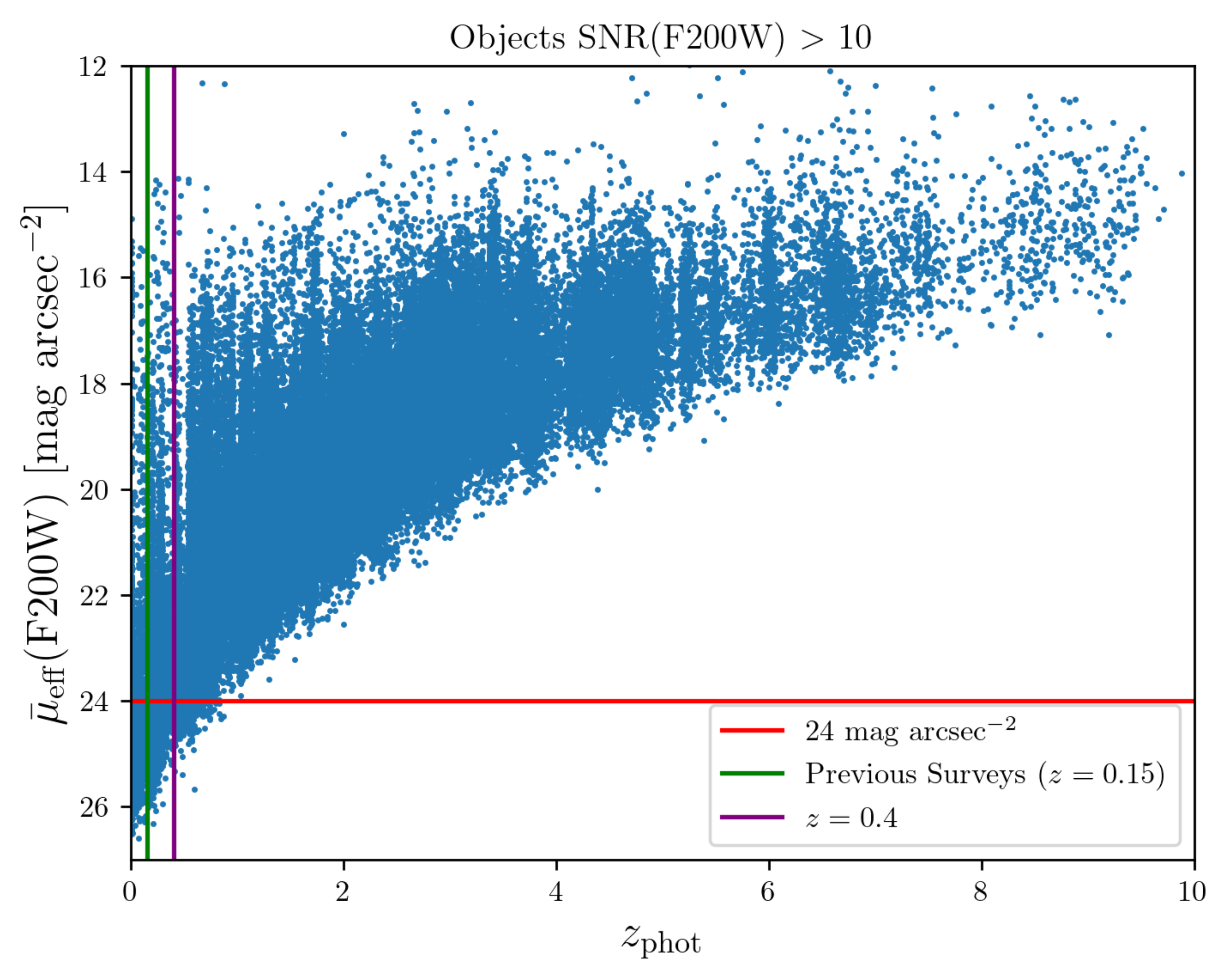
Surface Brightness Profiles with Pyimfit



$$\bar{\mu}_{\text{eff}} = m_{\text{tot}} + 2.5\log[2\pi(1-\epsilon)R^2_{\text{eff,arcsec}}] - 10\log(1+z)$$



$$\bar{\mu}_{\rm eff} = m_{\rm tot} + 2.5\log[2\pi(1-\epsilon)R^2_{\rm eff,arcsec}] - 10\log(1+z)$$



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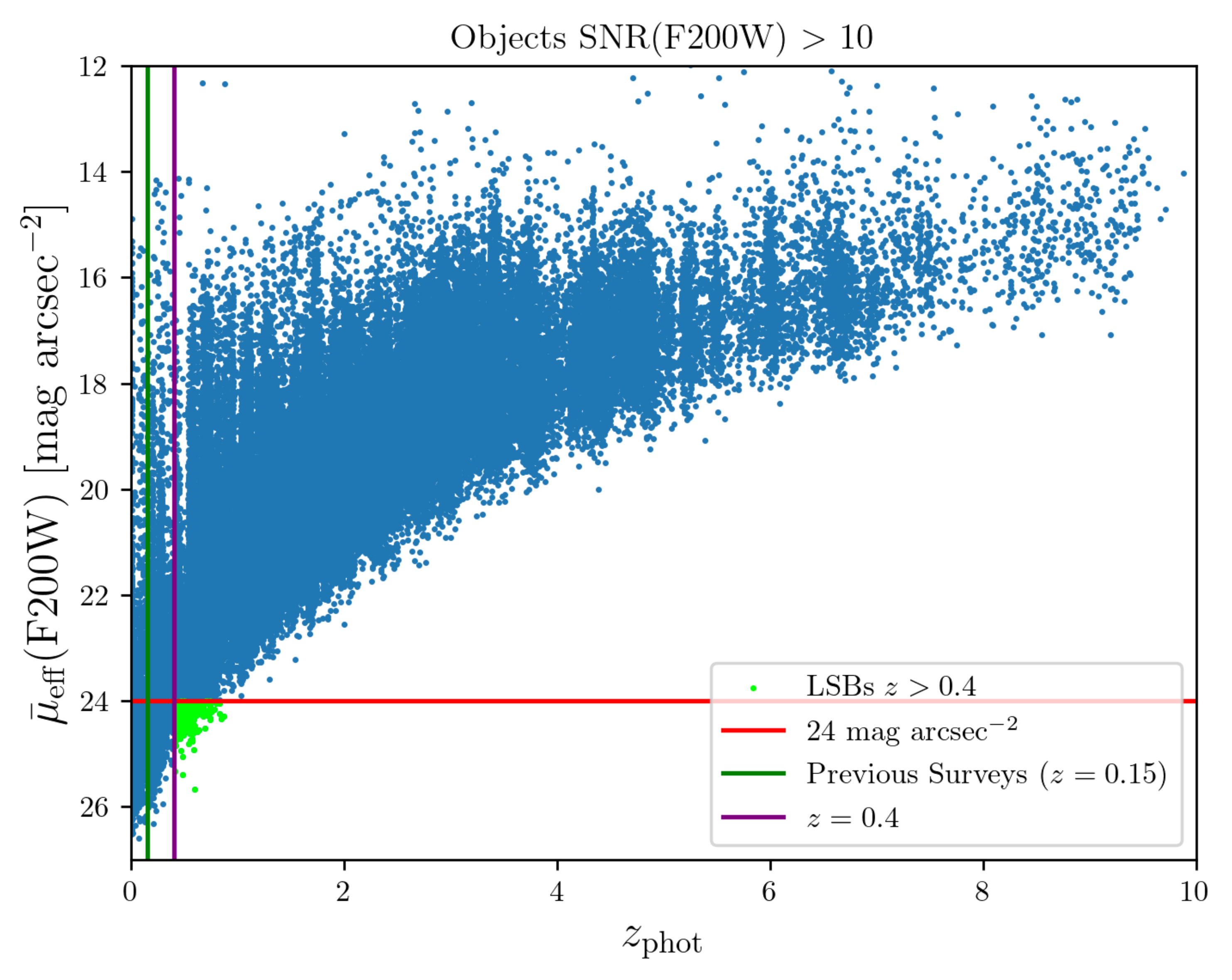
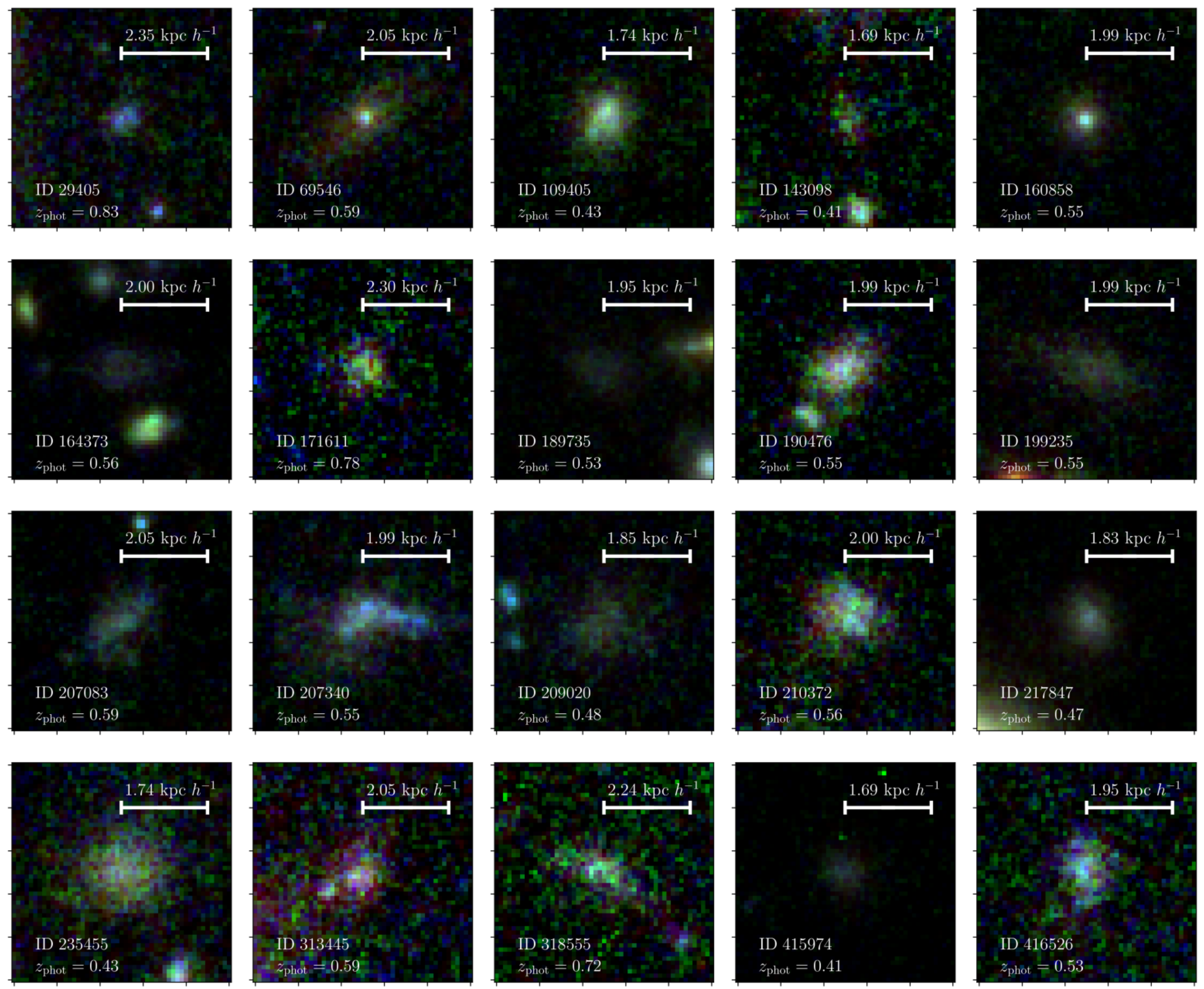
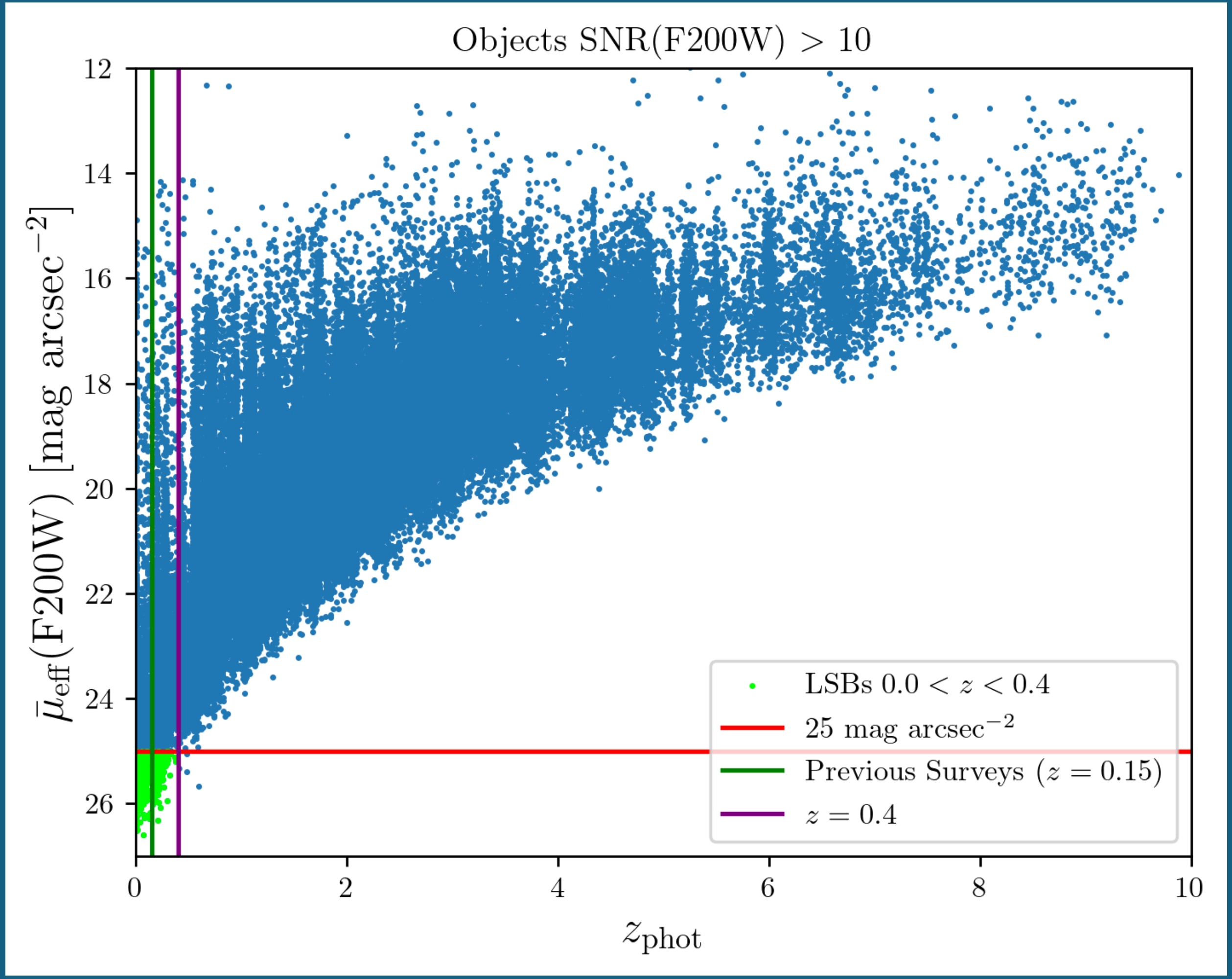
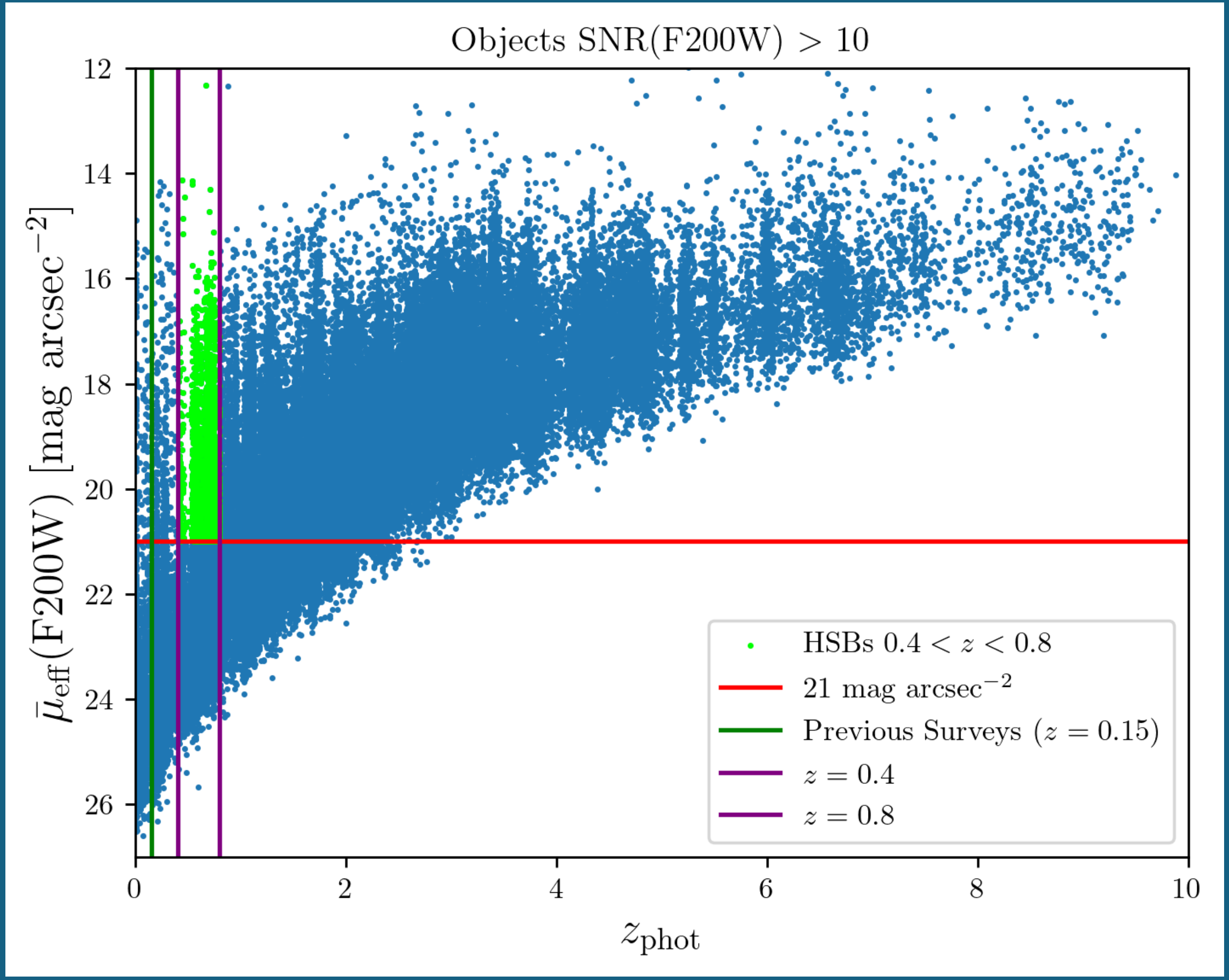


F277W/F200W/F115W RGBs



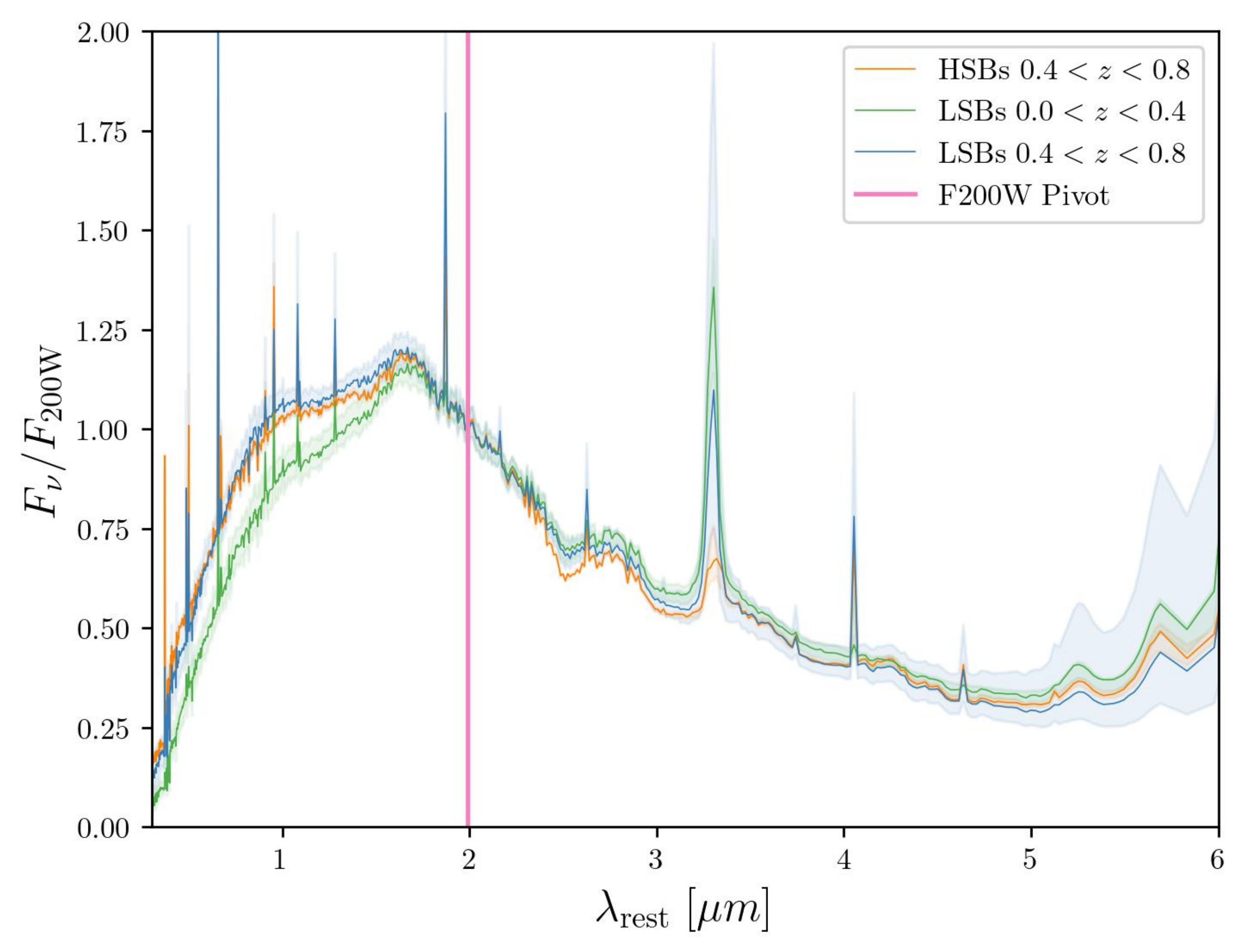
Comparison Samples





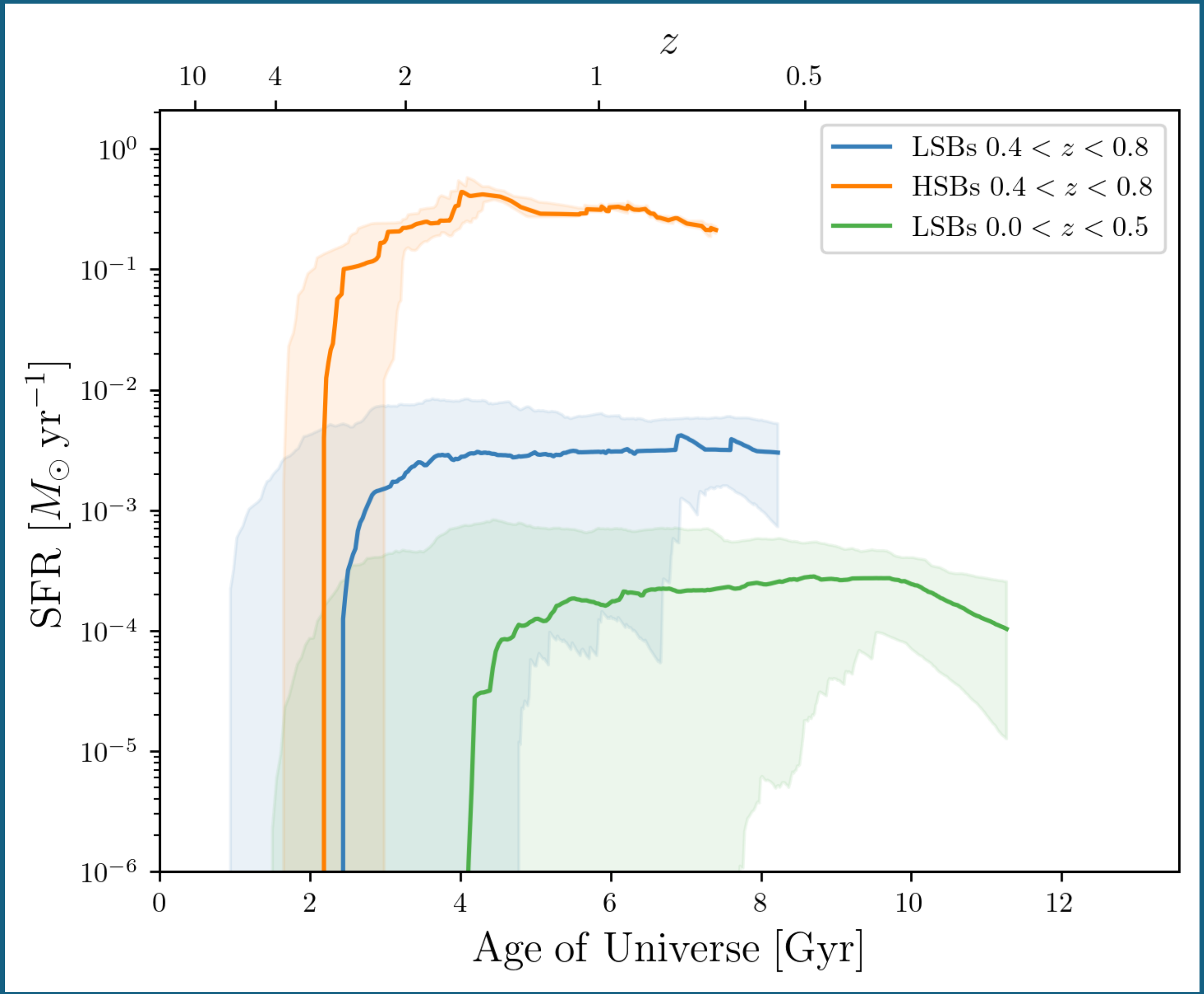
Analysis With BAGPIPES

- BAGPIPES fits photometric data (SEDs)
- Uses Bayesian analysis to infer star formation histories
- Stacked SED fits from BAGPIPES for each sample are shown on the right



Analysis With BAGPIPES

- Stacked star formation histories (SFHs) for each sample
- SFHs not well constrained for LSB samples
- Supports theoretical predictions about LSBs and HSBs past z=2



Conclusions

- Using NIRCam, we can study LSBs at higher redshifts than studied before
- These objects are faint and extended, similar to Malin 1
- Analysis with BAGPIPES confirms many theoretical predictions about the evolution of LSBs and HSBs past z=2
- Further spectroscopic analysis of these objects can reveal more about the formation and evolution of LSBs