

Suppressed Star Formation and AGN in Massive Galaxies at $z \sim 2.5$

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Ryan Quadri, Gregory Rudnick & the MUSYC collaboration

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Motivation

- ◆ When was the star formation suppression in massive galaxies initiated?
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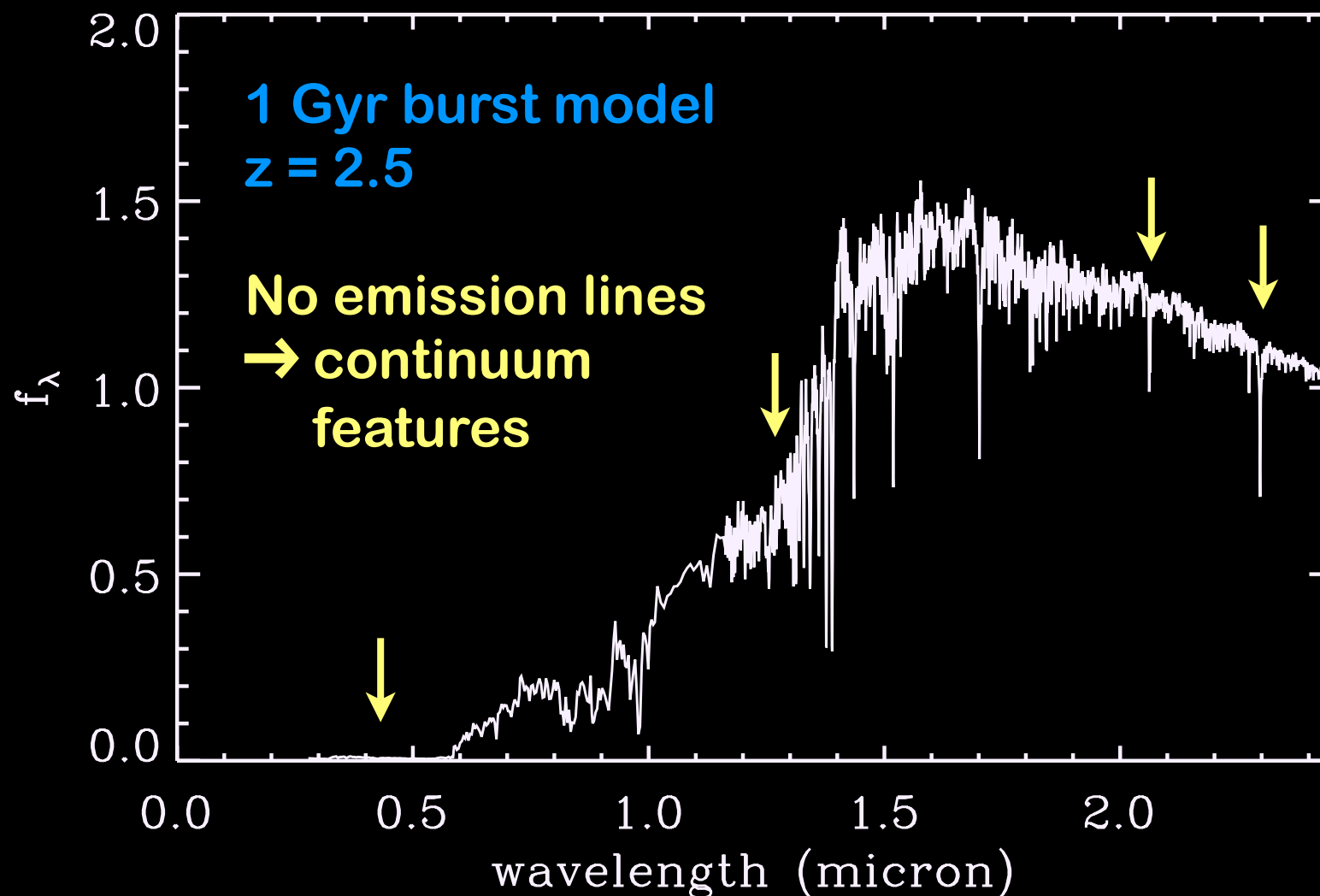
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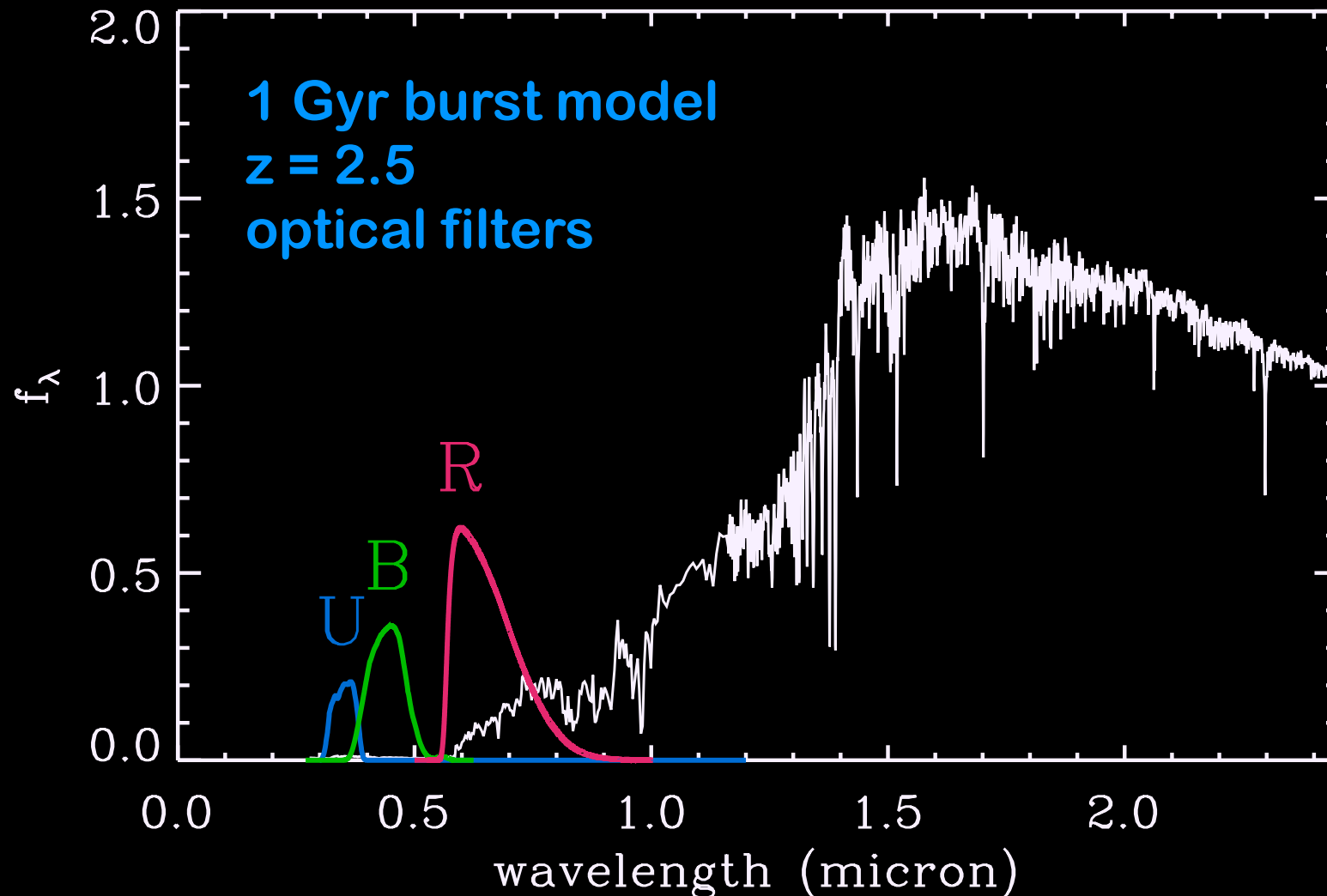
✦ Problems:

- ▶ most studies rely on photometric redshifts
- ▶ mostly broadband photometric studies

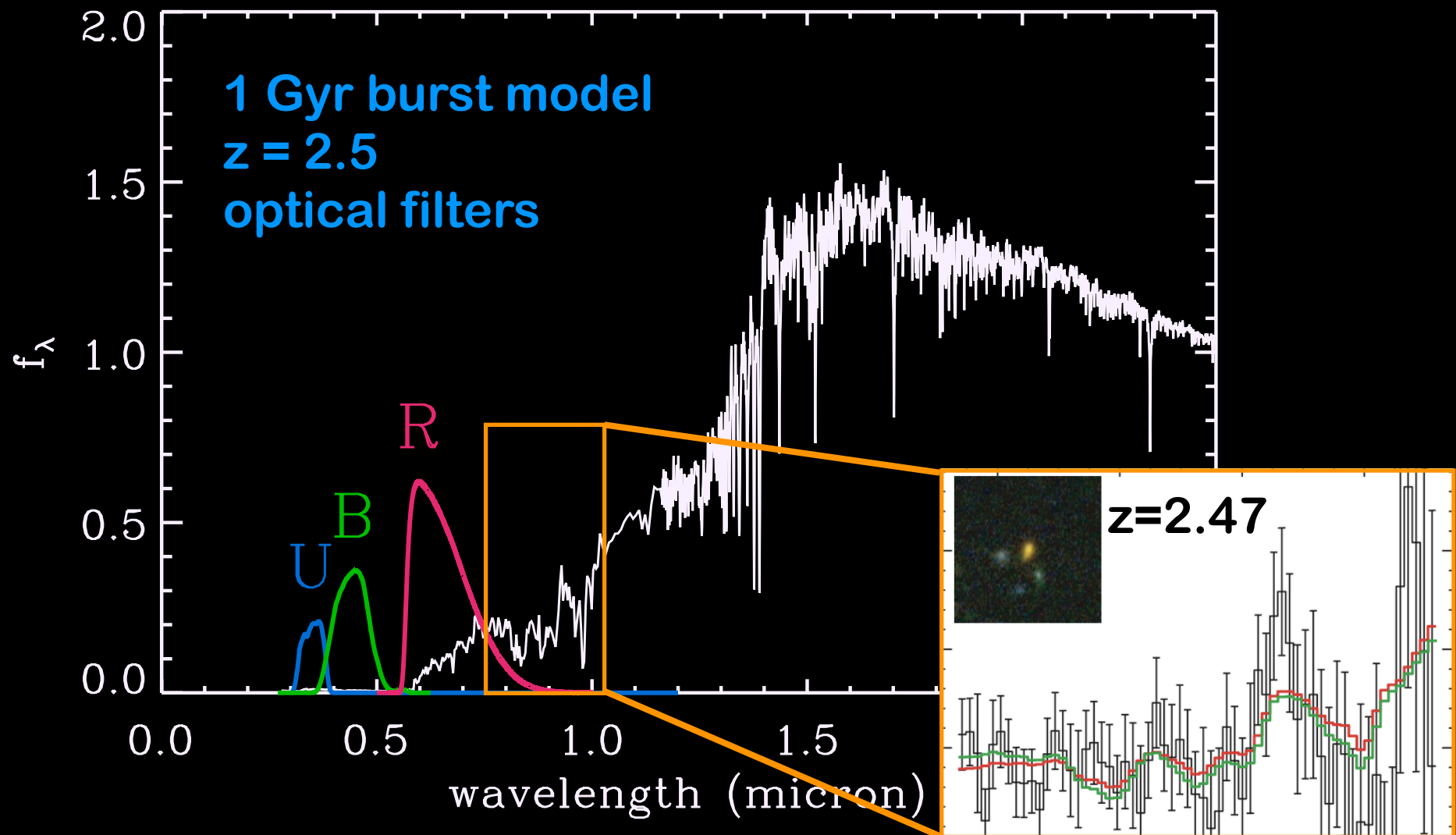
Why is it so difficult to obtain redshifts for $z > 2$ quiescent galaxies?



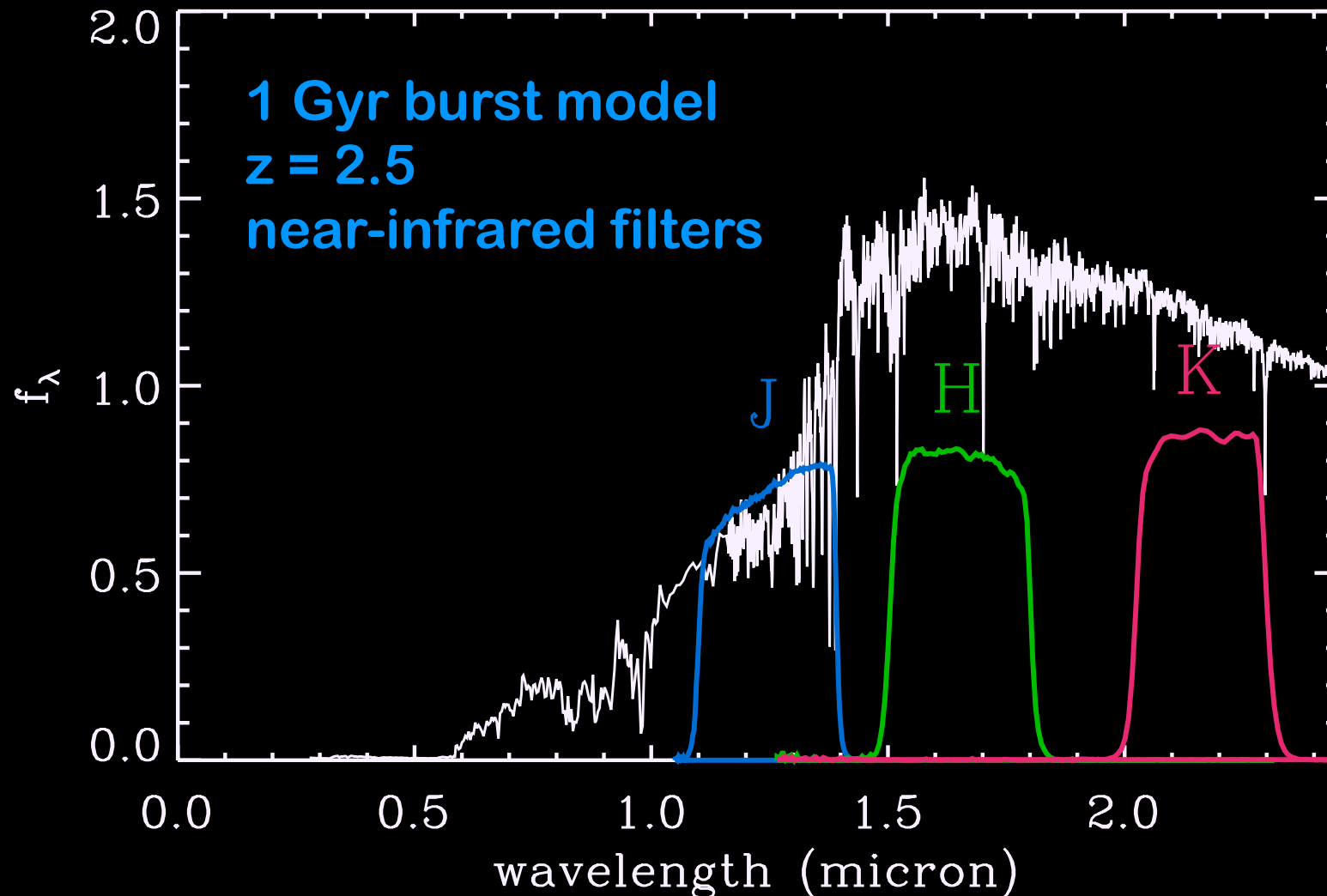
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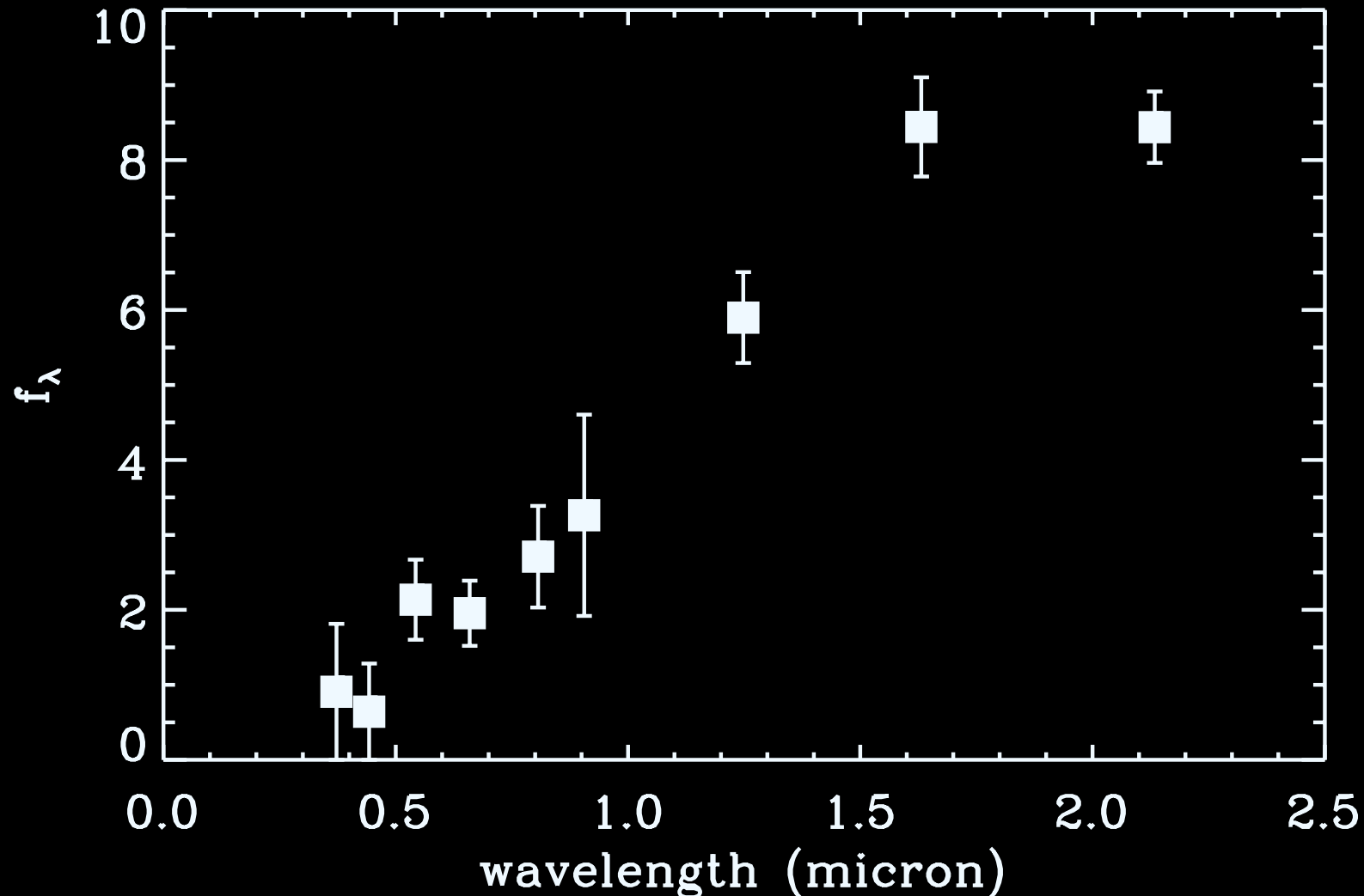
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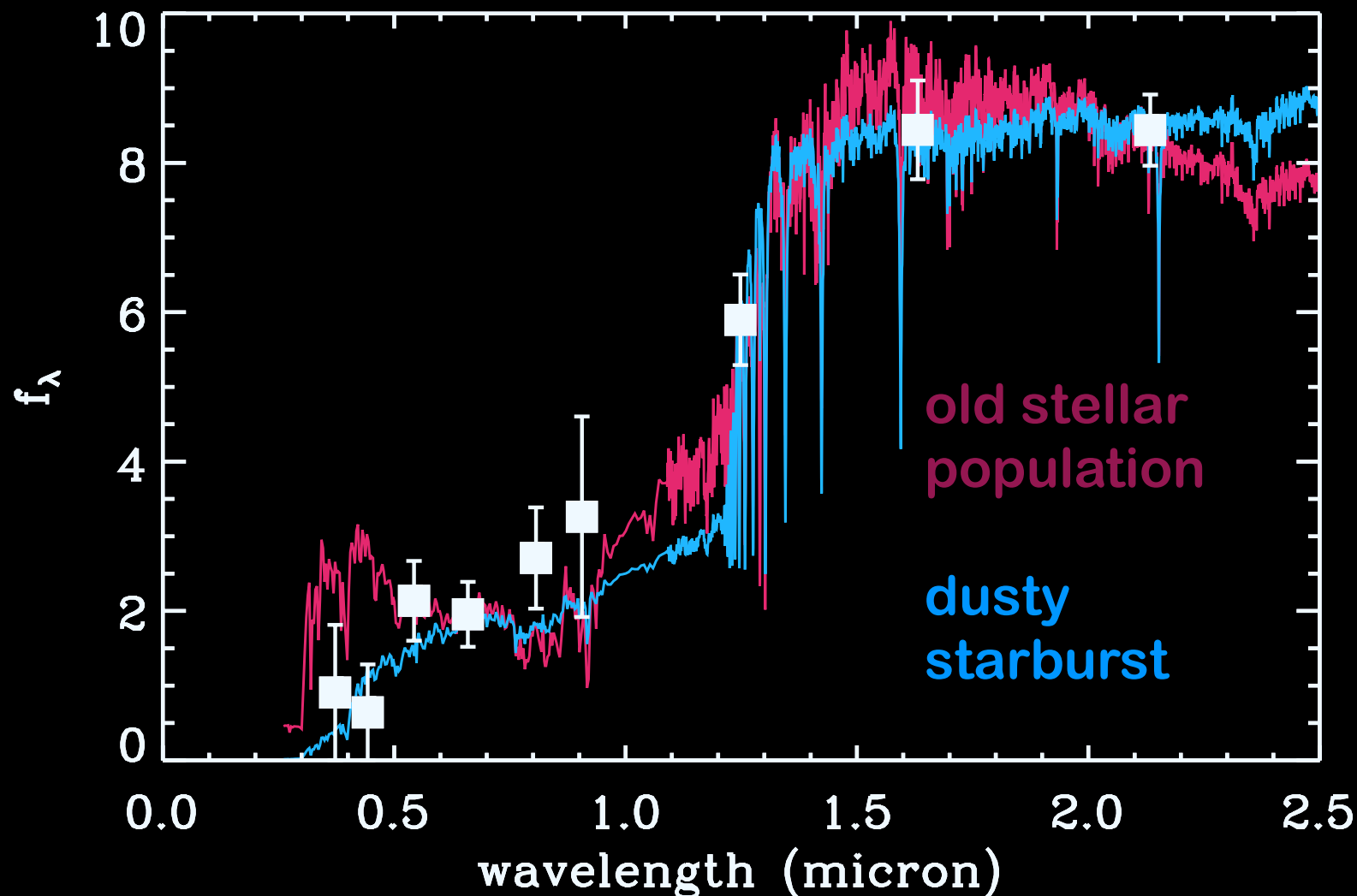
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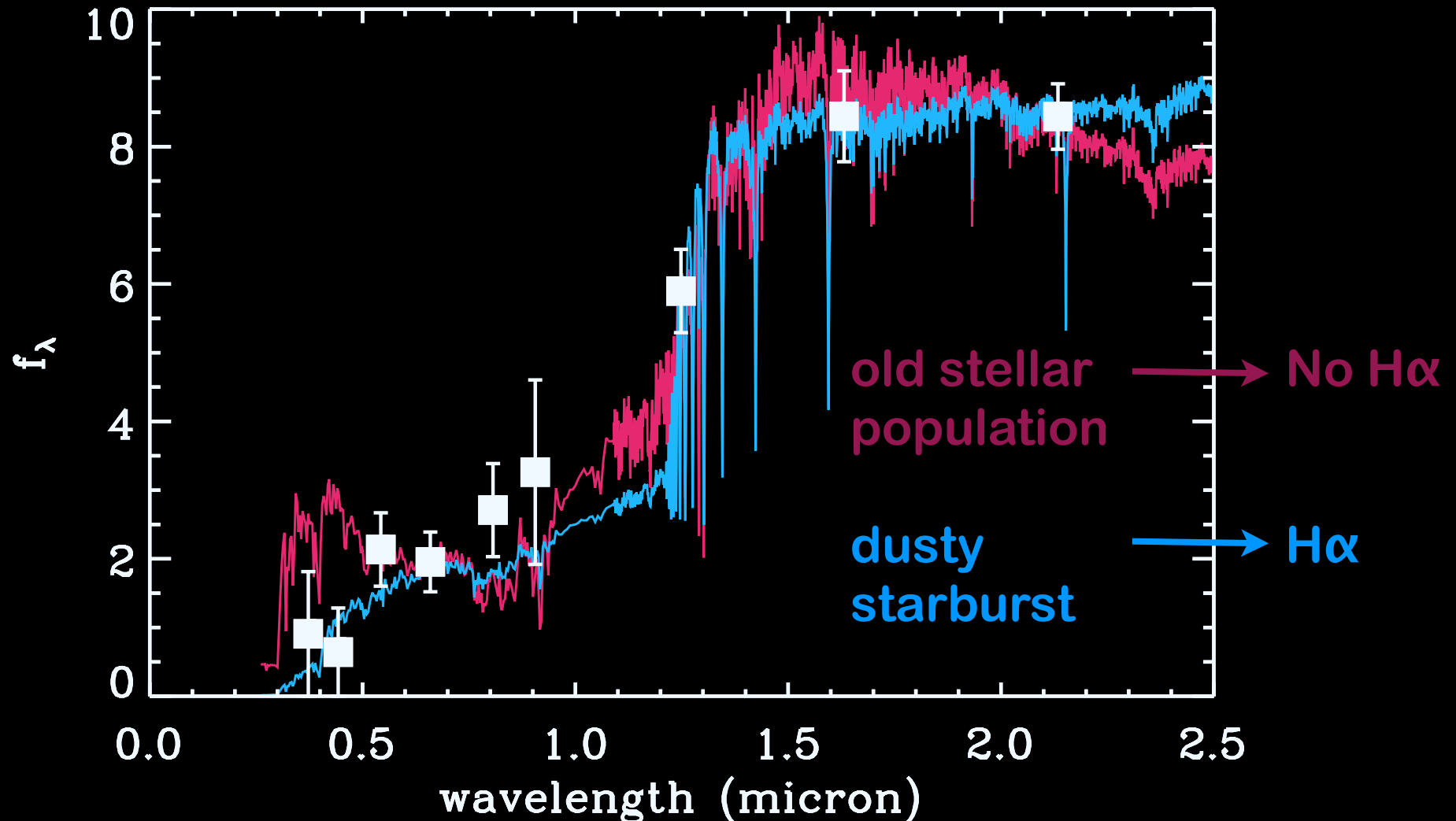
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GNIRS Spectroscopic Survey

✦ Gemini-South / GNIRS

- ▶ 26 Galaxies
- ▶ cross-dispersed spectra: 1.0-2.5 μm
- ▶ 1-4 hours per spectrum

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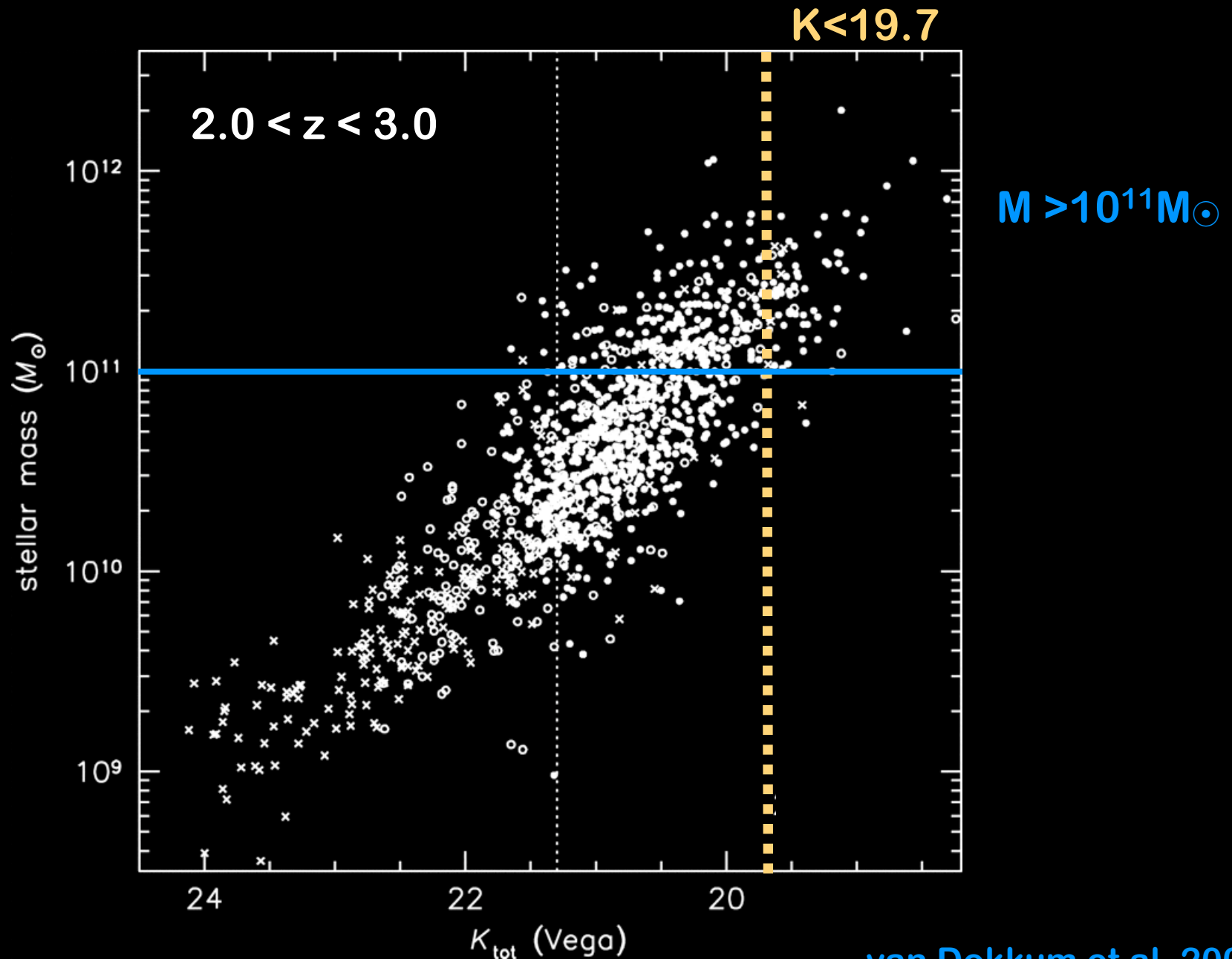
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✦ Selection

- ▶ **MUSYC** survey
- ▶ $2.0 < z_{\text{phot}} < 2.7$
- ▶ $K < 19.7$

Stellar mass vs. K-magnitude



van Dokkum et al. 2006

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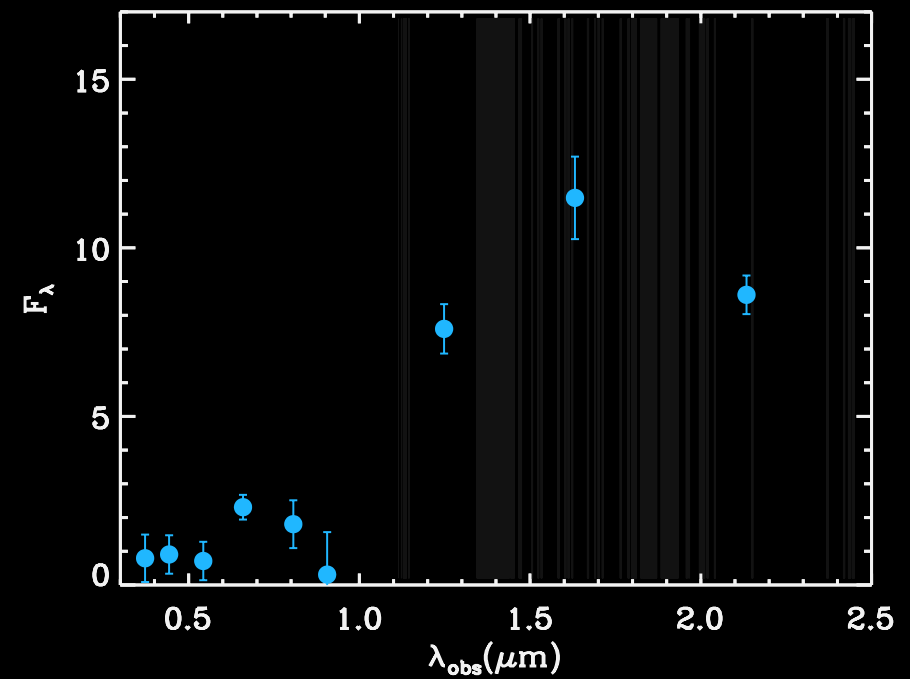
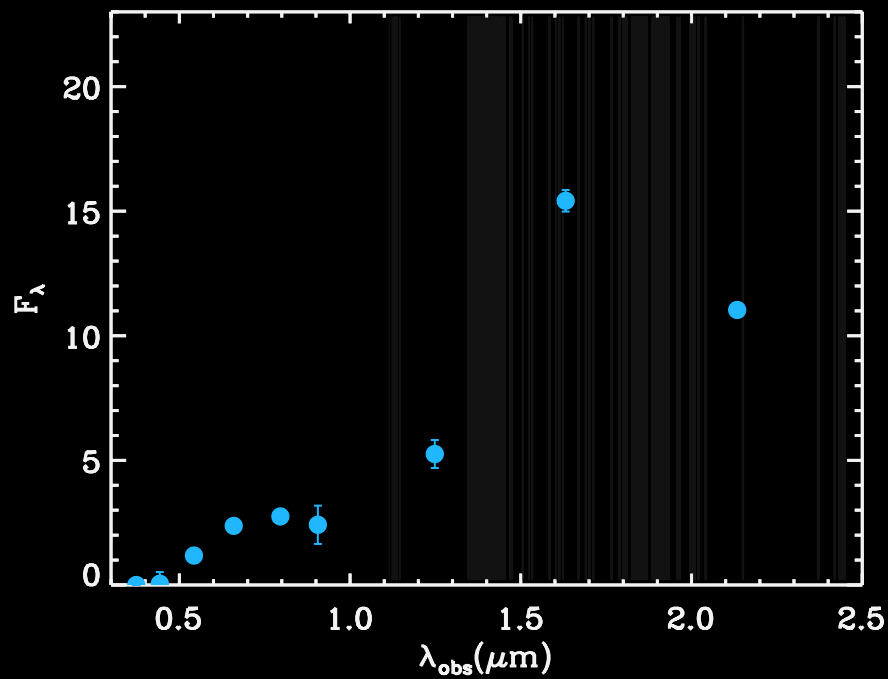
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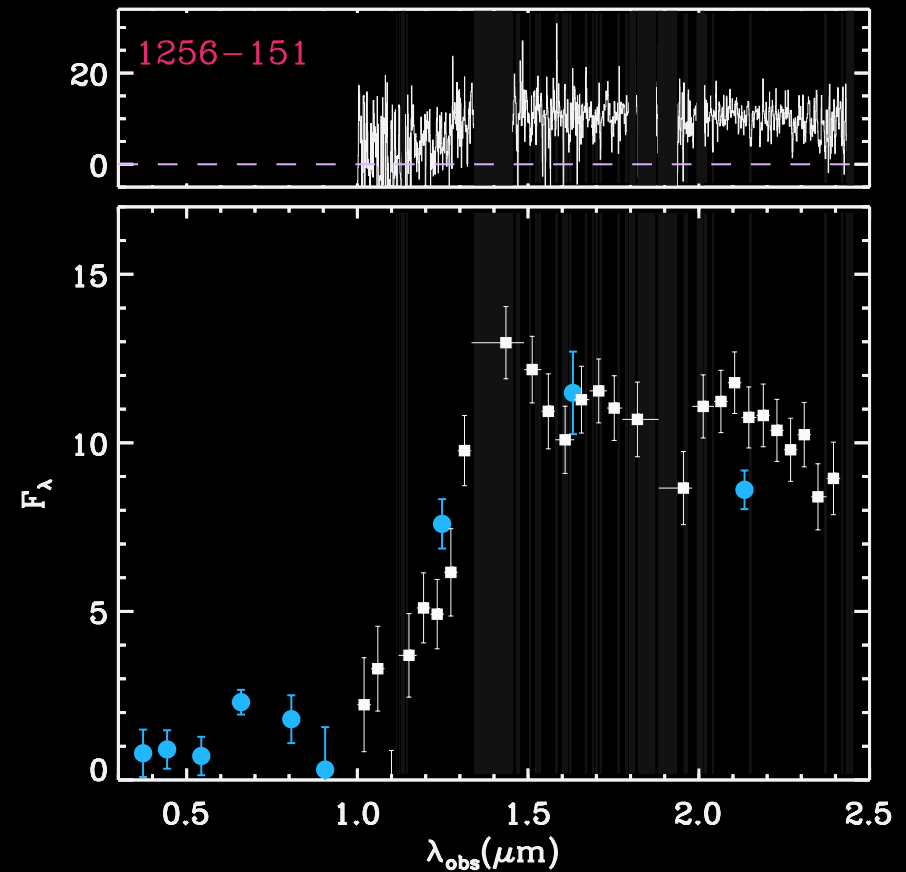
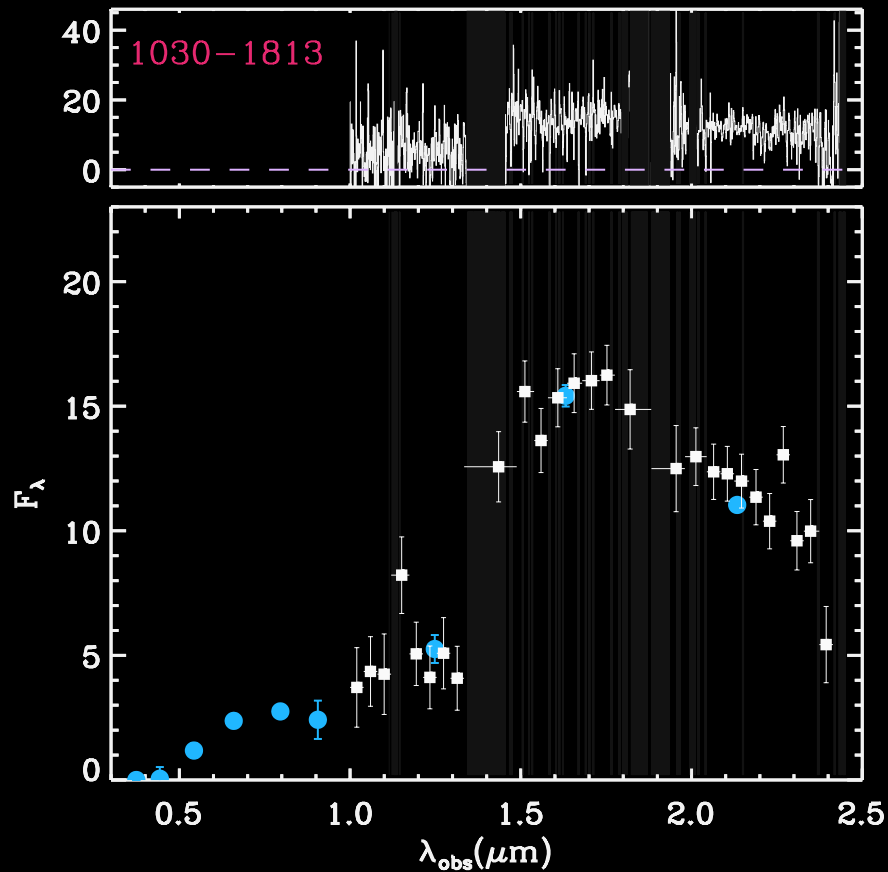
✦ Spectroscopic redshifts for all 26 galaxies

- ▶ 6 galaxies with $1.8 < z_{\text{spec}} < 2.0$
- ▶ 20 Galaxies with $2.0 < z_{\text{spec}} < 2.7$

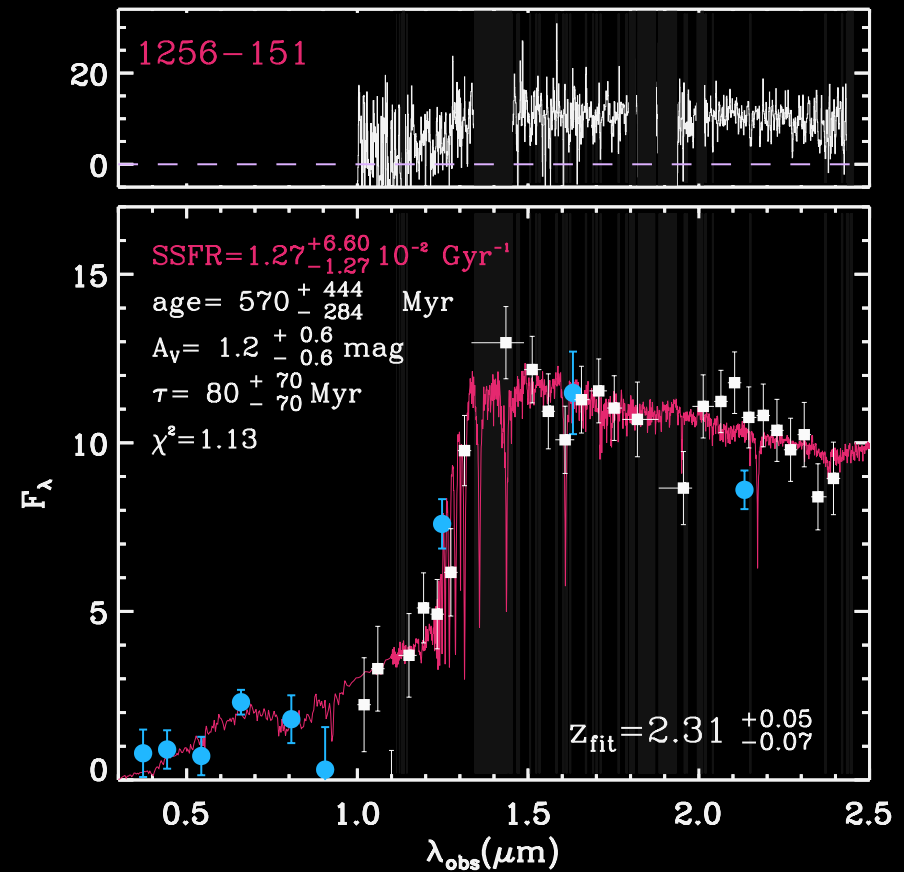
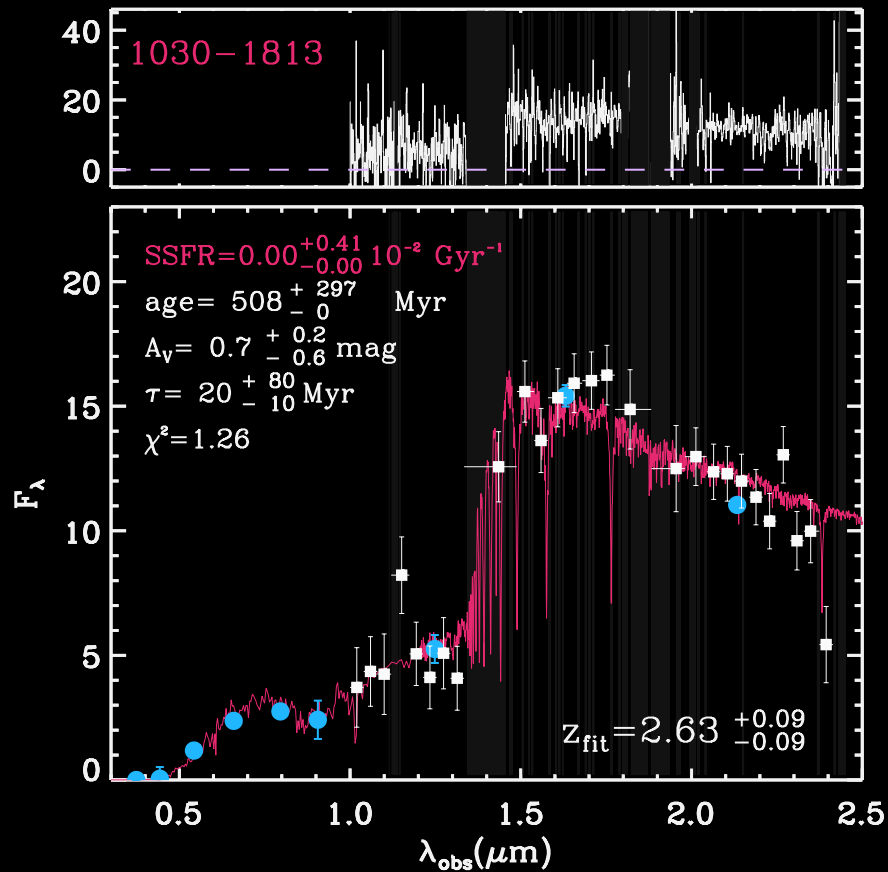
Galaxies without detected H α emission

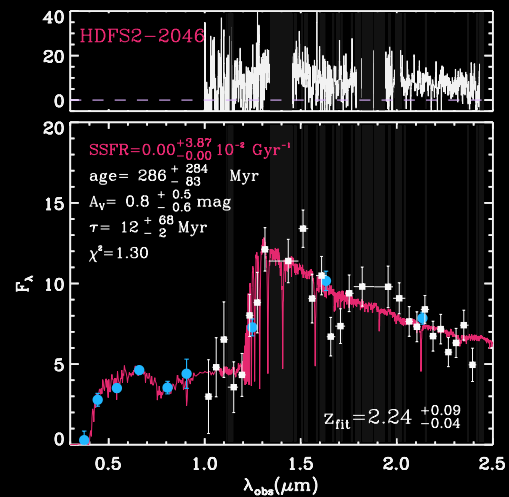
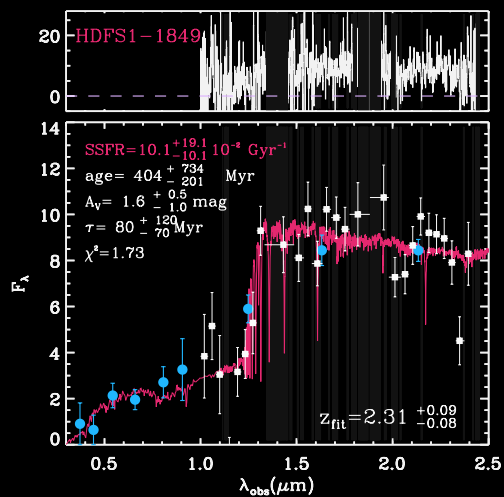
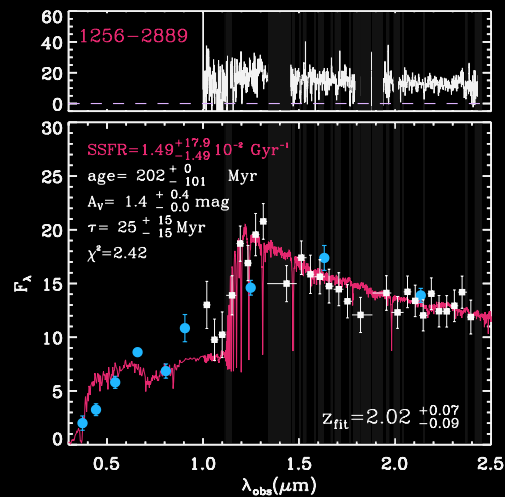
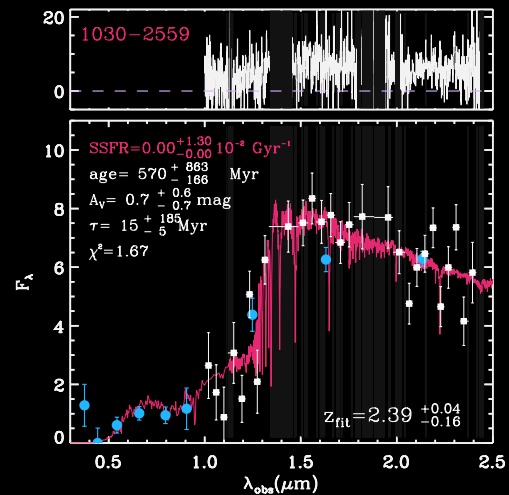
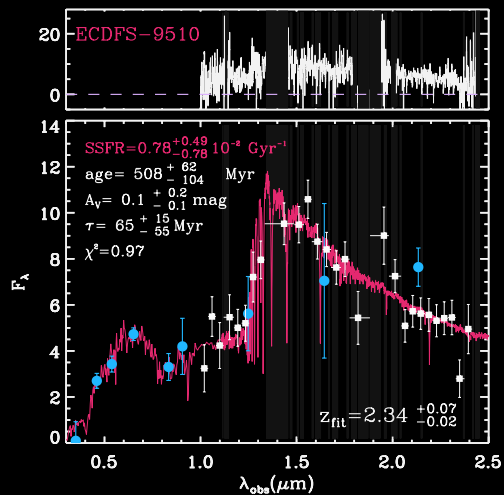
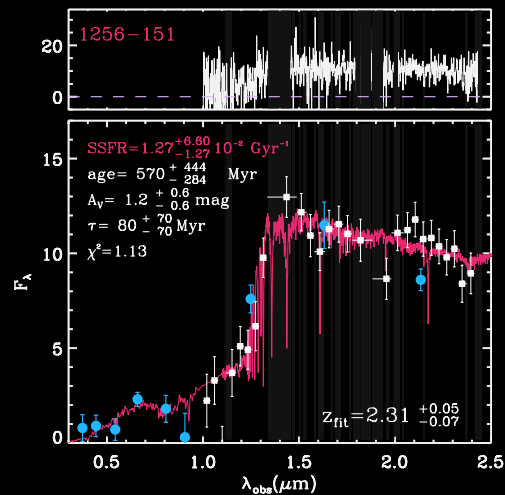
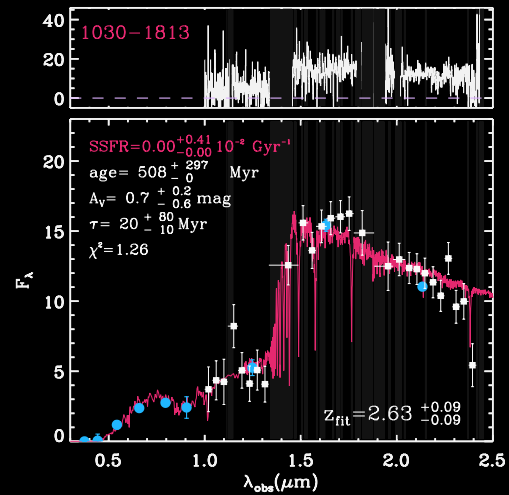
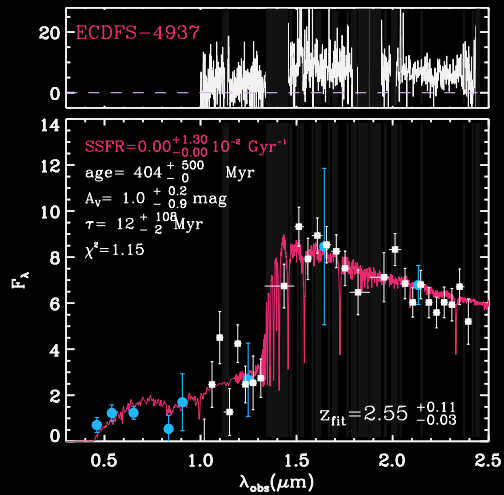
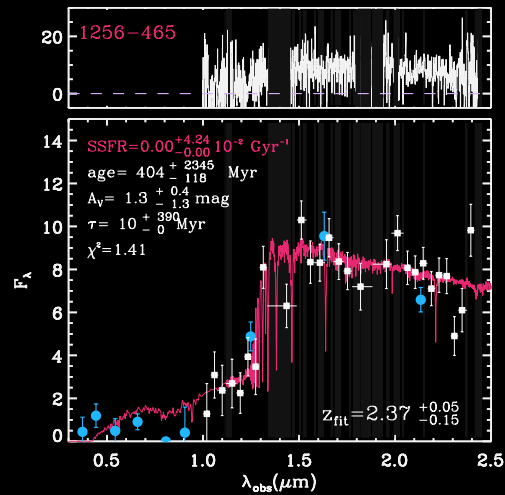


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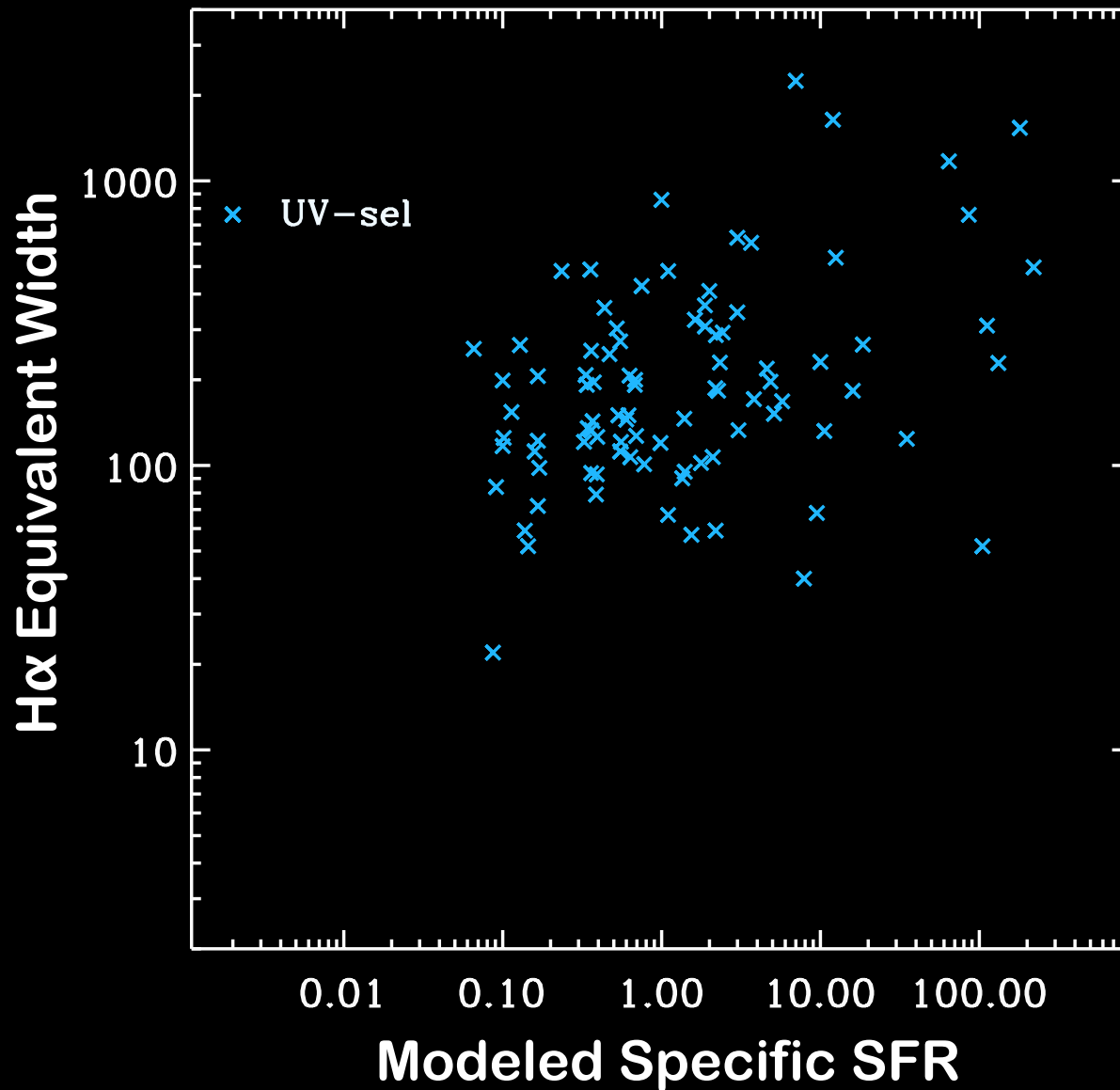


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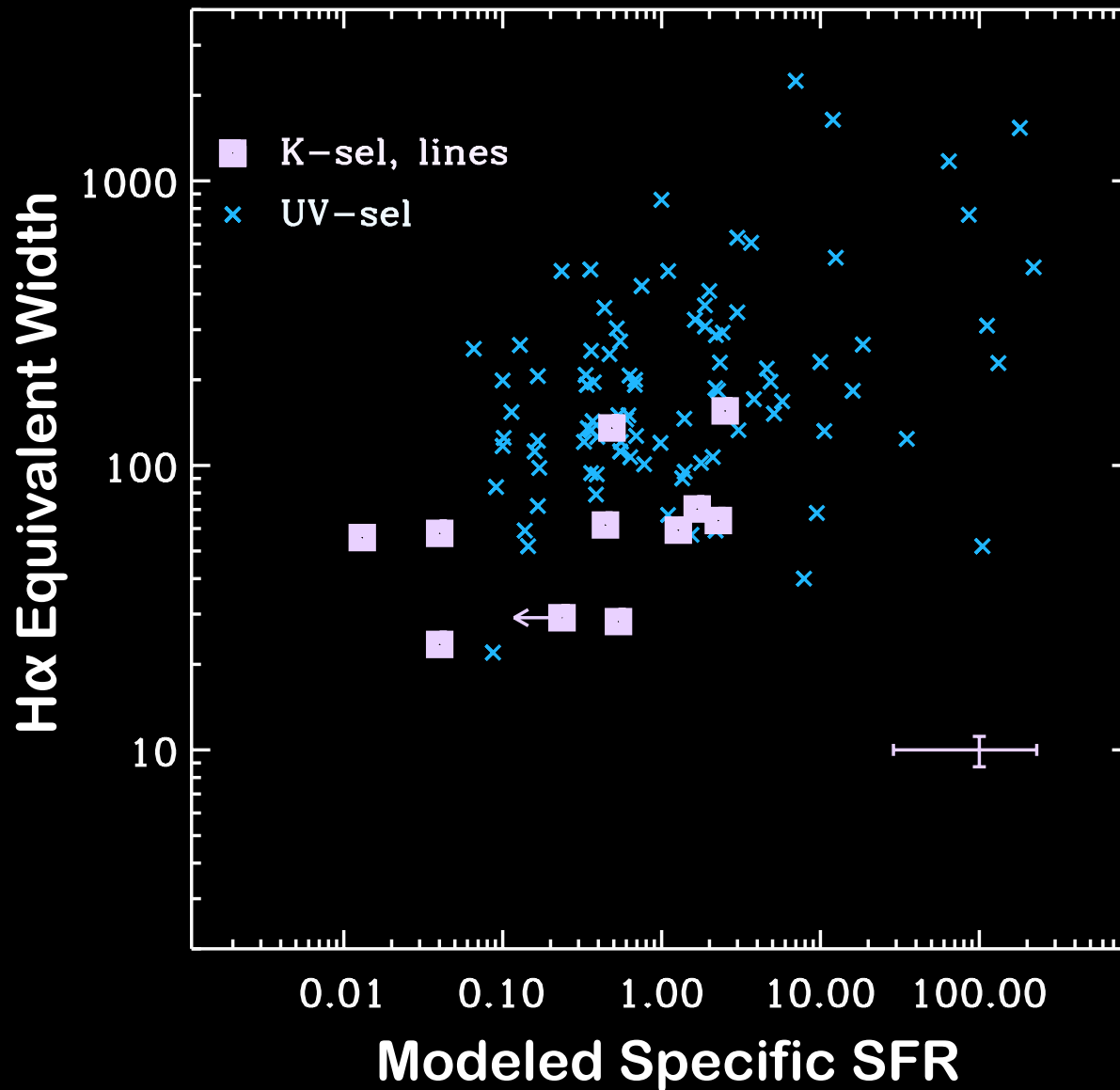




Stellar populations in galaxies at $z > 2$

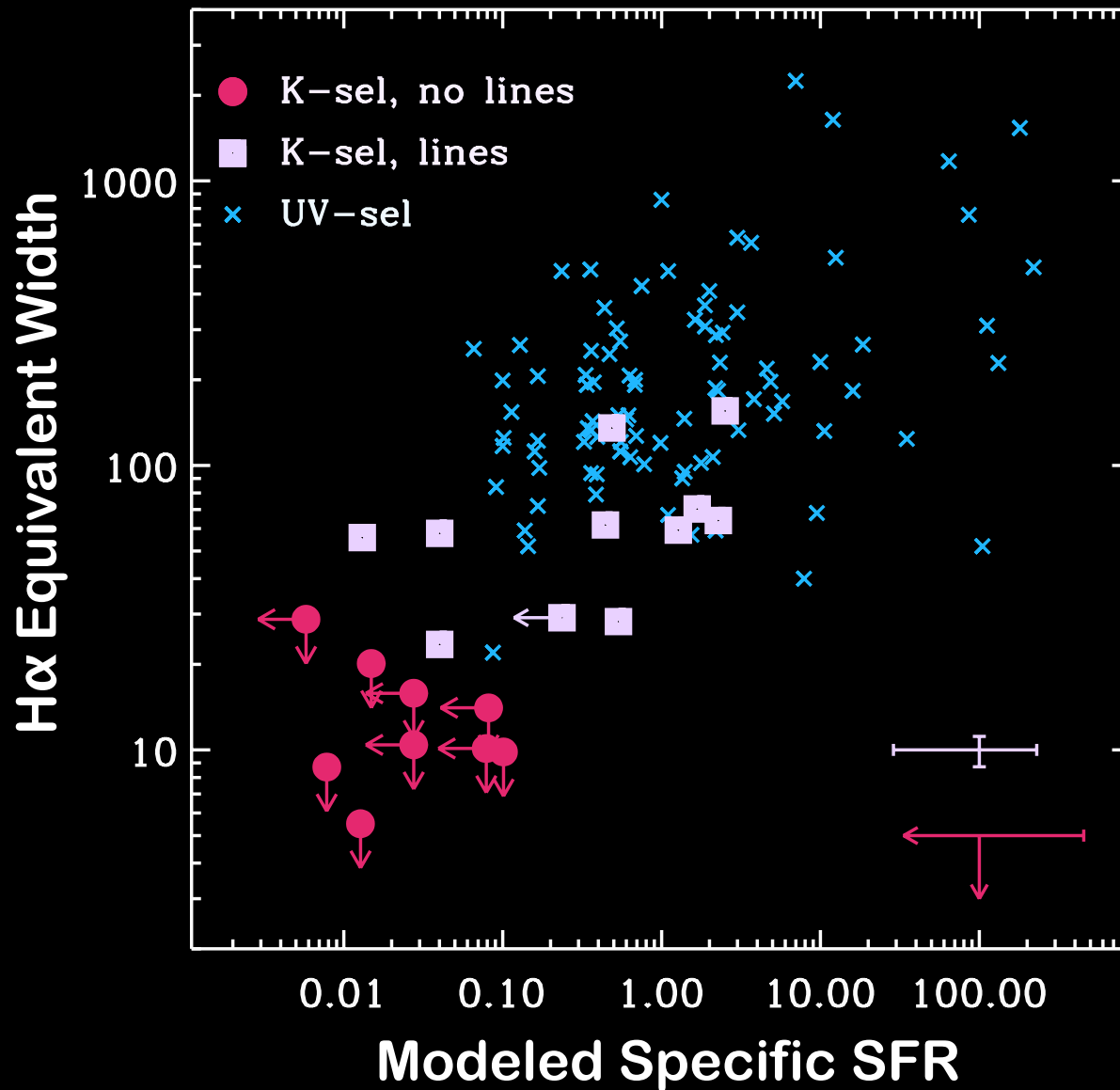


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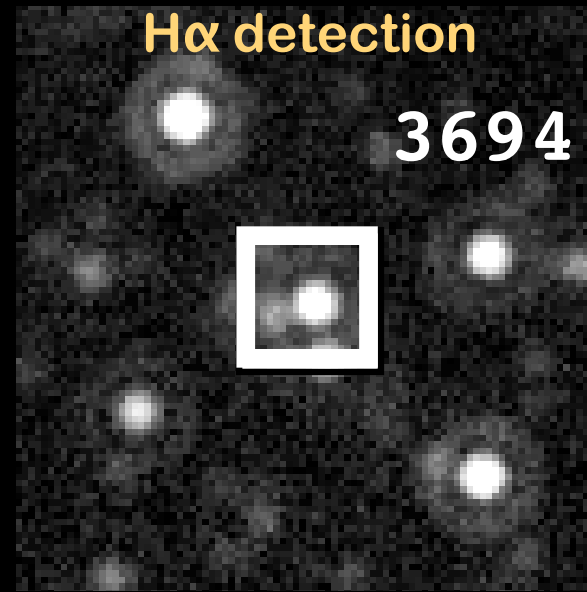
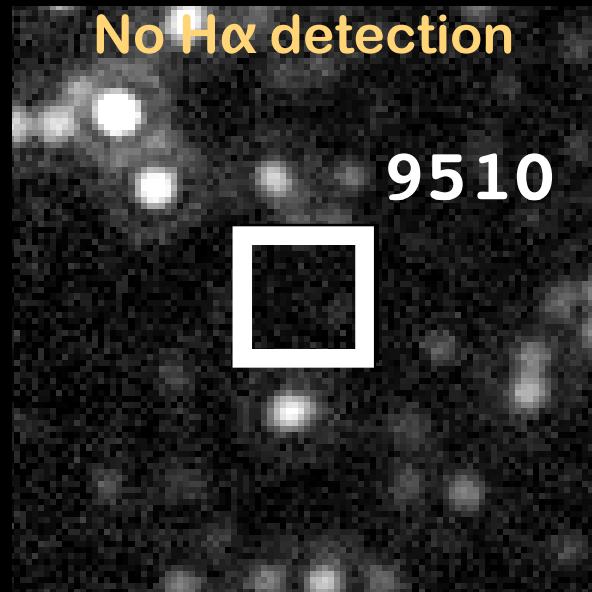
UV-sel: Erb et al. 2006; Kriek et al. 2006b

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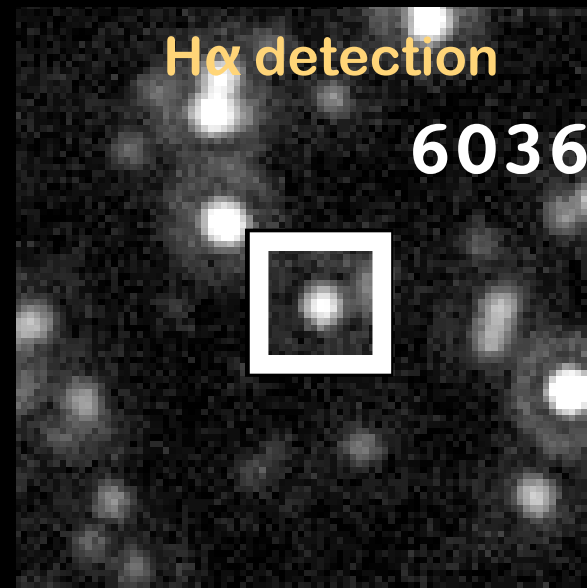
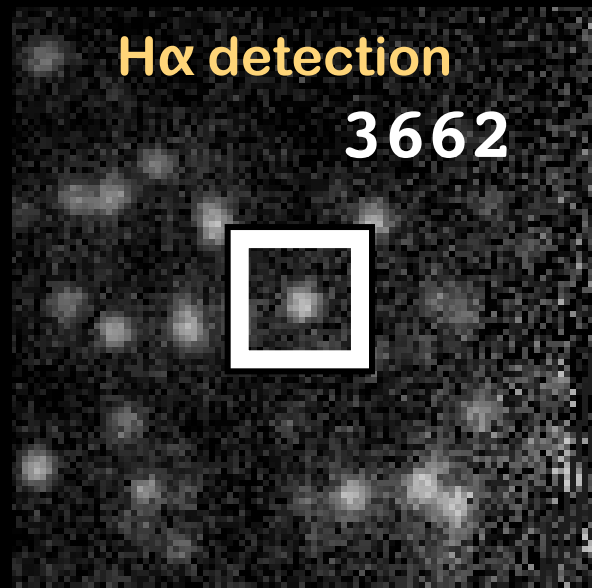


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Do we miss obscured star formation?



MIPS
24 μ m



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 - ▶ In about half of the massive galaxies at $z \sim 2.5$ the star formation is already suppressed

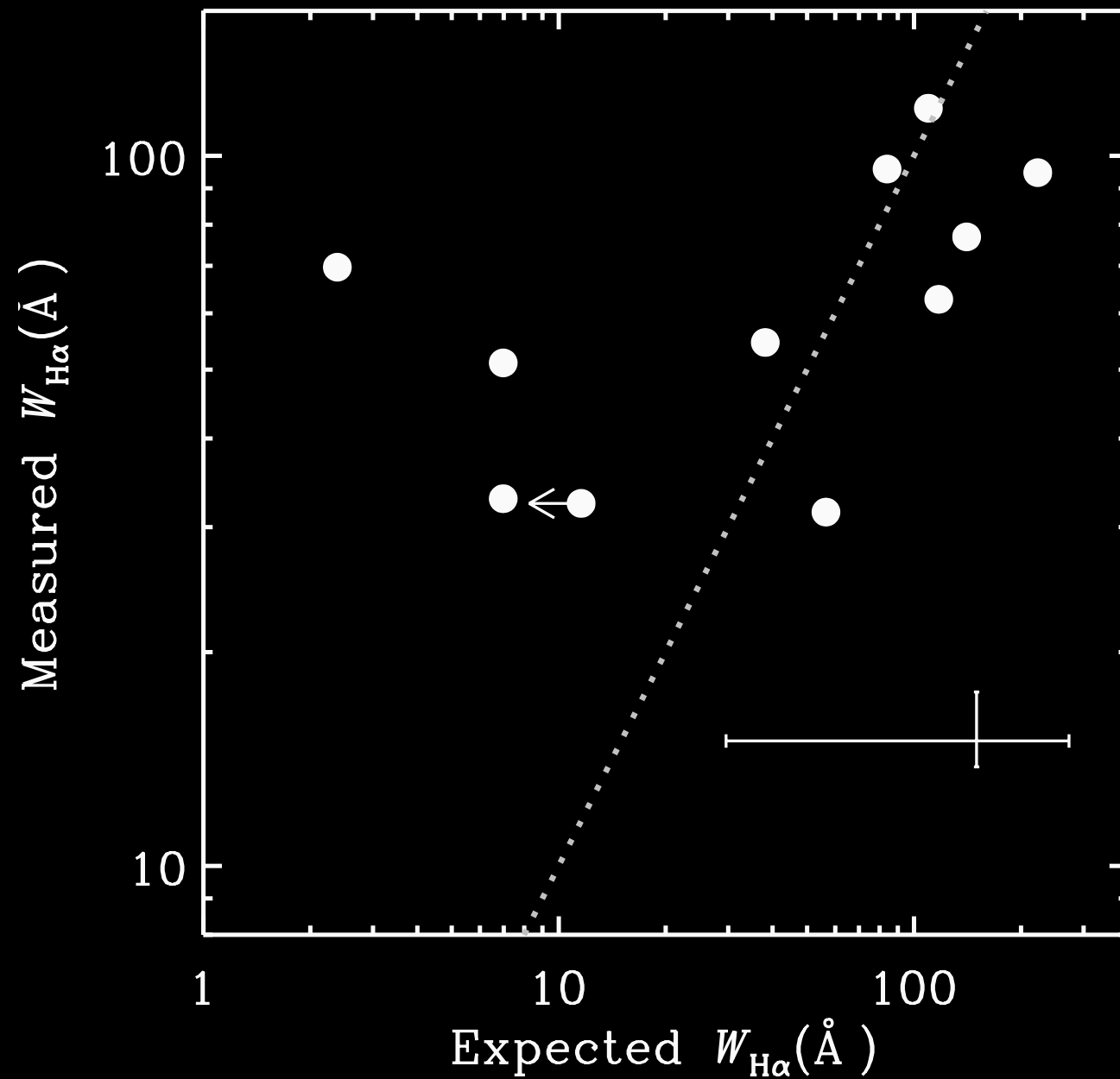
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- ◆ When was the star formation suppression in massive galaxies initiated?
 - ▶ In about half of the massive galaxies at $z \sim 2.5$ the star formation is suppressed
- ◆ What physical mechanism is responsible for the suppression?
 - ▶ AGN feedback? (e.g., Croton et al., Hopkins et al)

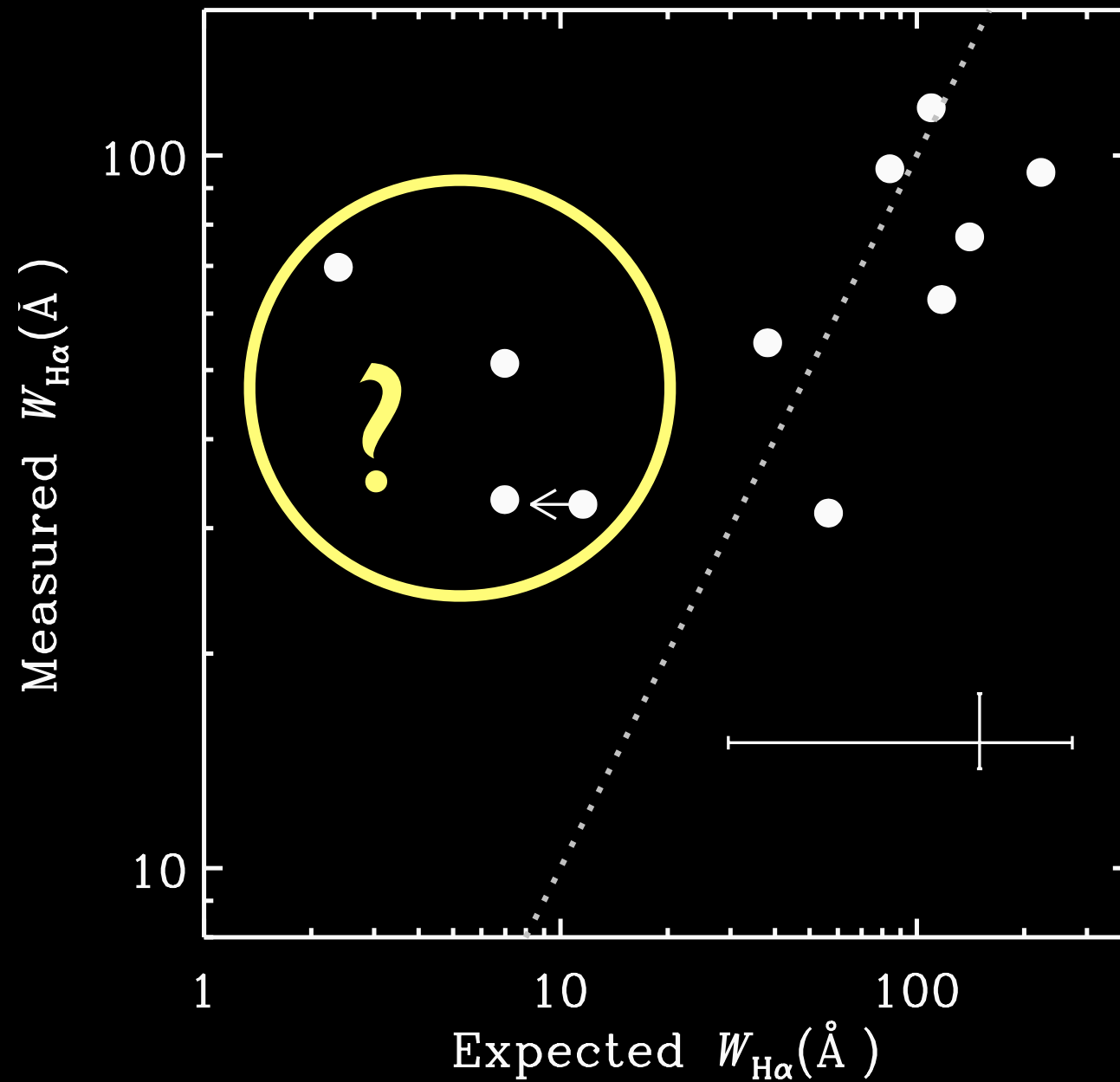
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- ◆ When was the star formation suppression in massive galaxies initiated?
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- ◆ What is the role of AGN in the transition from star-forming to quiescent galaxy?

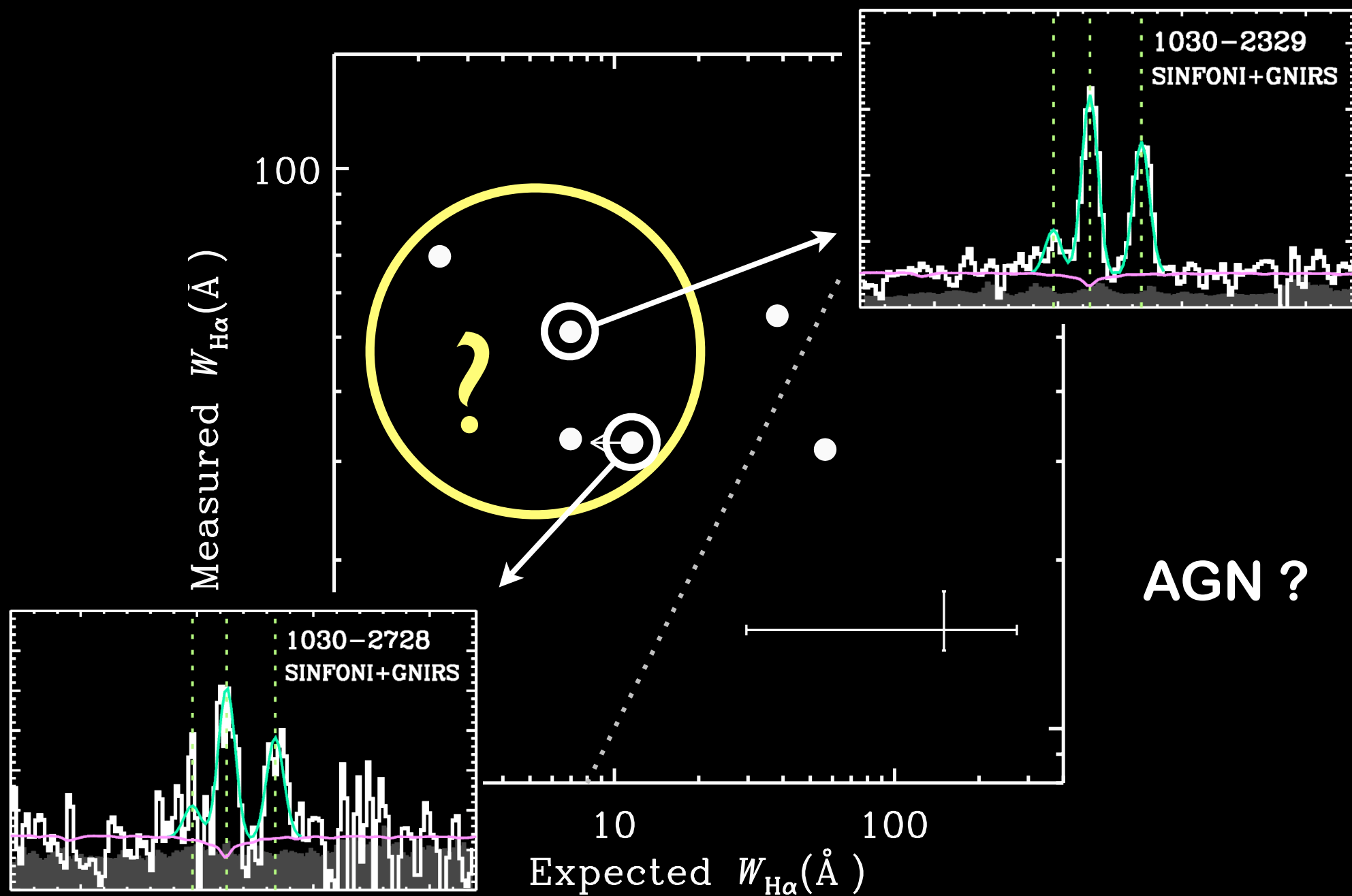
Origin of line emission



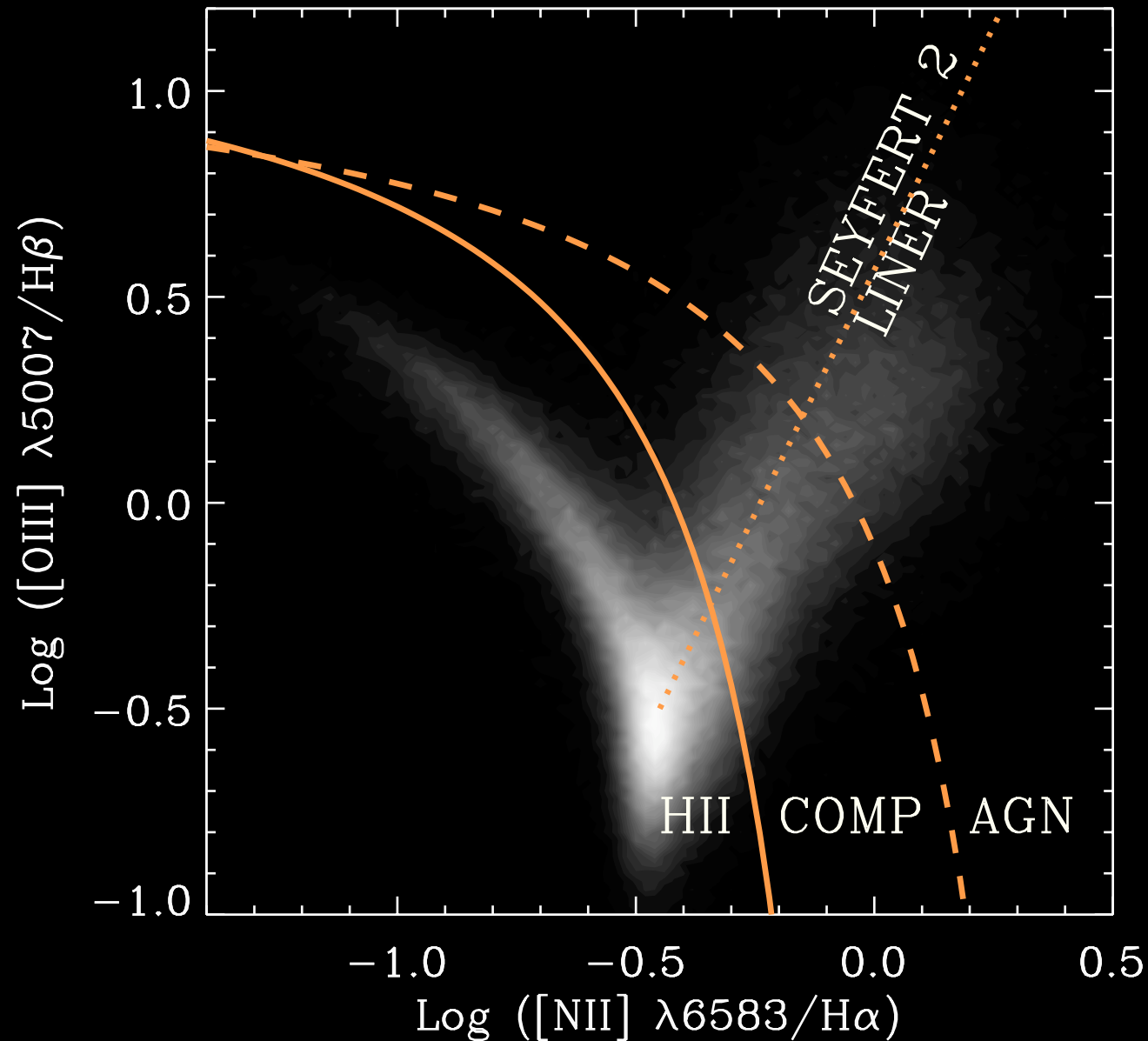
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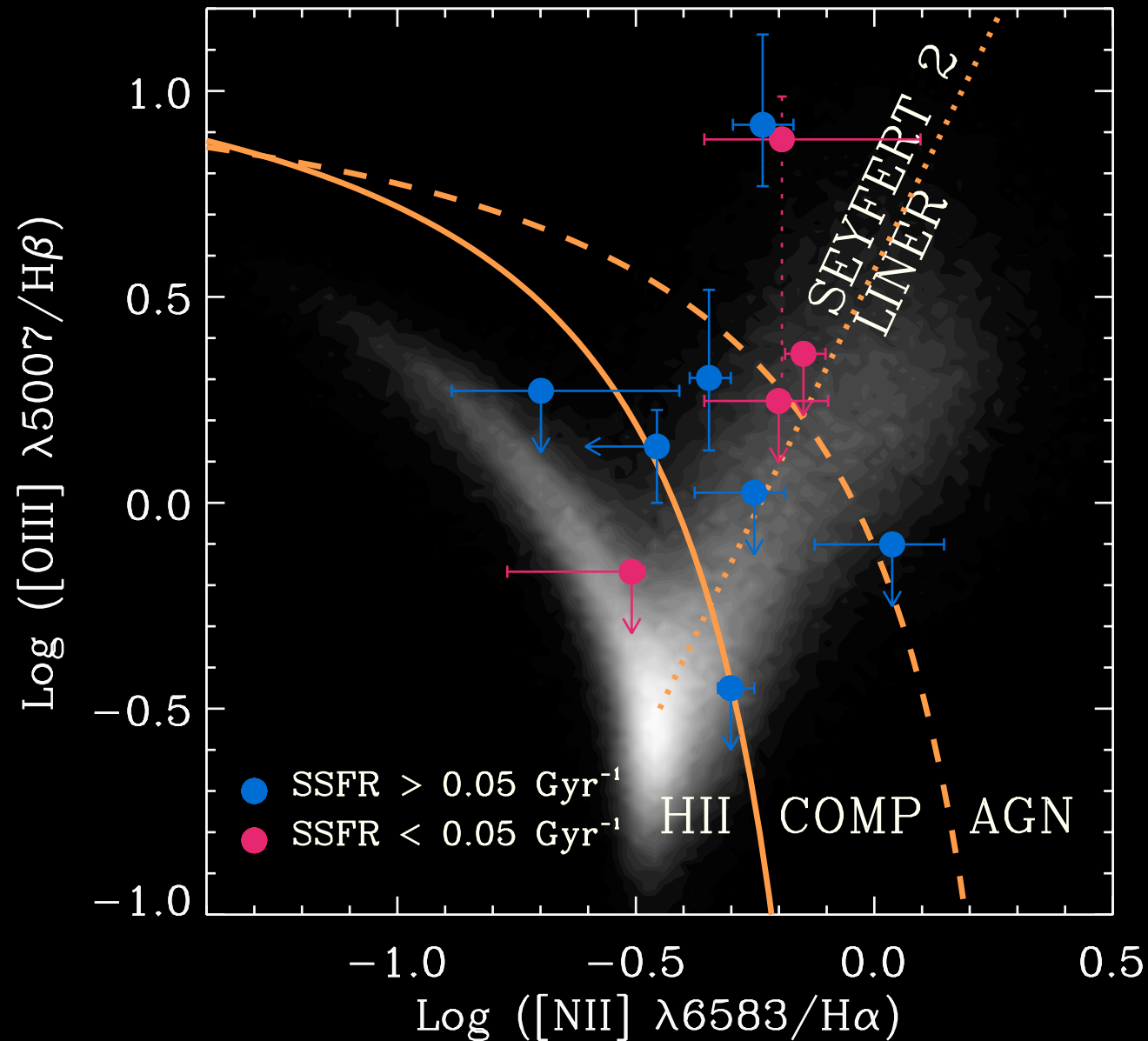
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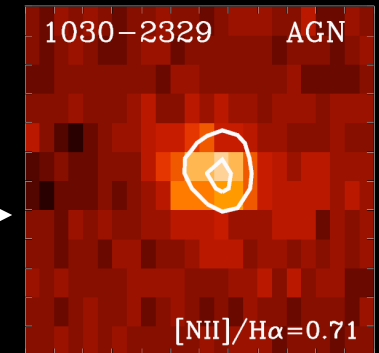
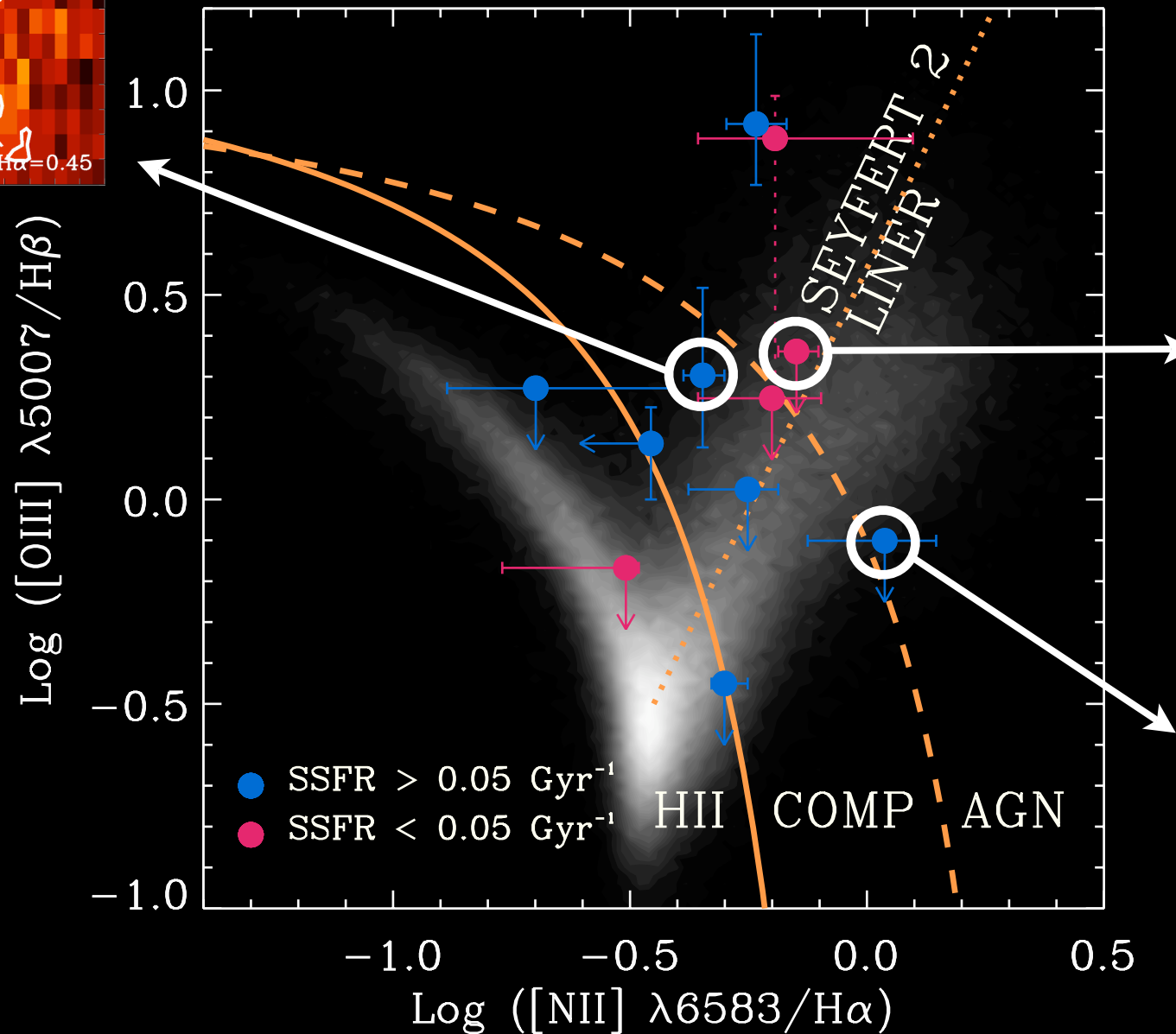
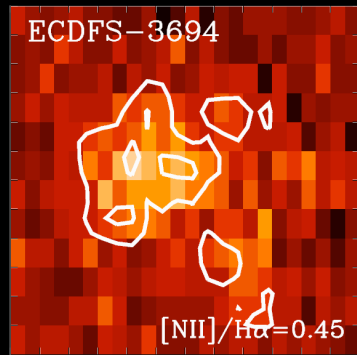
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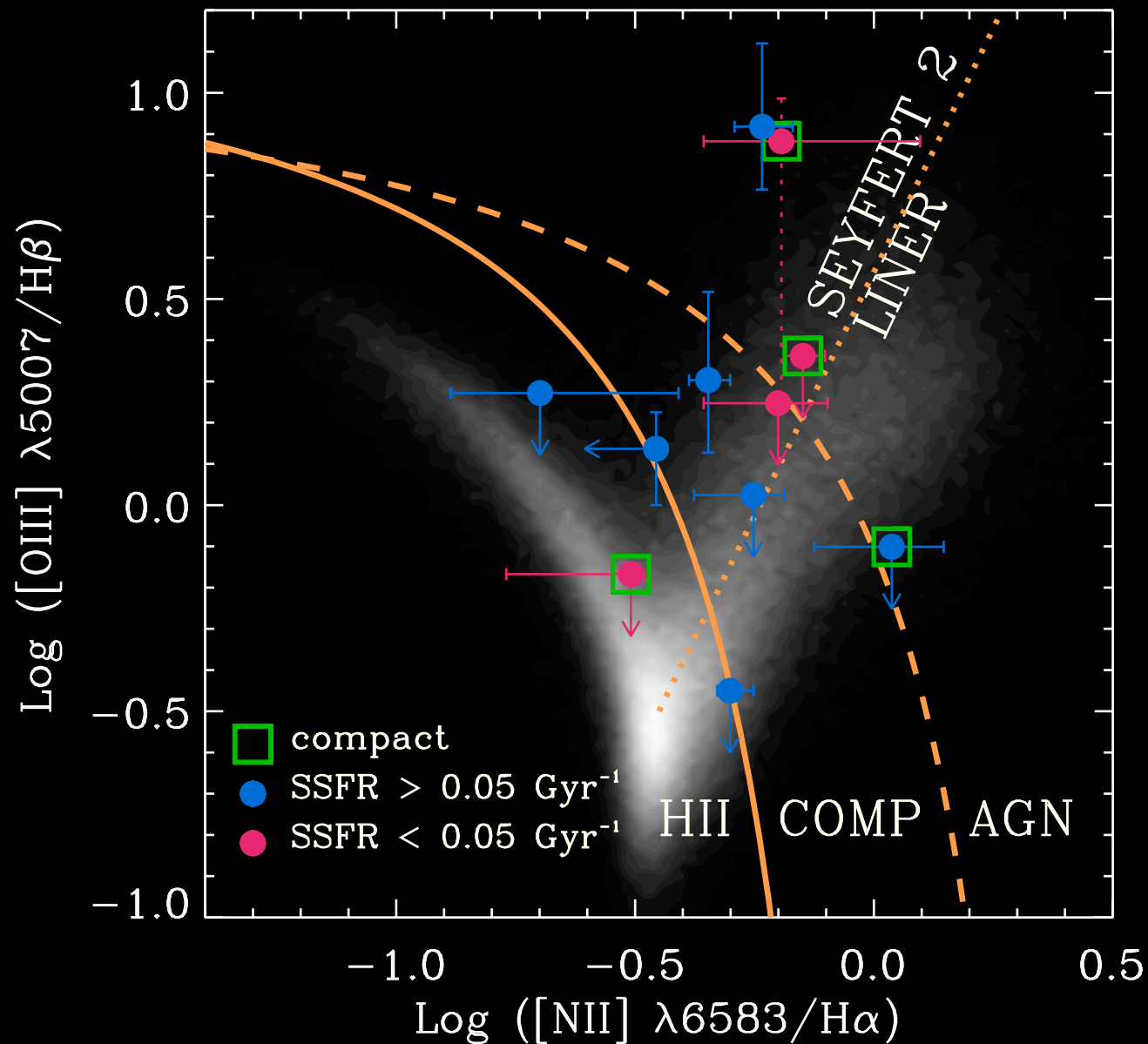
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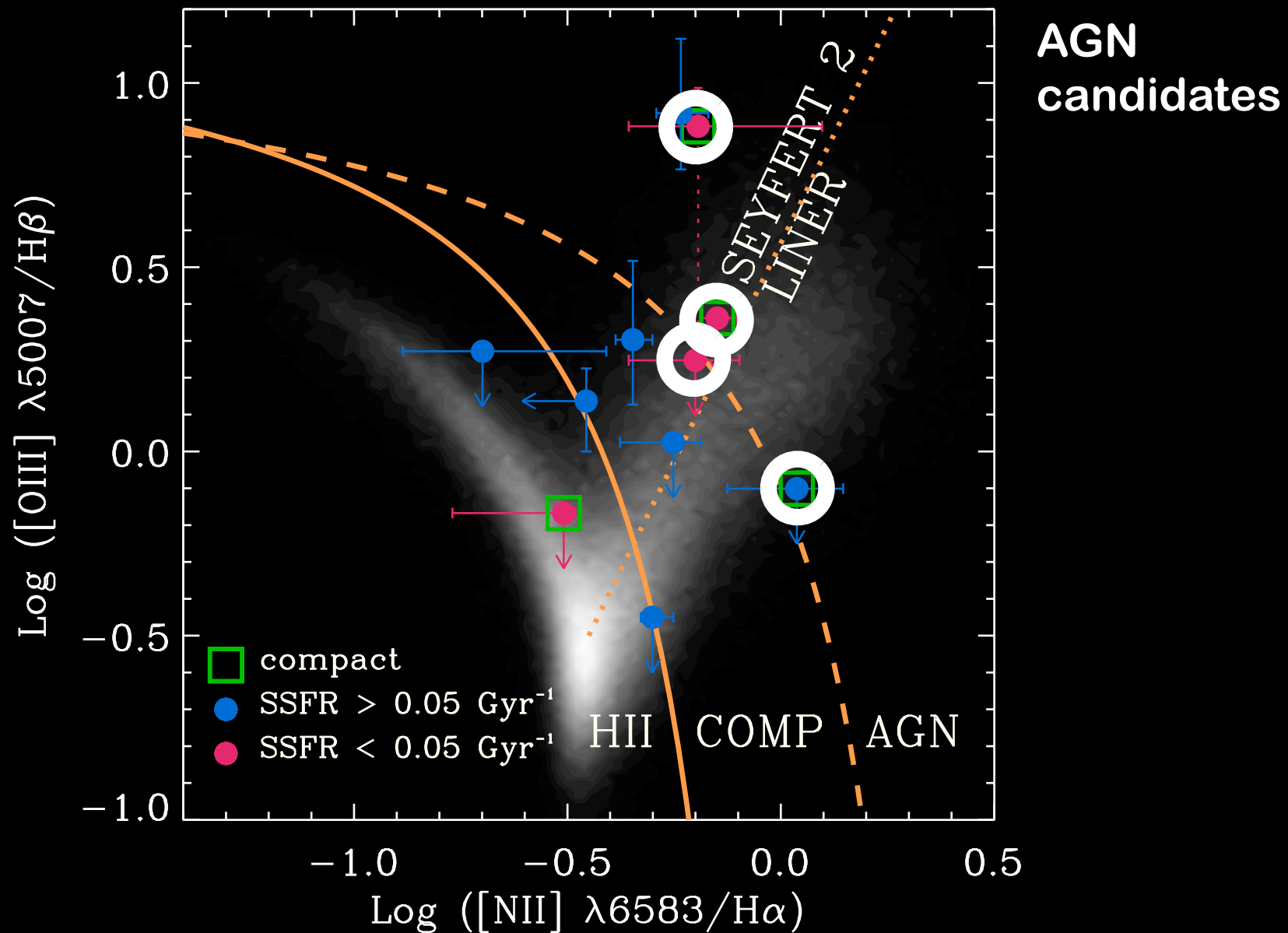
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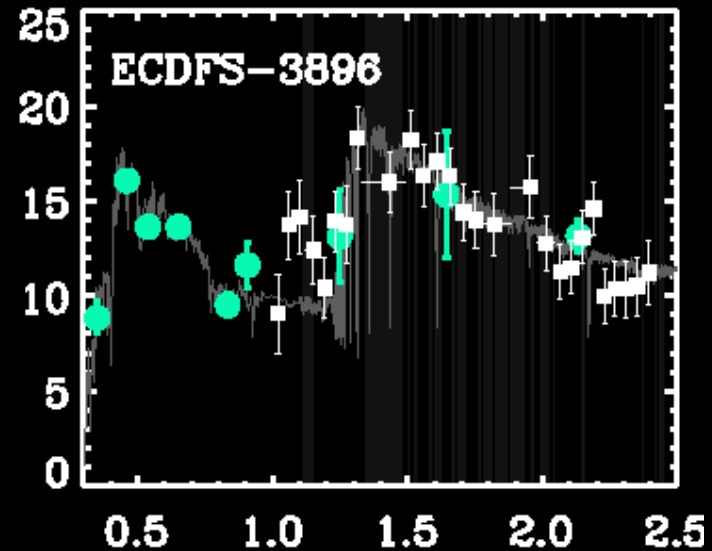
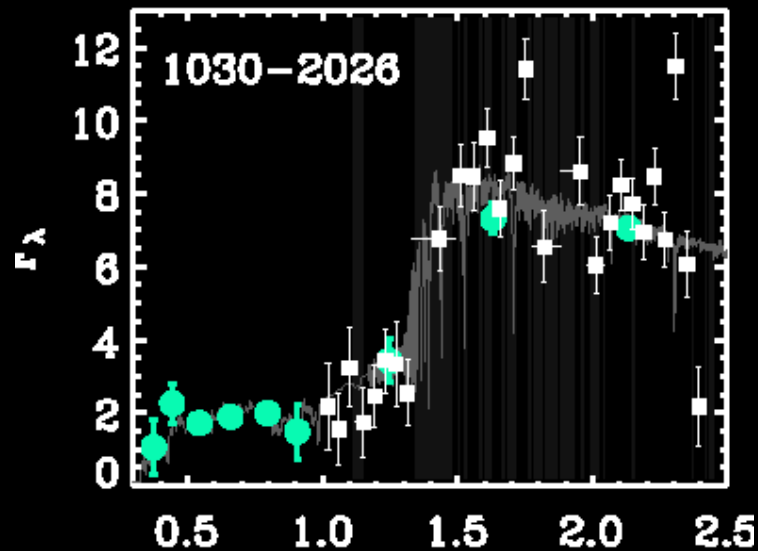
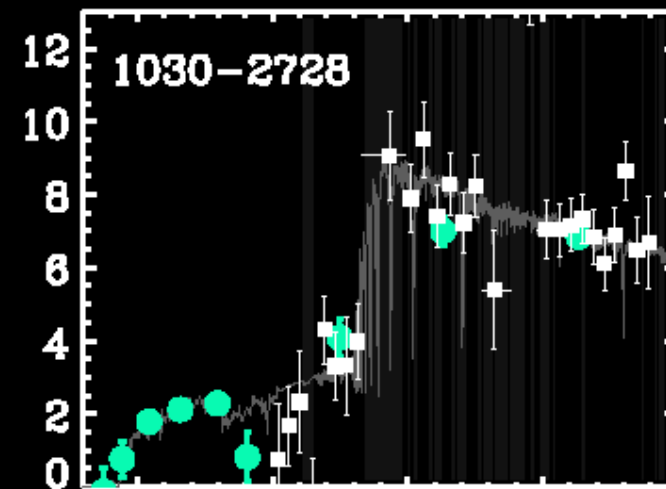
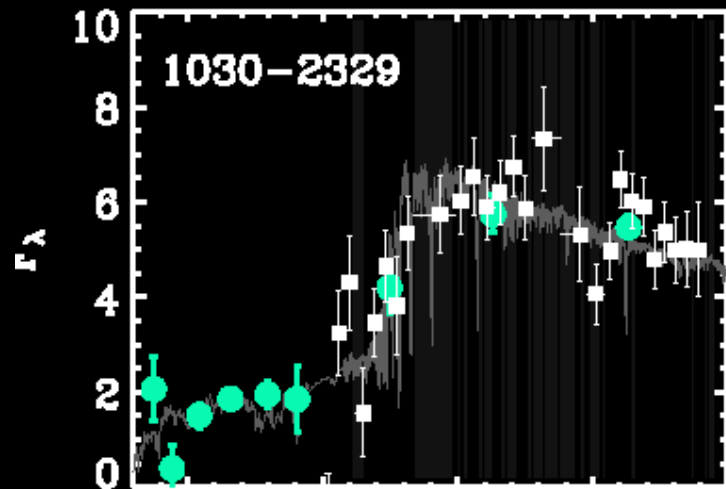
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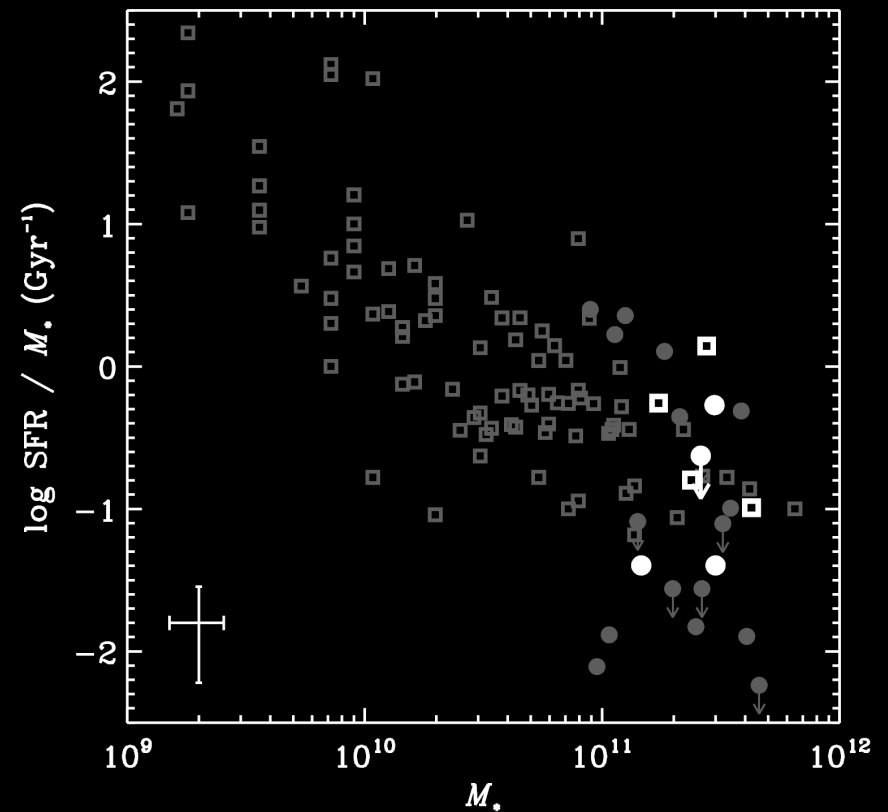
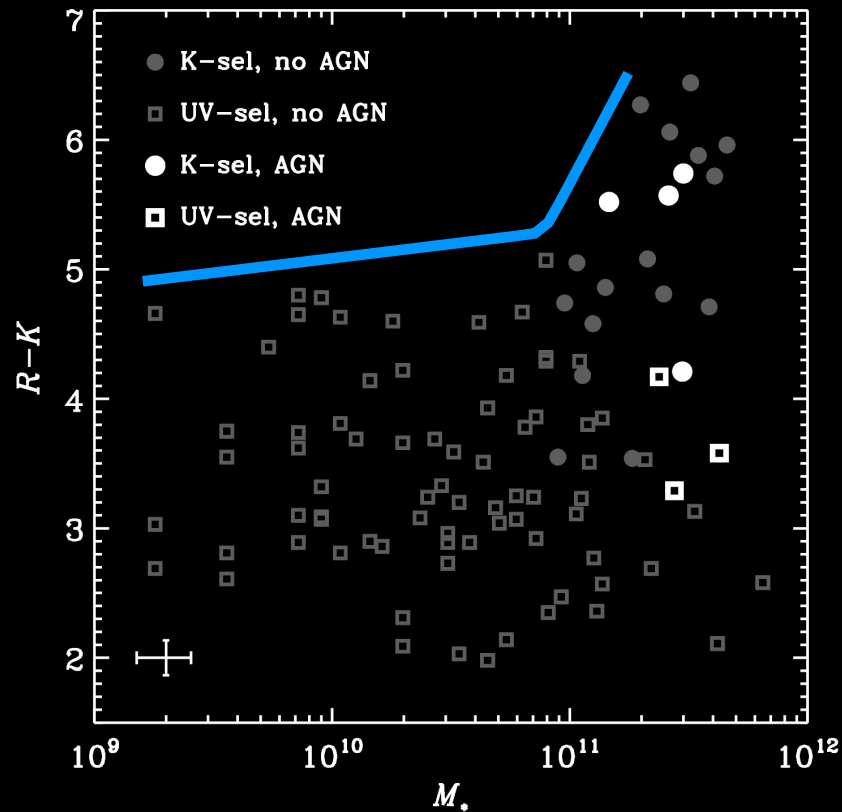
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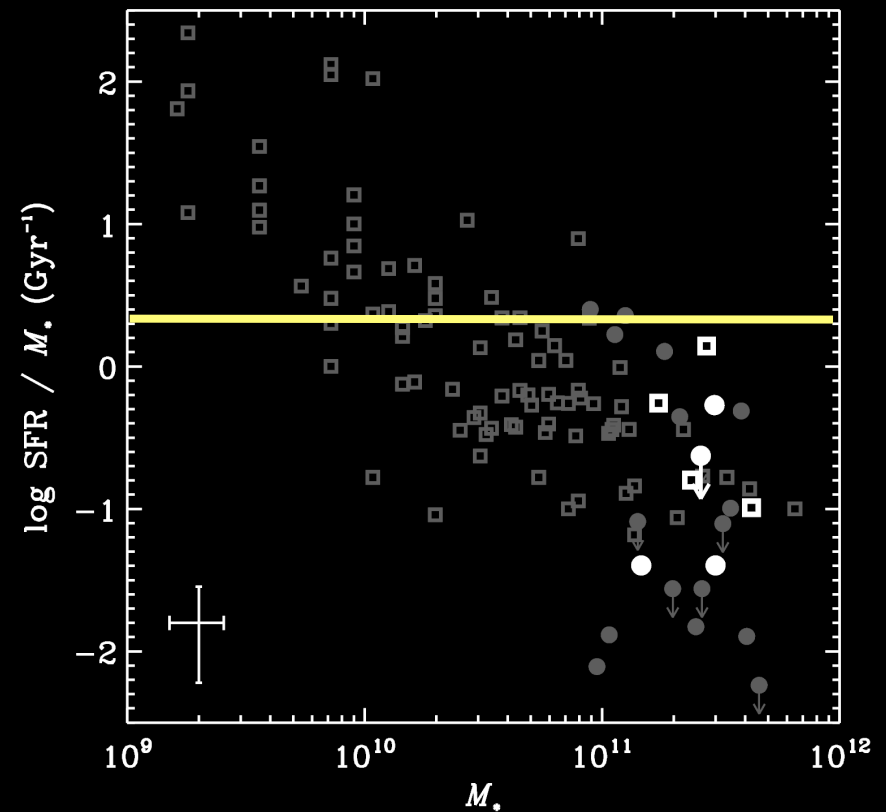
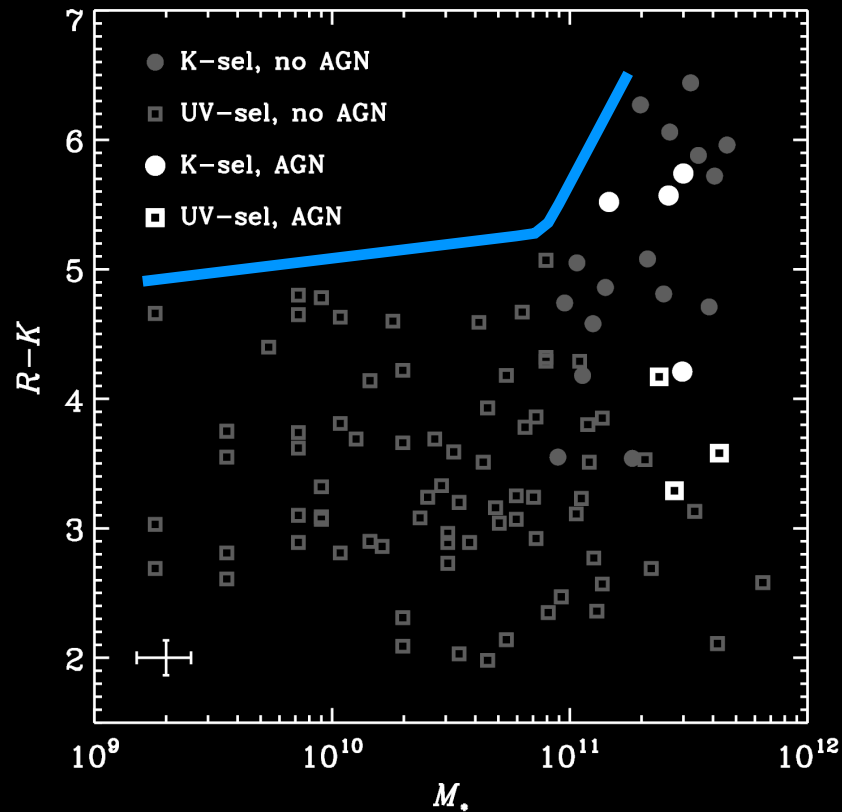
Stellar populations of AGN candidates



Stellar masses of AGN candidates at $z \sim 2.5$

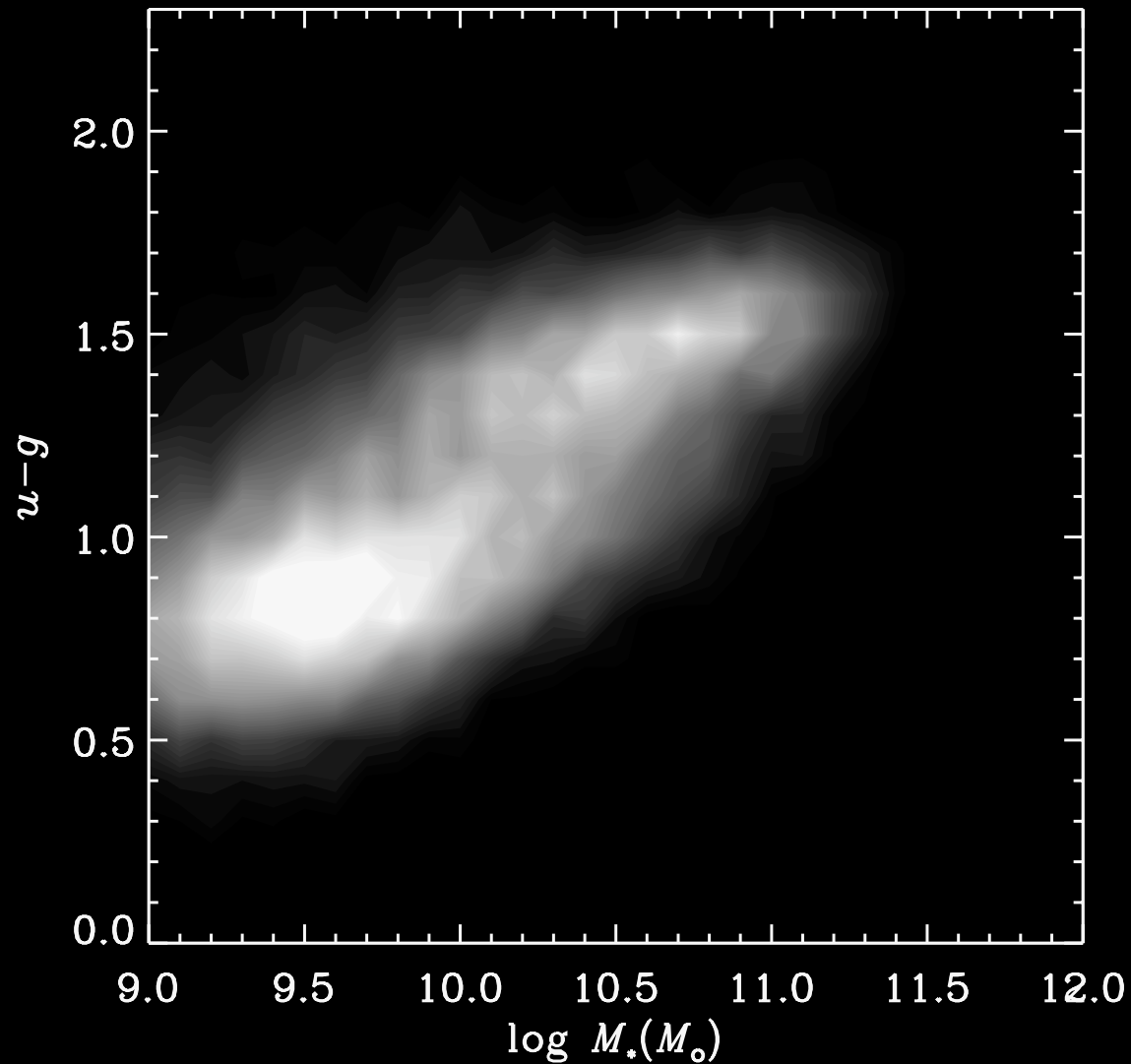


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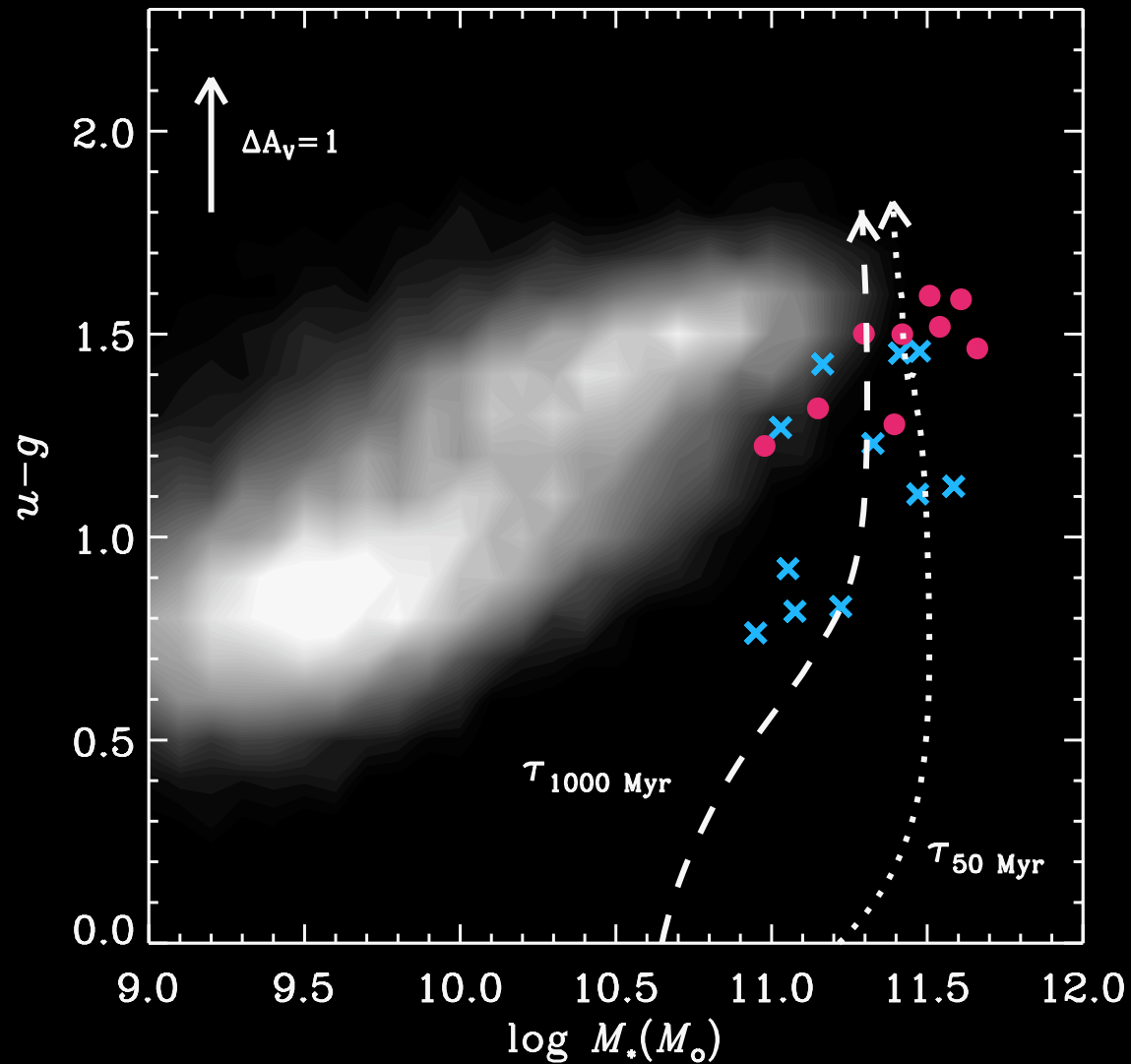


AGN fraction dependent on the stellar mass of the host galaxies?

Color-Mass diagram SDSS + $z \sim 2.5$



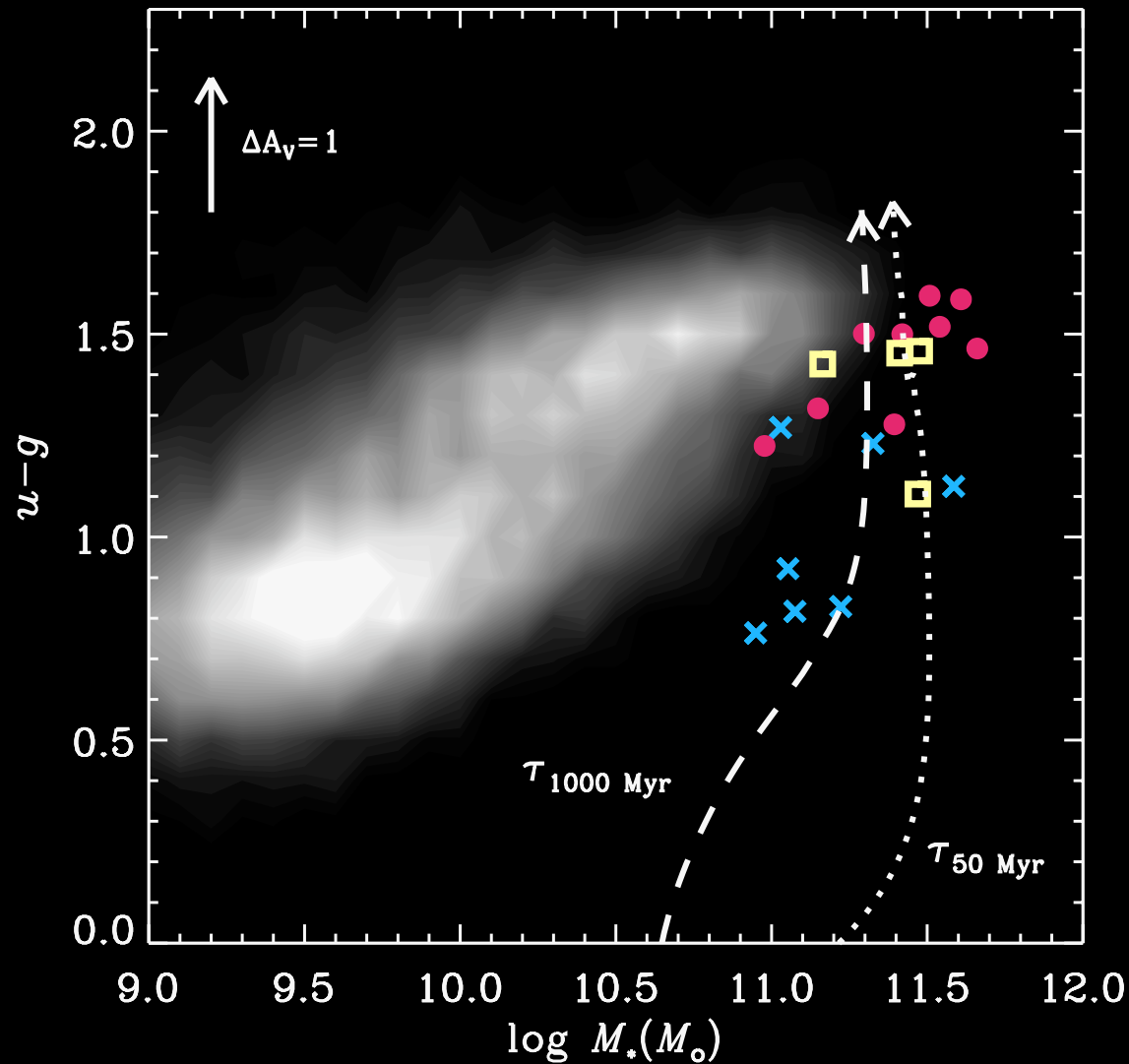
Color-Mass diagram SDSS + $z \sim 2.5$



Red:
no emission
lines

Blue:
emission
line
galaxies

Color-Mass diagram SDSS + $z \sim 2.5$



Red:
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lines

Blue:
Star-forming
galaxies

Yellow:
AGN
candidates

Conclusions

- ✦ In about half of the massive galaxies at $z \sim 2.5$ the star formation is already strongly suppressed
- ✦ About 20% of the massive galaxies at $z \sim 2.5$ may host an AGN

Questions

- ◆ Do quiescent galaxies at $z \sim 2.5$ only exist at the high-mass end?
- ◆ At what redshift was the suppression in the most massive galaxies initiated?
- ◆ What is the role of AGN in the transition from star-forming to quiescent galaxy?