

# Universal Non-Parametric Gas-Phase Metallicity Estimation

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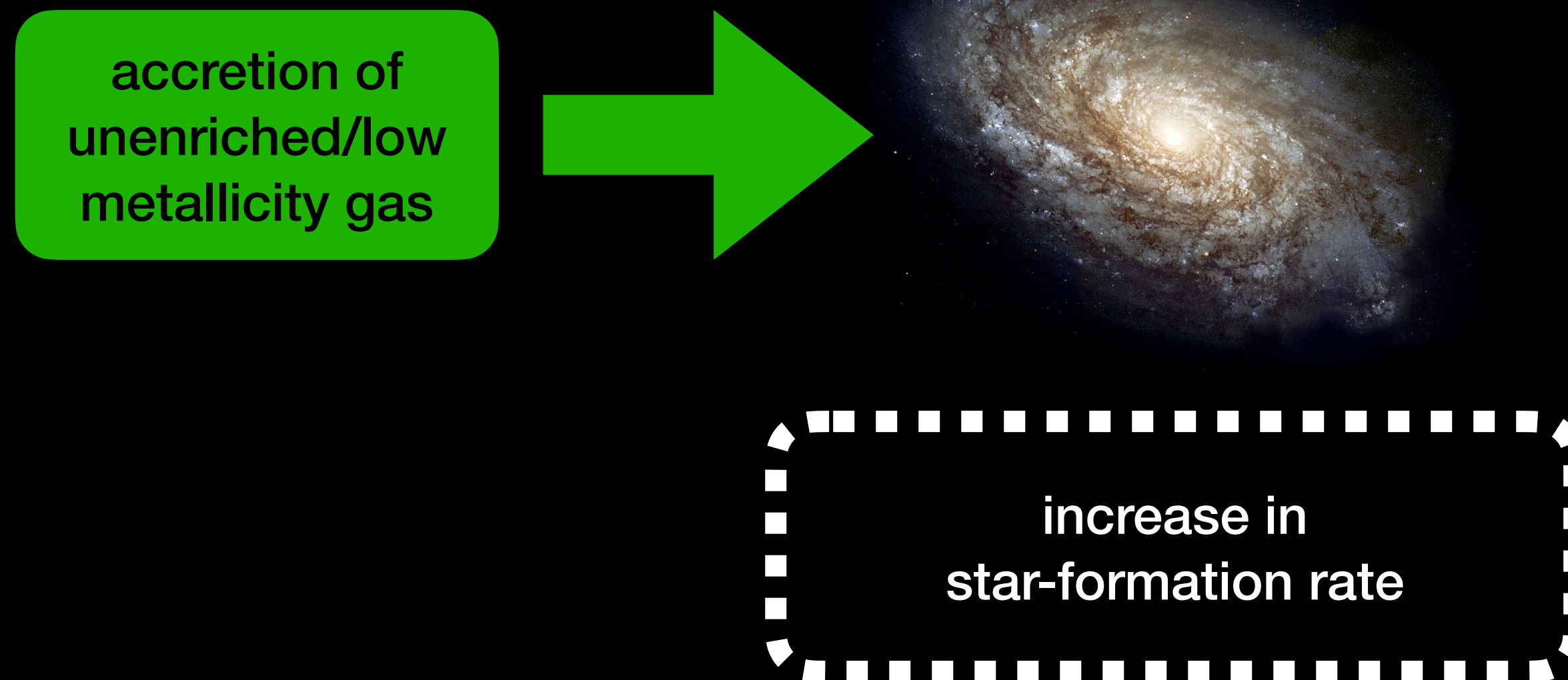


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The **chemical enrichment** state of a galaxy holds a record of **gas infall, enrichment, and outflow** processes

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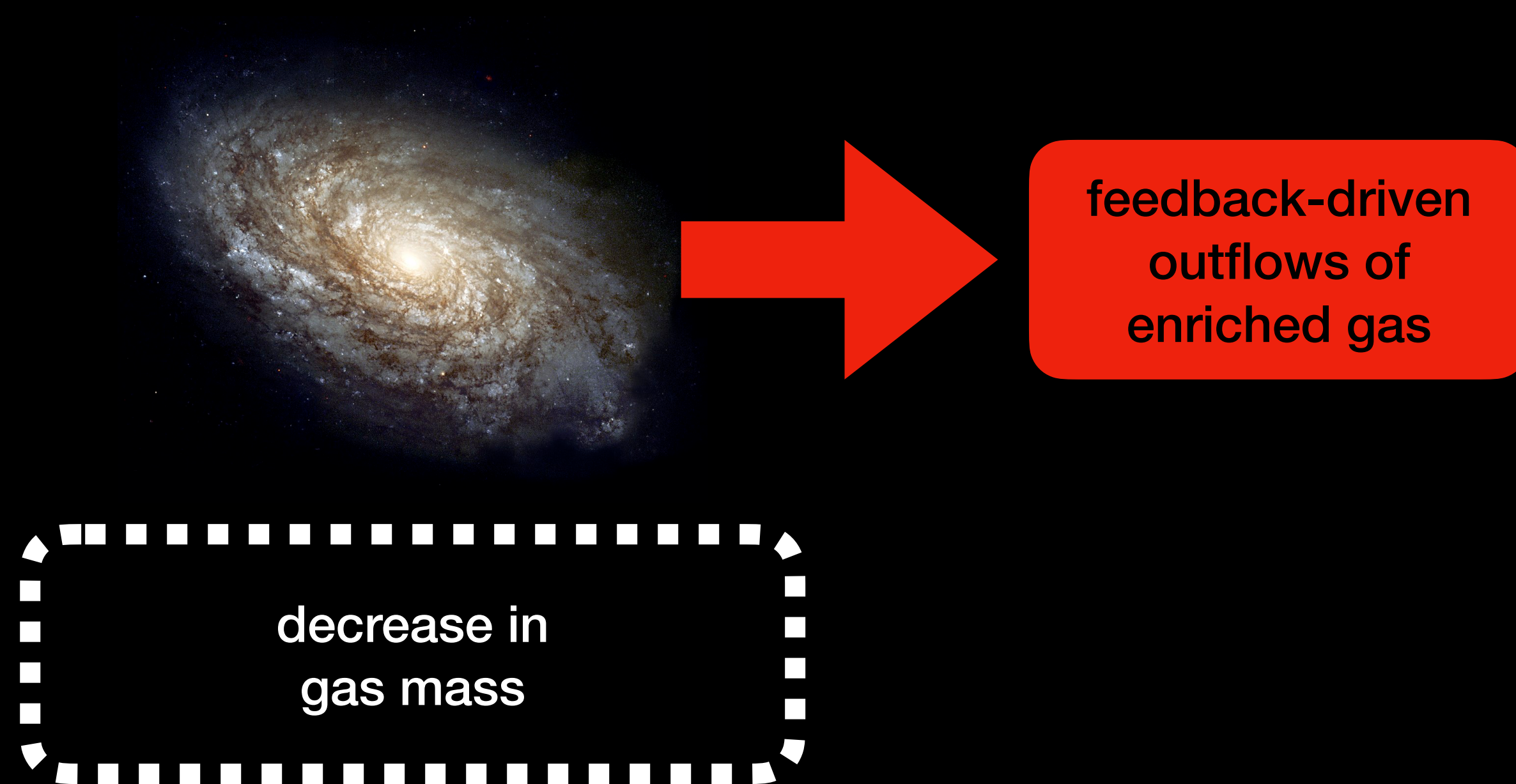
The **chemical enrichment** state of a galaxy holds a record of **gas infall, enrichment, and outflow** processes

enrichment through  
AGB stars & supernovae

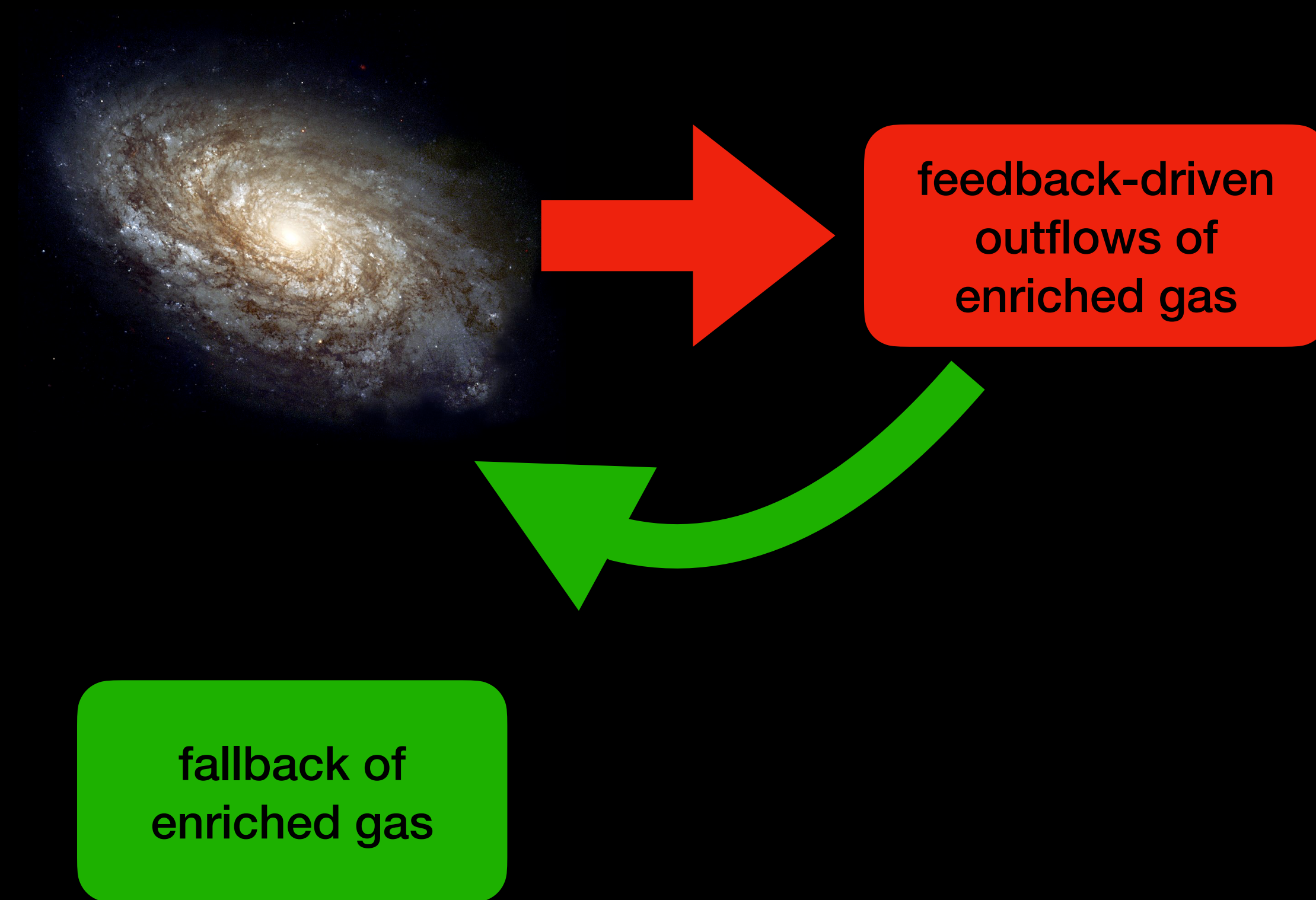


Increase in  
ISM metallicity

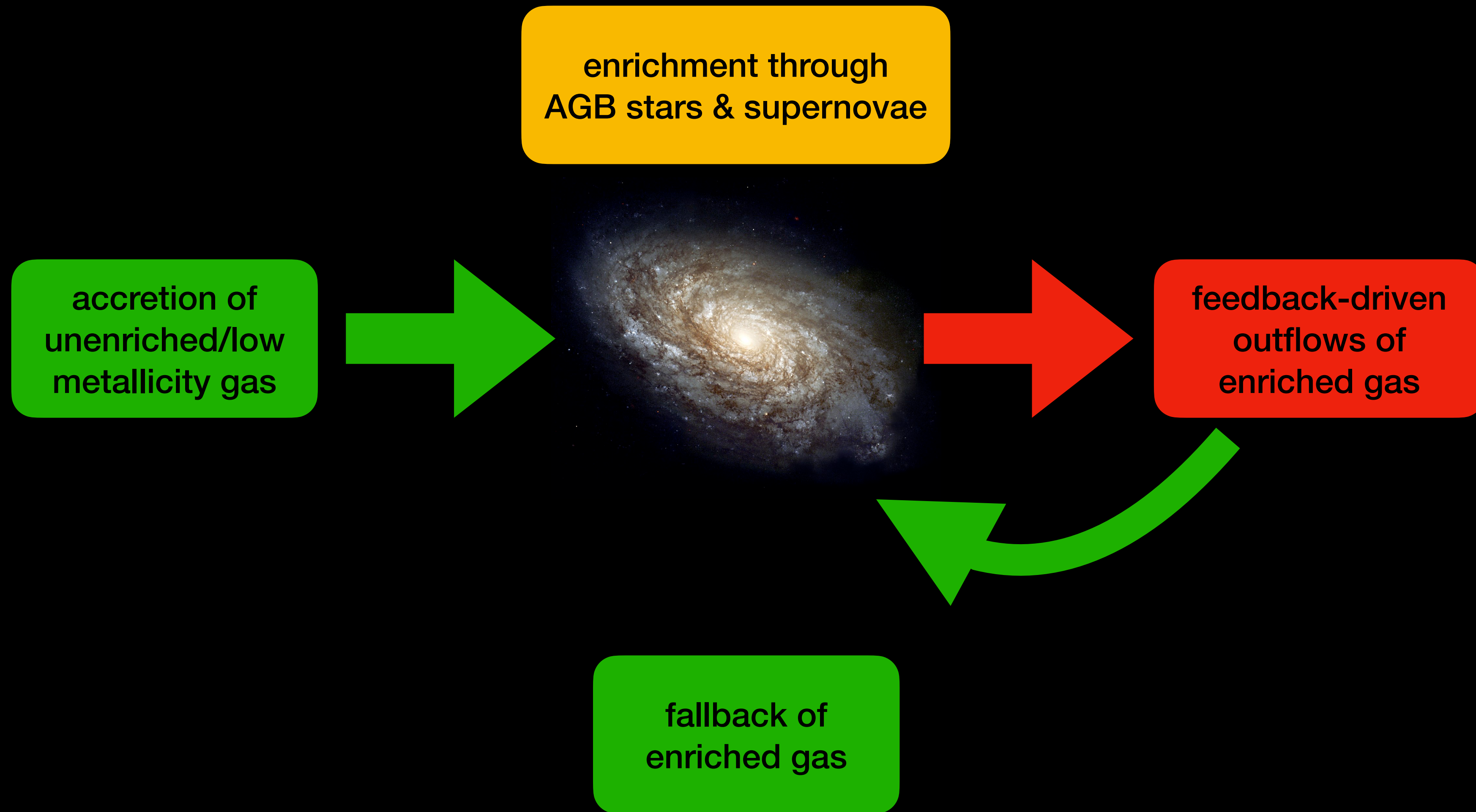
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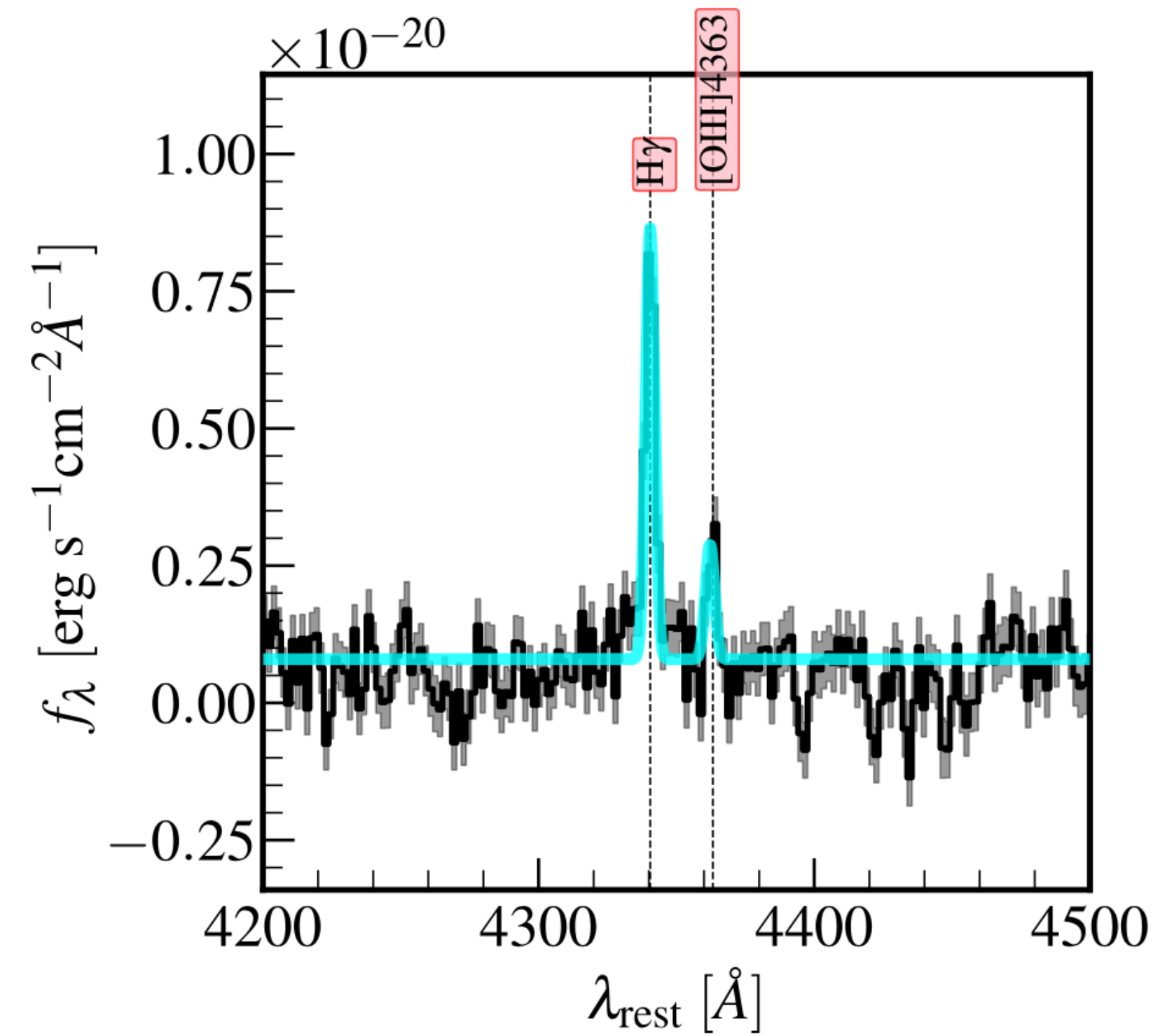
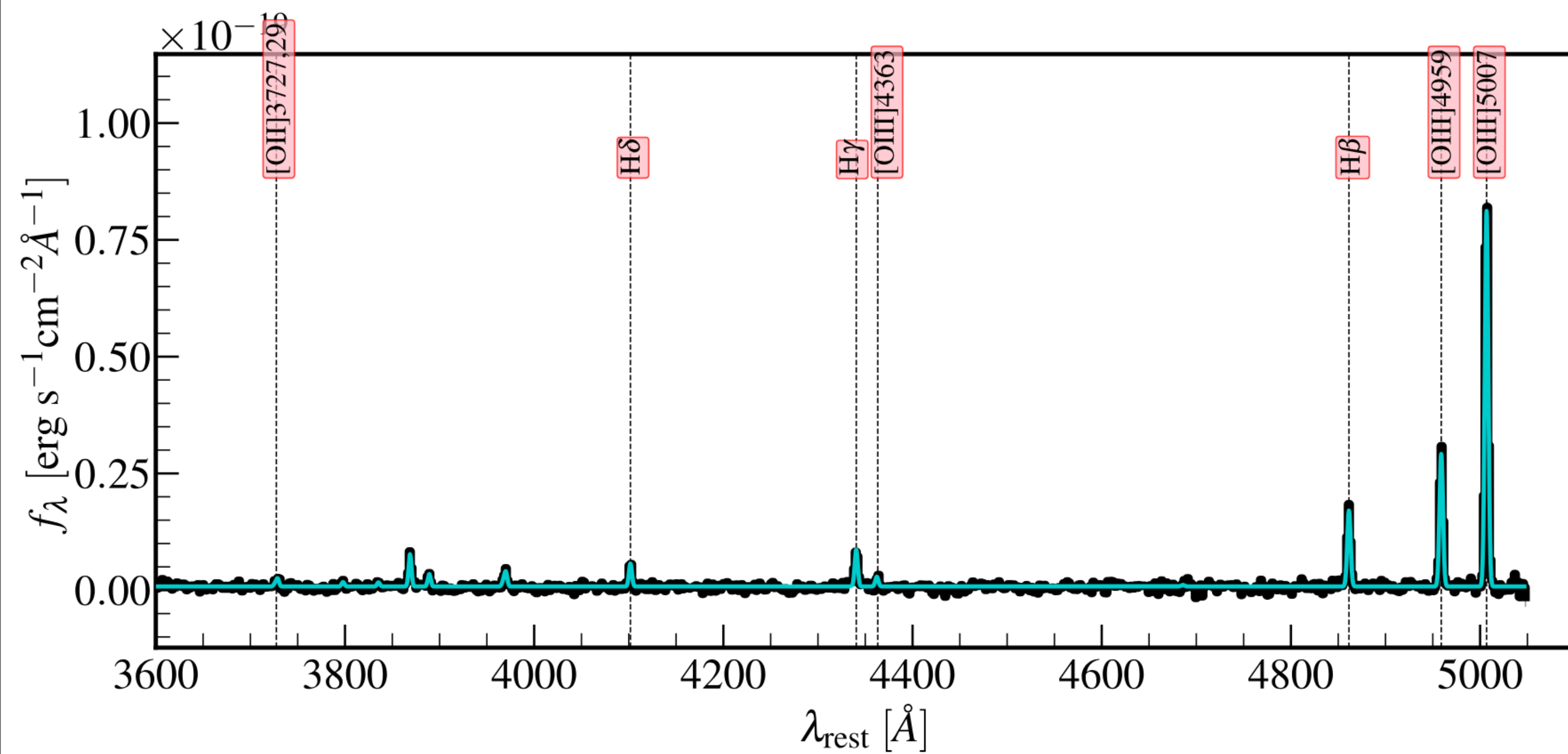


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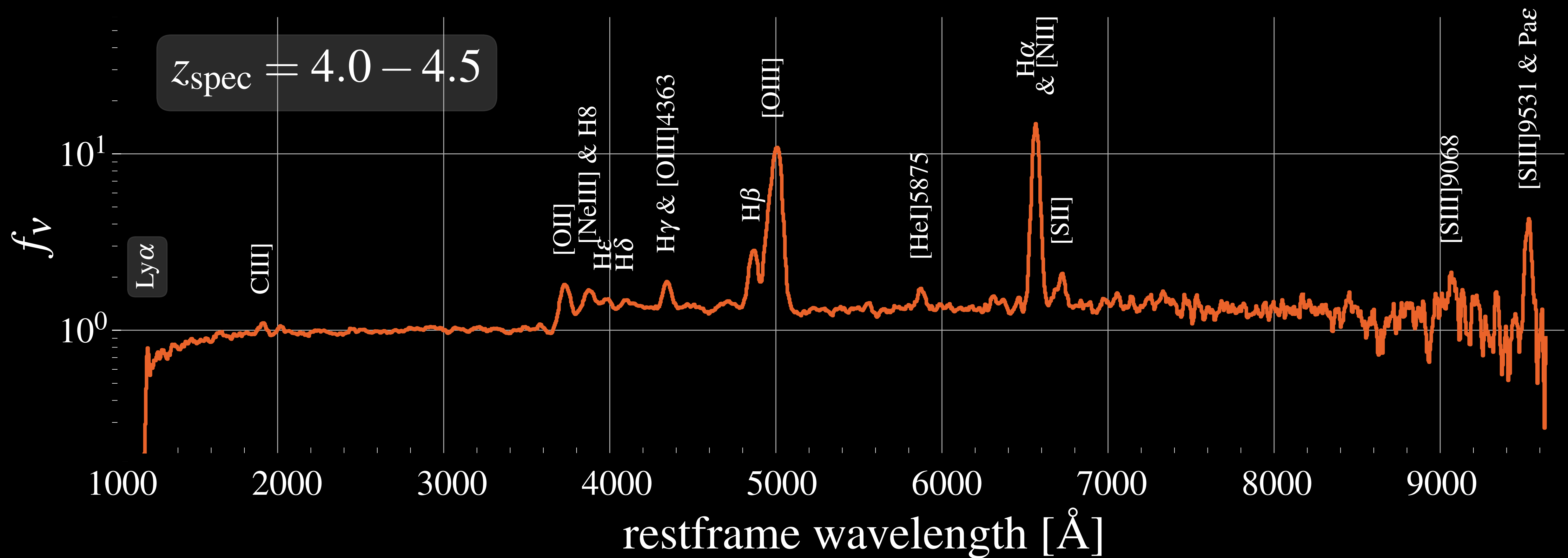


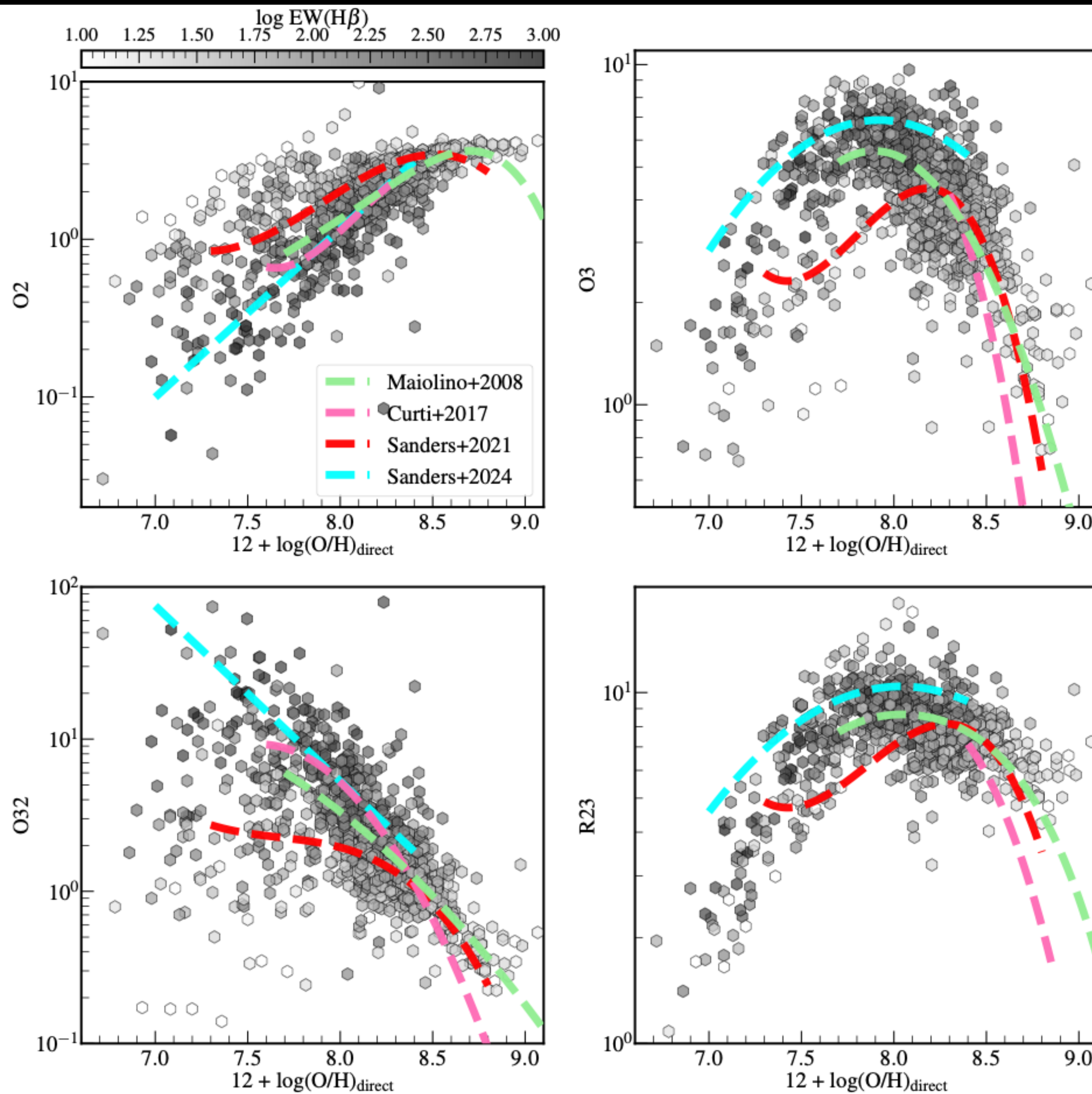
# The **chemical enrichment** state of a galaxy holds a record of **gas infall, enrichment, and outflow** processes



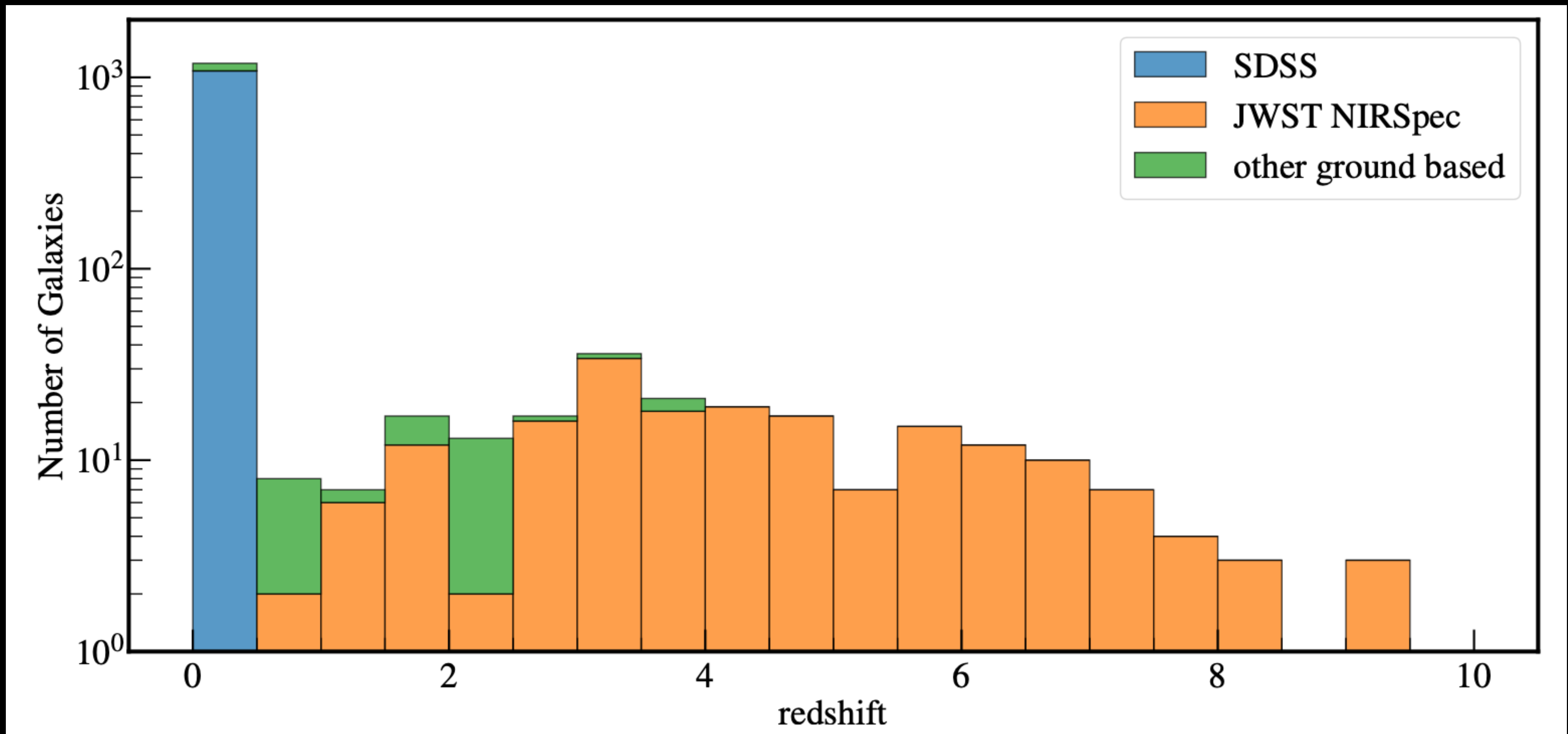


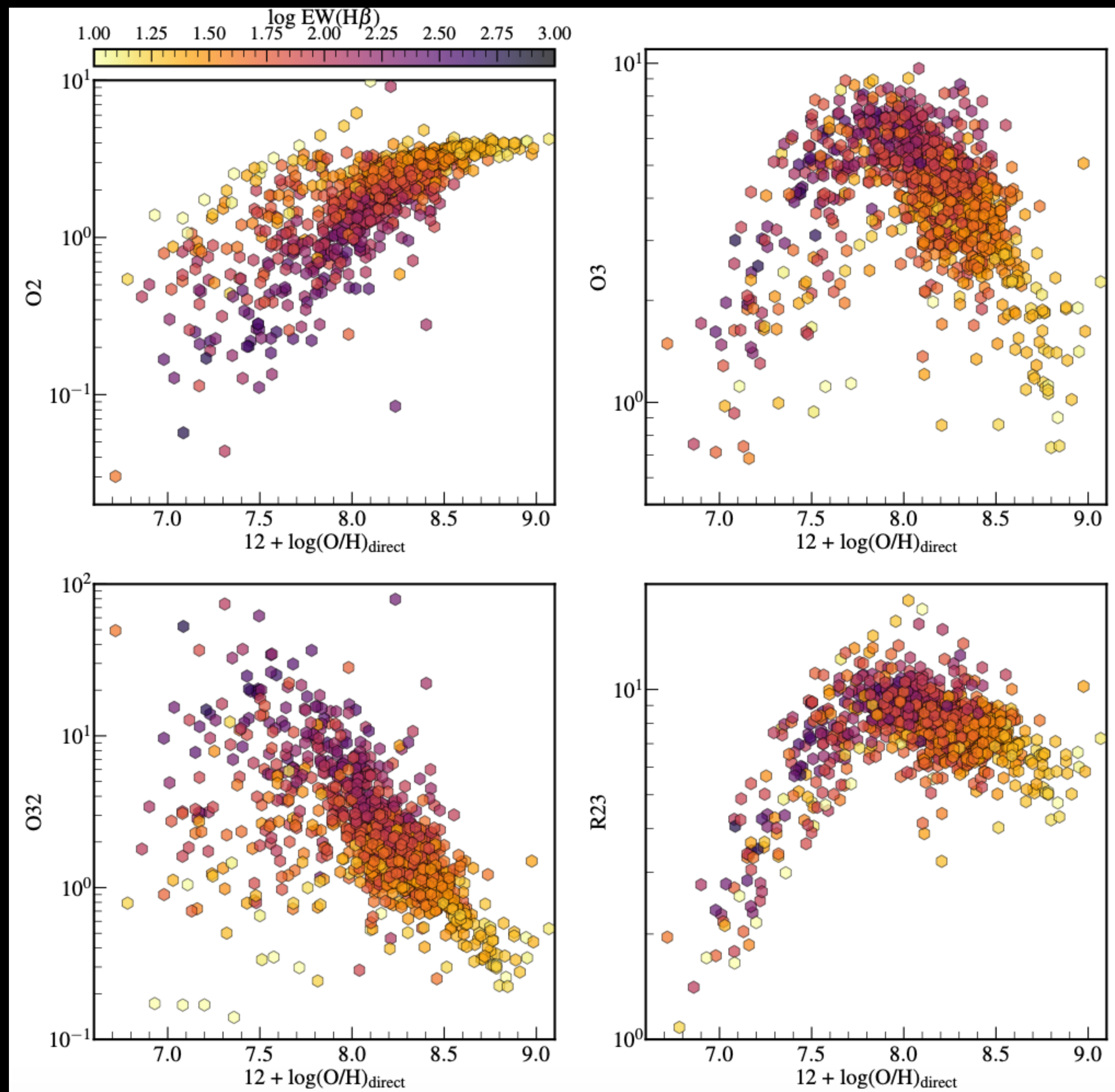
# NIRSpec Multi-Object Prism Spectroscopy



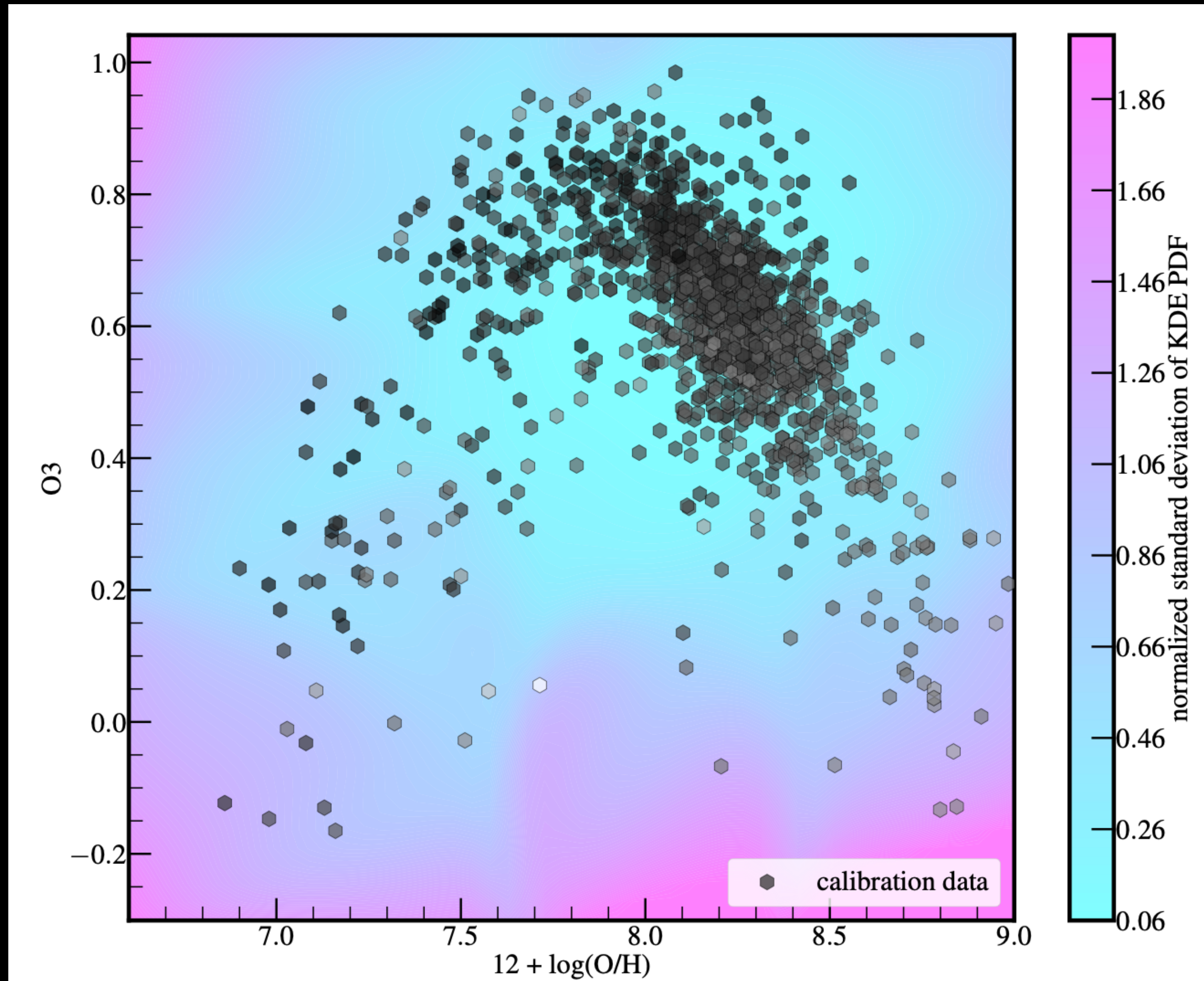


**~1500 galaxies, including ~150 from JWST NIRSpec**



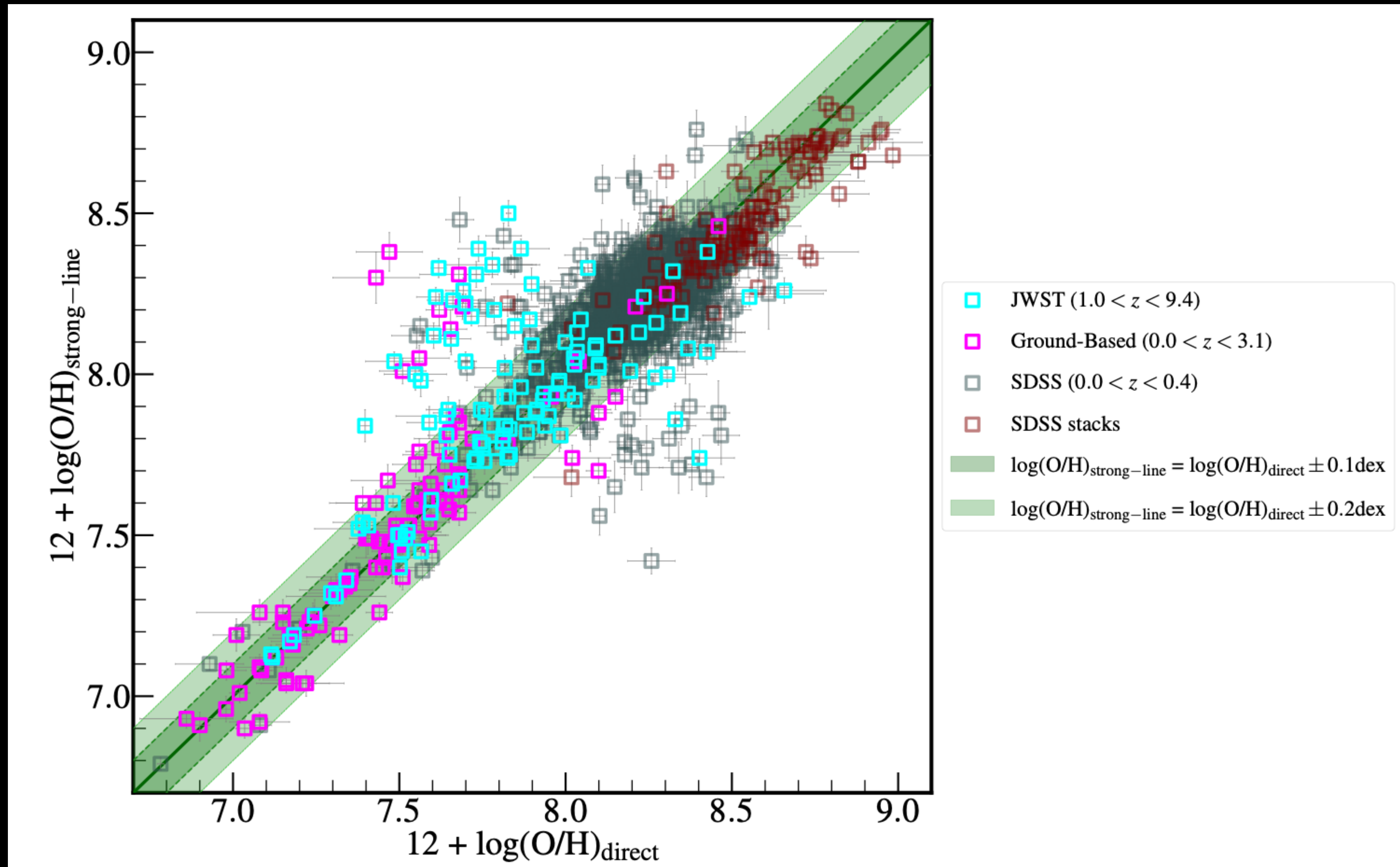


# Kernel Density Estimation

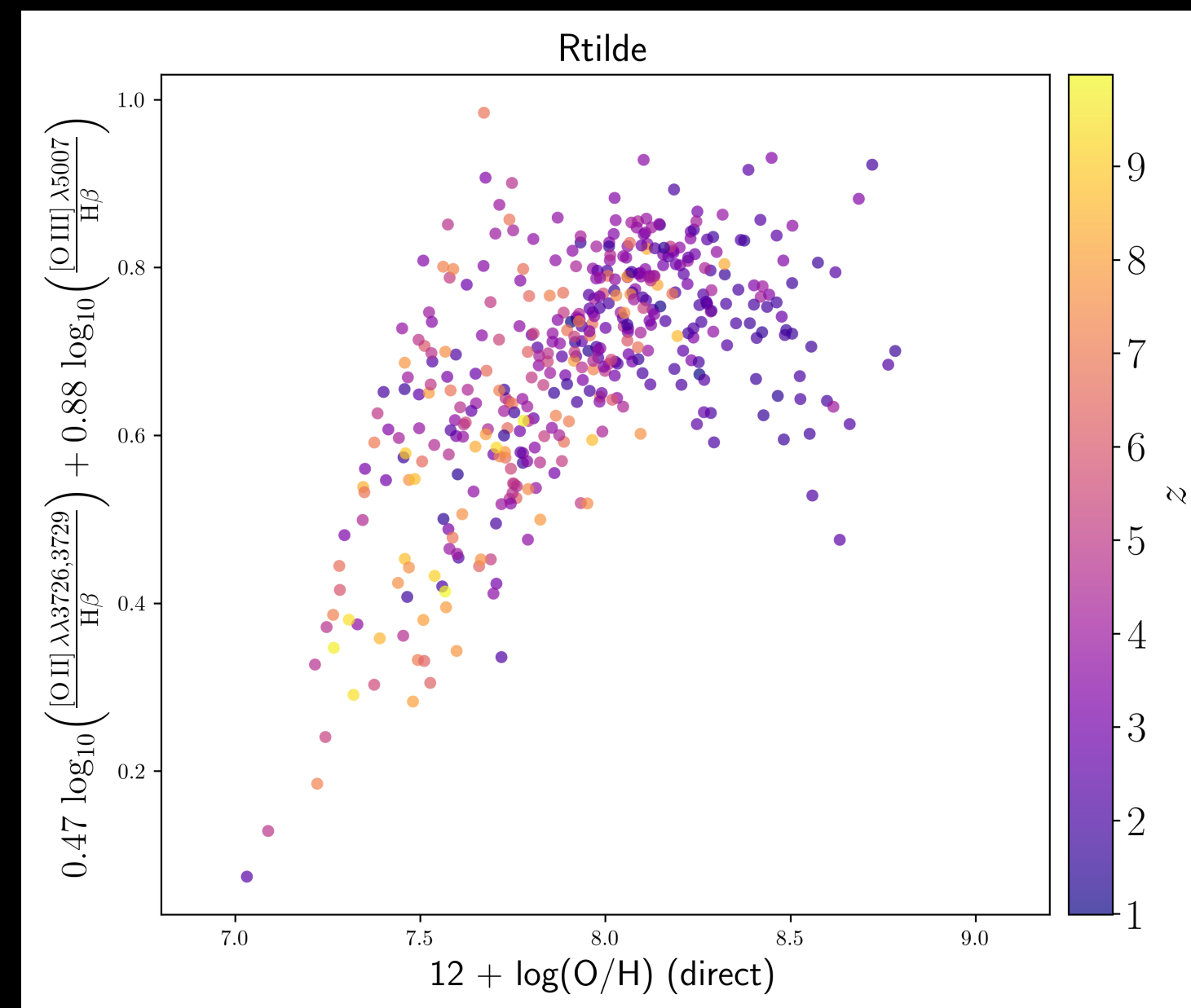
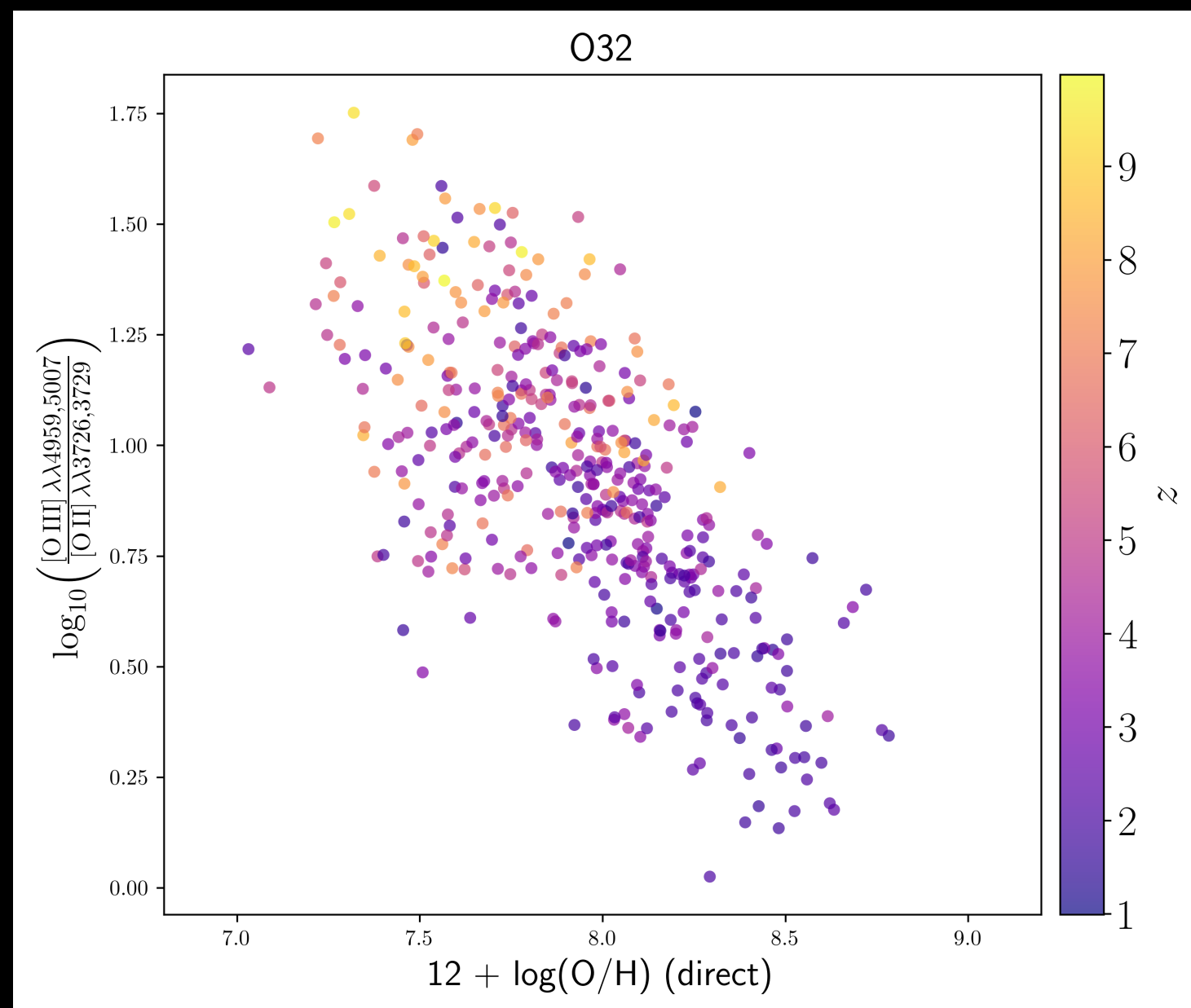
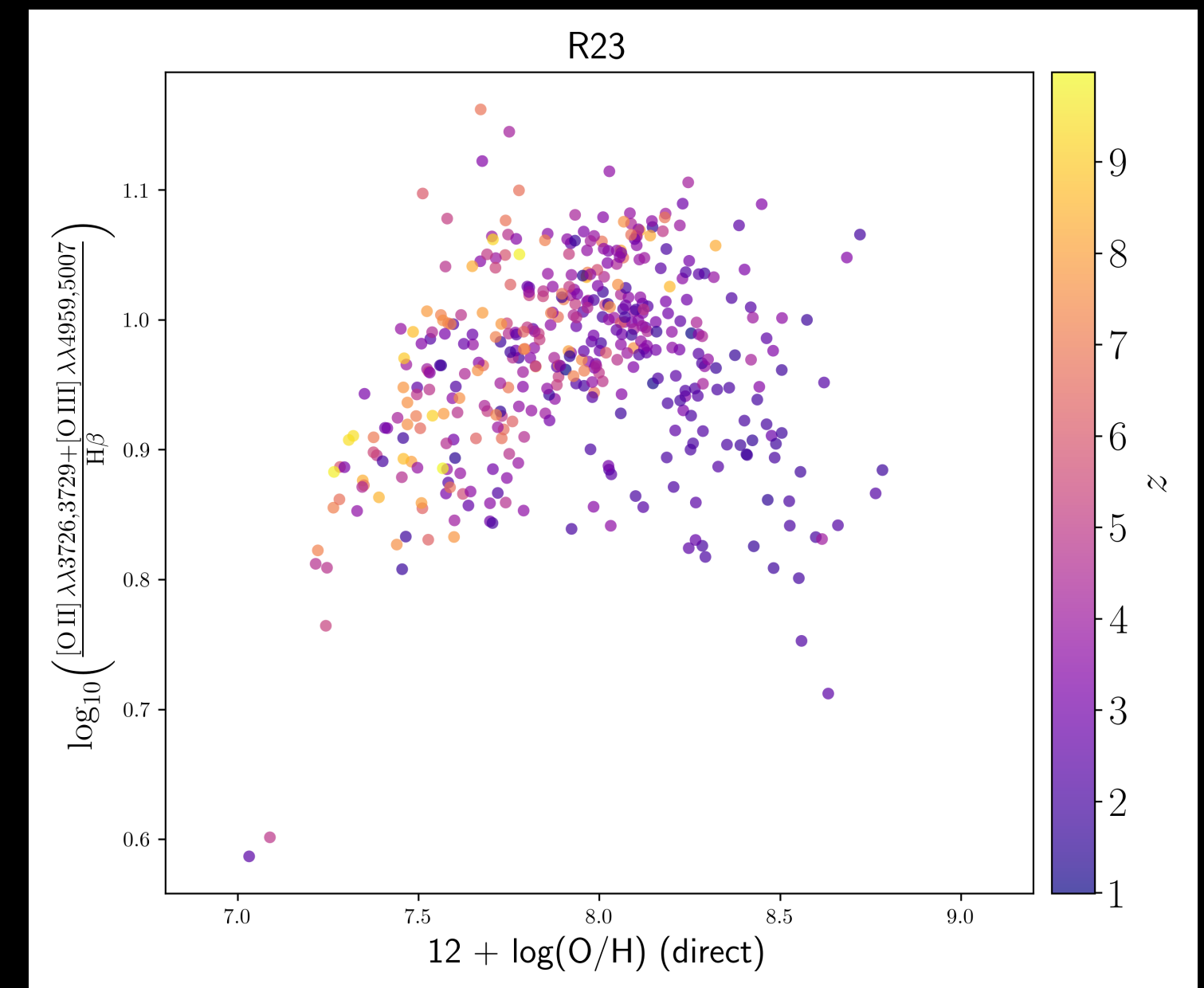
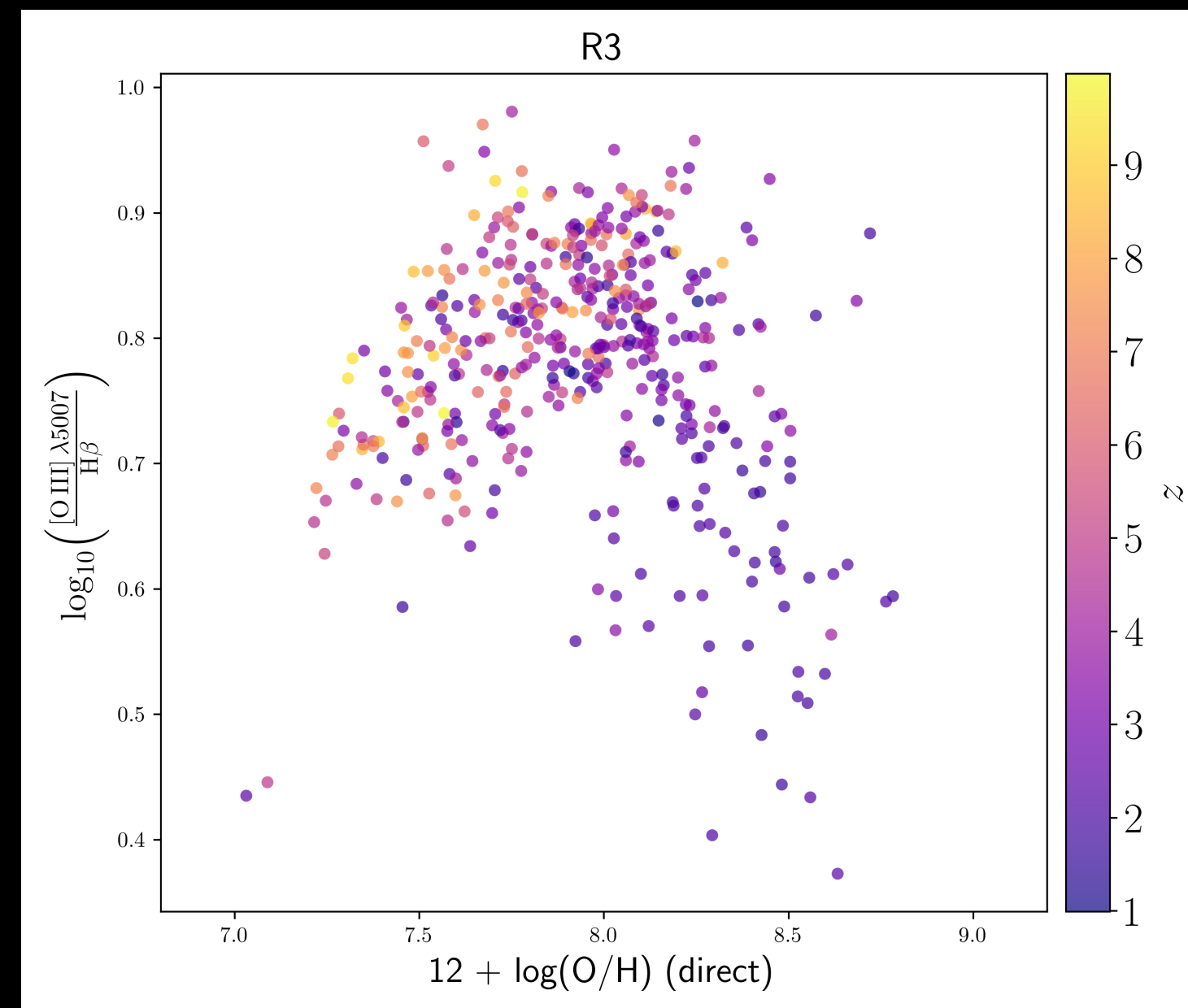
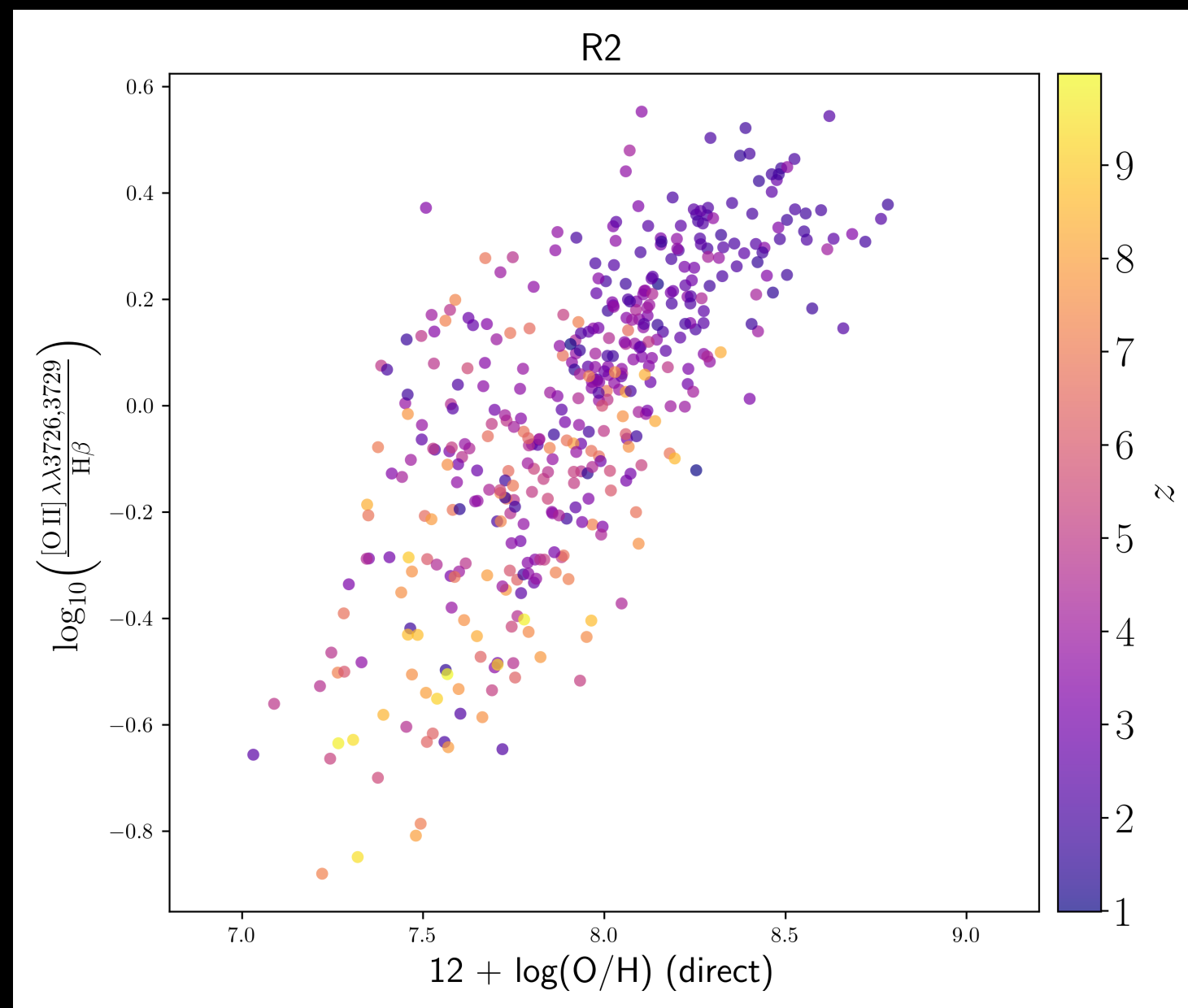


# Genesis-Metallicity

Accuracy better than 0.1 dex in O/H ratio



# New Strong-Line Calibration based on **>500 NIRSpec spectra at $1 < z < 10$** ~300 sources with 5sigma detections of all relevant lines (including [OIII]4363)



**Martin Karal & Langeroodi in prep.**

# genesis-metallicity

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non-parametric gas-phase metallicity and electron temperature estimation

- **strong-line metallicity estimation** when temperature-sensitive emission lines are unavailable
- **direct-method metallicity measurement** when the temperature-sensitive [O III]4363 line is detected (can also include [O II]7320,30 if available)
- **O<sup>+</sup> electron temperature estimation** from that of the O<sup>++</sup> zone when direct measurements of the former are unavailable
- **dust reddening correction** of the observed emission line fluxes when multiple Balmer lines are detected

## Installation

`genesis_metallicity` is pip installable:

```
pip install genesis_metallicity
```

