

# At the Break of Cosmic Dawn: JWST/MIRI Reveals the Detailed Physical Properties of JADES-GS-z14-0

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**JWST ADVANCED DEEP  
EXTRAGALACTIC  
SURVEY**

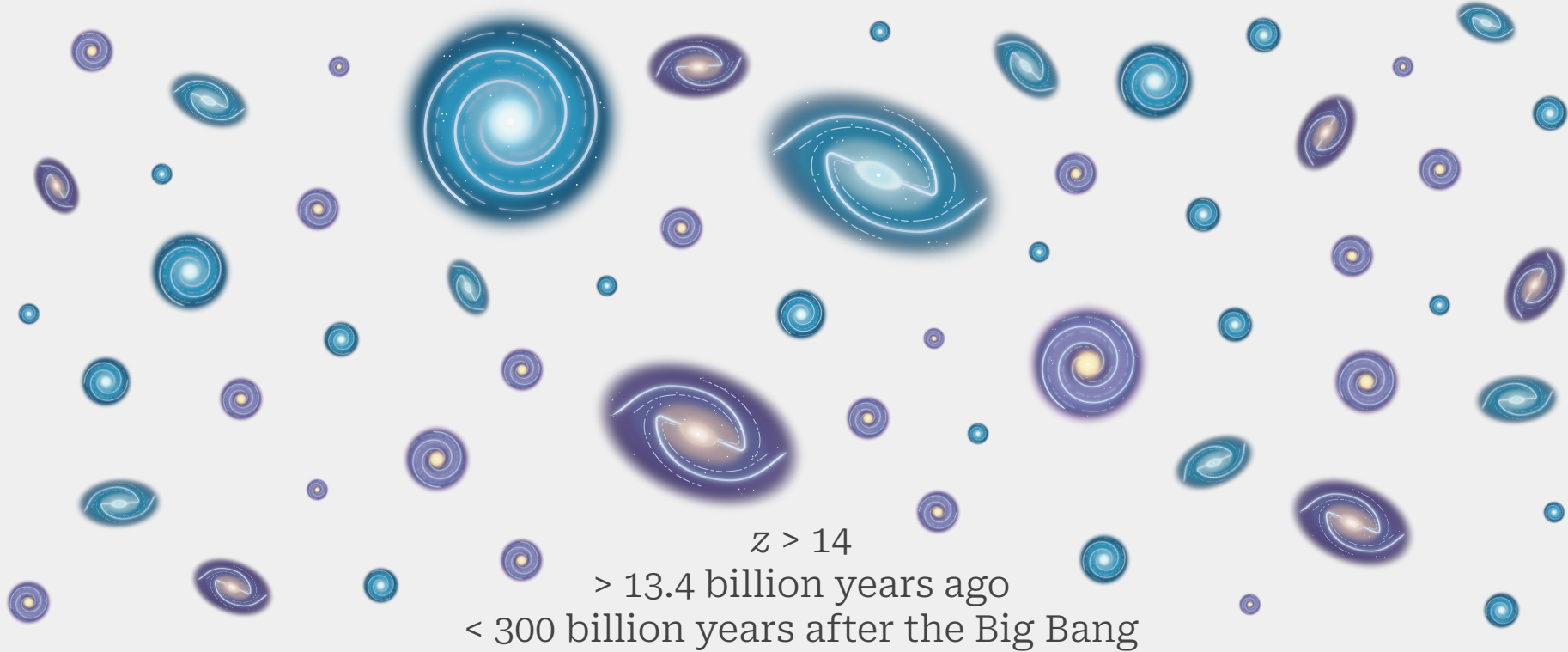
This is what we predicted to see with JWST...



$z > 14$   
> 13.4 billion years ago  
< 300 billion years after the Big Bang

**Very few luminous galaxies at high redshifts, i.e., Cosmic Dawn**

This is what we actually saw with JWST...



$z > 14$   
> 13.4 billion years ago  
< 300 billion years after the Big Bang

**Lots of luminous galaxies at high redshifts, i.e., Cosmic Dawn**

This is what we actually saw with JWST...



# My Research Tries to Answer the Question of “Why?”

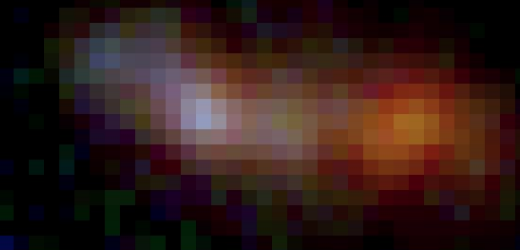
$z > 14$   
> 13.4 billion years ago  
< 300 billion years after the Big Bang

**Lots of luminous galaxies at high redshifts, i.e., Cosmic Dawn**

# JADES-GS-z14-0 at $z = 14.18$ ( $\sim 290$ Myr after the Big Bang)



$z = 3.47$



$z = 14.18$

NIRCam RGB  
RA: 53.08270 Dec: -27.85544

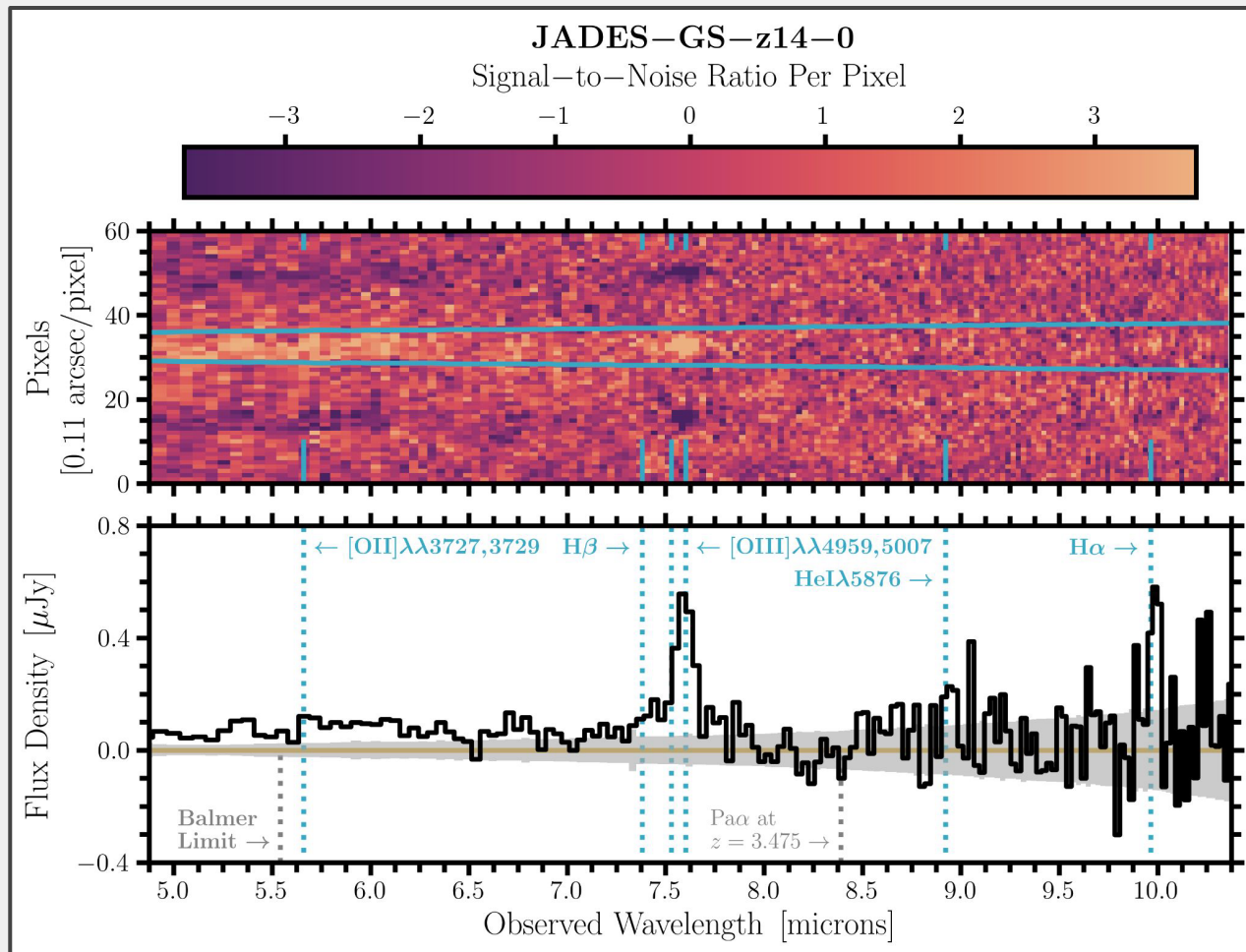


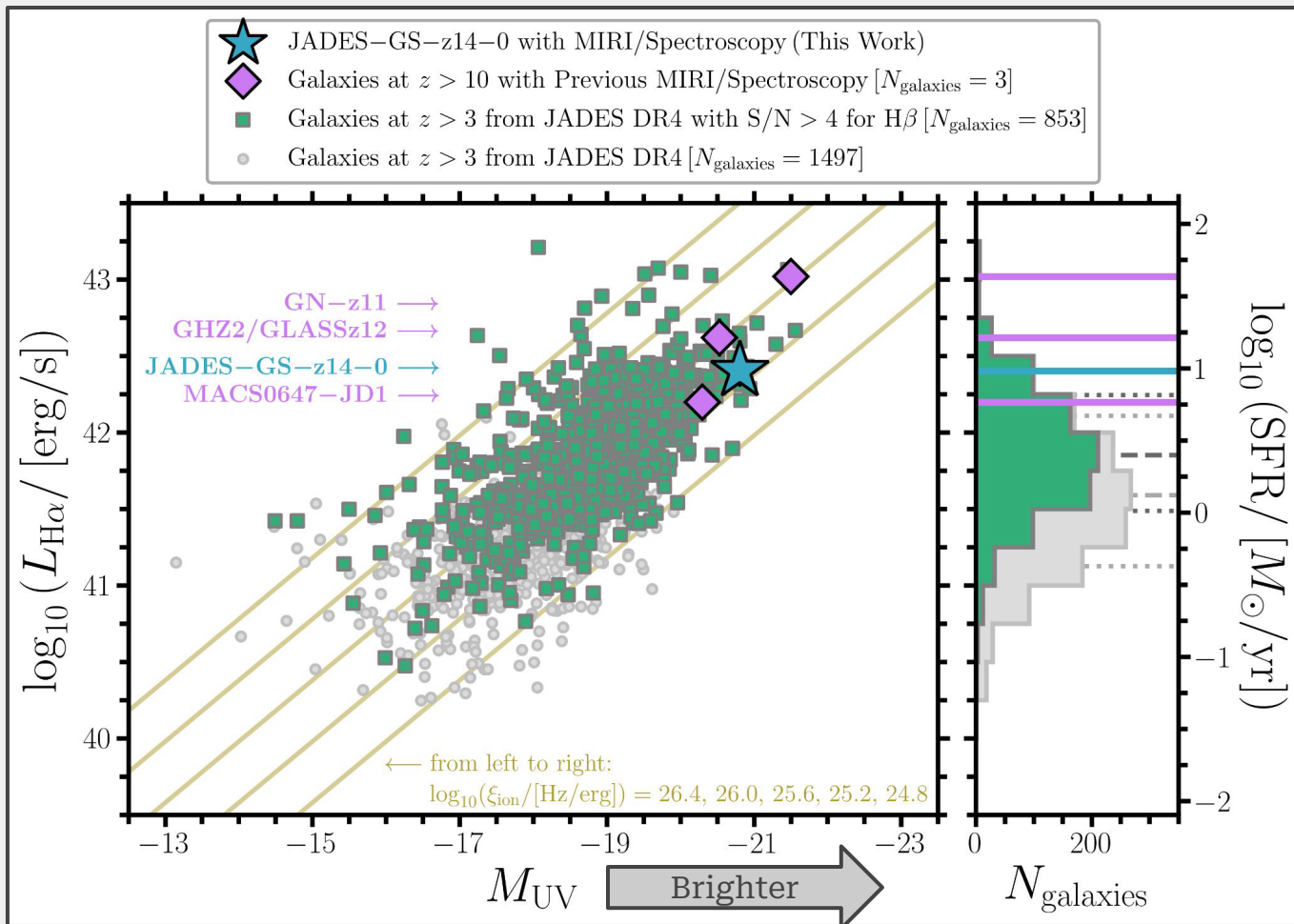
- $m_{UV} \sim 27.0$  AB mag
- $M_{UV} \sim -20.81, \beta_{UV} \sim -2.20$
- $R_{UV} \sim 260$  parsecs, half-light
- $\sim 300$  million solar masses

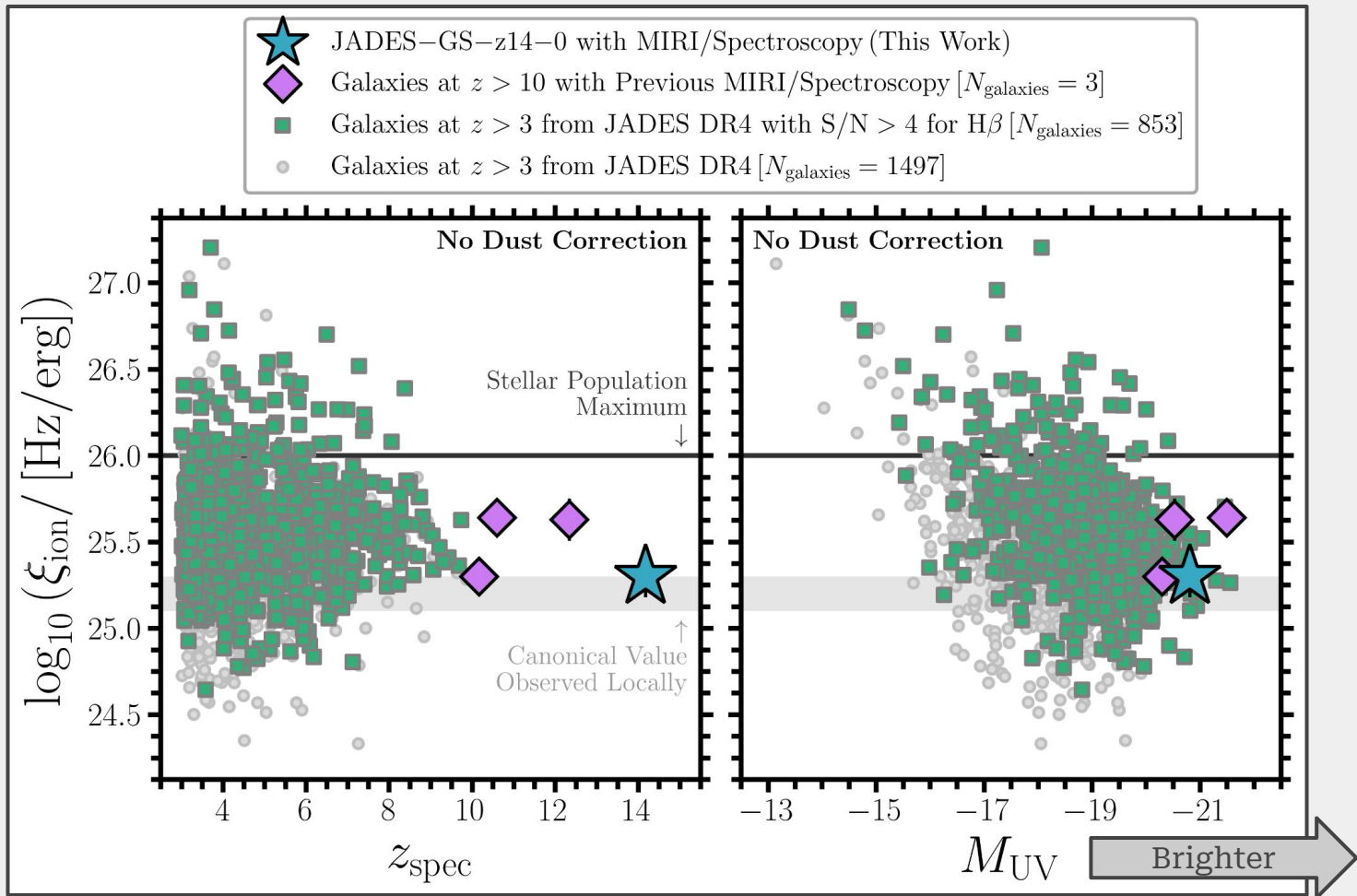
0.6"

Leaflet | FileSMap

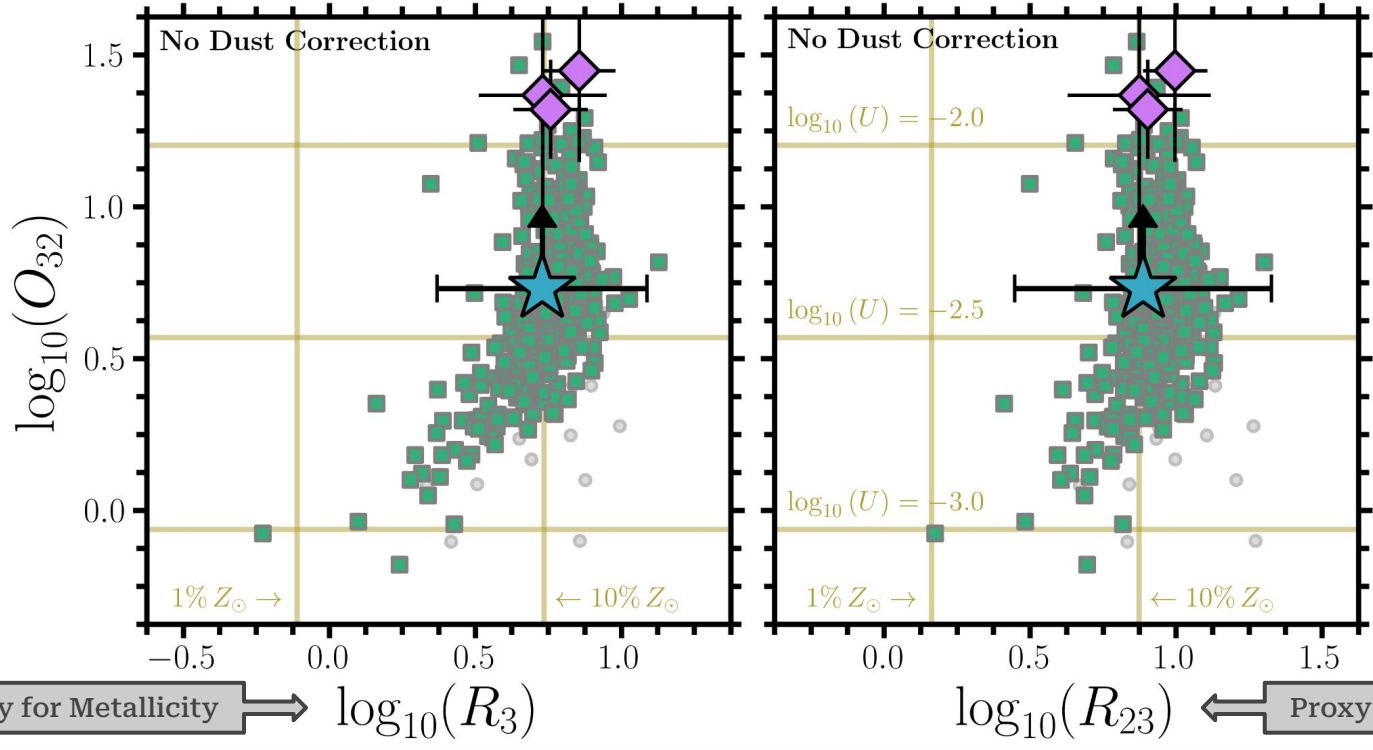
Ultra-Deep Spectroscopy  
(**~34 hours**) with  
the MIRI/LRS







- ★ JADES-GS-z14-0 with MIRI/Spectroscopy (This Work)
- ◆ Galaxies at  $z > 10$  with Previous MIRI/Spectroscopy [ $N_{\text{galaxies}} = 3$ ]
- Galaxies at  $z > 3$  from JADES DR4 with  $S/N > 4$  for  $H\beta$  [ $N_{\text{galaxies}} = 853$ ]
- Galaxies at  $z > 3$  from JADES DR4 [ $N_{\text{galaxies}} = 1497$ ]

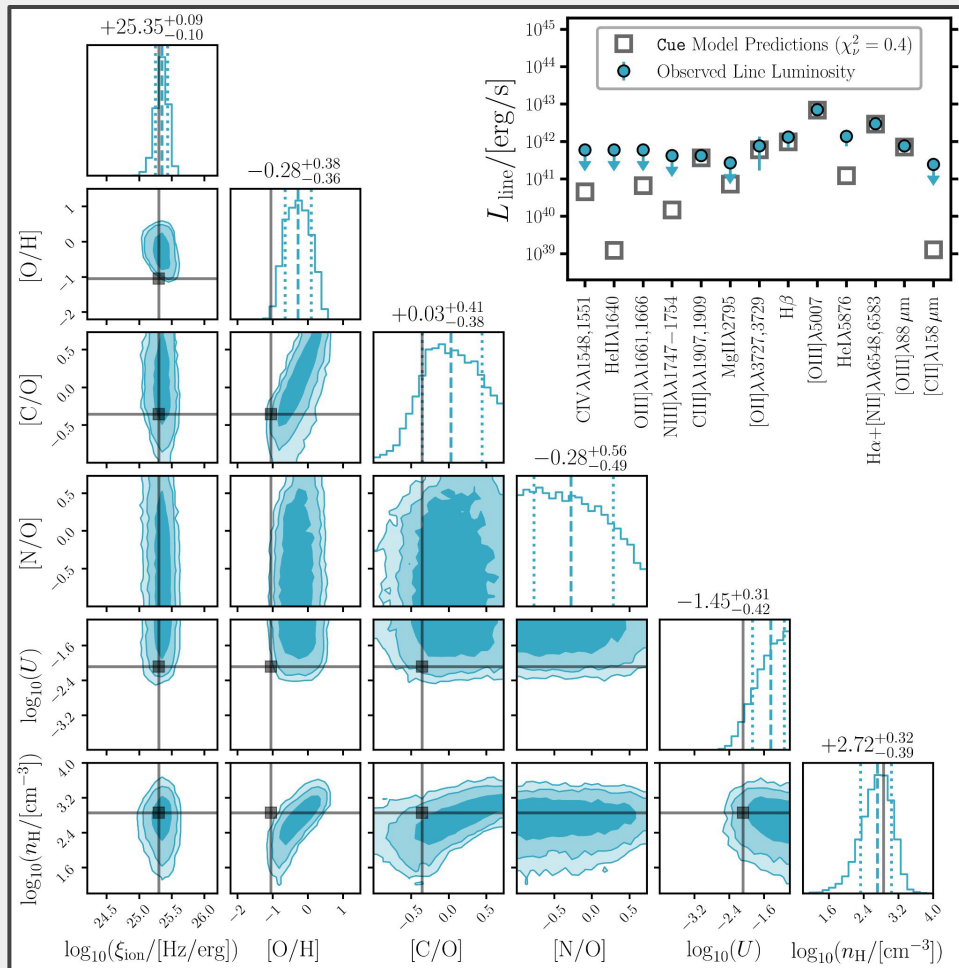


Proxy for Ionization Parameter

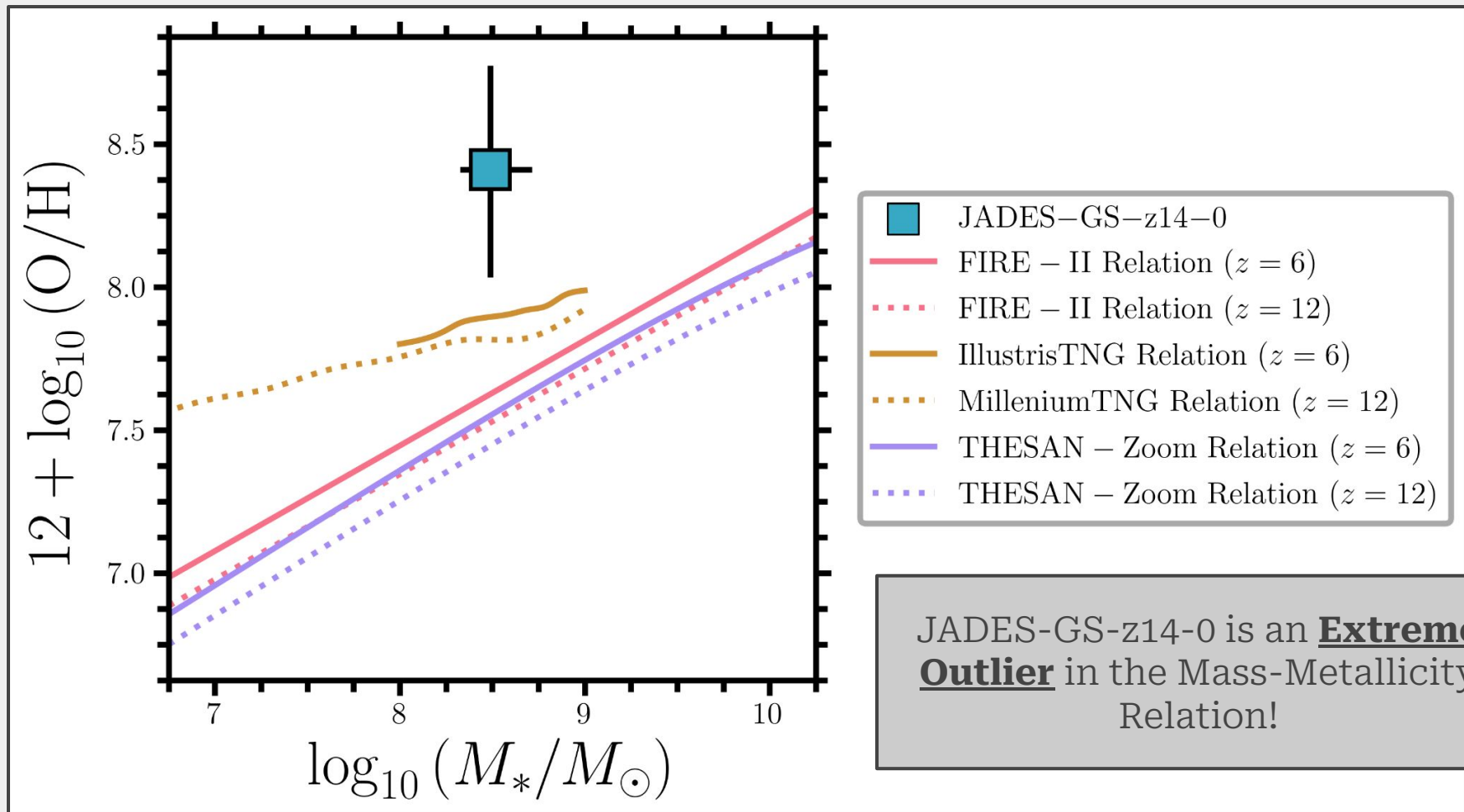
Proxy for Metallicity

Proxy for Metallicity

Detailed  
Photoionization  
Modeling Using  
**All** Emission  
Lines...



... Suggests **~50%**  
Solar Metallicity  
at  $z > 14$ !



We obtained the **deepest spectroscopy** ever acquired by JWST/MIRI for JADES-GS-z14-0 ( $z = 14.18$ ).

These observations reveal **extreme ionization conditions** and **rapid metal enrichment** less than 300 Myr after the Big Bang.

We find evidence for **bursty star-formation histories** and **increased star-formation efficiencies**.

JWST/MIRI is the future for understanding the first stars and galaxies!