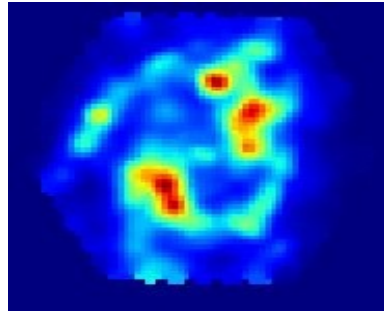


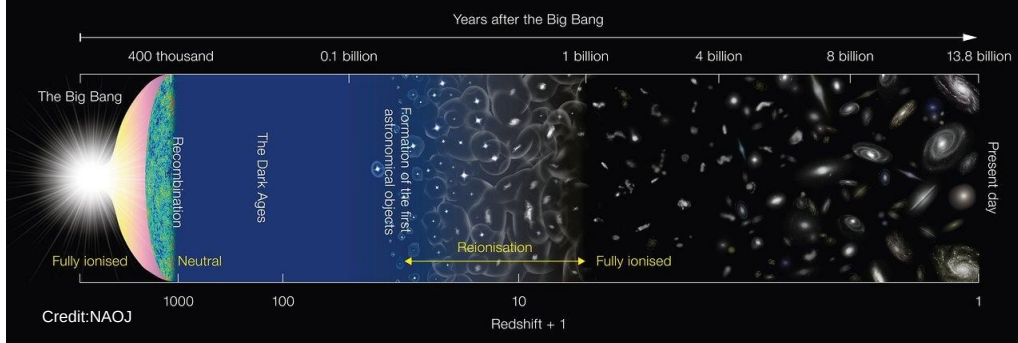
Identifying candidates for low-metallicity Lyman radiation leakage in the DESI survey

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Escape of Lyman radiation from galactic labyrinths
OAC, Kolymbari, Crete
7-11 April 2025

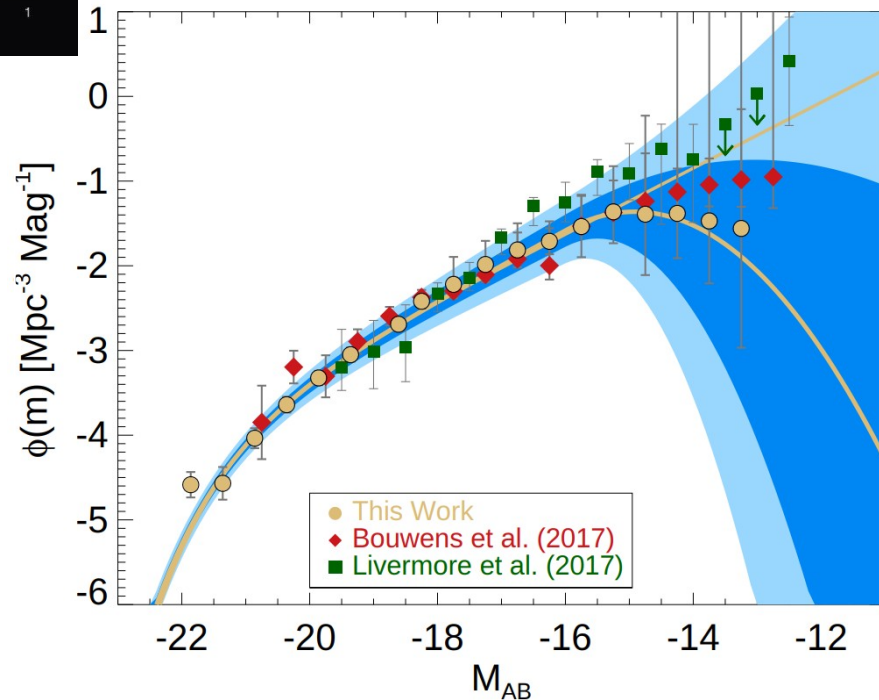


Sources of cosmic reionization:

- **Star-forming galaxies** (Robertson et al. 2010)
- AGNs and quasars (Madau & Haardt 2015)
- X-ray binaries (Fragos et al 2013)
- Decaying/annihilating dark matter (Oldengott et al. 2016)
- Shocks from structure formation (Kang et al. 2007)
- Cosmic rays

Low mass galaxies seem to be the main driver of cosmic reionization

UV luminosity function at $z \sim 6$

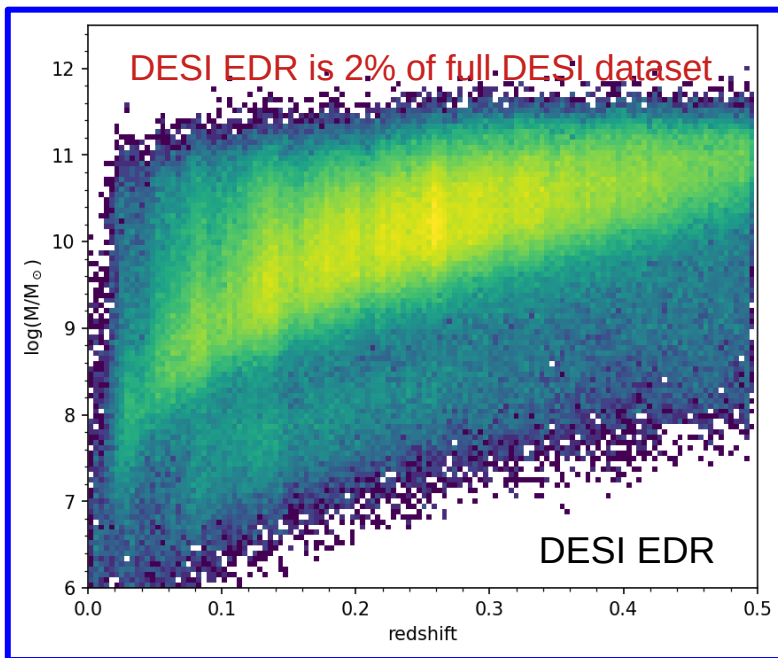
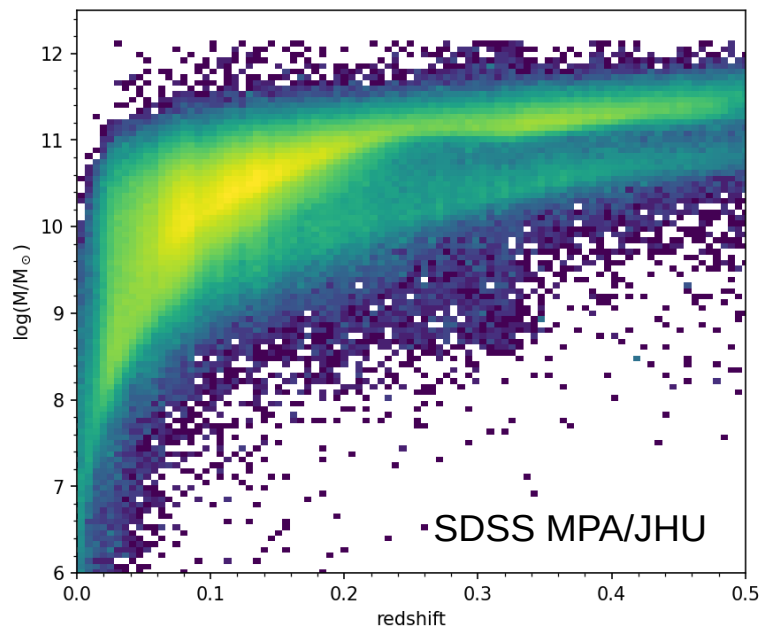


Atek et al. (2018)

Searching for LyC leakers among star-forming galaxies

- Direct detection of LyC emitters is difficult
- Indirect indicators
 - High O32 = [OIII]/[OII] ratio
 - Ly- α emission
 - UV absorption lines

Large sample of **low-mass** galaxies is needed



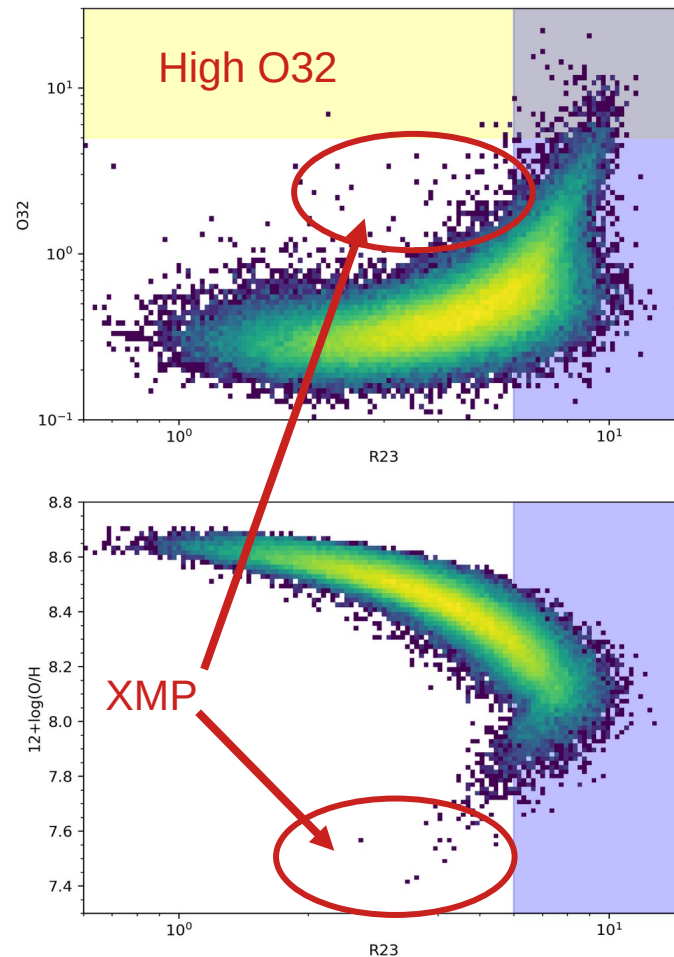
Searching for LyC leakers among star-forming galaxies

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How to identify metal-poor LyC leaker candidates?

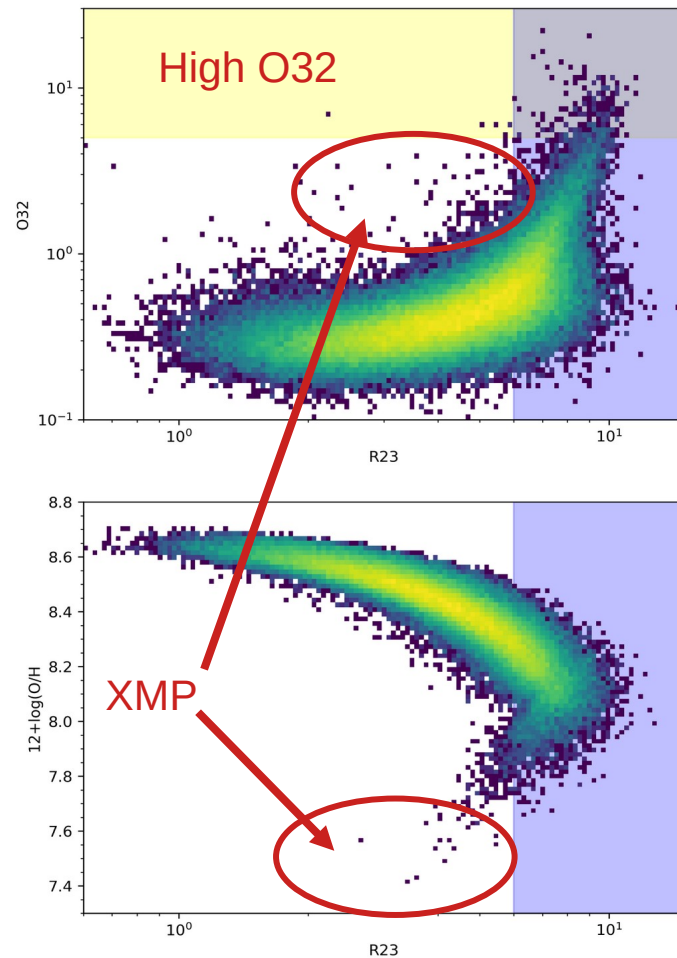
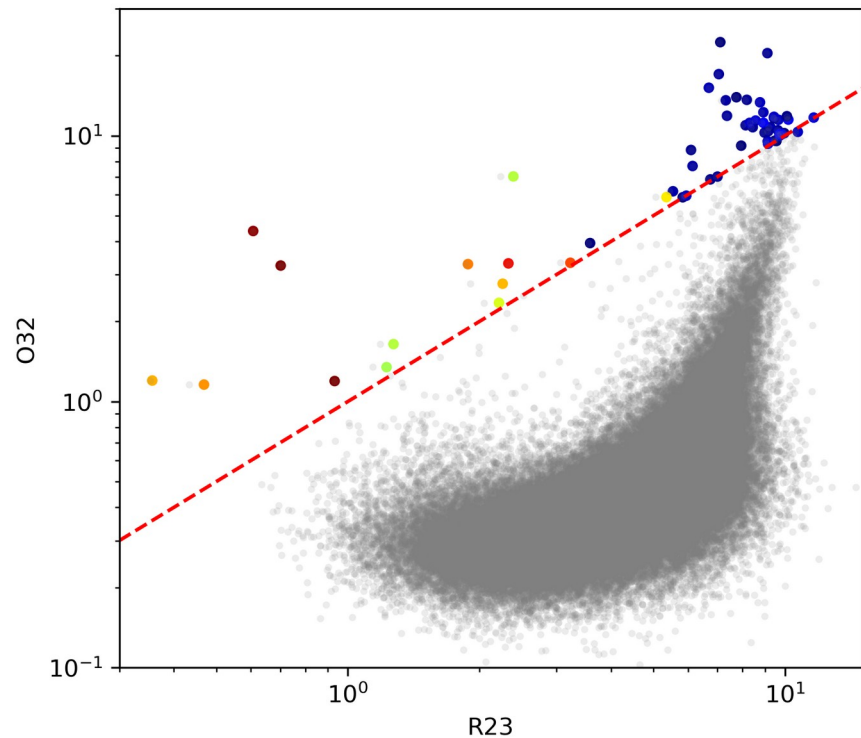
- DESI EDR sample from *Zinchenko et al. (2024)*
- 666773 galaxies at $z < 0.5$

$[OIII]/H\beta$ and $[OII]/H\beta$ depends on metallicity

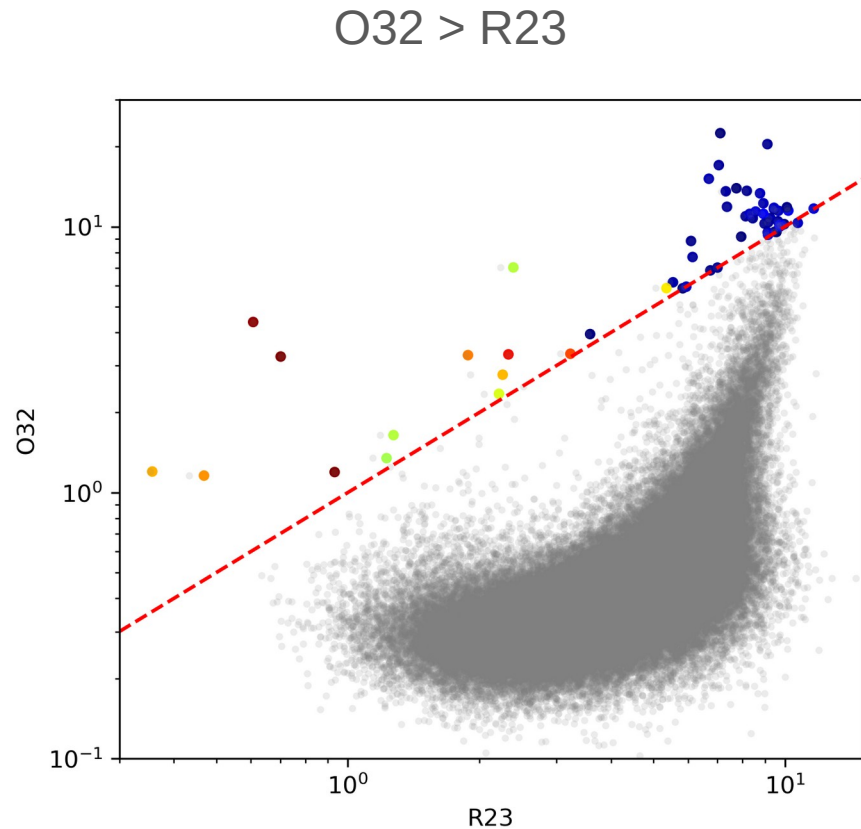


Searching for LyC leakers among star-forming galaxies

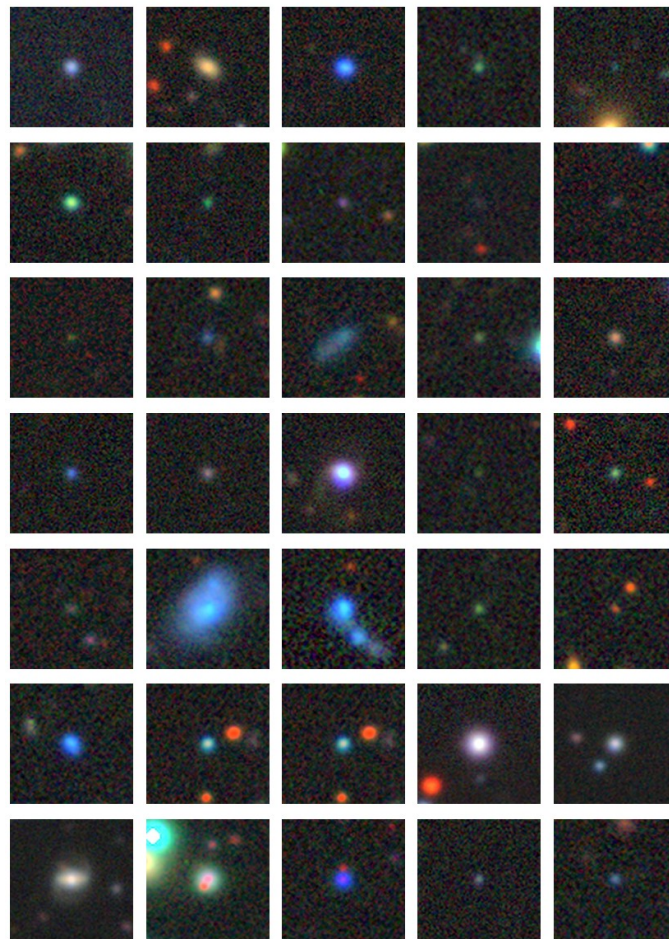
$O32 > R23$



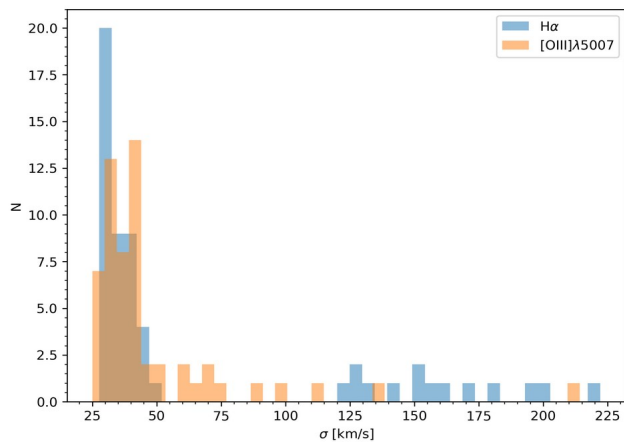
Searching for LyC leakers among star-forming galaxies



Legacy Survey DR10 cutouts



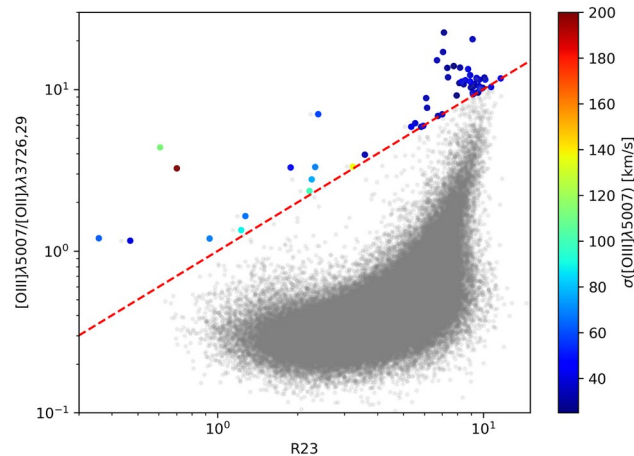
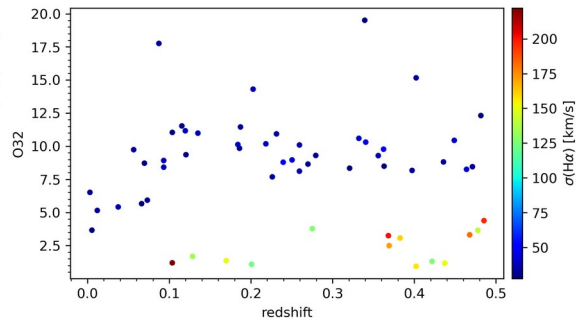
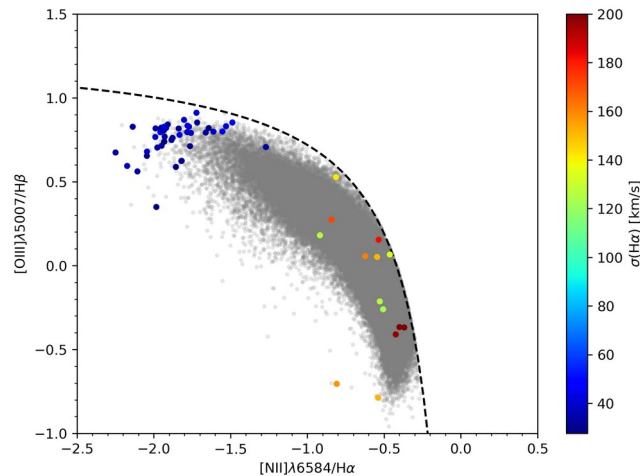
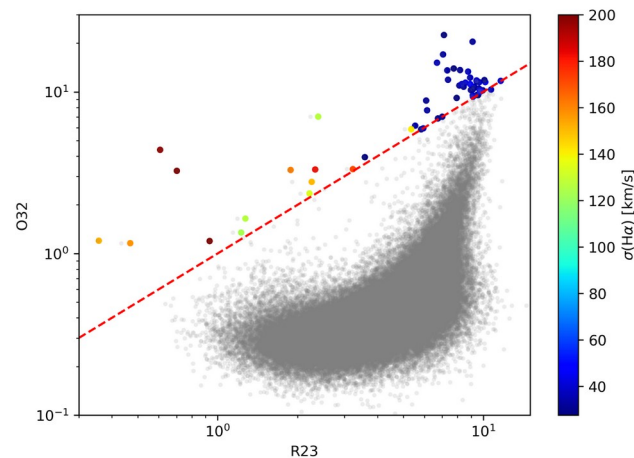
Searching for LyC leakers among star-forming galaxies



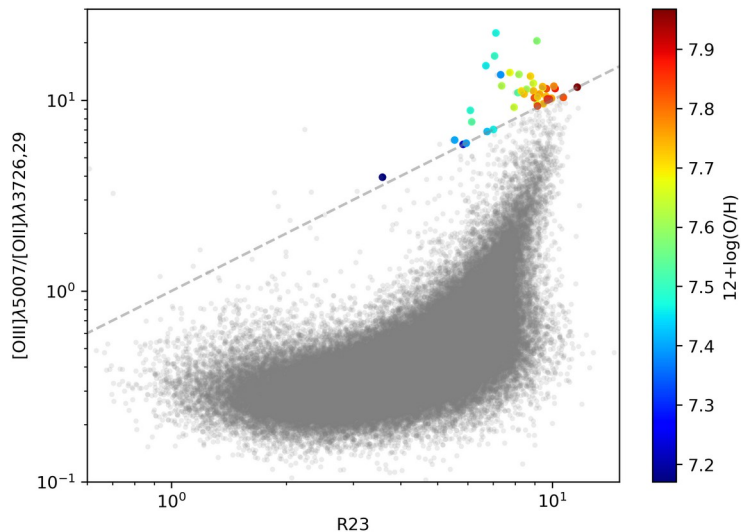
Selection criteria:

- $O32 > R23$
- $\sigma(H\alpha) < 100$ km/s

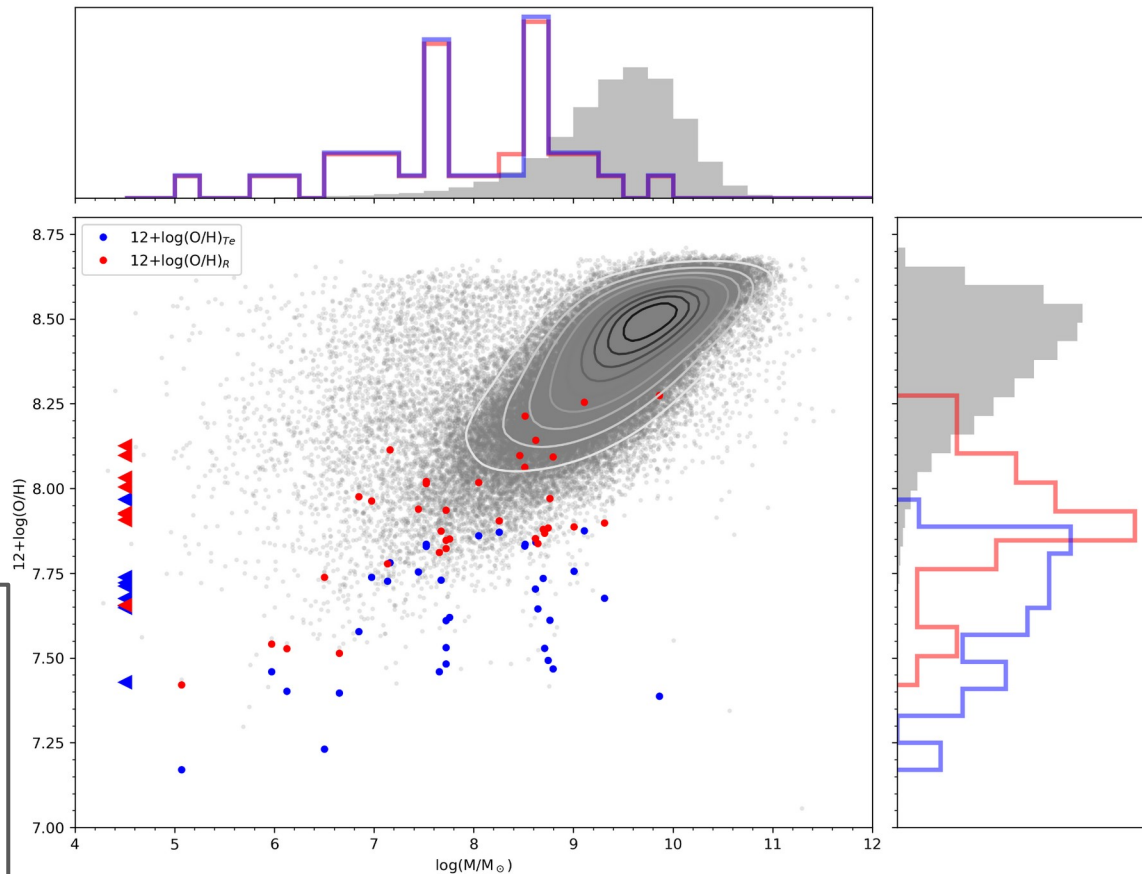
43 candidates identified



Physical properties

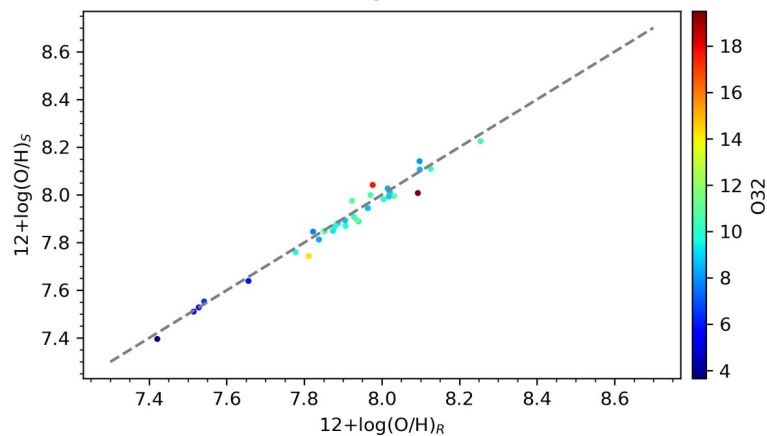
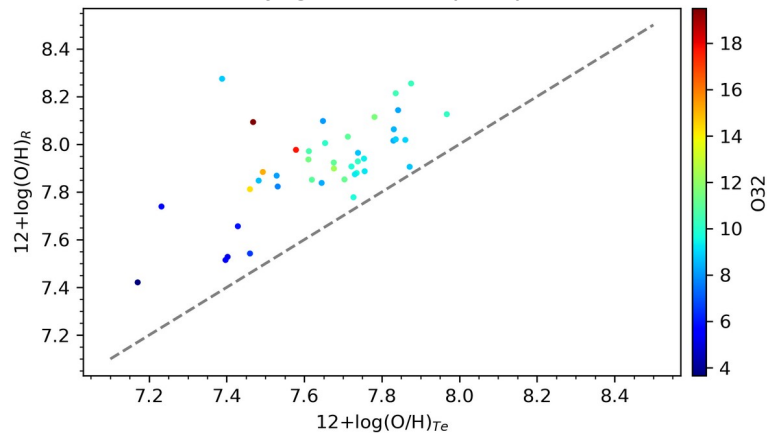


- 43 candidates identified
- $O32 = 4 \dots 20$
- $12+\log(O/H)_{Te} = 7.2 \dots 8.0$ dex
- 11 with $O/H < 7.5$ dex
- XMPs have lower R23
- R calibration gives slightly higher O/H

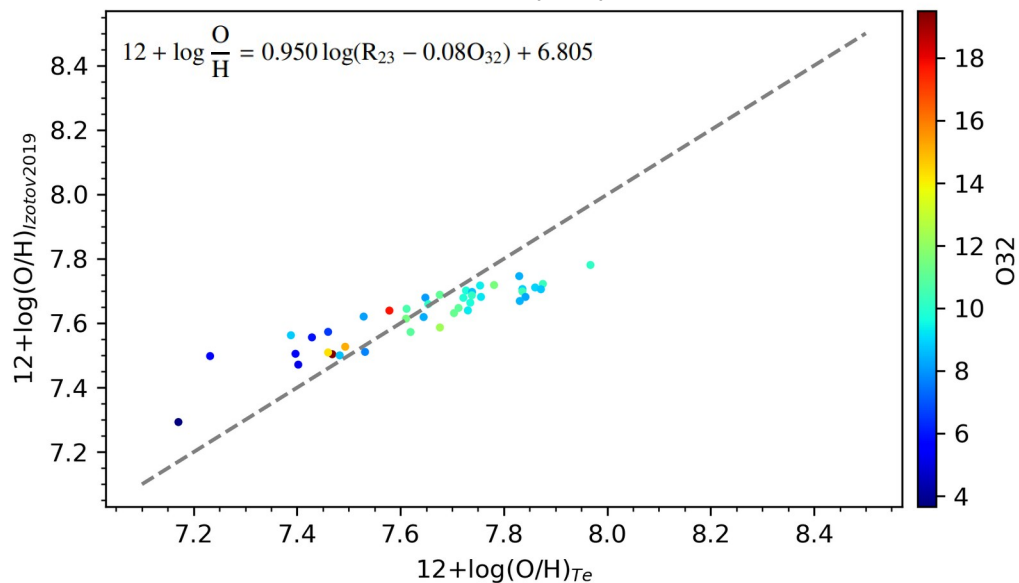


Oxygen abundance: calibrations vs T_e

Pilyugin & Grebel (2016)



Izotov et al (2019)



Conclusions

- Combination of O32, R23, and $\sigma(\text{H}\alpha)$ allows to select XMP LyC leaker candidates
- Identified 43 candidates, including 11 with $\text{O}/\text{H} < 7.5$ dex
- Calibration from Izotov et al. (2019) provides O/H compatible with Te-method in XMP regime
- DESI has a great potential for studying low-mass galaxies including LyC leakers. DESI EDR is only 2% of the full dataset

A long-exposure photograph of a night sky. The sky is dark, and numerous stars are visible as long, thin, diagonal lines of light, indicating the Earth's rotation. The lines are mostly white and blue, with a few reddish ones. In the lower center, a small, dark hill is visible, topped with a lighthouse that has several bright red and white lights. The overall scene is serene and captures the beauty of the night sky.

Thank you!