

Gas-phase metallicity of Magellan/MagE local analogs

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Knowledge about the amount of metals in galaxies is key to probe their physical evolution. Due to instrumental limitations, empirical relations have been used to derive metallicities of galaxies at high-redshift. As these are based on local HII regions with different physical conditions, we calibrate new relations using local analogs of high-redshift galaxies.

Data & method

We use Magellan/MagE¹ spectra of 11 compact (1-2") star-formation galaxies with $z < 0.2$. Galaxies were selected based on their position in the BPT diagram, overlapping with the high-redshift locus $z \sim 2-3$ [1, 2].

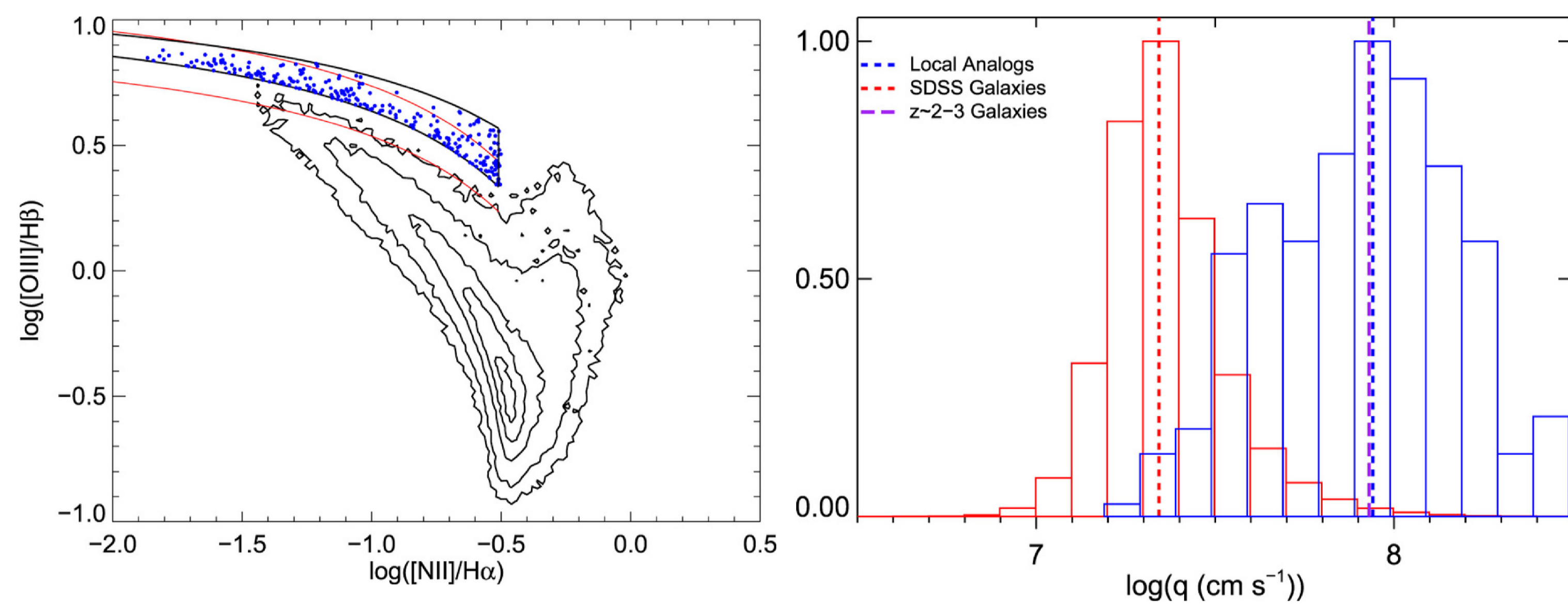
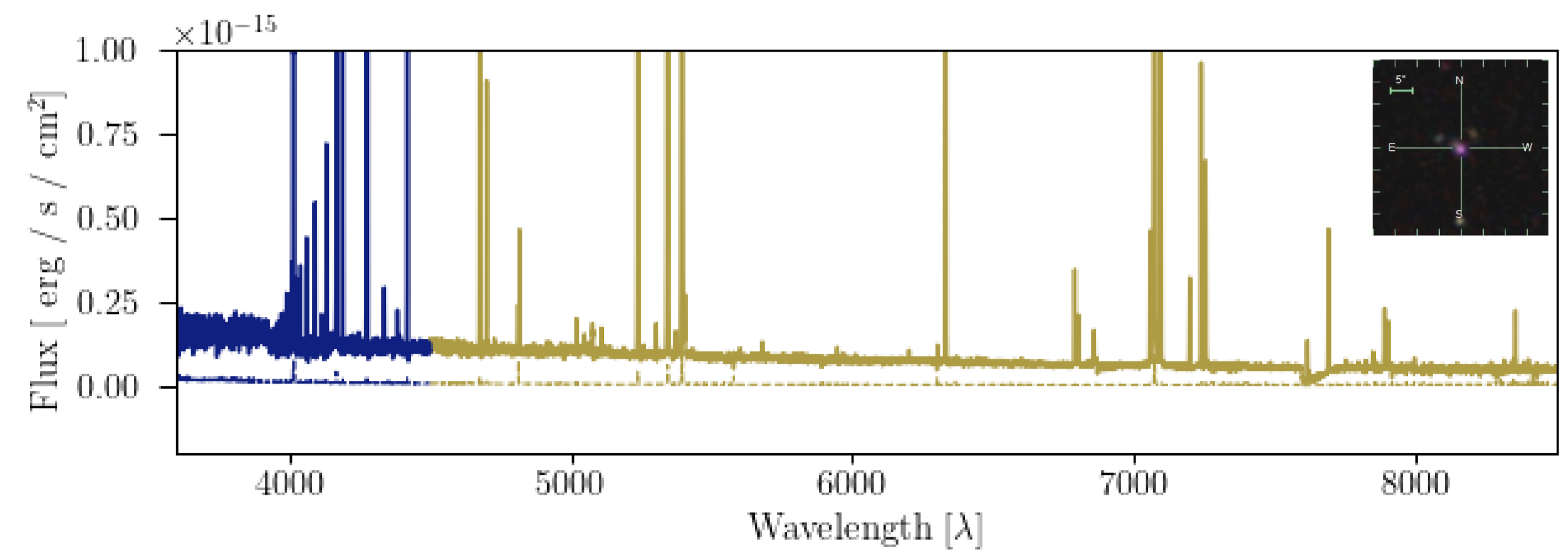


Figure 1: (Left) BPT diagram for galaxies selection. (Right) Ionization parameter of analogs compared to local and high redshift galaxies.

Spectra was reduced with PyPeIt² and calibrated using ESO standard stars³. One component gaussian profiles were fitted to the lines: [OII]λ7316,7329, [NII]λ6584,6548, Hα, [OIII]λ5007,4959,4363, Hβ, [OII]λ3716,3720. Oxygen abundance were calculated using the direct method [3].



Results

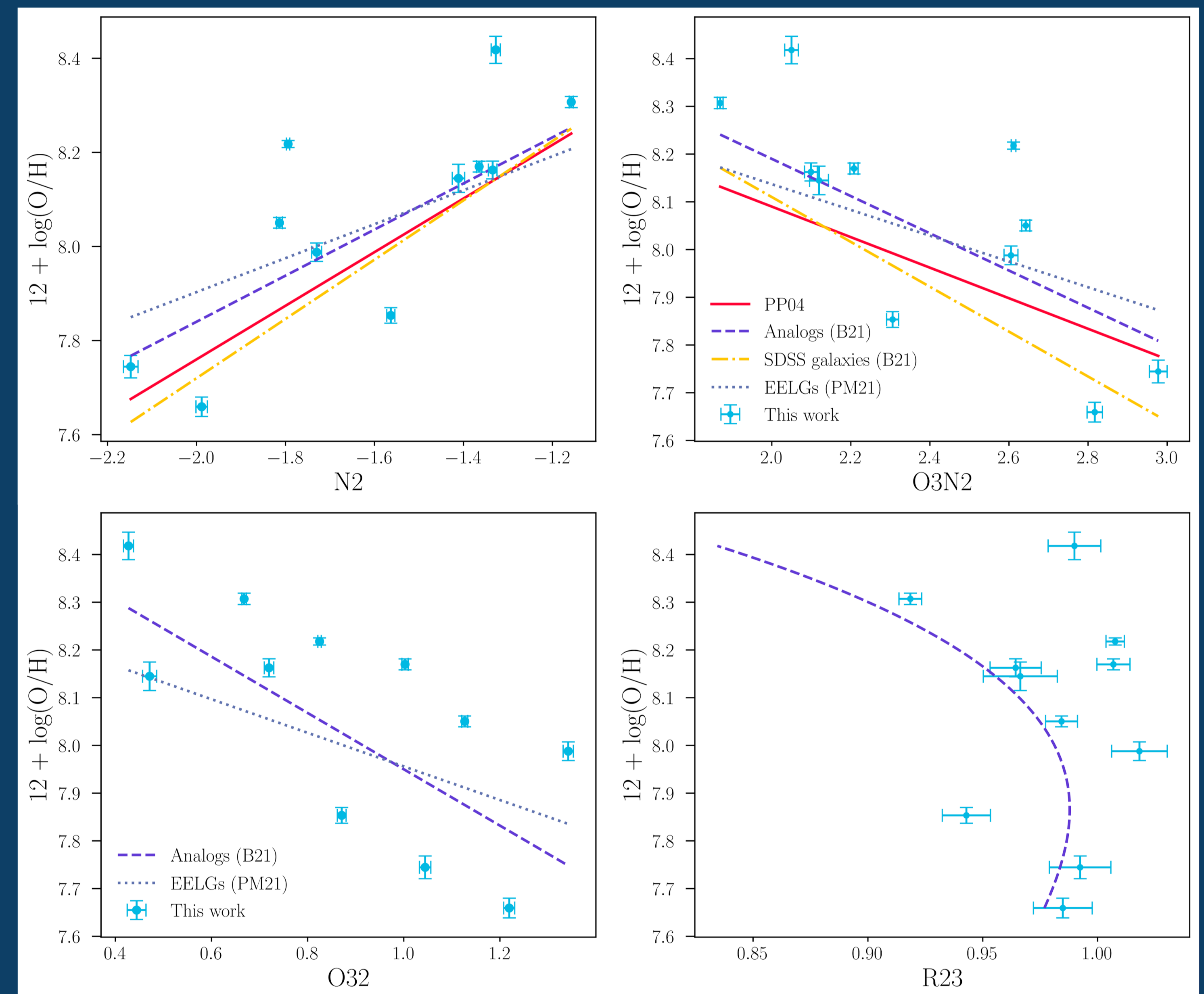


Figure 2: Oxygen abundance as a function of strong-line ratios N2 (Upper left), O3N2 (Upper right), O32 (Lower left), and R23 (Lower right).

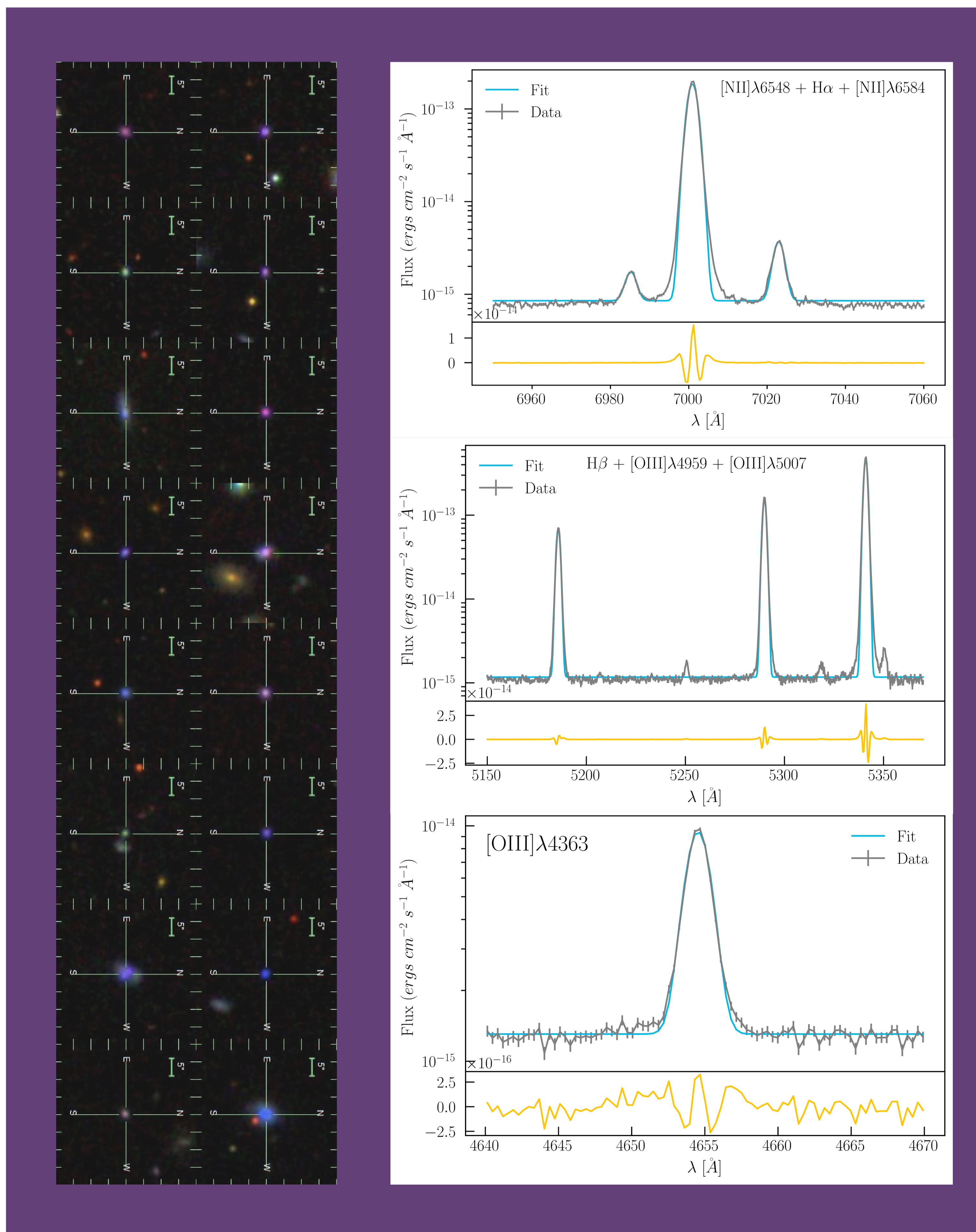
Analysis and conclusions

Blue dots represents our data. In general, most of our measurements agree with previous relations derived from stacked spectra of local analogs [5] and extreme emission-line galaxies [6], presenting larger differences with relations based in local HII regions [4] as expected.

One can see that there is a type of dual trend in both panels of Figure 2 and the left panel of Figure 3. Literature relations present large dispersion, therefore, we still need to test whether it is a different metallicity setup determining both trends or if they consist on mere outliers.

References

- [1] Bian, F., Kewley, L., & Dopita, M., ApJ. 822, 2, 62 (2016)
- [2] Steidel, C. C., et al. ApJ, 795, 165 (2014)
- [3] Pérez-Montero, E., IOP Publishing. 129, 974, 043001 (2017)
- [4] Pettini, M., Pagel, B., MNRAS. 348, 3, L59-L63 (2004)
- [5] Bian, F., et al. ApJ, 859, 2, 175 (2021)
- [6] Pérez-Montero, E., et al. MNRAS. 504, 1, 1237-1252 (2021)



¹<https://www.lco.cl/technical-documentation/mage/>
²<https://pypeit.readthedocs.io/en/release/>
³<https://www.eso.org/sci/observing/tools/standards.html>

