# The [CII] 158 micron line emission in high-redshift galaxies

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Gas is a crucial component of galaxies, providing the fuel to form stars, and it is impossible to understand the evolution of galaxies without knowing their gas properties. The [CII] fine structure transition at 158 microns is the dominant cooling line of cool interstellar gas. With the advent of ALMA and NOEMA, capable of detecting [CII]-line emission in high-redshift galaxies, there has been a growing interest in using the [CII] line as a probe of the physical conditions of the gas in galaxies, and as a star formation rate (SFR) indicator at z>4.

We have used a semi-analytical model of galaxy evolution combined with the photoionisation code CLOUDY to predict the [CII] luminosity of a large number of galaxies (25,000 at z =5) at 4 <z<8. The model takes into account the effects of CMB heating and attenuation that are important at such high redshifts. I will present the model, its predictions and comparisons with observations at z>4. In particular, the model allowed us to study in detail the L[CII]–SFR L[CII]–metallicity relations and their evolution with redshift. It reproduces the L[CII]– SFR relation observed for ~50 star-forming galaxies at z>4 and it is used to understand the observed dispersion, which is large and due to combined effects of different metallicities, ISRF, gas contents in the high-redshift galaxies, as well as timescales that are implicitly assumed when measuring the SFR in galaxies. I will also show that the model naturally produces the [CII] deficit which appears to be strongly correlated with the intensity of the radiation field in our simulated galaxies. Finally, I will discuss how such models are important in the framework of future observations with NOEMA and ALMA, as well as experiments targeting the [CII] line deep into the reionisation era (CONCERTO and Time).

**Références**

[1] Lagache G., Cousin M., Chatzikos M., A&A 609, 130 (2018)

[2] Lagache G., IAU Symposium 333 "Peering towards Cosmic Dawn", eds. Vibor Jelic and Thijs van der Hulst, arXiv:1801.08054 (2018)