Inferring the escape fractions of ionizing photons from H II regions in the Dwarf Galaxy Survey

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Part of the ionizing continuum produced by young stars can leak out of its host galaxy and ionize its surroundings, with great implications at high-redshift on the ionizing budget of reionization. Photon leakage being closely related to the structure of the surrounding interstellar medium (ISM), indirect gas tracers (e.g., emission lines) constitute valuable probes to understand what drives the escape fraction mechanism.

Local starbursting galaxies, with unevolved chemistry and intense radiation fields that resemble early Universe galaxies, are ideal laboratories to probe the ISM in primordial-like environments. Such galaxies with low dust and metal content, likely host a more patchy and porous ISM than their high-metallicity analogues [1]. To what extent this specific structure and the presence of strong, possibly non-stellar, feedback mechanisms contribute to the leakage of ionizing photons, remains to be quantitatively studied.

To address these questions we built a refined grid of models including density-bounded regions including a possible contribution of an X-ray source with Cloudy [2]. Using a new Bayesian code based on Monte Carlo sampling, MULTIGRIS [3], we combine these models as sectors under various assumptions to extract probability density distributions of the parameters and infer the corresponding escape fractions from H II regions. I will present a first application of the code, using the wealth of infrared tracers available for the Dwarf Galaxy Survey [4] to explore the dependencies of the escape fractions on various parameters and discuss promising line ratios to be used as proxies. Finally, I will present possible future applications, including to high-redshift galaxies with the already available and future detections from ALMA and JWST.

References

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