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Radiation Hydrodynamics of Turbulent HII Regions: LyC-LyA connection

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The question of whether early star-forming galaxies generated sufficient Lyman continuum (LyC) photons to drive cosmic reionisation is one of the major challenge in modern cosmology. Recent deep HST UV imaging and spectroscopy have revealed a signature of LyC leakage along the lines-of-sight of Lyman-alpha emitting galaxies. The observed correlations between LyC escape fraction, Lyman alpha line, and other nebular lines provide a valuable insight into the ISM of reionisation-era galaxies. In order to understand these new observational results, in this talk, we present a result from the RAMSES-RT simulation of turbulent HII regions in giant molecular clouds, examining the physical origins of the correlations between LyC leakage, HI covering fraction, kinematics, and the emergent Lyman alpha spectra. We discuss the role of turbulence and radiative feedback and show that radiative transfer through turbulent HII regions in molecular clouds is key for understanding the observed LyC leakage and the Lyman alpha spectral properties. We also discuss the extension to radiation magnetohydrodynamics and the effect of shocks, winds, and jets in UV nebular emission lines.

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