

Mock UV absorption lines in Ramses-RT simulations and link with escape fractions

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To understand the role of galaxies during the epoch of reionization, it is essential to know more about the values of the escape fractions of ionizing photons from those galaxies. Since the intergalactic medium was opaque to Lyman continuum radiation during reionization, it will never be possible to observe directly the escape fraction, so we have to rely on indirect measurements. One potential method for an indirect measurement uses the absorption lines from low-ionization states of metal, like Si III 1260Å, O I 1302Å etc. Those ions are good tracers of neutral hydrogen, and so the covering fraction measured from these absorption lines are thought to correlate well with the HI covering fraction. And, in turn, if the covering fraction of HI is less than unity, there are some low density channels in the ISM in which the ionizing photons can escape. Our aim is to compute mock spectra of these absorption lines from simulated galaxies and correlate their spectral characteristics with 1/ the covering fraction of HI along the same direction of observations and 2/ the escape fraction of LyC radiation along that line of sight. In this work, I selected a sample of galaxies from the “sphinx” RHD simulation (Rosdahl et al, 2018). For each galaxy, I compute the density of several absorbers in all the cells with KROME (Grassi et al, 2014), and I use RASCAS (Michel-Dansac et al, 2019) to scatter the stellar light through the interstellar medium of these galaxies (since all the LIS lines considered are resonant lines with or without fluorescent re-emission). Finally, I build mock spectra in chosen directions of observation using the peeling-off technics, and measure several observables such as equivalent widths—in absorption and in emission through fluorescent channels—, or velocities (V_{\min} at the maximum of absorption, V_{\max} the maximum velocity at which there is absorption). I will present first results on the link between these observables and the distribution of column density and velocity field along several lines of sights, discuss the notion of covering fraction, and the relation between velocity measurements on the spectrum and velocity distribution in the gas. Finally, I will show preliminary results on the correlations between these mock observables and the escape fraction of ionising radiation.

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