Global properties of circumgalactic medium at high-redshift: A spectroscopic study of strong Lyman-α forest absorbers

Debopam Som*[1] and Matthew Pieri

[1]LAM – Laboratoire d'Astrophysique de Marseille – France

Abstract

The circumgalactic medium (CGM) is shaped by the complex interplay of gas flows regulating the way stars and galaxies form and evolve. Understanding CGM properties, therefore, is crucial in understanding galaxy evolution. We present a study of the CGM probed by composite spectra constructed from a sample of strong Lyman-α forest absorbers at redshift $\sim$ 2.7. The absorbers, selected from $\sim$160,000 quasar spectra from BOSS/SDSS-III (DR 12), are identified based on their absorption strength and clustering. Single component model fits to the several Lyman-series lines, present in our composite spectra, suggest optically thin absorbing gas. Numerous lines from several metals in various ionisation stages are detected, with exquisite precision, in our composite spectra. We now go beyond the average properties provided by the composite spectra and forward model the entire metal population for every metal line. This allows us to incorporate the relative sizes of absorption populations between metal lines. We analyse the measurements from the metal absorption in combination with the H I column densities using various single-phase and multi-phase models and our results imply clumping on scales down to $<$ 100 pc and near-solar metallicities in the circumgalactic samples (probed primarily by low ionisation species), while high-ionization metal absorption consistent with typical IGM densities and metallicities is present in all samples. Our results provide important clues to the processes shaping CGM at high-redshift using Lyα absorbers in a column density regime largely unused so far in CGM studies.

*Speaker