

Absract - Modelling DLA Populations

Aditya Vidhate

Abstract

[Brief] Damped Lyman Alpha systems are peculiar objects observed in the Universe with a signature absorption line in the Lyman- α Hydrogen transition. The peculiarity lies in the fact that these objects systematically populate very faint galaxies, but with a very high Large Scale bias[1] (the Large Scale bias for faint galaxies is expected to be low). This project proceeds with a purpose of finding the effect of the surrounding Large Scale environment on the peculiarity of these populations, hence the repo name – DLA Environments.

Abstract

[Detailed] Our Universe is richly populated with various objects, to mention a few – stars, planets, Galaxies, black holes – each of which gives a deep insight in the laws of nature and Physics, that govern the Universe and us alike. One of such exotic objects are Quasars. **Quasars** appear as a very powerful source of radiation in our observations of space. Every Galaxy is expected to have a super-massive black hole at its center, due to which a huge amount of gas is pulled in towards it from the inter-Galactic medium – a process called Accretion. This gas gets heated up to immensely high energies and is the source of such powerful radiation observed as Quasars.

The speed of light is a fixed quantity and hence, naturally, light travels at finite speeds, which also implies that the farther we look out into space, the more into the past we are looking. Because our Universe is expanding, this factor can be quantified in a parameter called the **Redshift**. Higher the redshift of an object, farther and more into the past the object is.

Hydrogen is the dominant element that makes up our Universe, and Galaxies which are at a high redshift, tend to have more amount of neutral Hydrogen. When the powerful radiation emitted from Quasars passes through neutral Hydrogen, particular frequencies from the radiation get absorbed, in particular – the frequencies corresponding to the Lyman Alpha transitions. Such systems of Quasars, having a high absorption in the Lyman Alpha range of frequencies are called **Damped Lyman Alpha systems**.

Our Universe also has a very rich web like structure at very large scales, which is called the **Cosmic Web**. These webs can be visualized easily when seen from an extremely zoomed out view of our Universe. In reality, these webs are enormous distributions of Galaxies, arranged in a fashion which resembles a web on large scales, all due to the Physics that governs how matter attracts and evolves Gravitationally.

The eventual goal of this project, hence, is to find out what effect this Cosmic Web can have on the properties of Damped Lyman Alpha systems. Put differently – Can the cosmic web give us hints as to why the DLAs are populated peculiarly?

[1] The Large Scale Bias of Dark Matter Halos - Tinker et.al. {arXiv:1001.3162
[astro-ph.CO]}