Dwarf Galaxies: From the Deep Universe to the Present
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Galactic Ambient of Host Galaxies of GRBs

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Abstract. We studied a sample of 1672 galaxies in regions where a GRB event had occurred, in order to determine if the galactic environment plays a significant role on these energetic events. The Luminosity Function distribution for these galaxies shows some interesting features. For instance, there is a decline on the Luminosity Function at $M_r \sim -20.5$; a lack of flatness at $M_r \sim -14$ and higher-than-expected values of $\Phi(M_r)$ for $M_r < -22.5$. A comparison between our data and the Void, Wall and Early galaxies Luminosity Function was performed.

Keywords. GRBs, galactic environment, Luminosity Function.

1. Introduction

Studies of hosts galaxies properties showed that a high percentage of them corresponds to blue-dwarf galaxies with low metallicity. A previous work (Bernal (2017)) studied the color index and inverse concentration index (ICI) distribution of hosts galaxies and their vicinities. It was found that there are more red than blue galaxies and more early type than late type galaxies in the GRBs host vicinities. Furthermore, a comparison with void regions and wall galaxies from Hoyle *et al.* (2012) suggests that GRBs host galaxies regions are slightly different. In this work we explore the possible incidence of the galactic environment and propose the study of the galactic environment of host galaxies using the Luminosity Function to provide possible constraints on the progenitor and an opportunity to use these violent explosions to characterize the nature of the high redshift Universe.

2. Methodology

We calculate the Luminosity Function for the same sample of galaxies used in (Bernal 2017), i.e., 1672 galaxies from the SDSS DR12. In order to compute the magnitude M_r in the r-band of the SDSS we apply the method proposed in Lan *et al.* (2016) with cosmological parameters $\Omega_m = 0.26$ and $\Omega_\Lambda = 0.74$. Thus, we have got that $M_r = r - DM(z) - K(z)$, where r is the r-band magnitude, $DM(z)$ is the distance modulus at the redshift of the group and $K(z)$ is the K-correction of the galaxy.

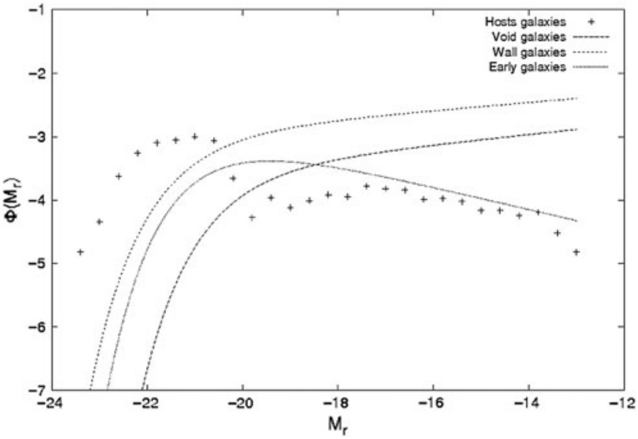

Figure 1. The data distribution of GRBS Hosts environment and the comparison with Void, Wall and selected Early galaxies from Moorman *et al.* (2015).

Furthermore, we made a comparison with the Luminosity Function of Void, Wall and selected Early galaxies in Moorman *et al.* (2015), who used the equation (Schechter function),

$$\Phi(M_r) = 0.4\phi ln(10)\{dex[0.4(M - M_r)(\alpha + 1)\}exp\{-dex[0.4(M - M_r)]\}, \qquad (2.1)$$

in order to fit the data. Finally, we fitted our data to the same function.

3. Results

The data distribution for the Luminosity Function calculated for GRBs Hosts Galaxies environment shows a significant slump at $M_r \sim -20.5$. For $M_r > -20$, a decline at $M_r \sim -14$ cuts the flat distribution. Furthermore, we note that the region delimited by $M_r < -22.5$ exhibits considerable values of $\Phi(M_r)$. The features showed by the data in Figure 1 did not allow us to fit properly the parameters ϕ, M and α to equation (2.2). Also, there is no apparent match between the void and wall curves and our data. Finally, the Early galaxies curve shows a good approximation to our data for values of $M_r > -20$.

4. Conclusion

We made a comparison between our data and the Void and Wall galaxies Luminosity Function and showed that neither a Void nor a Wall curve is a good approximation. Hence, we can say that GRBs Hosts vicinities show singular characteristics with respect to those environments.

We could not find a set of parameters that fit properly to the Schechter function (2.2). However, the Early galaxies curve exhibits a good approximation to the data, in agreement with color index and inverse concentration index Bernal (2017).

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