Long GRBs as tools to study galaxy evolution and star formation across the Universe

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Abstract

Gamma-ray bursts (GRBs) allow galaxies to be selected independently of their brightnesses and dust content at any wavelength. The association of Long GRBs (LGRBs) with the death of massive stars, makes this class of GRBs a tool to understand the evolution of star-formation and galaxies, complementary to current galaxy surveys, up to the highest redshifts. However, the progenitor star conditions necessary to produce LGRBs can affect the relation between the LGRB rate and star formation. In order to properly use LGRBs as an independent probe of galaxy and star formation evolution across the Universe, we must use complete samples of GRBs to determine the LGRB rate - SFR efficiency.

After an introduction on the current knowledge of LGRB host galaxy properties at high redshift, I will present the results of our study of the host galaxy properties of the Swift-BAT6 complete sample of LGRBs. Our results show that LGRBs are very powerful in selecting a population of faint low-mass star-forming galaxies, partly below the completeness limits of galaxy surveys. The LGRB rate - SFR efficiency seems to be strongly affected by metallicity, probably due to the conditions necessary for the progenitor star to produce a GRB. Under very basic assumption, we estimate that the LGRB rate can directly trace the SFR starting from $z \sim 4$. The use of the BAT6 complete sample makes these results not affected by possible biases which could have influenced past results based on incomplete samples.