Seventeenth Marcel Grossmann Meeting

Contribution ID: **481** Type: **Talk in a parallel session**

Paving the way for GRB cosmology with the Dainotti correlation

Friday, July 12, 2024 5:35 PM (25 minutes)

Despite decades of research, cosmology still lacks reliable probes to study the Universe in the intermediate redshift regime (from $z = 1$ up to $z = 1100$). Very few astronomical objects observed at such high distances can be standardized. We present the case of Gamma-Ray Bursts (GRBs, $z < 9.4$). For these sources, the observational luminosity distance can be derived using an empirical log-linear relation between the luminosity at the end of the plateau phase (L_a), rest-frame time at the end of the plateau (T_a^*), and peak luminosity (L_{peak}). This relation was first formulated by Dainotti et al. (2016) as:
$\log_{10} L_a = a \times \log_{10} T_a^* + b \times \log_{10} L_{peak} + c$.
Although this correlation has been shown to result from the intrinsic physics of the sources rather than observational effects, applying it to cosmological computations remains challenging. We still face the issue of pinpointing a coherent set of events. A reliable fitting method must properly account for selection bias and redshift evolution. We demonstrate that the raw data of the GRB sample is significantly affected by these effects and how to correct this data. Additionally, we present a circularity-free method for fitting the cosmological model based on a de-evolving procedure developed by Efron & Petrosian (1992). We discuss possible choices of probes with uniform properties, making them standardizable. Lastly, we present our results of fitting cosmological parameters and propose potential developments for the future.

Author: LENART, Aleksander (Astronomical Observatory, Jagiellonian University in Kraków)

Presenter: LENART, Aleksander (Astronomical Observatory, Jagiellonian University in Kraków)

Session Classification: Gamma ray bursts relationships in multi-wavenths as cosmological tools

Track Classification: Gamma-Ray Bursts (GB): Gamma ray bursts relationships in multi-wavenths as cosmological tools