GRB interstellar media studies: stepping to ATHENA era

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Gamma-ray bursts (GRBs) provide a bright, albeit transient, lightbeam from the distant universe. GRBs occur from low redshift to even at very high redshifts (e.g., z = 8.2). Imprinted on the power-law spectrum of their afterglow, they unveil the intergalactic medium along the line of sight and the interstellar medium (ISM) surrounding the GRB event within its host galaxy. The simple power-law spectrum and occurrence in star-forming regions (due to GRBs association with deaths of short-lived massive stars) make them excellent probes to study dust extinction curves in distant star-forming galaxies. The X-ray to optical/NIR spectral-energy distribution analysis of GRB afterglows not only give insight to the extinction curve but also reveal intrinsic host galaxy properties. The optical near-infrared spectrum of GRB is affected by dust and X-ray data although containing soft X-ray absorption (easily fitted and corrected plus providing the ISM total metal column density) is an excellent tool and important to infer the spectral slope of the afterglow. The Advanced Telescope for High ENergy Astrophysics (ATHENA) with a little broader X-ray wavelength range will provide a better handle on the future bursts spectral slope.