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GRB cosmology with other probes

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Cosmological models and their parameters are widely debated, especially about whether the current discrepancy between the values of the Hubble constant, H 0, obtained by Type Ia supernovae (SNe Ia) and the Planck data from the cosmic microwave background radiation could be alleviated when alternative cosmological models are considered. Thus, combining high-redshift probes, such as gamma-ray bursts (GRBs) and quasi-stellar objects (QSOs, or quasars), together with baryon acoustic oscillations and SNe Ia is important to assess the viability of these alternative models and whether they can cast further light on the Hubble tension. In this work, for GRBs, we use a three-dimensional relation between the peak prompt luminosity, the rest-frame time at the end of the X-ray plateau, and its corresponding luminosity in X-rays: the 3D Dainotti fundamental plane relation. Regarding QSOs, we use the Risaliti-Lusso relation among the UV and X-ray luminosities for a sample of 2421 sources. We correct both the QSO and GRB relations by accounting for selection and evolutionary effects with a reliable statistical method. We here use both the traditional Gaussian likelihoods (⊠⊠) and the new best-fit likelihoods (⊠⊠) to infer cosmological parameters of nonflat Lambda cold dark matter (ΛCDM) and flat wCDM models. We obtain for all the parameters reduced uncertainties, up to 35% for H 0, when applying the new ⊠⊠ likelihoods in place of the Gaussian ones. Our results remain consistent with a flat ΛCDM model, although with a shift of the dark energy parameter w toward w < -1 and a curvature density parameter toward Ω k < 0.

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