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Strong progenitor age bias in supernova cosmology and alignment with DESI BAO

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Supernova (SN) cosmology is based on the key assumption that the luminosity standardization process of type Ia SNe remains invariant with progenitor age. However, our comprehensive age measurements of 360 SN host galaxies reveal a significant (5.5 sigma) correlation between standardized SN luminosity and progenitor age, which is expected to introduce a serious systematic bias with redshift in SN cosmology. After correcting for this age bias with redshift, the SN dataset aligns more closely with the recent DESI BAO result, bringing the revised 'standard candle' (SNe) into concordance with the 'standard ruler' (BAO). When the three cosmological probes (SNe, BAO, CMB) are combined, we find a strong (> 7 sigma) tension with the LCDM model, suggesting a time-varying dark energy equation of state in a currently non-accelerating universe.

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