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Breaking the baryon-dark matter degeneracy in a model-independent way through the Sunyaev-Zeldovich effect

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We propose a model-independent Bézier parametric interpolation to alleviate the degeneracy between baryonic and dark matter abundances by means of intermediate-redshift data. To do so, we first interpolate the observational Hubble data to extract cosmic bounds over the (reduced) Hubble constant, h0, and interpolate the angular diameter distances, D(z), of the galaxy clusters, inferred from the Sunyaev-Zeldovich effect, constraining the spatial curvature, Ωk. Through the so-determined Hubble points and D(z), we interpolate uncorrelated data of baryonic acoustic oscillations bounding the baryon (ωb = h^2_0Ω_b) and total matter (ωm = h^2_0Ω_m) densities, reinforcing the constraints on h0 and Ωk with the same technique. Instead of pursuing the usual treatment to fix ωb via the value obtained from the cosmic microwave background to remove the matter sector degeneracy, we here interpolate the acoustic parameter from correlated baryonic acoustic oscillations. The results of our Monte Carlo–Markov chain simulations turn out to agree at 1–σ confidence level with the flat ΛCDM model. While our findings are roughly suitable at 1–σ with its non-flat extension too, the Hubble constant appears in tension up to the 2–σ confidence level. Accordingly, we also reanalyze the Hubble tension with our treatment and find our expectations slightly match local constraints.

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