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Observational signatures of dark energy and dark matter interactions

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We place observational constraints on two models within a class of scenarios featuring an elastic interaction between
dark energy and dark matter that only produces momentum exchange up to first order in cosmological perturbations. The first one corresponds to a perfect-fluid model of the dark components with an explicit interacting Lagrangian, where dark energy acts as a dark radiation at early times and behaves as a cosmological constant at late times. The second one is a dynamical dark energy model with a dark radiation component, where the momentum exchange covariantly modifies the conservation equations in the dark sector.
Using Cosmic Microwave Background (CMB), Baryon Acoustic
Oscillations (BAO), and Supernovae type Ia (SnIa) data, we show that the Hubble tension can be alleviated due to the additional radiation, while the σ_8 tension present in the Λ-cold-dark-matter model can be eased by the weaker galaxy clustering that occurs in these interacting models. Furthermore, we show that, while CMB+BAO+SnIa data put only upper bounds on the coupling strength, adding low-redshift data in the form of a constraint on the parameter S_8 strongly favours nonvanishing values of interaction parameters. Our findings are in line with other results in the literature that could signal a universal trend of the momentum exchange among the dark sector.

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