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Testing generalized logotropic models with cosmic growth

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We check the dynamical and observational features of four typologies of logotropic dark energy models, leading to a thermodynamic cosmic speed up fueled by a single fluid that unifies dark energy and dark matter. We first present two principal Anton-Schmidt fluids where the Gruneisen parameter is free to vary and then fixed to the special value We also investigate the pure logotropic model, corresponding to Finally, we propose a new logotropic paradigm that works as a generalized logotropic fluid, in which we split the role of dark matter and baryons. We demonstrate that the logotropic paradigms may present drawbacks in perturbations, showing a negative adiabatic sound speed which make perturbations unstable. We thus underline which model is favored over the rest. The Anton-Schmidt model with is ruled out while the generalized logotropic fluid seems to be the most suitable one, albeit weakly disfavored than the ΛCDM model. To fix numerical constraints, we combine low- and higher-redshift domains through experimental fits based on Monte Carlo Markov Chain procedures, taking into account the most recent Pantheon supernovae Ia catalogue, Hubble measurements and σ8 data points based on the linear growth function for the large scale structures. We also consider two model selection criteria to infer the statistical significance of the four models under exam. We conclude there is statistical advantage to handle the Anton-Schmidt fluid with the Gruneisen parameter free to vary and/or fixed to The generalized logotropic fluid indicates suitable results, statistically favored than the other models, until the sound speed is positive, becoming unstable in perturbations elsewhere. We emphasize that the ΛCDM paradigm works statistically better than any kinds of logotropic and generalized logotropic models, while the Chevallier-Polarski-Linder parametrization is statistically comparable with logotropic scenarios.

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