

New parameterization for unified dark matter and dark energy

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The equation of state for unified dark matter and dark energy

In general form, we can consider the following phenomenological function for the equation of state of unified dark fluid:

$$w(a) = w_0 + f(1 - e^{-w_1(a-1)}), \quad (1)$$

when function $f(a)$ is continuous and differentiable for all a . In a simple form, we propose $f(a) = \alpha a$ and then the following EOS parameter for unified dark matter and dark energy:

$$w = w_0 + \left(1 - \left(\frac{w_0 + \alpha}{\alpha}\right)^{1-a}\right).$$

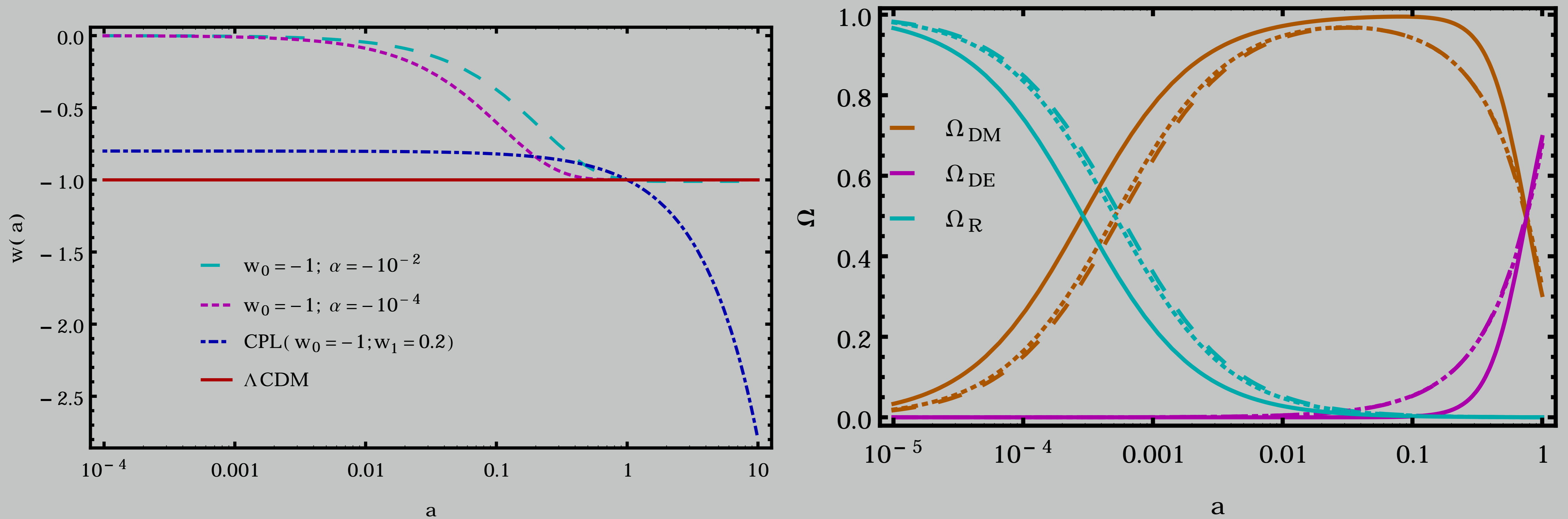


Figure 1: The evolution of the EoS parameter and the fractional energy density of cosmic components in terms of cosmic scale factor

We study this parameterization both on background expansion and perturbation scales. Using the cosmological data including those of S_nIa, CMB, BAO, Hubble rate, BBN and H_0 data in background level combined with growth rate data extracted from RSD experiments, we implement the MCMC analysis and constraints the cosmological parameters within this model and compare the results with that of the Λ CDM cosmology. Our model appears to be perfectly consistent with the Λ CDM model, while providing unification of DE and DM.