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N-body simulations of primordial dark matter halos

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In the standard Λ CDM model, bounded structures would not have formed until the late universe because of the following premises: gravity is the dominant force responsible for matter clustering, and primordial density perturbations follow a nearly scale-invariant spectrum at all scales. Still, it should not be like that in an alternative cosmology. We consider a light scalar field - which can be regarded as dynamical dark energy - and a beyond the SM fermion as our cold dark matter particle.

These two species are coupled to each other. If the strength of the coupling is strong enough, the system approaches an attractor solution in which their density parameters and that for radiation remain constant. This scaling solution induces such a rapid growth of the fermionic density perturbations that it quickly becomes nonlinear and may lead to the formation of primordial dark matter halos. To explore whether these structures form, we have modified AX-GADGET, a module of the N-body code P-GADGET3.

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