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On the impact of $f(R)$ gravity on the Large Scale Structure

We investigate the exponential $f(R)$ symmetric teleparallel gravitation, namely $f(R) = R + R_0(1 - \sqrt{-R/R_0})$ using ME-GADGET code to probe the structure formation with box sizes $L_{\text{box}} = 10/100 \text{ Mpc}/h$ and middle resolution $N^{1/3} = 512$. To reproduce viable cosmology within the aforementioned modified gravity theory, we first perform Markov Chain Monte Carlo (MCMC) sampling on OHD/BAO/Pantheon datasets and constrain a parameter space. Furthermore, we also derive theoretical values for deceleration parameter $q(z)$, statefinder pair $\{s, r\}$ and effective gravitational constant G_{eff} , perform $f(R)$ diagnostics. While carrying out N-body+SPH simulations, we derive CDM+baryons overdensity/temperature/mean molecular weight fields, matter power spectrum (both 2/3D, with/without redshift space distortions), bispectrum, two-point correlation function and halo mass function. Results for small and big simulation box sizes are therefore properly compared, halo mass function is related to the Seth-Tormen theoretical prediction and matter power spectrum to the standard CAMB output.

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