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Searching for dark matter isocurvature initial conditions with N-body Simulations

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Small fraction of isocurvature perturbations may exist and correlate with adiabatic perturbations in the primordial perturbations. Naively switching off isocurvature perturbations may lead to biased results. We study the effect of dark matter isocurvature on the structure formation through N-body simulations. From the best fit values, we run four sets of simulation with different initial conditions and different box sizes. We find that, if the fraction of dark matter isocurvature is small, we can not detect its signal through matter power spectrum and two point correlation function with large scale survey. However, the halo mass function can give an obvious signal. Compared to 5% difference on matter power spectrum, it can get 37% at $z = 3$ on halo mass function. This indicates that future high precise cluster count experiment can give stringent constraints on dark matter isocurvature perturbations.

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