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Project Title : Influences of the present accelerated expansion of the universe
on the large-scale structure
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Abstract

In this project, we investigate behaviors of cosmological perturbations in various models for the accelerating universe. We show that the density perturbations in Ricci dark energy model have an instability problem such that the magnitude of perturbations grows rapidly in time and quickly becomes unphysically large. This problem is not easy to be alleviated, especially when the perturbations in baryons are taken into account. We also study the three-form models for the accelerating universe, and find that three-form field has a quantum instability, called ghost, when matter appears in the universe. However, the three-form field can drive the accelerated expansion of the universe during inflation without a ghost. This means that three-form field can play a role of inflaton. Our further investigation shows that the reheating and preheating processes after inflation can occur properly when the three-form field is an inflaton. Finally, we study how the dynamics of dark energy can influence the non-linear matter power spectrum, and find that the peaks of baryon acoustic oscillation (BAO) in the non-linear matter power spectrum can be significantly shifted when the energy fraction of the dark energy during matter dominated era is larger than one percent.

Keywords: cosmology, cosmological perturbation theory, Ricci dark energy, three-form dark energy, three-form inflation, baryon acoustic oscillation

