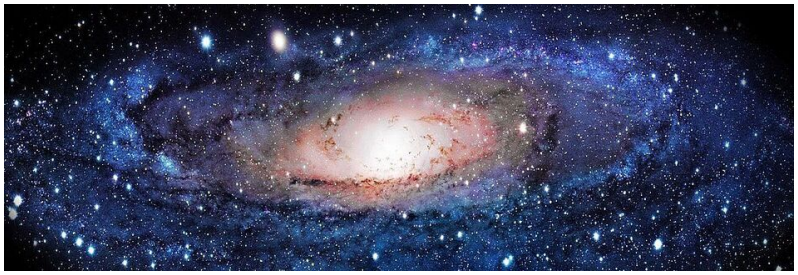

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Confronting the Chaplygin gas with data: background and perturbed cosmic dynamics

In this work, we undertake a unified study of background dynamics and cosmological perturbations in the presence of the Chaplygin gas. This is done by first constraining the background cosmological parameters of different Chaplygin gas models with SNIa data, and then feeding these observationally constrained parameters in the analysis of cosmological perturbations. Based on the statistical criteria we followed, none of the models has a substantial observational support but we show that the so-called 'original'and 'generalized' Chaplygin gas models have some observational support and less observational support, respectively, whereas the 'modified'and 'modified generalized'Chaplygin gas models miss out on the less observational support category but cannot be ruled out. The so-called 'generalized cosmic Chaplygin gas'model, on the other hand, falls under the no observational support category of the statistical criterion and can be ruled out. We follow the 1 + 3 covariant formalism of perturbation theory and derive the evolution equations of the fluctuations in the matter density contrast of the matter-Chaplygin gas system for the models with some or less statistical support. The solutions to these coupled systems of equations are then computed in both short-wavelength and long-wavelength modes.

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