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Interacting dark sector: mapping fields and fluids, and observational signatures

Monday, 5 July 2021 17:39 (20 minutes)

In this talk, I will discuss a cosmological model with dark energy – dark matter interaction. Demanding that the interaction strength Q_ν in the dark sector must have a field theory description, a unique form of interaction strength can be obtained. I will show the equivalence between the fields and fluids for the $f(R, \chi)$ model where f is an arbitrary, smooth function of R and classical scalar field χ , which represents dark matter. Up to first order in perturbations, there is a one-to-one mapping between the classical field theory description and the phenomenological fluid description of interacting dark energy and dark matter, which exists only for this unique form of interaction. Different formulations of interacting dark energy models in the literature can be classified into two categories based on the field-theoretic description. Then I will discuss the quantifying tools to distinguish between the interacting and non-interacting dark sector scenarios. I will focus on the variation of the scalar metric perturbed quantities as a function of redshift related to structure formation, weak gravitational lensing, and the integrated Sachs-Wolfe effect and show that the difference in the evolution becomes significant for lower redshifts ($z < 20$), for all length scales. (Based on arXiv: 2006.04618)

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