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Cosmography as a tool to discriminate between modified gravity and dark energy

Wednesday 25 September 2019 09:00 (45 minutes)

Cosmography can be considered as a sort of a model-independent approach to tackle the dark energy/modified gravity problem. In this talk, the success and the shortcomings of the ΛCDM model, based on General Relativity and standard model of particles, are discussed in view of the most recent observational constraints. The motivations for considering extensions and modifications of General Relativity are taken into account, with particular attention to $f(R)$ and $f(T)$ theories of gravity where dynamics is represented by curvature or torsion field respectively. The features of $f(R)$ models are explored in metric and Palatini formalisms.
Cosmological dynamics of $f(R)$ models is investigated through the corresponding viability criteria. Afterwards, the equivalent formulation of General Relativity (Teleparallel Equivalent General Relativity) in terms of torsion and its extension to $f(T)$ gravity is considered.
Finally, the cosmographic method is adopted to break the degeneracy among dark energy models. A novel approach, built upon rational Pad\'e and Chebyshev polynomials, is proposed to overcome limits of standard cosmography based on Taylor expansion. The approach provides accurate model-independent approximations of the Hubble flow. Numerical analyses are presented to bound coefficients of the cosmographic series. These techniques are thus applied to reconstruct $f(R)$ and $f(T)$ functions and to frame the late-time expansion history of the universe with no \emph{a priori} assumptions on its equation of state. A comparison between the ΛCDM cosmological model with $f(R)$ and $f(T)$ models is reported.

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