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Is cosmography a useful tool for testing cosmology?

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Model-independent methods in cosmology have become an essential tool in order to deal with an increasing number of theoretical alternatives for explaining the late-time acceleration of the Universe. In principle, this provides a way of testing the Cosmological Concordance (or LambdaCDM) model under different assumptions and ruling out whole classes of competing theories. One such model-independent method is the so-called cosmographic approach, which relies only on the homogeneity
and isotropy of the Universe on large scales. We show that this method suffers from many short-comings, providing biased results depending on the auxiliary variable used in the series expansion and is unable to rule out models or adequately reconstruct theories with higher-order derivatives in either the gravitational or matter sector. Consequently, in its present form, this method seems unable to provide reliable or useful results for cosmological applications.

Summary

I will review various approaches to cosmological modelling in f(R) theories of gravity, using both top-down and bottom-up constructions. The top-down models are based on Robertson-Walker geometries and employ techniques such as Dynamical Systems methods and the reconstruction of the gravitational action from the expansion history of the Universe. The bottom-up constructions are built by patching together sub-horizon-sized regions of perturbed Minkowski space. The results obtained suggest that these theories do not provide a theoretically attractive alternative to the standard Concordance model of cosmology.

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Primary author: DUNSBY, Peter (University of Cape Town)

Presenter: DUNSBY, Peter (University of Cape Town)

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