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Baryon Acoustic Oscillations: difficulties, assumptions and a new promising cosmological standard ruler for the Euclid galaxy survey

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Baryon Acoustic Oscillations (BAO) are one of the most useful and used cosmological probes to measure cosmological distances independently of the underlying background cosmology. However, in the current measurements, the inference is done using a theoretical clustering correlation function template where the cosmological and the non-linear damping parameters are kept fixed to fiducial LCDM values. How can we then claim that the measured distances are model-independent and so useful to select cosmological models? Motivated by this compelling question we introduce a rigorous tool to measure cosmological distances without assuming a specific background cosmology: the "Purely-Geometric-BAO". I will explain how to practically implement this tool with clustering data. This allows us to quantify the effects of some of the standard measurements' assumptions.
However, the inference is still plagued by the ambiguity of choosing a specific correlation function template to measure cosmological distances. We address this issue by introducing a new approach to the problem that leverages a novel BAO cosmological standard ruler: the "Linear Point". Its standard ruler properties allow us to estimate cosmological distances without the need of modeling the poorly-known late-time nonlinear corrections to the linear correlation function. Last but not least, it also provides smaller statistical uncertainties with respect to the correlation function template fit. All these features make the Linear Point a promising candidate to properly measure cosmic distances with the upcoming Euclid galaxy survey.

In-person participation

Yes

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