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Evading non-linearities: Baryon Acoustic Oscillations at the linear point

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Cosmology has made fundamental progress thanks to the role of standard rulers. The acoustic peak in the Large Scale Structure clustering correlation function is one of them. However, in the era of precision cosmology, its power has been highly challenged by how late time non-linearities distort the correlation function. Fortunately this is not the end of the story! I will explain how we can evade non-linearities identifying a scale in the correlation function, called the “linear point”, that is an excellent cosmological standard ruler: its position is insensitive to non-linear gravity, redshift space distortions, and scale-dependent bias at the 0.5% level; it is geometrical, i.e. independent of the power spectrum of the primordial density fluctuation parameters. Moreover, the linear point increases its appeal as it is easily identified irrespectively of how non-linearities distort the correlation function. Equally relevant, the correlation function amplitude at the linear point is similarly insensitive to non-linear corrections to within a few percent. Therefore, exploiting the particular Baryon features in the correlation function, we propose three new estimators for growth measurements. We perform a preliminary test in current data finding encouraging results and motivating more careful future investigations.

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