

# Evolution of the inhomogeneous universe: From Inflation to structure formation

Contribution ID: 18

Type: **not specified**

## Non-linear treatment of cosmological perturbations

*Friday, November 8, 2024 11:20 AM (20 minutes)*

Linear-perturbation theory has proven to be an extremely powerful tool to compare inflationary models with observational data. Recently, the newcoming high-precision observations call for predictions beyond linear perturbations. Such effects are known to be relevant for example in the production of primordial black holes or scalar-induced gravitational waves. The separate-universe approach proposes to capture some of these non-linearities. It describes the universe as a set of causally disconnected homogeneous and isotropic patches (FLRW). In this talk, I will show that by allowing the patches to exhibit constant curvature, the separate-universe approach can be extended to non-slow-roll models. I will discuss the case of ultra-slow roll where this new approach allows to correctly predict the power spectrum of scalar perturbations together with non-Gaussianities.

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**Session Classification:** Parallel Session-Inflation and EU