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Near field cosmology with constrained simulations: an overview

Thursday, 15 June 2023 12:00 (30 minutes)

Numerical simulations are the driving force behind much of the theoretical progress in our understanding of the formation of structure in the universe. Cosmological simulations must cover a large dynamical and mass range. A representative volume of the universe should be large, but this comes at the expense of the resolution. To overcome this problem we developed a new approach over the last two decades which consists of using observations of the nearby universe as constraints imposed on the initial conditions of the simulations.

The resulting constrained simulations successfully reproduce the observed structure within a few tens of megaparsecs around the Milky Way including the nearby well known clusters of galaxies. We have performed first constrained simulations within the CLUES project (Constrained Local UniversE simulations). More recently zoomed high resolution gasdynamical simulations allowed to study the formation of the Local Group in the right large scale environment, the HESTIA (High-resolution Environmental Simulations of The Immediate Area) project.

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