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Homogeneous and Inhomogeneous full-GR cosmological dynamics

Friday, 14 June 2019 15:30 (50 minutes)

In this talk I will first describe results from cosmological simulations in the nonlinear post-Friedman approximation, a kind of post-Newtonian formalism for cosmology, showing how gravito-magnetic effects are produced by structure formation. Then I will focus on recent fully nonlinear numerical relativity simulations representing the evolution of initial perturbations in a Einstein de Sitter background. Main results are: 1) back-reaction effects on the overall expansion of the model are very small; 2) voids expansion rate is significantly higher than that of the background; 3) over-densities can reach turn-around later than predicted by the standard top-hat model. I will end the talk with some more speculative work on homogenous Bianchi IX models that can be taken to represent the most general spatial average of the universe: using a nonlinear equations of state and anisotropic stress we show that Einstein equations admit bouncing (nonsingular) solutions where the typical Bianchi IX chaos and anisotropies are suppressed. In this scenario, therefore, the isotropic universe in which we live is the results of the dynamics. To establish the significance of these results is the goal of future work.

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