Contribution ID: **153**   Type: **not specified**

General relativistic corrections in N-body simulations – The N-body gauge

Wednesday 9 September 2015 11:10 (20 minutes)

We discuss different gauge choices and their advantages in the context of N-body simulations. The initial conditions for N-body simulations are usually generated by employing the Zel'dovich approximation. We show that the initial displacements generated in this way generally receive a first-order relativistic correction.
We identify a novel gauge, called N-body gauge in the following, in which this relativistic correction is absent. Therefore the Zel'dovich approximation provides accurate initial conditions in the N-body gauge.
Furthermore we show that a conventional Newtonian N-body simulation includes all first-order relativistic contributions in the absence of pressure perturbations and anisotropic stresses if we identify the coordinates in Newtonian simulations with those in the N-body gauge.
We therefore conclude that the N-body gauge is uniquely suited for N-body simulations. When setting the initial conditions using the Zel'dovich approximation and running a conventional Newtonian N-body simulation the results include all linear relativistic effects if the output is understood in terms of the N-body gauge. In addition we analyse the limitations of the N-body gauge due to pressure perturbations and anisotropic stresses from residual radiation or a non standart cosmology.

Presenter: FIDLER, Christian (CP3 , Belgium)

Session Classification: CMB, LSS and cosmological parameters