[구CD-03] Measuring the matter energy density and Hubble parameter from Large Scale Structure

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We investigate the method to measure both the present value of the matter energy density contrast and the Hubble parameter directly from the measurement of the linear growth rate which is obtained from the large scale structure of the Universe. From this method, one can obtain the value of the nuisance cosmological parameter $\Omo$ (the present value of the matter energy density contrast) within 3% error if the growth rate measurement can be reached $z >3.5$. One can also investigate the evolution of the Hubble parameter without any prior on the value of H_0 (the current value of the Hubble parameter). Especially, estimating the Hubble parameter are insensitive to the errors on the measurement of the normalized growth rate $f \sigma_8$. However, this method requires the high z ($z >3.5$) measurement of the growth rate in order to get the less than 5% errors on the measurements of $H(z)$ at $z \leq 1.2$ with the redshift bin $\Delta z = 0.2$. Thus, this will be suitable for the next generation large scale structure galaxy surveys like WFMOS and LSST.

[구CD-04] Effects of the Initial Conditions on Cosmological N-body Simulations

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Cosmology is entering an era of percent precision with large surveys, demanding accurate simulations. In this paper, we aim to study the effects of initial conditions on the results of cosmological simulations, which will help us to make percent-level accuracy simulations. For this purpose, we use a series of cosmological N-body simulations with varying initial conditions. We test the influence of the initial conditions, namely the pre-initial configuration (preIC), the order of the perturbation theory, and the initial redshift, on the statistics associated with the large scale structures of the universe such as the halo mass function, the density power spectrum, and the maximal extent of the large scale structures. We find that glass or grid pre-initial conditions give similar results. However, the order of the Lagrangian perturbation theory used to generate the initial conditions and the starting epoch of the simulations play a crucial role, especially at high redshift ($z \sim 2$—4). The initial conditions have to be chosen with care, taking into account the specificity of the simulation.