Lyman-Alpha forest. Adopting a particle-based implementation, we follow the evolution of gas, dark matter (cold and warm), massive neutrinos, and dark radiation, and consider several combinations of box sizes and number of particles. Noticeably, for the first time, we simulate extended mixed scenarios describing the combined effects of warm dark matter, neutrinos, and dark radiation, modeled consistently by taking into account the neutrino mass splitting. Along the way, I will also highlight some new results focused on the matter and flux statistics.

[구 CD-03] Star formation beyond z=0 and its role in the multiverse

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The cosmological constant is accountable for the accelerated expansion of our Universe.

Observational data have provided a tight constraint on the cosmic star formation history from z = 8 to the present. What happens to the star formation rate beyond z=0?

I will discuss the star formation rates, along with the properties of the intergalactic mediumfrom our suite of simulations into the future. Since Lambda becomes dominant in the future of our universe, I further simulate counter-factual universes to assign anthropic weights to each universe within the multiverse setting.

I will argue that using the asymptotic star formation efficiency as weights, we almost double previous estimates of observers living in universes similar to ours. The expected value of the energy density of Lambda is also closer to the observed value. I will also discuss potential future works to improve the applicability of the anthropic reasoning of the cosmological constant.

[구 CD-04] [발표취소]

[구 CD-05] Identification of Cosmic Voids as Massive Cluster Counterparts

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We present a new void definition that connects voids with clusters, the high-density counterpart. We use a pair of ΛCDM simulations whose initial density fields are sign inverted versions to each other, and study the relation between the effective void volume and the corresponding cluster mass. Massive cluster halos $(M \geq 10^{13} M_{\odot}/h)$ are identified in one simulation at z=0 by linking dark matter particles. The corresponding void to each cluster is defined in the other simulation as the region occupied by the member particles of the cluster. We find a universal functional form of density profiles at z=0 and 1. We also find a power-law relation between the void effective radius and the corresponding cluster mass. Based on these findings, we identify cluster-counterpart voids directly from a density field without using the pair information by utilizing three parameters such as the smoothing scale, density threshold, and minimum core fraction. We identified voids corresponding to clusters more massive than $M \geq 3 \times 10^{14} M_{\odot}/h$ at approximately 70-74 \% level of completeness and reliability. Our results suggest that we can detect voids comparable to clusters of a particular mass-scale.

[구 CD-06] Model-independent test of gravity

Benjamin L'Huillier
Yonsei University

Using redshift-space distortion, I reconstruct the growth history as a smooth function using model independent methods. Assuming general relativity, I obtain the expansion history independently of the dark energy model, and test it to the supernovae data. The results are consistent with general relativity as gravity and the cosmological constant as dark energy, although interestingly negative dark energy densities are not ruled out by the data at z~0.7 to 1.

[구 CD-07] Model-independent Constraints on Type Ia Supernova Light-curve Hyperparameters and Reconstructions of the Expansion History of the Universe

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We reconstruct the expansion history of the universe using type Ia supernovae (SN Ia) in a manner independent of any cosmological model assumptions. To do so, we implement a nonparametric iterative smoothing method on the Joint Light-curve Analysis (JLA) data while