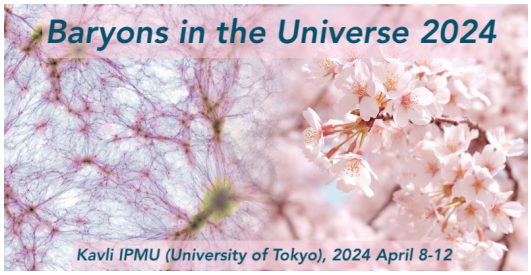

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Simulating Sunyaev-Zel'dovich Effects with Baryon Pasting

Tuesday, 9 April 2024 11:20 (20 minutes)

"The inverse Compton scattering of cosmic microwave background (CMB) photons with hot cosmic gas induces spectral distortions of CMB. This effect leads to the secondary anisotropy of CMB temperature and is referred to as the Sunyaev-Zel'dovich (SZ) effect. The SZ effect is a sensitive probe into the cosmic gas distribution and has been employed to constrain cosmological models and address cluster astrophysics. For the statistical analysis of measurements of SZ effects, mock simulations are employed to estimate the covariance matrix of the SZ statistics and evaluate the systematic uncertainties. However, simulations of cosmic gas evolution is computationally expensive, and thus, fast generation of mock SZ observations is critical for the statistical analysis.
We present a fast methodology ""Baryon Pasting"" to produce mock observations of the SZ effects based on the dark matter only N-body simulations coupled with the analytic intracluster medium model. As validation of our methods, we have produced 108 all-sky maps. Our method can produce a mock map within a few hours, even for all-sky coverage with a parallel computational environment. The power spectra measured from mock SZ maps are consistent with the halo model prediction. We also discuss the ongoing project to create a suite of mock multi-wavelength observations, including SZ effects, with supercomputer Fugaku."

Presenter: OSATO, Ken