



Contribution ID: 185

Type: **Talk**

Void spin distribution as a powerful probe of σ_8

Monday 8 September 2025 17:30 (30 minutes)

We present a numerical proof of the concept that the void spin distributions can provide a tight constraint on σ_8 without being severely deteriorated by the degeneracies of σ_8 with $\Omega_{\text{cdm}} h^2$, M_ν and w . Applying the Void-Finder algorithm to AbacusSummit N-body simulations of 15 different cosmological models, we identify the voids and measure the magnitudes of rescaled specific angular momenta of void halos as their spins. We determine the probability density distribution of void spins for each model and for the first time find it to be well approximated by the generalized Gamma distribution. It turns out that the best-fit values exhibit very sensitive dependence only on σ_8 . This exclusive σ_8 -dependence of the void spin distributions is confirmed to be robust against the variation of the mass and number cuts of void halos. We also test an observational feasibility of estimating the void spins from real data on the galaxy redshifts.

References

Kang, G. and Lee, J., “Void spin distribution as a powerful probe of σ_8 ”, Journal of Cosmology and Astroparticle Physics, vol. 2025, no. 6, Art. no. 011, IOP, 2025. doi:10.1088/1475-7516/2025/06/011.

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Session Classification: Afternoon session

Track Classification: Probes of the Universe from measurements - CMB, LSS, and BH of any mass