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Exploring the effects of primordial non-Gaussianity at galactic scales

Thursday, 4 May 2023 14:00 (20 minutes)

In this talk, I will show you my investigation of the effect of significant small-scale primordial non-Gaussianity on structure formation and the galaxy formation process. Specifically, we explored four different types of non-Gaussianities: positive and negative skewness and kurtosis. Generically, we find a distinct and potentially detectable feature in the matter power spectrum around the non-linear scale. The feature might have interesting consequences for the S_8 tension. We then show in particular that a positively skewed distribution with f_{NL} of the order of 1000 at these scales, implies that typical galaxy-sized halos reach half of their present-day mass at an earlier stage and have a quieter merging history at $z < 3$ than in the Gaussian case. Their environment between 0.5 and 4 virial radii at $z = 0$ is less dense than in the Gaussian case. This quieter history and less dense environment has potentially interesting consequences in terms of the formation of bulges and bars. Moreover, we show that the two most massive subhalos around their host tend to display an interesting anti-correlation of velocities, indicative of kinematic coherence. All these hints will need to be statistically confirmed in larger-box simulations with scale-dependent non-Gaussian initial conditions, followed by hydrodynamical zoom-in simulations to explore the detailed consequences of small-scale non-Gaussianities on galaxy formation.

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