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A Non-Gaussian Universe?

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Modifying the unconstrained small-scale initial conditions of the Universe could be a game changer for our understanding of cosmic structure formation and address challenges in small-scale galaxy formation. In this talk, I will present you my investigations of the effects of significant small-scale primordial non-Gaussianity (PNG). I have found that such PNGs introduce a distinct and potentially detectable feature in the matter power spectrum around the non-linear scale. This feature is promising to solve the S8 tension, which would then be a smoking gun of non-trivial inflationary physics. I will also demonstrate you that PNGs result in typical galaxy-sized halos reaching half of their present-day mass earlier and experiencing a quieter merging history for z<3 compared to the Gaussian case. At z=0, their environment between 0.5 to 4 virial radii, is less dense than in the Gaussian scenario, potentially affecting the universality of the NFW profile. This quieter merging history and less dense environment could have significant implications for the formation of bulges and bars in galaxies.Based on hydrodynamical simulations that I conducted, I will show that with all feedback prescriptions eing otherwise identical, simulations with a positively skewed distribution form galaxies slightly later than in the standard ΛCDM model and lead to simulated galaxies with more disky kinematics than in the standard case. Thus, such small-scale PNG could potentially help alleviate simultaneous tensions in cosmology and galaxy formation.

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Classification de Session: Présentations