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Bimodal distributions in the stochastic-δN formalism with the inflaton and the curvaton

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The stochastic formalism is an effective theory of long-wavelength modes that incorporates probabilistic noise from short-wavelength modes as they exit the horizon. This is expected to have non-perturbative properties, particularly useful in the context of primordial black hole (PBH) formation. Indeed, PBHs are formed from large perturbations exceeding a threshold when they re-enter the horizon.

In this presentation, I will review the stochastic delta-N formalism allowing us to calculate curvature perturbations and demonstrate the application of this formalism to the case with the presence of a curvaton. I will demonstrate bimodal distributions of curvature perturbations, whose peaks correspond to each reheating scenario of the curvaton since the stochastic delta-N formalism is supposed to behave non-perturbative and distributions have certain width. Finally, the possibilities of PBH formation in this scenario will be mentioned.

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