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Constraints on preinflation fluctuations in a nearly flat open Λ_{CDM} cosmology

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Summary

We analyze constraints on parameters characterizing the pre-inflating universe in an open inflation model with a present slightly open Λ_{CDM} universe. We employ an analytic model to show that for a broad class of inflation-generating effective potentials, the simple requirement that some fraction of the observed dipole moment represents a pre-inflation isocurvature fluctuation allows one to set upper and lower limits on the magnitude and wavelength scale of preinflation fluctuations in the inflaton field, and the curvature of the preinflation universe, as a function of the fraction of the total initial energy density in the inflaton field as inflation begins. We estimate that if the preinflation contribution to the current Cosmic Microwave Background (CMB) dipole is near the upper limit set by the Planck Collaboration then the current constraints on Λ_{CDM} cosmological parameters allow for the possibility of a significantly open $\Omega_i < 0.4$ preinflating universe for a broad range of the fraction of the total energy in the inflaton field at the onset of inflation. This limit to Ω_i is even smaller if a larger dark-flow tilt is allowed.

Primary author: Dr NGUYEN, Lan (Hanoi National University of Education)

Presenter: Dr NGUYEN, Lan (Hanoi National University of Education)

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