

A Step in Flux to Suppress Axion Isocurvature

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The QCD axion is one of the most compelling dark matter candidates, but faces a stringent isocurvature constraint, which requires a relatively low Hubble scale during inflation. If the axion was heavier than the Hubble scale during inflation, its isocurvature is suppressed and the constraint significantly relaxes. We point out a novel mechanism for achieving this, relying on the topological nature of a monodromy mass for the axion. Such a mass term has an integer coefficient, so it could naturally have been very large during inflation and exactly zero by the time of the QCD phase transition. This integer can be viewed as a quantized flux, which is discharged in a first-order phase transition that proceeds by the nucleation of charged branes. We provide a detailed case study of the scenario in which the tunneling event occurs during inflation.

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