

Abstract Submitted  
for the APR15 Meeting of  
The American Physical Society

**General Study of Perturbations in Bouncing and Cyclic Models**

RILEY MAYES, TIRTHABIR BISWAS, COLLEEN LATTYAK, Loyola University New Orleans — Perturbations are important in both understanding and evaluating the importance of bounces and turnarounds in models that predict a cyclic evolution of our Universe. Moreover, tracking these perturbations through the entirety of the cycle is important as it provides an outlet for a qualitative comparison with Cosmic Microwave Background (CMB) observations. However, tracking these perturbations through each cycle proves difficult as the physics to describe bounces and turnarounds is not well established. Therefore, we first studied general analytical and numerical techniques in order to understand the evolution of fluctuations in simple cosmological models where physics is better understood. In our research, we first developed analytical techniques from background solutions to establish a solid foundation for describing super-Hubble fluctuations in our early Universe. These analytical solutions were developed for both bounces and turnarounds allowing us to numerically verify and then further investigate the consequences of these solutions in models such as bounce inflation and cyclic inflation.

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Date submitted: 04 Jan 2015

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