PrimordialPy: a Python library for computing primordial power spectrum and PBHs abundances in single-field inflation

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Abstract

PrimordialPy is an open-source scientific library developed in Python for the study of single-field inflationary models. Cosmic inflation stands as one of the leading paradigms of modern cosmology, making its analysis essential for understanding the fundamental aspects of the early universe. PrimordialPy is designed to facilitate numerical computations of the inflaton dynamics, primordial perturbations, the primordial power spectrum, and the abundance of primordial black holes in an efficient, modular, and accessible way. The user is free to implement any single-field inflation model with a canonical kinetic term by defining the inflaton field ϕ and the corresponding model parameters. The source code of the project is available at GitHub.

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1 Introduction

La inflación cósmica se ha convertido en la piedra angular y el esquema teórico lider para explorar la física del universo temprano, proporcionando una teoría solida sobre el origen y evolución de las perturbaciones primordiales y de la formación de estructra a gran escala. De acuerdo con esta teoría, el universo sufrió una expansión acelerada en una época muy temprana,

2 Physics of single-field inflation

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$$H = \sum_{j=1}^{N} \Big[J(S_j^x S_{j+1}^x + S_j^y S_{j+1}^y + \Delta S_j^z S_{j+1}^z) - h S_j^z \Big]. \tag{1}$$

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References

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[2] P. Ginsparg, *It was twenty years ago today ...*, http://arxiv.org/abs/1108.2700.