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Type : **Poster**

Lattice simulations of alpha-attractor inflation: numerical sensitivity and model comparisons

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Inflation is a proposed period of accelerated expansion in the early universe, providing a mechanism for generating the primordial fluctuations that seeded cosmic structure. Many inflationary models are able to match the large-scale observations of the CMB and LSS, whilst differing in their dynamics and small-scale characteristics. Nonlinear effects could provide additional information about inflationary dynamics, motivating methods that retain nonlinear field evolution such as lattice simulations. For the theoretically well-motivated slow-roll α -attractor models, however, the nonlinear corrections are expected to be small, making their numerical resolution challenging. We used InflationEasy to study E/T-model α -attractor inflation, testing whether a lattice framework could resolve departures from linear theory and differences between these models, after accounting for numerical sensitivity.

Our pipeline was validated against a published ultra-slow-roll benchmark. A numerical sensitivity study, varying spatial resolution, box size and integration parameters, identified restricted wavenumber ranges with 1% – 5% numerical sensitivity in the curvature and post-inflationary scalar-induced GW spectra. A comparison of the E-model lattice results with a homogeneous-background evolution found no numerically resolved backreaction, while curvature power spectra agreed with linear theory within numerical sensitivity. A model normalisation test showed that replacing a common leading-order normalisation with model-specific normalisations reduced the observed differences in E/T-model results below numerical sensitivity.

These results demonstrate the difficulty of resolving nonlinearity and differences between models for highly perturbative slow-roll inflationary models, and highlight the importance of numerical control and consistent model normalisation when interpreting small differences between inflationary predictions.

Did you give a contributed talk at CASCA 2026?

No

If you are selected for a poster, would you be interested in giving a short flash talk on your work?

Yes

What is your career level?

Undergraduate

Which keyword describes the area of focus of this talk?

Cosmology

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