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Reconstructing the inflaton's speed of sound using Cosmological data

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Observations of Planck's CMB favours a canonical slow-roll single-field scenario for inflation. However, simple multi-field extensions can also explain the current data, and on top some of the existing anomalies not accounted for by the canonical scenario. We present our search for multi-field-motivated extra degrees of freedom in the context of an effective single field theory with a varying speed of sound ⌧ of the adiabatic mode. Transient reductions in ⌧ produce deviations (or "features") in the primordial power spectrum of scalar perturbations. Features of sufficient intensity may be observed in the CMB angular power spectrum (T and E), and in the power spectrum of galaxy clustering and weak lensing. Moreover, our theory predicts also correlated features in higher-order correlators (e.g. the bispectrum). We present a standard methodology based on Gaussian Processes for general Bayesian reconstruction of primordial dynamics that imprint primordial features, accounting for theoretical priors in a natural way, and show some results when we reconstruct the reduction of the speed of sound using cosmological data.

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