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Curvature Perturbations and non-Gaussianities from Waterfall Phase Transition during Inflation

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We consider a variant of hybrid inflation where the waterfall phase transition happens during inflation. By adjusting the parameters associated with the mass of the waterfall field, we arrange that the phase transition is not sharp so inflation can proceed for an extended period after the waterfall phase transition. We show that one can work in the limit where the quantum back-reactions are subdominant compared to the classical back-reactions. It is shown that significant amount of large scale curvature perturbations are induced from the entropy perturbations. The curvature perturbations spectral index runs from a blue spectrum to a red spectrum depending on whether the mode of interest leaves the horizon before the phase transition or after the phase transition. This can have interesting observational consequences on CMB. The non-Gaussianity parameter f_{NL} is calculated to be $\lesssim 1$ but much bigger than the slow-roll parameters.

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