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Ultraslow-roll inflation on the lattice: backreaction and nonlinear effects

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Violating the slow-roll regime in the final stages of inflation can significantly enhance curvature perturbations, a scenario often invoked in models producing primordial black holes and small-scale scalar-induced gravitational waves. In this regime, tree-level computations may become insufficient, and nonlinear corrections can play a crucial role. In this talk, I will discuss how lattice simulations can assess the impact of nonlinear effects, both on backreaction to the background and the evolution of nonlinear curvature perturbations. Our systematic study of various USR potentials on the lattice shows that nonlinear corrections are significant in the parameter space relevant for PBH and GW production. These findings demonstrate the need to go beyond leading-order perturbation theory to make robust predictions for inflation models featuring a USR phase.

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