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Minimal Warm Inflation with the heavy QCD axion

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Slow-roll inflation is a successful paradigm. However, even small couplings of the inflaton to other light fields can dramatically alter the dynamics and predictions of inflation. As an example, the inflaton can generically have an axion-like coupling to gauge bosons. Even relatively small couplings will automatically induce a thermal bath during inflation. The thermal friction from this bath can easily be stronger than Hubble friction, altering the usual predictions of any particular inflaton potential. Thermal effects suppress the tensor-to-scalar ratio, r, significantly, and predict unique non-gaussianities. This axion-like coupling provides a minimal model of warm inflation which avoids the usual problem of thermal back-reaction on the inflaton potential. I will discuss a realization of these dynamics in which a heavy QCD axion takes the role of the minimal warm inflaton, and QCD gluons in their unconfined phase comprise the thermal bath, introducing the first model of warm inflation in which the thermal friction emerges directly form coupling the inflaton to Standard Model particles. Exploring hybrid warm inflation as specific example that can fit the current cosmological data, I will show that future collider and beam dump experiments have discovery potential for a heavy QCD axion compatible with the minimal warm inflaton.

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