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Constraining multifield inflation and supersymmetry breaking in no-scale supergravity

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Since the building-blocks of supersymmetric models include chiral superfields containing pairs of effective scalar fields, a multifield approach is particularly appropriate for models of inflation based on supergravity. We discuss two-field effects in no-scale supergravity models motivated by string compactifications, and show how they can alter the model predictions for the scalar spectral index n_s and the tensor-to-scalar ratio r. In particular, we show that no-scale models naturally yield Planck-friendly results, in the form of an effective Starobinsky potential for the inflaton, or through a reduction of r to very small values, $r \ll 0.1$, due to an enhancement of the scalar power spectrum, in chaotic models with a quadratic potential.

We also discuss phenomenological aspects of our no-scale models, which exhibit a variety of possible patterns of soft supersymmetry breaking, including examples of the pure no-scale type $m_0 = B_0 = A_0 = 0$, of the CMSSM type with universal A_0 and $m_0 \neq 0$ at a high scale, and of the mSUGRA type with $A_0 = B_0 + m_0$ boundary conditions at the high input scale. We finally discuss inflaton decays and reheating bounds on inflation, including scenarios where the inflaton possesses direct Yukawa couplings to MSSM fields, where the inflaton decays via gravitational-strength interactions, and in the presence of a non-trivial gauge kinetic function.

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