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Sub-Planckian ☒^2 Inflation with an R^2 term in the Palatini formalism

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We discuss a model of inflation with a minimal Image potential. There are two main problems with conventional Image chaotic inflation: the tensor to scalar ratio is generally unacceptably large, and it requires a super-Planckian inflaton field in order to inflate. It has been shown recently that a minimal Image inflation model with an Image term in the context of Palatini gravity is able to solve the problem of a large tensor to scalar ratio while maintaining the successful prediction of the scalar spectral index. In this work we seek to answer the following questions: can the inflaton in this model remain sub-Planckian and remain consistent for Planck-suppressed potential corrections, and can this model produce a viable post-inflation cosmology? We show that for large enough values of the dimensionless coupling alpha on the Image term, it is possible for the relevant inflaton in the Einstein frame to be sub-Planckian and for the scalar spectral index to be unaffected by Planck-suppressed potential corrections. In addition, we show that the reheating temperature is large enough for a viable post-inflation cosmology, and that the model conserves unitarity during inflation. We discuss some specific reheating mechanisms and the evolution of the inflaton field after inflation, including the possibility of condensate fragmentation.

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