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Kinetic scalar curvature extended $f(R)$ gravity

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Abstract

In this work we study a modified version of vacuum $f(R)$ gravity with a kinetic term which consists of the first derivatives of the Ricci scalar. We develop the general formalism of this kinetic Ricci modified $f(R)$ gravity and we emphasize on cosmological applications for a spatially flat cosmological background. By using the formalism of this theory, we investigate how it is possible to realize various cosmological scenarios. Also we demonstrate that this theoretical framework can be treated as a reconstruction method, in the context of which it is possible to realize various exotic cosmologies for ordinary Einstein–Hilbert action. Finally, we derive the scalar–tensor counterpart theory of this kinetic Ricci modified $f(R)$ gravity, and we show the mathematical equivalence of the two theories.

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