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Explorations in Metric-Affine Quadratic Gravity

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Abstract: It is a common assumption that well below the Planck scale gravity can be treated classically in the framework of General Relativity. Nevertheless, the quantum interactions of gravitating matter fields are expected to generate modifications in the Einstein-Hilbert action. Such modifications are non-minimal couplings of scalar fields to curvature or quadratic curvature terms. It has been known that in the framework of the Einstein- Hilbert action the standard (metric) formulation is entirely equivalent to the Palatini (or metric-affine) formulation in which the connection is an independent dynamical variable in addition to the metric. Nevertheless, in the presence of the above non-minimal terms the two formulations yield different theories, possibly with additional gravitational degrees of freedom. We consider metric-affine gravity coupled to scalar fields in the presence of the above non-minimal terms, derive the equivalent metric theory and its resulting particle content and discuss applications to inflation.

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