

The covariance principle of torsion based theories of gravity

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April 19, 2019

A fully consistent theory of gravitation equivalent to General Relativity can be formulated in terms of torsion with zero curvature, the so called Teleparallel equivalent to General Relativity (TEGR). In this approach the description of gravitational interaction is given by a force equation where the consistency of the theory is satisfied even in the lack of the equivalence principle, giving rise to establish a framework in quantum regimes where the gravitational mass and inertial mass fluctuation can potentially arise. From this formulation the quest of finding a quantum version of gravity can be similar to other gauge invariant theories where the metric does not play a dynamical role, instead the explicit form of a gravitational gauge potential is a solution to the gravitational field equation. Motivated by quantum effects an effective approach in torsion gravity can be simply thought of adding a small variation in the TEGR action giving rise to a whole new plethora of solutions in cosmology, black hole physics, compact objects etc. The question is, does this simple variation preserve all the symmetries of a curvature formulation of gravity and what are the relationships between these ontologically different theories in an effective approach.