General Relativity and Quantum Cosmology

Modified Jordan-Brans-Dicke theory with scalar current and the Eddington-Robertson gamma-parameter

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The Jordan-Brans-Dicke theory of gravitation, which promotes the gravitational constant to a dynamical scalar field, predicts a value for the Eddington-Robertson post-Newtonian parameter gamma that is significantly different from the general relativistic value of unity. This contradicts precision solar system measurements that tightly constrain gamma around 1. We consider a modification of the theory, in which the scalar field is sourced explicitly by matter. We find that this leads to a modified expression for the gamma-parameter. In particular, a specific choice of the scalar current yields gamma=1, just as in general relativity, while the weak equivalence principle is also satisfied. This result has important implications for theories that mimic Jordan-Brans-Dicke theory in the post-Newtonian limit in the solar system, including our scalar-tensor-vector modified gravity theory (MOG).

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