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A Palatini formalism for MOND in $f(\chi)$ gravity

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In this work we construct a relativistic extension of the MODified Newtonian Dynamics (MOND) in the metric formalism $f(\chi)$ using the Palatini approach. We show that a simple power law: $f(\chi) = \chi^b$, with $b = 3/2$ corresponds to the non-relativistic form of MOND. Amongst the many approaches proposed to extend MOND to a relativistic regime, the Palatini metric formalism discussed here, yields second order field equations, which is a desirable (but not a necessary) requirement in a gravitational theory. We briefly discuss lensing applications of this proposal.

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