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Beyond the Post-Newtonian expansion using Non-relativistic Gravity

I will discuss an action principle for non-relativistic gravity, as has recently been obtained from a covariant large speed of light expansion of Einstein's theory of gravity. This action reproduces Newtonian gravity as a special case, but goes beyond it by allowing for gravitational time dilation while retaining a non-relativistic causal structure. As a consequence, it can be shown that the three classical tests of general relativity (perihelion precession, deflection of light and gravitational redshift) are passed perfectly by this extension of Newtonian gravity. I will present the underlying symmetry principle of the action as well as the extension to any order in the 1/c expansion of GR. Finally I will comment on the relation to the PN expansion and discuss how this novel expansion may be useful in astrophysical settings.

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