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(G*) On the validity of the quasi-static approximation in scalar-tensor theories of Gravity

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The accelerating expansion of the universe has been widely studied beyond the standard -cold dark matter model (CDM) through modified gravity and dynamical dark energy models. Such modifications of laws of gravity at large scales usually require a new degree of freedom beyond the CDM cosmology. In this work, we utilize the scalar-tensor theories of gravity to study models of scalar field dark energy non-minimally coupled to matter. We focus our study on a symmetron model, which is one of the modified gravity models with a screening mechanism, and provide a detailed analysis to investigate the evolution of the universe via an exact solution of field equations and within the quasi-static approximation (QSA). We consider two scenarios where in one case the scalar field is only coupled to dark matter and in the other it couples to all of the matter. We identify the range of the symmetron model parameters for which the QSA is valid.

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