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Alleviating H0 tension in generalized Galileon theories

The Standard Model of Cosmology, namely Λ-Cold Dark Matter (ΛCDM) plus inflation in the framework of general relativity, proves to be very efficient in describing the universe evolution, both at the background and perturbation levels. However, theoretical issues such as the cosmological constant problem and the non-renormalizability of general relativity, as well as the possibility of a dynamical nature for the late-time acceleration, led to the appearance of various extensions and modifications. The last years there have appeared an additional motivation in favour of extensions/modifications of the concordance cosmology, namely the need to incorporate tensions such as the H_0. This tension arises from the fact that the Planck collaboration estimation for the present day cosmic expansion rate is $H_0 = (67.27 \pm 0.60)\, km/s/Mpc$, which is in tension at about 4.4 with the 2019 SH0ES collaboration (R19) direct measurement, i.e $H_0 = (74.03 \pm 1.42)\, km/s/Mpc$, obtained using the Hubble Space Telescope observations of 70 long-period Cepheids in the Large Magellanic Cloud. In this work we are interested in alleviating the H_0 tension in the framework of Horndeski gravity. Horndeski gravity, which is equivalent to Generalized Galileon theory, is the most general four-dimensional scalar-tensor theory that has second-order field equations and thus is free from Ostrogradski instabilities. Hence, by choosing suitable sub-classes of the theory we can obtain a cosmological behavior that is almost identical with that of ΛCDM at early times, but which at intermediate times deviates from it due to the weakening of the gravitational interaction, and thus alleviating the tension.

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