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R^n GRAVITY AS VIABLE ALTERNATIVE TO DARK MATTER: APPLICATION TO STELLAR DYNAMICS

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The role of $f(R)$ gravity, as well as the other modifications of standard Einstein's gravity, is to explain the accelerated expansion, structure formation of the Universe, and some other phenomena at extragalactic scales (such as e.g. flat rotation curves of spiral galaxies) without adding unknown forms of dark energy or dark matter. In $f(R)$ model, the Ricci scalar in the Einstein-Hilbert action is replaced by a general function of it. Its power-law form R^n, here is analyzed using observed orbits of S-stars and also their computer simulations. We review the various consequences of the $f(R)$ gravity parameters (r_c - characteristic radius i.e. scalelength depending on the gravitating system properties and β - universal constant) on stellar dynamics and investigate their constraints from the observed S-star orbits. The presented results show that these observations could put reliable constraints on the parameters of R^n gravity.