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The use of realistic equations of state in f (R, T) gravity theory and massive neutron stars

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In this work we investigate neutron stars (NS) in f (R, T) gravity for the case R + 2λT , R is the Ricci scalar and T the trace of the energy-momentum tensor. The hydrostatic equilibrium equations are
solved considering realistic equations of state (EOS). The NS masses and radii obtained are subject to a joint constrain from massive pulsars and the event GW170817. The pressure gradient inside the star, in this theory of gravity, depends on the inverse of the sound velocity. Since this velocity is quite low in the crust, |λ| need to be very small. The existence of the NS crust demands the |λ| values to be much smaller than the ones used with simpler EOS in the previous works of Neutron Star calculations in this modified gravity theory. The finding that using several relativistic and non-relativistic models the variation on the NS mass and radius is almost the same for all the EsoS in f (R, T) theory, manifests that our results are insensitive to the high-density part of the EOS.
Finally, we highlight that our results indicate that conclusions obtained from NS studies done in modified theories of gravity without using realistic EOS that describe correctly the NS interior can be unreliable.

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