Black hole solutions of Gauss-Bonnet theory in the presence of a perfect fluid

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Abstract
In this paper, the solutions of the Gauss-Bonnet theory of gravity was proposed in the presence of a perfect fluid with thermodynamic pressure $P$ and energy gravity $\rho$ in $n$-dimension. Accordingly, perfect fluid tensor was regarded as energy-momentum tensor and the static and radiating solutions for the linear equation of state $p = w\rho$ was calculated. This solution contains all the solutions already being proposed for Gauss-Bonnet gravity, such as asymptotically flat or asymptotically uncharged (anti)-de Sitter, radiating asymptotically flat and (anti)-de Sitter solutions as well as some new static and radiating solutions for different $w$ values. We go through the properties of the new static and radiating solutions. We also show that the solutions satisfy the dominant and weak energy conditions and they present black holes with one or two horizons or naked singularities provided that the parameters of the solutions are chosen suitable.

Keywords: Gauss-Bonnet gravity, energy-momentum tensor, linear equation of state, dominant and weak energy condition