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Modified Power Law Cosmology with higher order curvature terms and observational constraints

This research paper examines the Ricci scalar R and the Gauss-Bonnet invariant G to characterize a cosmological model in flat space-time via $f(R,G)$ gravity. Our model assumes that $f(R,G)$ is an exponential function of G combined with a linear combination of R. We scrutinize the observational limitations under a power law cosmology that relies on two parameters - H_0, the Hubble constant, and q, the deceleration parameter, utilizing the 57-point H(z) data, 8-point BAO data, 1048-point Pantheon data, joint data of H(z) + Pantheon, and joint data of H(z) + BAO + Pantheon. The outcomes for H0 and q are $H_0 = 68.008^{+0.087}_{-0.079}$ km s^{-1} Mpc^{-1}, $q = -0.105^{+0.009}_{-0.011}$, $H_0 = 67.989^{+0.096}_{-0.102}$ km s^{-1} Mpc^{-1}, $q = -0.107^{+0.010}_{-0.010}$, $H_0 = 68.020^{+0.098}_{-0.108}$ km s^{-1} Mpc^{-1}, $q = -0.110^{+0.009}_{-0.010}$, $H_0 = 68.016^{+0.097}_{-0.096}$ km s^{-1} Mpc^{-1}, $q = -0.109^{+0.010}_{-0.011}$, $H_0 = 68.010^{+0.094}_{-0.100}$ km s^{-1} Mpc^{-1}, $q = -0.108^{+0.010}_{-0.010}$ respectively. We also address Energy Conditions, $Om(z)$ analysis, and cosmographical parameters like Jerk, Lerk, and Snap. Our estimation of H_0 is remarkably consistent with various recent Planck Collaboration studies that utilize the ΛCDM model. According to our research, the power law cosmology within the context of $f(R,G)$ gravity provides the most comprehensive explanation for the important aspects of cosmic evolution.

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