

Peer Review

# Review of: "Parameterized Deceleration in $f(Q, C)$ Gravity: A Logarithmic Approach"

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The paper explores a novel approach to understanding the acceleration and deceleration of the universe by parameterizing the deceleration parameter  $q(z)$  within the framework of modified gravity theories, with a specific logarithmic form. The authors investigate a specific extension of nonmetricity gravity,  $f(Q, C)$  gravity, which incorporates both the nonmetricity scalar and a boundary term in an additive manner. The chosen parameterization exhibits a transition from a decelerating to an accelerating universe.

The key objective of the study is to explore how the universe's transition from deceleration to acceleration can be modeled using this extended gravity framework. The authors use observational data from Type Ia supernovae and Hubble measurements to constrain the model parameters. The statistical techniques used are chi-squared minimization and Markov Chain Monte Carlo (MCMC) fitting.

Overall, the writing of the paper is easy to follow and smooth. There are some suggestions and comments here for the authors' consideration:

1. Page 8:  $q(z) = q_0 + q_1 \log[\alpha - \beta]$  should be  $q(z) = q_0 + q_1 \log[\alpha] - \beta$ .
2. Page 9: IV Data Interpretation. The authors could provide more information regarding the likelihood functions and priors used for the parameters. Additionally, it would be helpful to include details on the burn-in period used in the MCMC simulations, the convergence behavior, and the acceptance rate of the MCMC simulations.
3. It would be beneficial if the code and data were made available for others to use and verify the results.

4. How were the values of  $\gamma_1$ ,  $\gamma_2$ , and  $n$  determined in the  $f(Q,C)$  model for the OHD and Pantheon + SHOES datasets? Are the results sensitive to changes in these parameters?
5. Could the authors provide a physical interpretation of the parameters for  $q_0$ ,  $q_1$ ,  $\alpha$ , and  $\beta$ ?

## Declarations

**Potential competing interests:** No potential competing interests to declare.