Qeios

Peer Review

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

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

Summary

The paper *"Parameterized Deceleration in f(Q, C) Gravity: A Logarithmic Approach"* presents a novel logarithmic parameterization of the deceleration parameter within the *f(Q, C)* gravity framework, providing an alternative explanation for cosmic acceleration. It is theoretically rigorous, using observational data and advanced statistical methods like MCMC for parameter estimation. The study successfully models the transition from deceleration to acceleration and provides insightful cosmological diagnostics.

Strengths:

- **The study is relevant and novel, engaging with contemporary issues in cosmology such as dark energy and modified gravity theories.**
- **Theoretical rigor is evident in its formulation of *f(Q, C)* gravity and derivation of field equations.**
- **Uses robust data and methodology, including Bayesian inference and Markov Chain Monte Carlo (MCMC) techniques.**
- **Successfully demonstrates a transition from deceleration to acceleration, aligning with observational data.**

Areas for Improvement:

- **Inconsistent formatting and truncated mathematical expressions.**
- **Typos and grammatical errors.**

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- **Complex derivations need clearer step-by-step explanations.**
- **Lacks strong physical justification.**
- **Needs comparative analysis with other parameterizations.**
- **Assumption of integer values for nn is not well justified.**
- **Does not discuss potential instabilities or effects of higher-order terms.**
- **Heavy reliance on statistical fitting without deep discussion of physical meaning.**
- **Differences in transition redshift values need better explanation.**
- **Lack of discussion on systematic errors and confidence intervals.**

1. **Future Prospects:**
    - **Conclusion is somewhat repetitive and lacks clear future research directions.**
    - **Could explore applications to inflationary models or large-scale structure formation.**

Recommendations for Improvement:

- **Improve mathematical clarity with stepwise derivations.**
- **Provide better justification for the chosen parameterization.**
- **Compare findings with standard models such as ΛCDM.**
- **Address uncertainties in data and parameter estimation.**
- **Expand on theoretical implications and potential extensions.**

Conclusion:

This is a well-structured paper with a strong theoretical foundation. However, it would benefit from clearer assumptions, stronger justifications for parameter choices, and deeper discussion of physical implications. Addressing these aspects would significantly enhance its impact and accessibility.

Declarations

Potential competing interests: No potential competing interests to declare.