

Peer Review

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

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This study introduces a logarithmic deceleration parameter in nonlinear gravity, modeling cosmic acceleration without exotic fields. Using Hubble and supernova data, it captures Universe expansion transitions, aligning with observations.

The author has run the code individually with CC and SNe Ia datasets, which is incorrect for CC. For SNe Ia, it is only valid when using the SNe Ia dataset with SHOES calibration. Considering these issues, my recommendations are as follows:

- 1. Use Joint Analysis:** Using CC data alone leads to issues such as reduced chi-squared values less than one. This indicates model overfitting, suggesting that the CC dataset alone may not be statistically appropriate. The significantly low reduced chi-squared values raise concerns about the reliability of the results. Therefore, it is recommended to use a joint analysis combining CC and SNe Ia datasets.
- 2. Clarify SNe Ia Dataset:** The author has not specified which SNe Ia dataset was used, whether it is with or without SHOES calibration. This should be explicitly mentioned for clarity and reproducibility.
- 3. Important recent advancements:** Since the author has used the Hubble parameterization, they should also include the following works in the manuscript:
<https://doi.org/10.1016/j.jheap.2025.01.001>, <https://doi.org/10.1016/j.jheap.2024.08.003>,
<https://doi.org/10.1142/S0217732324500998>, <https://doi.org/10.1142/S0217732324500871>,
<https://doi.org/10.1140/epjp/s13360-024-05163-6>, <https://doi.org/10.1016/j.jheap.2024.05.004>.

4. I would also recommend that the author include statistical metrics such as reduced chi-square, AIC, and BIC, along with ΔAIC and ΔBIC . These should be incorporated following the previous suggestions.

Once all the points are properly addressed, I would be happy to review the manuscript again, with particular emphasis on the joint analysis and clear mention of which SNe Ia dataset (with or without SHOES calibration) has been used.

Declarations

Potential competing interests: No potential competing interests to declare.