Dear Reviewer,

Thank you for your review and insightful comments on our manuscript. We sincerely appreciate the time and effort you have dedicated to providing such valuable feedback. Below, we have addressed each of your observations and comments in detail. We hope that our responses and explanations meet your expectations and clarify any concerns.

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RC:

The research in this article, which uses fuzzy clustering optimization for wave impedance inversion, belongs to a relatively outdated approach. The principle description of the paper is quite detailed, but most of it belongs to the derivation of classical theories. However, the following concerns need to be addressed before the paper can be accepted for publication.

Answer:

The proposed algorithm introduces a custom definition of fuzzy clustering optimization as an additional term in the objective function for acoustic impedance inversion. The approach, its solution, and the resulting outcomes are novel, demonstrating the potential of the method. Therefore, we respectfully disagree with the characterization of the proposed approach as 'outdated.' It seems that this term may instead be referring to the individual optimization terms included in the objective function. However, these terms are widely utilized in recent related research. The proposed algorithm combines the advantages of these terms while mitigating their cumulative drawbacks. Furthermore, modifications and improvements have been implemented to address the detailed comments provided by the editors.

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1. Algorithm flow or algorithm pseudocode should be supplemented;

   Answer:

   Algorithm 1 is added to explain the propose method.

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2. The visual images provided by the author, such as seismic profiles and inversion results, have poor drawing quality;

   Answer:

   The figures have been revised and provided with a resolution of 500 dpi. Additionally, the figures are available as separate files.

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3. The evaluation of inversion results is not very scientific and reasonable. It is recommended to compare and quantitatively evaluate them with logging data.

Answer:

Figure 7 and Table 1 evaluate the results of the inversion and compare them with the available well log data.

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4. The conclusion section needs to discuss the limitations of the method.

Answer:

Thank you for noting this issue. The conclusion section is revised accordingly.