Review of: "Dynamic structure factors and equation of state of fluid iron under Earth’s core condition"

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Potential competing interests: No potential competing interests to declare.

The abstract provides a concise overview of the study's objectives, methodologies, and findings regarding the dynamic structure factors and equation of state of fluid iron under Earth's core conditions. It effectively communicates the purpose of the study and its importance in understanding the geodynamo. The methodology involving ab initio molecular dynamics and a multivariate polynomial method for EOS is outlined, along with key findings such as the consistency of static structure factors and dispersion curves with experimental data. However, the abstract could benefit from clearer transitions between sections and a more explicit statement of the study's objectives.

The introduction offers a comprehensive overview of the significance of equations of state (EOS) and longitudinal sound velocity (VP) in understanding Earth's core dynamics. While it effectively highlights the importance of these parameters, improvements can be made in terms of clarity, citation consistency, and contextualization within the broader field of geophysics. Providing a clear statement of the study's objectives and better integration with the conclusion could enhance the introduction's effectiveness.

In the "Methods and Calculations" section, improvements can be made in terms of clarity, explanation of concepts, and integration with the results. Ensuring clear labeling of equations and consistent notation is crucial for comprehension. Additionally, a more detailed discussion of verification and validation methods, as well as any limitations associated with the computational techniques, would enhance the section's robustness.

The "Results and Discussions" section effectively presents findings on structure factors and ion-ion dynamic structure factors of iron under Earth's core conditions. However, there's room for improvement in terms of interpreting results, providing more context on observed changes, and integrating methodology with results. Clarifying the significance of observed similarities and discrepancies with experimental data and discussing factors influencing accuracy would strengthen the analysis.

Finally, in the "Conclusion" section, a more explicit tie-in with the study's objectives and main findings could enhance the conclusion's impact. Summarizing key findings and their implications within the broader context of Earth's core dynamics would provide a more cohesive conclusion.

Overall, addressing these points will improve the clarity, coherence, and impact of the paper, enhancing its contribution to the field of geophysics and materials science.