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28 October 2025

Dear Prof. Juhlin

We are pleased to submit the revised manuscript eguphere-2025-3117 entitled “**Reflection seismic imaging of the manganese mineralisation in the Griqualand West Basin, South Africa**” for publication. We appreciate and have addressed the constructive comments from the Editor, the Assistant Editor, and the reviewers. Below we reviewed the comments and incorporated them into the manuscript, please note that the original comments our responses are printed in **blue** for reviewer 1, and **green** for reviewer 2. The line numbers are referred to in the file Sihoyiya et al._track_changes.docx. All the changes to the manuscript are tracked in the file Sihoyiya et al._track_changes.docx. A clean version of the manuscript is also provided in the file Sihoyiya et al._clean.docx.

We believe that the manuscript is now much improved, and we hope that you find it acceptable for publication.

Sincerely,

Mpofana Sihoyiya and co-authors

Commented: Main geological interpretation results (Nine reflectors) were presented in the paper titled “Reflection seismic imaging of the manganese mineralisation in the Griqualand West Basin, South Africa” by Joggee et al. (2025), the first and the second authors are also co-authors of the

published paper. The difference of the manuscript and their prior paper and new findings must be presented in the manuscript.

- Corrected and updated on Line 95 of Sihoyiya et al. 2025_Track_Changes.

Commented: Authors stated a lot about data acquisition method to obtain high-quality and -resolution seismic data, not reflection seismic imaging in the conclusion section. They do not correspond to the title of the manuscript. Authors should focus on what you want to present in the manuscript.

- Corrected and updated on Line 1 of Sihoyiya et al. 2025_Track_Changes.

Commented: Line 65, Figure 1a is not clear. It is important to give regional and local geological maps to help readers understand geological background. A typical lithostratigraphic section is preferable. And the location and layout of seismic survey lines do not need to be shown in Figure 1b, there are displayed in Figure 2.

- Corrected and updated on Line 71 of Sihoyiya et al. 2025_Track_Changes.

Commented: Line 181, the recording time of raw shot gather in Figure 5c is 1000 ms, not same with other shot gathers. Is it right? Reflections should be marked in Figure 5c-5e.

- Corrected and updated on Line 228 of Sihoyiya et al. 2025_Track_Changes.

Commented: Line 186, main data processing methods and key parameters should be given in a table and examples of raw shot gathers dominated by reflection waves or with clear reflections waves should be shown after data processing in the processing section.

- Corrected and updated on Line 262 and 228 of Sihoyiya et al. 2025_Track_Changes.

Commented: Line 188, pre-stack migration was applied in this study, but I cannot see any pre-stack migration results in the manuscript. The Kirchhoff post-stack time-migrated seismic sections is stated in the caption of Figure 7. What kind of migration methods did you use?

- Corrected and updated on Line 389 of Sihoyiya et al. 2025_Track_Changes.

Commented: Line 199, You may consider to focus on near-surface structure with refraction tomography results.

- Corrected and updated on Line 305 of Sihoyiya et al. 2025_Track_Changes.

Commented: Line 251-270, nine reflectors were interpreted through reflection seismic profiles. However, reflectors numbered 1 and 2 do not agree with the results of your prior results (Jogee et al., 2025). I am wondering if there are your new results.

- Corrected and updated on Line 344 and 347 of Sihoyiya et al. 2025_Track_Changes.

Commented: Line 274, “stud” should be “study”?

- Corrected and updated on Line 369 of Sihoyiya et al. 2025_Track_Changes.

Commented: Line 292, I don’t understand why you didn’t provide profile 3 result.

- Thank you for pointing this out. Profile 3 was omitted due to poor data quality, which made reliable interpretation difficult.

Commented: Line 320, profile 3 was also missed in Figure 8.

- Thank you for pointing this out. Profile 3 was omitted due to poor data quality, which made reliable interpretation difficult.

Commented: Overall, the manuscript is clearly written and mostly well structured (see comments in the pdf). However, its novelty appears rather limited compared to Jogee et al. (2025). Most of the processing and interpretation steps are essentially identical to the earlier publication. The only substantial addition seems to be the tomographic component, while even the perspective 3D view and horizon picking were already shown previously — yet these are not included here. To strengthen the contribution, I recommend a more explicit comparison with the earlier work and a clearer demonstration of what is new in this study.

- Corrected and updated on Line 95 of Sihoyiya et al. 2025_Track_Changes.

Commented: Please add a table summarizing the acquisition parameters.

- Added on Line 172 of Sihoyiya et al. 2025_Track_Changes.

Commented: Please include examples of the seismic data both before and after processing. This would allow readers to better evaluate the impact of your workflow (see also the comments in the pdf).

- Added on Line 208 of Sihoyiya et al. 2025_Track_Changes.

Commented: Provide a more detailed explanation of how guided waves were handled during processing.

- Added on Line 242 of Sihoyiya et al. 2025_Track_Changes.

Commented: Currently you are showing less information compared to Jogee et al. (2025).

- We have added the focus of the current study on Line 95 of Sihoyiya et al. 2025_Track_Changes, emphasized the new contributions, and provided additional figures or supplementary material on Sihoyiya et al. 2025_Track_Changes.

Commented: When describing sediment thicknesses across the profiles, consider including a map of thickness distribution. This would help clarify where the sedimentary cover (low-velocity zone) is thickest and how it may impact image quality.

- Thank you for the valuable comment. To the authors' knowledge, no sediment thickness map has been published for the study area. The interpretation of sediment thickness in this work is constrained using results and geological information from previous studies conducted in the region (Reimold et al., 2002; Tinker et al., 2002; Tsikos and Moore, 1997; Beukes et al., 2016; Westgate et al., 2020).

Commented: Profile 3 appears to be missing

- Thank you for pointing this out. Profile 3 was omitted due to poor data quality, which made reliable interpretation difficult.

Commented: Ensure that the profiles are displayed with the correct aspect ratio (Profiles 1 and 2 are twice as long as Profile 5).

- Corrected and updated on Line 388 of Sihoyiya et al. 2025_Track_Changes.

Commented: Clarify whether different CDP bin sizes were used across the profiles.

- Clarified on Line 239 of Sihoyiya et al. 2025_Track_Changes.

Commented: You provide a detailed overview of the expected boundaries. Have you computed a synthetic seismogram from the series of reflection coefficients? This would allow for a direct comparison with the seismic images and could significantly strengthen the interpretation.

- Added on Line 406 of Sihoyiya et al. 2025_Track_Changes.

Commented: Why is no 3D interpretation or perspective view included here, given that one was already presented in Jogee et al. (2025).

- Added on Line 475 and 506 of Sihoyiya et al. 2025_Track_Changes.

Commented: Please add interpretation figures for each profile (highlighting the main geological units, etc.), similar to Profile 1 in Figure 12 of Jogee et al. (2025)

- Thank you very much for the constructive comment. We appreciate the suggestion to include interpretation figures for each profile. However, the main focus of this manuscript is on the methodological and processing aspects of the data. The detailed geological interpretations, including annotated figures, have already been comprehensively presented in Jogee et al. (2025). To avoid repetition, we have therefore not included these figures here.

Commented: Line 13: these technical details should not appear in the abstract

- Corrected and updated on Line 14 of Sihoyiya et al. 2025_Track_Changes.

Commented: Line 25: Mn

- Corrected and updated on Line 30 of Sihoyiya et al. 2025_Track_Changes.

Commented: Line 27: Mn

- Corrected and updated on Line 33 of Sihoyiya et al. 2025_Track_Changes.

Commented: Line 32: Mn

- Corrected and updated on Line 37 of Sihoyiya et al. 2025_Track_Changes.

Commented: Line 33: what kind of geophysical surveys? reflection seismics?

- Corrected and updated on Line 38 of Sihoyiya et al. 2025_Track_Changes.

Commented: Line 55: This sentence stands somewhat alone.

- Corrected and updated on Line 60 of Sihoyiya et al. 2025_Track_Changes.

Commented: Line 57: what do you mean by carefully planned?

- Corrected and updated on Line 62 of Sihoyiya et al. 2025_Track_Changes.

Commented: Line 58: why is the survey cost effective?

- Thank you for the comment. The survey is considered cost-effective because it employed a small and portable seismic source (GPEG500), which significantly reduced mobilisation, operational, and acquisition costs compared to conventional large-scale vibroseis or explosive sources, while still achieving sufficient energy penetration and data quality for imaging the target manganese-bearing horizons.

Commented: Line 62: number of Geophones? Geophone spacing?

- Thank you for the comment. The number of geophones and their spacing are provided in the acquisition summary table, as these parameters vary between profiles due to differences in line length, terrain conditions, and acquisition objectives.

Commented: Line 65: add a box showing the location of b.

- Corrected and updated on Line 71 of Sihoyiya et al. 2025_Track_Changes.

Commented: Line 72: UAV was mentioned already in the sentence before

- Corrected and updated on Line 83 of Sihoyiya et al. 2025_Track_Changes.

Commented: Line 95: varying from ? to ?

which order of magnitude?

- Corrected and updated on Line 115 of Sihoyiya et al. 2025_Track_Changes.

Commented: Line 99: again, how thick are these layers? Can we expect that they can be resolved using reflection seismics?

- Thank you for the comment. The manganese-bearing layers in the study area are relatively thin, ranging between 5 and 8 m in thickness, while they can reach up to approximately 45 m in areas south of the study site.

Commented: Line 107 – 118: I think this should not be part of the geology section. You can move this to the seismic section instead.

- Thank you for the comment. The section provides important geological context relevant to the seismic interpretation and is therefore briefly introduced here to establish the geological framework. However, we acknowledge your suggestion and will streamline this part in the geology section, while expanding the discussion of its seismic relevance in the seismic interpretation section for better structural coherence.

Commented: Line 138: delete high resolution

- Corrected and updated on Line 160 of Sihoyiya et al. 2025_Track_Changes.

Commented: Line 169: noise

- Corrected and updated on Line 187 of Sihoyiya et al. 2025_Track_Changes.

Commented: Line 163: what is this stripe pattern?

- Corrected and updated on Line 190 of Sihoyiya et al. 2025_Track_Changes.

Commented: Line 163: Typo : ground roll, guided waves

- Corrected and updated on Line 190 of Sihoyiya et al. 2025_Track_Changes.

Commented: Line 182: there is not shot 98 figure 1.

It would also be good to highlight the shown shots in fig. 1. And additionally show shots at the same locations for the crossing lines.

- Corrected and updated on Line 228 of Sihoyiya et al. 2025_Track_Changes.

Commented: Line 195: What is the reason for 10Hz lower boundary?

- Thank you for the comment. The lower boundary of 10 Hz was chosen because most of the raw shot gathers are dominated by low-frequency ground roll energy in the 8–14 Hz range. Setting the lower cutoff at 10 Hz was intended to mitigate the influence of ground roll energy.

Commented: Line 218: new paragraph.

- Corrected and updated on Line 283 of Sihoyiya et al. 2025_Track_Changes.

Commented: Line 240: Is the initial model still part of the results? can you restrict the velocity models to the ray-covered parts?!

- Thank you for the helpful comment. The tomographic velocity models presented in Figures 7 and 9 are indeed restricted to the ray path–covered zones. However, when shown as standalone models, limiting them strictly to these zones reduces their visual clarity and continuity.

Commented: Line 240: It would also be good to compare the intersections of the profiles in more detail, eg using velocity vs. Depth profiles at these locations

- Added on Line 475 of Sihoyiya et al. 2025_Track_Changes.

Commented: Line 286: which numbers?

- Corrected and updated on Line 381 of Sihoyiya et al. 2025_Track_Changes.

Commented: Line 308 – 313: move this to 3.3

- Corrected and updated on Line 419 of Sihoyiya et al. 2025_Track_Changes.

Commented: Line 355: how would you optimize a future survey in this region, based on your experience with these data?

- Corrected and updated on Line 500 of Sihoyiya et al. 2025_Track_Changes.

Commented: Line 369 – 375: I cannot agree with your argument. Both, explosives and conventional vibroseis trucks are not causing problems when operating on sand....

- Corrected and updated on Line 529 and 531 of Sihoyiya et al. 2025_Track_Changes.

Commented: Line 379: please add examples to demonstrate the repeatability your mentioned enhanced signal-to-noise ratio

- Updated on Line 537 of Sihoyiya et al. 2025_Track_Changes.