

Dear Giacomo Medici

Thanks for the careful review of our manuscript. Here below we have responded to all your remarks.

Please find below our comments outlined in blue

Kind regards

Sikelela Gomo

Johannesburg, 14/07/2025

(Corresponding Author)

## RESPONSE

Line 37. You use multiple times “conduits”. This word has a specific meaning in karst hydrology. Thus, I suggest an universal change into “preferential flow-pathways”

Done

Lines 60-63. “Near-surface characterization...environmental, and civil engineering infrastructure”. Insert recent literature on recent near-surface hydrogeophysical characterization in fractured/faulted bedrocks.

- Medici, G., Munn, J.D., Parker, B.L. 2024. Delineating aquitard characteristics within a Silurian dolostone aquifer using high-density hydraulic head and fracture datasets. *Hydrogeology Journal*, 32, 1663-1691.

- Svetina, J., Prestor, J., Mozetič, S., & Brenčič, M. (2025). Ambient intraborehole flow in a highly productive aquifer in Ljubljana, Slovenia. *Journal of Hydrology: Regional Studies*, 57, 102139.

We thank for the interesting suggestions, but after reading the papers we do not think they are relevant for the present case since they do not refer to the investigated region and formations. Moreover, reviewers invited by the editor have commented that the geological and general description is already lengthy and has possibly redundant references.

Lines 92-94. You have clarified the 3 specific objectives. What about the general goal?

We agree that the general goal of the paper was not properly expressed. We have revised the abstract, the introduction and discussion and conclusion to clarify the multiple methodological and specific objectives addressed by the paper. We have hence clarified that the paper has a methodological objective that is maximizing the information that can be extracted from the groundroll in seismic reflection data to provide a VS model of the near surface to a significant depth. To increase the illumination we used the data both in common shot gather and in common receiver gather configuration (which is on our knowledge new in the field of surface wave data analysis) and we pushed the processing to the limit of resolution and investigation depth. The availability of a VS model to a depth of about 300 m allowed us to carry out a structural and geological interpretation connecting the information from deep exploration and in mine evidences with the near surface structure and providing the prove that dikes known to crosscut the formation at mine depth reach the surface. These aspects have been better explained.

Line 135. “Slump faults”. Please, clarify the nature of these faults. What about the presence of extensional, strike-slip and thrusts?

The paragraph containing sentence 135 has been edited to reflect/mention the structures enquired about. Generally, the Transvaal Supergroup shows evidence of both extensional and thrust faulting (Cousins, 1962).

Lines 135-145. Please, provide more detail on the type and genesis of the tectonic structures given the nature of the manuscript.

To address this point, the above-mentioned section of the manuscript has been modified to the following:

“The Transvaal Supergroup is displaced by post-Transvaal Supergroup age faults (extensional faults) associated with the Vredefort Impact Crater (Cousins, 1962) and is intruded by massive suites of mafic and ultramafic rocks (i.e., dyke swarms and sill provinces) thought to be ‘pre’- ‘syn’- and ‘post’-Bushveld Complex in age (Willemse, 1959; Sharpe, 1982, 1984; Schreiber et al., 1992; Gumsley et al., 2017). Additionally, the rocks of the Pretoria Group are displaced by post-Pretoria Group faults (i.e., both extensional and thrust faults) that displace both the Pretoria Group rocks and the base of the Transvaal Supergroup, and slump-faulting (extensional faults), which only affects the formations within the Transvaal Supergroup (Cousins, 1962). The slump faulting does not transgress beyond the base of the Transvaal Supergroup and is thought to originate from the subsidence of the Chuniespoort Group of the Transvaal Supergroup. Thus, the tectonic structures in this study are the post-Transvaal Supergroup age faults (extensional faults) followed by the post-Pretoria Group age faults (extensional and thrust faults). The post-Pretoria Group extensional faults include the slump-faulting. The post-Transvaal Supergroup/Pretoria Group age faults and intrusions are prone to mining-induced seismicity and influence the hydrology of the West Rand acting as pathways for water migration from the overlying Chuniespoort Group dolomitic units down to the gold reefs’ mining levels (~3.5 km below ground surface) (Van Niekerk and Van Der Walt, 2006; Manzi et al., 2012). The intersection of these water conduits during mining often negatively affects the productivity of the mine and increases the safety risk to mine personnel and infrastructure. Thus, their delineation is important in ensuring mine safety, longevity, and increased productivity.”

Lines 155- 279. Paragraphs 3, 4 and 5 look three sub-paragraphs of a “methodology”. I suggest 3.1, 3.2, and 3.3.

Done

Line 412. “Investigate the structural linkage”. Do you mean “structural geology linkage”? Please, specify.

Yes, this is what is meant and has been corrected.

Figures and tables

Figure 1a. The type of the northern fault is clear (strike-slip), not for the other tectonic lines. Can you improve main body, figure and caption on this point?

We looked at this thoroughly, however, the rest of the lineaments shown on the map most likely represent fault zones. Therefore, they are not associated with a single/simple fault line, but a broader zone of deformation made up of parallel or subparallel multi-fault segments related to a rich tectonic history (e.g., Colesberg lineament and the Thabazimbi-Murchison lineaments), thus we cannot associate them with one orientation.

Figure 1b. Labels and words that describe the stratigraphic column are not readable.

These have been improved

Figure 2. Insert the age of the lithotypes in the legend.

The legend in Figure 2 has been modified to show the age of the present formations.

Figure 14. Same issue here, labels and words that describe the geological model are not readable.

Corrected