Peer Review Report

Review Report on A quantitative particle-based approach for the geometallurgical assessment of tailings deposits

Original Research, Earth Sci. Syst. Soc.

Reviewer: Fenghui Wu
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EVALUATION

Q 1 **Please summarize the main findings of the study.**

This study explores a novel combination of methods for incorporating particle data into geometallurgical models of tailings deposits. Particle binning based on mineralogy and particle size was combined with geostatistical modelling-based simulations of both bulk chemistry and the frequencies of individual particle bins. Particle populations across the tailings deposit were reconstructed by bootstrap resampling of particles from the individual particle bins at the estimated ratios. The distribution of processing-relevant particle properties throughout the tailings deposit were predicted with corresponding uncertainties. There are clear systematic trends in the spatial distributions of different particle types, resulting from the sedimentary-style deposition of the tailings. As a result, robust models could be developed for particle size and mineralogy, which strongly control the sorting of particles during deposition, and other related properties, such as sulphide mineral grain sizes. This study demonstrates how particle-based geometallurgical models can be developed and what can be achieved with the resulting data, including simulations of a bulk flotation process and estimation of acid mine drainage potential, with the aim of improving the accuracy of resource and reserve estimations of tailings deposits and the sustainable and responsible management of natural and man-made resources.

Q 2 **Please highlight the limitations and strengths.**

Explored a novel combination of methods for incorporating particle data into geometallurgical models of tailings deposits, But it does not reflect the actual application value.

Q 3 **Please comment on the methods, results and data interpretation. If there are any objective errors, or if the conclusions are not supported, you should detail your concerns.**

(1) The lack of practical application value in this study has not been reflected, and there is a lack of detailed research support materials.
(2) The evaluation method proposed in this study does not reflect the adaptability to different regions, types, and environmental conditions.
(3) All the images in the manuscript have poor aesthetic effects, it is recommended to make revisions.
(4) The logical hierarchy of the entire article is not very clear, and the entire research story is not written clearly.
(5) The cited references are too outdated, it is recommended to use the latest literature.

Q 4 **Check List**

Is the English language of sufficient quality?
No.

Is the quality of the figures and tables satisfactory?
No.

Does the reference list cover the relevant literature adequately and in an unbiased manner?

No.

Are the statistical methods valid and correctly applied? (e.g. sample size, choice of test)
Yes.

If relevant, are the methods sufficiently documented to allow replication studies?
No.

Are the data underlying the study available in either the article, supplement, or deposited in a repository? (Sequence/expression data, protein/molecule characterizations, annotations, and taxonomy data are required to be deposited in public repositories prior to publication)
No.

Does the study adhere to ethical standards including ethics committee approval and consent procedure?
Yes.

If relevant, have standard biosecurity and institutional safety procedures been adhered to?
Yes.

Q 5 **Please provide your detailed review report to the editor and authors (including any comments on the Q4 Check List):**

Recommendation: Reject
The paper entitled “A quantitative particle-based approach for the geometallurgical assessment of tailings deposits” employs explores a novel combination of methods for incorporating particle data into geometallurgical models of tailings deposits. In my opinion, the paper cannot be published in its present form. It needs major adjustments and corrections.
(1) The lack of practical application value in this study has not been reflected, and there is a lack of detailed research support materials.
(2) The evaluation method proposed in this study does not reflect the adaptability to different regions, types, and environmental conditions.
(3) All the images in the manuscript have poor aesthetic effects, it is recommended to make revisions.
(4) The logical hierarchy of the entire article is not very clear, and the entire research story is not written clearly.
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QUALITY ASSESSMENT

Q 6 **Originality**

Q 7 **Rigor**

Q 8 **Significance to the field**

Q 9 **Interest to a general audience**

Q 10 **Quality of the writing**

Q 11 **Overall quality of the study**