

Peer Review Report

Review Report on Time zero for Net Zero: a coal mine baseline for decarbonising heat

Original Research, Earth Sci. Syst. Soc.

Reviewer: Aaron Cahill

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EVALUATION

Q 1 Please summarize the main findings of the study.

The paper describes a significant body of work investigating all aspects of a shallow mine system in Scotland in the context of its use for geothermal energy extraction. The paper describes hugely interdisciplinary work covering hydrogeological, geochemical, microbiological and geo-mechanical aspects of the shallow mine system. Specific focus of the paper is describing characterization of a "time zero" baseline from which to delineate any future deviations or perturbations induced by geothermal energy extraction. In this case the paper describes the foundational set up of what will likely be an important research field site and in this case does not seek to, or need, to make final conclusions as such. It simply describes the potential for shallow mine geothermal, describes clearly the context and need for the field site, the rationale for characterization of the shallow mine system and critical zone, describes the detailed initial investigations conducted and from that develops an initial conceptual site model. It does this very well and I find the CSM is comprehensive, high quality and fully worthy of publication. I have only minor suggestions and comments for revision.

Q 2 Please highlight the limitations and strengths.

Strengths: Very well written, highly interdisciplinary, a unique field site with clear importance for aiding deployment of shallow mine geothermal applications, sub-disciplines are led/described by recognized leaders and provides a great showcase of interdisciplinary critical zone science. The CSM formulated is high quality and offers a great benchmark for other such studies.

Limitations: Method descriptions are lacking and mostly reference other papers making it difficult to know from reading this paper alone what was done and how. Some shortcomings in recognition of subsurface fluid flow complexities for both gases and groundwater (more specific comments provided). Various other little tweaks and clarifications could improve the paper (see specific comments)

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.

In general a good high quality paper with respect to methods, results and interpretation --- see specific comments for some issues/suggestions

Q 4 Check List

Is the English language of sufficient quality?

Yes.

Is the quality of the figures and tables satisfactory?

Yes.

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

Yes.

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

Not Applicable.

If relevant, are the methods sufficiently documented to allow replication studies?

Yes.

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)

Yes.

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):

see uploaded PDF

QUALITY ASSESSMENT

Q 6 Originality	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Q 7 Rigor	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Q 8 Significance to the field	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Q 9 Interest to a general audience	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Q 10 Quality of the writing	<input checked="" type="checkbox"/>				
Q 11 Overall quality of the study	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>