

Peer Review Report

Review Report on Multi-isotope geochemical baseline study of the Carbon Management Canada Research Institutes CCS Field Research Station (Alberta, Canada), prior to CO₂ injection

Original Research, Earth Sci. Syst. Soc.

Reviewer: CLARE E BOND

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EVALUATION

Q 1 Please summarize the main findings of the study.

The study is a baseline survey of geochemical and isotopic data from a carbon storage field research station. It considers the possibility of using geochemical monitoring to track injected CO₂. The study discusses which geochemical/isotopes are best place to track CO₂ at the field research station.

Q 2 Please highlight the limitations and strengths.

The study would be of greater value if it put the findings into the context of other potential CO₂ injection sites. What might work where and in what (geochemical) situations? The study is comprehensive in the plots and comparisons made from the isotopic data. The paper does not discuss the difference in values obtained in different sampling campaigns, or between analyses completed in different labs.

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.

The conclusions are supported by the data and interpretation. I feel the naming of the sections could be better, the 'discussion' is really data analysis and interpretation, it takes the 'raw' data and adds value by additional plotting and interpretation.

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)

Yes.

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):

The study is a baseline survey of geochemical and isotopic data from a carbon storage field research station. It considers the possibility of using geochemical monitoring to track injected CO2.

The study discusses which geochemical/isotopes are best placed to track CO2 at the field research station.

Overall the paper is well written and covers the key aspects of assessing the potential for geochemical monitoring at the CO2 injection site.

I feel that the paper would be more valuable if it considered the implications of the study for geochemical modelling of CO2 more broadly e.g. to other sites.

The discussion section is less of a discussion and more further data analysis.

I suggest that this section is renamed data interpretation and a discussion is added that puts the work back into the context of previous studies.

The other area not covered by the paper is the discrepancies in analysis sampled at different times and analysed in different laboratories for example the differences in stable isotope values for GCW1-4 in table 1, also seen in figure 3. It would be good to see these discussed at least in terms of limitations of the study, recommendations for sampling over n years... different seasons, atmospheric conditions etc. The comments made on borehole capping timing and atmospheric pressure in the results section would be good to be summarised in recommendations at the end. It would be good to include the timing of the baseline survey with regard to the injection schedule, because it just helps with the visual context.

I have made some very minor suggestions to add clarity to the text in the attached PDF and have made some suggestions on figures and figure captions.

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 type="checkbox"/>	<input type="checkbox"/>
Q 10 Quality of the writing	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Q 11 Overall quality of the study	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>