The paper by Purkamo *et al.* is an extensive study of deep granite groundwater in Kurikka, Finland. The study is notable for its analysis of a large number of hydrochemical, geochemical and biological parameters, which distinguishes it from comparable investigations. This comprehensive data collection has the potential to provide valuable insights into the system.

However, the manuscript appears to be in the early stages of development and could benefit from streamlining and more concise data representation. While the data is valuable for characterizing subsurface ecosystems, I would advise against publishing it in its current form.

Major comments:

1) The study contains a wealth of data from a variety of locations, but several aspects of the data analysis and presentation require substantial improvement to enable the reader to follow the relationship between sites and measurements and convey key messages. We recommend that the authors perform statistical analysis to link their data and identify important trends and distinguishing/similar features between sites. Furthermore, Tables and Figures should be improved for readability and clarity.

2) The central narrative of the manuscript requires reconsideration. The title and conclusions regarding subsurface connectivity and transport processes are not adequately supported by the data because no direct measurements or modeling of groundwater flow paths, hydraulic connectivity between boreholes, or microbial advection were performed. The study is based on single-time-point sampling without replication which is insufficient to infer connectivity or transport between sites.

3) The general writing of the manuscript should be improved and the introduction and discussion require further integration. In the current form many sections are disconnected and include unnecessary details. Many items are introduced but the connection between topics and the rational for inclusion is missing.

Minor comments:

Title

There is no modeling or measurement of flow path in the paper. Its rather the microbial and hydrogeological characterization of the multi-layered aquifer system in Kurikka, Western Finland.

Figures and Tables

Figure 1: Colors of the cross section and colors of the legend do not match.

Table 1: Please designate if MM.DD.YYYY or DD.MM.YYYY

Figure 4 and 5: Please remove border around the figures. Missing units on the x axis.

Introduction

Line 69: Biological isotope fractionation is a passive process. The slight difference in mass influences e.g. bond length and vibrational entropy within the molecule, making the enzymes work more

efficiently with the 'more flexible' light isotope. It's not an active 'decision' of the microbe. Please rephrase.

Line 81: Not all groundwater systems are "cool." Also, "cool" is a subjective description of temperature. Please rephrase.

Line 94: This does not make sense. In order to survive, many groundwater microbes must reduce oxygen, nitrate, sulfate, or iron and oxidize organic carbon (in the case of heterotrophs) or reduced sulfur, nitrogen, or iron to produce energy for CO_2 fixation (in the case of chemolithoautotrophs).

Line 106: Please shortly introduce how microbial communities might be of interest for contaminant remediation. This is the first time it is named as an aim of the study.

Line 108: 'The region' or 'This region'

Methods

Line 128: Adding sub-headers to the Materials and Methods section would greatly improve clarity.

Line 137: Would be good if the weather conditions during this sampling were put into a broader context, e.g. did the precipitation differ significantly from the annual average, how variable are temperature and precipitation over a year?

Lines 224 to 225: Please provide additional information on visualization and statistical methods.

Results

Line 235: If the chloride measurement is wrong, it can be excluded.

Line 239: "Level of system openness" sounds strange. Connection to surface, maybe? Please rephrase.

Line 240ff: This doesn't seem to belong to the results. Introduction?

Line 245f: Calculations can be explained in the methods section.

Line 282: Units are missing.

Line 284: Units are missing.

Line 309: Section 3.4 is only one sentence. If this data is not relevant for the main storyline it can go to the supplement.

Line 322: If there are exceptions, it's not "all samples."

Line 232: What is that dissolved oxygen concentration?

Lines 238 to 245: This information should be moved to methods.

Line 344: It is unclear how the read numbers are distributed across the samples.

Line 345: Table 5 contains diversity indices not the microbial community data.

Line 386: This is surprisingly little and it might be good to revisit the bioinformatics pipeline to determine why so little was retained. Chimera removal can lead to relatively large losses for fungal sequences, which might have happened here but this should be clarified.

Discussion

The discussion of fungal and archaeal taxa beyond the biodiversity patterns is missing. A short discussion of their potential role in the studied system would be important.

Line 422: Please adjust typo: "…have groundwaters also have high TDS…"

Line 429: This is an interesting connection to above ground activity, and it would be helpful to have better contextualization (potentially in the introduction together with the bioremediation of aquifer contaminants).

Lines 432 to 436: This would benefit from better integration into the other data and seems detached from the rest of the discussion.

Lines 459 and 460: Please define the "microbial process".

Lines 460 to 466: This would be an interesting place for an introduction of which microbes in the microbial community could be performing sulphate reduction.

Lines 507 to 509: Please expand on the reasons for low Sulfate reducers in the high sulfur well. Also please clearly define which taxa are considered sulfate reducing. This is also true for the iron and nitrogen cycling microbes.

Line 519ff: If dissolved oxygen is present at all sites, aerobes should be able to grow.

Line 546: Interesting, please clarify and cite literature.

Lines 565 to 567: Would be an interesting place to expand on the role of nitrogen cycling microbes in contaminant remediation.

Line 570: What about a correlation analysis between microbial species and environmental parameters?

Line 615: In what way are the results relevant for groundwater extraction endeavors? This could be discussed a bit more.