

Interactive comment on “From substrate to soil in a pristine environment – pedochemical, micromorphological and microbiological properties from soils on James Ross Island, Antarctica” by Lars A. Meier et al.

Anonymous Referee #1

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In this work, Meier et al present a detailed investigation of two soil profiles from James Ross Island near the Antarctic Peninsula. They use standard techniques to analyse soil physicochemistry and microbial communities of the sites.

Overall, the manuscript is well-written and methodologically sound. The introduction provides an effective summary of what is known about how physicochemical conditions affect soil properties and microbial communities. The site description, methods, and results are clear and appropriate. The discussion brings the manuscript together, considering how the soil properties affect the microbial communities, and vice-versa.

C1

The manuscript is extremely detailed.

I have two major suggestions for how the manuscript can be improved:

1. The authors should dedicate more discussion to the energy sources of the community

While the paper is generally very detailed, in my opinion more focus needs to be spent on the potential energy sources for the community. The cell counts observed are high for soils with such low organic carbon content.

Could inorganic energy sources such as atmospheric hydrogen, atmospheric CO, and ammonia potentially be sustaining this community? The authors mention that Actinobacteria were present, but other H₂-scavenging phyla (Acidobacteria, Chloroflexi) and CO-scavenging phyla (Proteobacteria, Chloroflexi) are known.

It is also mentioned that potential ammonia-oxidising Thaumarchaeota are present in the community. Based on the physicochemical analysis, how much ammonia is available to sustain them?

It is also not clear, based on the results or figures, how abundant Cyanobacteria and algae were in the community. Can the authors dedicate a few sentences in the results to clarifying this? It is stated that phototrophs were ‘nearly absent’, but it would be more informative to state their relative abundance (even if tiny). It is stated that chloroplast reads were removed, so presumably some chloroplasts were detected.

2. The authors should modify and consolidate the figures and possibly tables

The figures are not always as informative as the text. It is not entirely clear, based on the figure or legend, what the satellite image of Figure 1 and how this relates to the inlet. Could this figure be modified?

For Figure 2 to 5, could these photographs be amalgamated into a single multi-panel figure given they show similar things?

C2

For Figure 8, while the heatmap is a useful summary, the odd colouring makes it hard to see trends. Could the authors modify this to increase the contrast and make more abundant OTUs darker than lighter. OTUs with 0% relative abundance should be white rather than navy blue.

In addition, some of the tables may be more suited for supplementary material.

I also have several minor suggestions:

L91-93: I disagree with this assessment. Most studied topsoils in Antarctic ice-free regions harbour diverse microbial communities with 16S rRNA gene counts exceeding 107. L82: Please change 'proofing' to 'proving' L99: Clarify what is meant by 'ornithogenic' soil given it is a specialised term L139-143: As this sentence is quite complicated, I recommend breaking it up into two: "These soils are not influenced by vascular plants, sulfides, and penguin rookeries. Our study aims to identify major soil and microbiological properties by combining pedomorphological methods with microbial community studies based on high throughput sequence analyses." L500: Consider modifying 'laboratory' to 'study site'. L659: Please change 'fixate' to 'fix'

Interactive comment on Biogeosciences Discuss., <https://doi.org/10.5194/bg-2018-488>, 2018.