

## ***Interactive comment on “A next generation sequencing of Arctic bacteria in snow and frost flowers: identification, abundance and freezing nucleation” by R. Mortazavi et al.***

### **Anonymous Referee #3**

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The study by R. Mortazavi et al. on arctic bacteria in snow and frost flowers, describe genomically-based characteristics as well as freezing nucleation properties. The investigation presented is valuable and interesting in many aspects; however, there are some important points that should be considered or further explained. In addition, some more information is required, mainly in the method section. My specific comments are below:

1- From the title it is understood that only bacteria were investigated. If the authors choose to include fungi analysis as well, the title should be rephrased to generalize the case for microbes instead of bacteria accordingly.

2- P. 32097, lines 20-21: An explanation of the different snow type as well as the frost flowers is required in the introduction.

3- Could the authors please provide some information on the poor media used for the fungi (SDA)? How did you make sure that bacteria will not grow in the mycological agar?

4- P. 32099, lines 16-18:

i) For DNA isolation - please specify where the bacterial cells were taken from (plates or field sample).

ii) In general, the description of the extraction procedure as well as the NGS analysis lacks some information (volume of bacteria sample to be extracted, cell concentration/mass, the amount of DNA used for NGS analysis etc.).

iii) Please add some information on the extraction efficiency differences between the two DNA extraction kits.

5- P. 32100, Lines 2-3: abbreviation for BLASTN should be “Basic Local Alignment Search Tool for DNA/nucleic acid”.

6- P. 32101, Lines 19-21: (“NGS analysis... V1-V3 primers”): this part should be in the method section.

7- A statistics paragraph should also be added in the method section where lines 6-8 in P. 32102 should be placed in.

8- Why figure A1-3 and Tables A1-2 are not under numbers? If the authors meant to separate them as supporting information, it should be clearly presented. The current presentation is confusing and unnecessary. The figures are also very hard to understand (axis titles as well as legends in most Figures).

9- P. 32102, Lines 23-24: the authors explain that pyrosequencing was done only for bacteria. In the present terminology, it is understood that this is not the case for other

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analyses (IN, electron microscopy etc.), however fungi were analyzed here only for cultivability. Therefore, please rephrase this sentence to be more accurate.

10- P. 32103, lines 22-26: The authors should refer the readers to some published data on the different chemical/physical composition or other elements such as RH, microclimate etc., which might affect the growth of the microbes in the different snow forms. Additional discussion on this point is required.

11- P. 32104, lines 10-14: please expand some more on the anti-freezing properties and IN abilities in the same microbe. Why this phenomenon is interesting? was this observed in other previously published data? What do the references at the end of the sentence relate to? Is there any significance for the presence of such microbes in this environment? It is understood from the text that you describe here your results. However, there are few citations at the end of the line. If it is another published data, please rephrase this sentence.

12- P. 32109, lines 3-5: where was this species shown to oxidize radioactive materials? Please add relevant citations. additional explanation on this anecdote is required. Is there any information on uranium in this area? Or does it require some future investigation?

13- It is hard to understand from the presented data how the fungal cultivated results relate or contribute to the main conclusions of this paper. Could the authors clarify this point, and emphasize it more clearly in the discussion? In the present form, this specific data on fungi seems unrelated to the whole paper.

14- P. 32109, lines 25-28 and P. 32110 lines 1-3: it seems that there is some mistake in these two sentences. Please check.

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Interactive comment on Atmos. Chem. Phys. Discuss., 14, 32093, 2014.

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