

COMMENTS TO REFEREE 1

Review of „Ice nucleation by viruses and their potential for cloud glaciation” by Adams et al.

In the study, a range of different types of viruses are examined (partially also in modified form) concerning their ice nucleation activity and their possible contribution to ice nucleating particles (INP) on an atmospheric level. This has been a severely understudied field so far, and the study adds important knowledge to the field. Although the results “only” show, that viruses might not be a major contributor to these INP this is an important contribution to our understanding of biogenic INP.

It is a very well written and thoroughly conducted study. The structure of its former submission to a higher ranking journal still can be seen, but this does not make it less valid. It is great that this so far underexamined class of biogenic microorganisms, namely viruses, was examined with respect to their ability to nucleate ice with such great care, thought and thoroughness.

I only have a few minor / technical issues and can, after these have been corrected, fully support publication in Biogeosciences.

Minor issues:

line 76: “of other samples” -> “than other samples”

Reply: corrected.

lines 179 - 181: Maybe it has to do with my background and field of expertise, but I do not understand this part. Could you please put it in context a bit more? It concerns the following two sentences:

“Putative IN-proteins were determined in the viral genomes based on the repetitiveness of IN motif occurrences in the sequences, as well as the total INM coverage. The INM coverage is calculated from the total length of the protein sequence matching the INM sequences compared to the total length of the protein.”

Reply: Lines 179-181 were adjusted (and simplified) accordingly: “In order to predict putative IN-proteins in the viral genomes, total INM coverage as well as the occurrence of repetitive IN motives was studied. INM coverage is calculated from the length of the matching INM sequence compared to the total length of the protein.”.

line 185: For the non-biologists amongst your readers, explain "pfu".

Reply: Explanation added.

Also (as this becomes important in equation (2): How was this concentration of pfu determined?

Reply: The explanation “One plaque corresponds to the progeny of one virus that initially infected the host cell. Plaque forming units measures the number of infective virus particles in the sample.” was added after the explanation of pfu.

lines 192-193: “Viral samples were vortexed for 30 seconds prior to being pipetted to ensure the particles were evenly distributed through the suspension.” I’m confused - shouldn’t this lead to settlement of the particles rather than mixing? Please add a sentence of explanation to the text.

Reply: Virus particles would only settle if an ultracentrifuge was used with a much higher g force. We used a vortex mixer to agitate the suspension. This has been clarified.

lines 293-295: You write that biological INP play an important role in the terrestrial mid-latitudes. This is true not only there: Gong et al. (2020) showed that biogenic INP in the marine region of the Cape Verde, influenced by the Sahara, can contribute substantially to highly ice active INP, and that the majority of the INP there were supermicron in size. This, nevertheless, still leaves room for viruses to contribute. A brief discussion of this study in the context of your results could be added.

(Gong et al. (2020), Characterization of aerosol particles at Cape Verde close to sea and cloud level heights - Part 2: ice nucleating particles in air, cloud and seawater, Atmos. Chem. Phys., 20, 1451-1468, doi:10.5194/acp-20-1451-2020.)

Reply: The discussion has been amended to make it broader than just the mid-latitudes and the citation added.

line 486: Pietila -> Pielilä

Reply: Corrected to Pietilä, which is her (Maija K. Pietilä) correct name.

Table S4: Citations from this table should be added in the SI references. And it's "Ardon-Dryer"!

Reply: The name Ardon-Dryer is corrected in the table, and the references added.

Table S5: If you broaden the first column just a bit, it will look nicer ("nucleation" would be in one line, then).

Reply: Corrected.