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## ***Interactive comment on “Survival and ice nucleation activity of bacteria as aerosols in a cloud simulation chamber” by P. Amato et al.***

### **Anonymous Referee #1**

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#### General comments:

The work by Amato et al was motivated by one important question: How does the viability, concentration and IN activity of typical IN active bacteria change over time after aerosolization and cloud formation. The experiments were performed in a cloud simulation chamber and the experimental setting was carefully considered. Their findings show an exponential decrease of cultivability of airborne cells with unchanged IN activity, i.e. dead cells were still IN active. Furthermore they could show that the number of IN active cells decreased after cloud formation and dissipation. The manuscript is well written and the results are well presented. To further improve the manuscript I would like to see the following issues addressed:

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Specific comments:

Introduction, page 4059: It is well explained why certain bacteria stains were used in this study, but I miss here the motivation to investigate the influence of sulfates.

Material and methods, page 4061, line 23: It is not clear to me what "the frequency of INP per cell was > 2% etc." means. If it means that more than 2% of the cells in the suspension were IN active shouldn't it be per total cells then? This would make more sense when reading the text. Why not use frequency of IN active cells as later used in the text (page 4069, line 27).

Page 4063, line 6: It is written that in all cases clouds were generated. Can the authors explain why only in two out of 14 cases aerosol samples were collected after dissipation?

Figure S1: The symbols are partly hard to distinguish e.g. Exp 10 and Exp 7 have both red lines? I suggest to also including the information in the legend that the temperature was reduced in Exp.8

Throughout the manuscript: Why are IN active cells called sometimes INP and sometimes IN active cells? Can the authors clarify?

Other comments/typos: Abstract: page 4057, line20: space is missing in perm2

Material and methods page 4061, line 7: it seems that a word is missing here: acted "as" cloud condensation nuclei. Page 4061, line 23: particle"s" or "an" ice nucleating particle?

Results and Discussion page 4070, line 14: frequency of IN"P" per cell? Figure 4 caption: "per total airborne cell" sounds odd, just per cell or airborne cell is good

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