

## ***Interactive comment on “H<sub>2</sub>O<sub>2</sub> modulates the energetic metabolism of the cloud microbiome” by Nolwenn Wirgot et al.***

**Anonymous Referee #1**

Received and published: 4 September 2017

Review Comment on "H<sub>2</sub>O<sub>2</sub> modulates the energetic metabolism of the cloud microbiome"

**General Comments** This manuscript describes experiments and statistical analysis of field data that indicate that cloud bacteria have a strong impact on the loss of H<sub>2</sub>O<sub>2</sub> from cloud water and that the bacteria exhibit depleted ATP after exposure to H<sub>2</sub>O<sub>2</sub>. The work is important because it provides additional evidence that the presence of living microorganisms in cloud water strongly affects the chemistry of the cloud water with implications for cloud processing and downstream outcomes. This work is novel and of high quality. I have provided specific and technical comments below.

**Specific Comments** Line 32: change to “formation and fate” to indicate formation and degradation may be affected

C1

Line 76, 235: Here and elsewhere, I would suggest eliminating the use of “microflora” and use either “microbial community”, “microorganisms”, or “microbiome”

Line 114: 10481 g should be rounded to realistic significant figures

Line 116 – 118: Please add a citation for the technique

Line 120: use “. . . cloud water solution. . .”

Line 127: Please briefly state how the pH was adjusted.

Line 150-151: Please clarify that the H<sub>2</sub>O<sub>2</sub> and iron complex were added at in situ cloud water concentrations, but all other constituents and bacteria were added at 10x the in situ concentration as stated in Lines 128-131. How does this concentration discrepancy affect the overall chemical reactivity of the cloud water medium as compared to in situ cloud water? How does this difference affect the activity of the microbes? Is there any concern that the microorganisms would be less stressed or vulnerable under the artificial conditions than actual cloud water conditions?

Line 164-166: This passage is not very clear with respect to language and technical aspects and needs to be re-written. What is “affline function”?

Line 166: Clarify how the initial degradation rate was calculated. Via the first two time points? Or other?

Line 174-175: What is the fixed part of the sampler? What alcohol was used? How does alcohol vapor affect cloud water chemistry as the samples are collected?

Line 180-206: This entire passage is redundant. This passage does not represent results. Please eliminate or work relevant parts into the Introduction, Methods or Discussion.

Line 220-221: Redundant.

Line 222-225: Is there any significance to the fact that the Sphingomonas isolate is less

C2

active on H<sub>2</sub>O<sub>2</sub> or that *Sphingomonas* and *Pseudomonas* 13b-2 seem not to recover with respect to the ATP concentration as well as *Pseudomonas* 13b-3? Could the authors discuss further?

Line 248: Which previous conditions are referred to here?

Line 263-275: This passage is either restating the Methods, or should be moved to the Methods. The Methods should include how data were collected and how statistical analyses were performed. Here it might be better to discuss the final set of data that resulted – i.e. Line 268 – 269 where it is explained how many events were selected for use. Then followed by the presentation of the PCA results.

Also, here and in the Methods it would be good to state how many sampling events were available. Then it could be stated that 37 events (of xx total) were selected after the constraints (e.g. no more than 10 percent of missing values) were applied.

Line 268: It is not entirely clear exactly what the 10 percent refers to. Does this mean that no more than 10 percent of data for any specific sample or any specific parameter was missing?

Line 310: Since the specific transcriptomic /metabolomic response of the microorganisms was not determined, the authors should indicate that the organisms “likely” or “probably” responded to the conditions using the mechanisms stated.

Line 324: avoid “very” and other qualitative wording

Line 327-332: This passage is not clear. Do you mean that formate metabolism could be inhibited by presence of H<sub>2</sub>O<sub>2</sub>? Please expand this discussion a little more to make the intended points.

Table 1: What is the rationale for the number of significant figures shown in each case. Should they be different for different data sets?

Line 333-334 and Figure 6 legend: Please edit to indicate that this is a hypothesized

C3

mechanism. Since the actual response of cells was not measured, these mechanisms cannot be known with certainty.

Line 342: It would be good to examine the response of the organisms on a transcriptomic basis as well to confirm what genes are expressed in response to the H<sub>2</sub>O<sub>2</sub> stress. Technical Corrections

Line 40: use “parameters”

Line 60: use “. . .A few decades ago, living microorganisms were observed in cloud water. . .”

Line 62: use “nutrient”

Line 64: change “Few” to “Several”

Line 69: “. . .to efficiently degrade. . .”

Line 70: eliminate “to” and “to the”

Line 70: eliminate “have”

Line 79: use “radiation”

Line 81: eliminate the first occurrence of “the”

Line 87: eliminate “the”

Line 88: instead of “Thanks to the fact that. . .” use “Because. . .”

Line 90: eliminate “the”

Line 91: eliminate the first occurrence of “of”

Line 104-106: This sentence should be re-written. Something like “It is crucial to consider all sinks and sources of H<sub>2</sub>O<sub>2</sub>, especially in atmospheric chemistry models, since H<sub>2</sub>O<sub>2</sub> impacts many relevant processes in the atmosphere.”

C4

Line 114: "g" should be italicized

Line 121: eliminate the space after "concentrations"

Line 129-130: use "...the bacterial cell concentration..."

Line 134: replace "consisted" with "were performed"

Line 139: add a space between the number value and the unit

Line 142 and elsewhere: use "rpm"

Line 164-166: This passage is not very clear with respect to language and technical aspects and needs to be re-written. What is "affine function"?

Line 168: Eliminate "The". Add the company for R.

Line 170: use "less than" instead of "inferior"

Line 174: use "sterilized beforehand"; replace "during" with "for"

Line 232 and elsewhere: use "within the same order of magnitude"

Line 233: replace "than" with "of"

Line 234: use "...separately analyze..."

Line 76, 235: Here and elsewhere, I would suggest eliminating the use of "microflora" and use either "microbial community", "microorganisms", or "microbiome"

Line 235: use "clouds"

Line 236: eliminate both "the"s

Line 245: use "strain"

Line 254-257: Redundant and restates methods. Eliminate the first two sentences and replace the next two with something like "Results for the number of culturable bacteria in the presence or absence of H<sub>2</sub>O<sub>2</sub> are shown in Figure 3. "

C5

Line 260: replace "was multiplied" with "increased"

Line 287: comma after "ATP"

Line 288: use "less than" instead of "inferior"

Line 292: replace "as" with "since"

Line 304: replace "to" with "at"

Line 312: use "reported"

Line 330: eliminate the second occurrence of "the"

Figure and Tables For figures and tables, I would suggest using the following wording:

"Values shown are averages of triplicates plus/minus one standard deviation"

"Symbols are averages of triplicates and error bars represent the standard error. Where error bars do not appear they are smaller than the symbol"

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Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2017-581>, 2017.

C6