

Interactive comment on “The Importance of Biological Particles to the Ice Nucleating Particle Concentration in a Coastal Tropical Site” by Luis A. Ladino et al.

Anonymous Referee #1

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General comments

This manuscript presents data on physical, chemical and biological aerosol parameters observed during a campaign lasting two weeks at a coastal site on the Yucatan peninsula. Technically, the measurements were well done and there are little similar data from the same region. In general, the manuscript is clearly written.

The data obtained with the various instruments employed are weakly related, in part because of a mismatch in sampling duration and timing between INP and other parameters (chemical and biological). The sampling duration was per sample 6 hours for INP (2-3 samples a day, morning and afternoon), 48 hours for chemical components,

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5 min for bacteria and fungi (4 samples a day, in the morning). Further, no link can be made between the cultured microorganisms identified (Tab. 2) and ice nucleation activity, because the cultured organisms were not tested for ice nucleation activity. Much of the relations discussed between INP and other parameters are speculation supported through reference to other literature, without the current study adding substantial new evidence in support of it. Because of that, I would like to encourage the authors to put more effort into relating the different parameters in a way that each parameter can tell us more than its individual story. To start, you could try to combine data from the optical particle counter with size resolved INP concentrations to tell for different size classes the fraction of particles that are ice nucleation active (e.g. what was the ratio INP/aerosol particle in the different MOUDI size classes? How did the ratio change during the passage of the cold front?).

Specific comments

Page 5, line 136-138: Measurements of INP concentrations with the cold cell need to be described in more detail. At least their principle should be clear to reader without having to look up the paper by Mason et al. (2015a).

Fig. 3 duplicates the time series measured by the CPC, which is already shown in Fig. 2. Combine Fig. 2 and Fig. 3, and make the time series of wind speed and direction (now panel B in Fig. 3) the top panel of the combined Figure because wind is the factor driving the aerosol concentrations, so logically this factor should come first.

Figure 4: I would like to see the data of the present study as points, not just as a shaded area, where I can not see by how many points a particular part of the area defined. In particular, I am curious to see how many points support the very high [INP] at temperatures above -10°C . I suggest to revise the Figure in a way that the data taken from Kanji et al (2017) are shown as shaded areas only (no points) and the data of the present study are superimposed on this background as points (perhaps use different symbols for data obtained during the passage of cold fronts).

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Page 8, first line (and page 11, line 344): The aerosol number concentrations are reported as mean plus-minus one standard deviation, assuming a normal distribution of values. Although this is common practice, it is not correct because aerosol number concentrations have a log-normal distribution. I strongly encourage the authors to apply the less common, but correct metrics (median and multiplicative standard deviation) as explained in Limpert et al. (2001; *BioScience*, 51, 341-352, freely available at: <https://stat.ethz.ch/~stahel/lognormal/bioscience.pdf>). Why perpetuate a common mistake?

The Conclusion section is mostly a summary of the Results and Discussion section. It should go further than that.

Technical corrections

Title: Perhaps replace “importance” with “contribution”

Page 1, last line: The statement “Biological particles were likely found to be very important. . .” does not make sense to me. Do you mean “Biological particles could potentially be very important. . .”

Page 2, line 37: “Given the potential INP role of a variety of aerosol particles . . .” do you mean “Given the potential role of a variety of aerosol particles as INPs. . .”

Page 3, line 88: “presents”, not “present”

Page 3, last line: Why “importance” and not simply “potential relevance”? The word “importance” is a premature value judgement here, at the end of the introduction section.

Page 5, line 128: I would turn the order of the cut-sizes the other way round, so that it follows the logic of the instrument (i.e. 10 μm , 5.6 μm , . . .0.18 μm).

Page 6, line 162: delete “with”; line 165: replace “0” (zero) in “Na₂C₀3” with “O” (capital “o”).

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Page 8, line 260: change to “At temperatures. . .” (plural).

Page 9, line 273: “Saclay”, not “Saclary”.

Page 10, line 311: change “elements/cations/ions” to “elements and ions are sodium and chlorine, respectively chloride”; line 322: why “elements/cations/ions” and not just “elements and ions”, cations are ions.

Page 11, line 353: “temporal mismatch of the data”, not “uncertainty in the analysis”.

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