

Interactive comment on “Chemical characterization of fog and rain water collected at the eastern Andes cordillera” by E. Beiderwieden et al.

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Biederweiden et al. HESSD Review

1. General comment

The authors report on their concentration measurements in fog and rain water samples collected at the El Tiro site in South America. This is essential work to increase our understanding of the huge geographic variability found in fog and rainwater ion concentrations around the world and thus deserves publication.

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2. Specific comments

Minor issues that the authors should address before the manuscript can be accepted for publication:

Abstract: I realized that the Thalmann et al. (2002, Atm. Res.) and the Burkard et al. (2003, Atm. Env.) papers are lacking in the incomplete list of results published from other mountainous sites. However, in the text I did not even find any mention of this comparison. I would consider this a valuable information, which should be added with a table and a text paragraph to the text (being as complete in referencing other work as possible). If the authors however do not agree with this, then the abstract must be worked over to reflect the contents of the text more adequately (concerns last paragraph of abstract only).

P. 866, l. 6: A roof prevented rain from reaching the fog sampler: add “R” in sampler; moreover, this is too bold a statement and only holds for rather low wind speeds. Please make a quick calculation up to which wind speed rain can really be considered not to hit the strings and then extend the phrase by adding “if horizontal wind speed was $<XY \text{ m s}^{-1}$ ”

P. 867, l. 9–10: this statement is not quite correct and could even be misleading for readers: 1 m above topography sounds perfect, but in detail the HYSPLIT topography can be a couple of hundred meters (!) higher or lower than true topography, especially in mountainous areas. My suggestion for a rewording is: “...the last 120 hours arriving at 1 m above surface level of the heavily smoothed model topography at the location where the fog sampler was installed.”

P. 868, l. 10: earlier you said that you cleaned the fog sampler once a week (p. 866, l. 12–13); how come that you now claim that ion concentrations were too high due to dry deposition? I understand your text that if there was no fog, then you did not collect any fog samples, but you cleaned the fog sampler after 1 week at most, did you? That

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means that the maximum length of dry deposition on the teflon strings is 7 days minus an hour or more (otherwise there would not have been any fog at all I guess). So please rectify this. If you really want to say that cleaning once a week is not enough then it would be essential to say so because this would warn others about what is needed if they were to carry out similar measurements.

P. 873, Conclusions: (see also details below): there are two things I'd like to have the authors changed in their conclusion. (1) if your goal was to figure out the characteristics of fog at some place, e.g. in an interdisciplinary project where other scientists might be interested in your findings, then it is normally not a good conclusion to claim one should go elsewhere; it's normally more a judgement of methods that may not succeed at certain locations. (2) since you did not measure LWC it would be more helpful for the reader to know if there are other observations that could suggest that one or the other fog is denser than its cousin. Maybe you know that you get typically more water per hour under comparable wind speed from one wind direction compared to the other, or you know that visibility is worse when the wind is from one direction compared to the other. In addition to the generic statement, that we should be measuring LWC in order to know LWC (which is quit obvious), such additional information would be very valuable for readers.

3. Technical corrections

P. 866, l. 14: give details on material used (stainless steel?)

P. 866, l. 19: introduce abbreviations upon first use (PE was not introduced)

P. 868 l. 3: add TO in "...should be equal to that of..." (or, if you prefer, ...should equal the cations...)

P. 868, l. 8: could non-foggy be replaced by fog-free?

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P. 869, l. 6: replace “die” by “the” (German word in English text)

P. 869, l. 11: add “substantially” to ...is substantially larger than the respective median sum...

P. 869, l. 19: add P-level for the statement “...but are not significant.”

P. 869, l. 25: replace “for” by “that of” in ...heterogeneous than that of the pacific samples.

P. 870, l. 20: add plural s to “in the fog samples”

P. 871, l. 2: correct to “...is more heterogeneous than that of the rain samples”.

P. 871, l. 14: “due to the heterogeneity of the data sets”: do you mean the “high variability of the data” (which suggest that they represent one data ensemble, however with high natural variability), or that the data are “heterogeneous”, not belonging to one ensemble, and maybe with a mixture of credible good values but also bogus values? If the first is meant, then please use the wording “high variability of the data”. If the latter is meant then please reword, since the logic is not clear: when you compare data sets, then you implicitly assume that each data set belongs to one group ensemble, which e.g. can be described statistically by its mean, standard deviation (implying normal distribution of data points), but if this is NOT the case, then also your method to distinguish data sets will fail due to unfulfilled implicit assumptions in the test. If you claim that there are differences, but your test fails to show significance in this difference, then one would normally argue that the number of samples taken is too low given the high natural variability of the data (but then this would not be a heterogeneity at all). Please clarify this minor detail.

P. 872, l. 9: Say something about the typical number of rain events that occur in a week so that the reader can validate this statement.

P. 872, l. 14: use “ion budget” in place of “ion balance”, since a balance is balanced by definition and cannot be unbalanced! But a budget can.

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P. 872, l. 27: I have never encountered pH in plural before! I suggest to modify to “...with a pH around 5” or “...with pH values around 5”.

P. 873, l. 1: ...city OF Loja

P. 873, l. 5–7: what is meant by “pacific fog arrived at the result that the differences are not statistically significant”? Are differences in concentration not significant? Or differences in distributions? Or differences in occurrences? What did you test for? Give a P.value to indicate your definition of statistical significance.

P. 873, l. 14: it is not possible to exlude any anthropogenic influence even at another site, but one could reword to “...Ocean in order to minimize possible anthropogenic influence”.

P. 873, l. 17: “...thus higher liquid water concentrations of ions”: this is not logical: concentrations are in mass or equivalentents per liter, thus concentration does not change with volume! Thus, it does not increase automatically with LWC, but the ion flux (deposition) increaes (which however was not quantified).

Table 1: put an emdash in empty fields (or a zero)

Tables 2–5: please don't place zeros for values below detection limit, but use e.g. <2 for NH_4^+ and the corresponding values for the detection limits of other components. This applies not only to min values, but also to the median which occasionally is below detection limit (but not necessarily 0.0)

Fig. 2: Give units of the numbers in the caption. Maybe redraw to improve quality of this figure.

Fig. 3: label axes. It would improve readability of this map if you could put a bright grayshading over the ocean area which would allow many readers to interpret the south-easterly trajectories as a group that travels mostly over ocean, not land surface.

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