

Interactive comment on “One year of aerosol refractive index measurement from a coastal Antarctic site” by Z. Jurányi and R. Weller

Anonymous Referee #2

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Review of “One year of aerosol refractive index measurement from a coastal Antarctic site” submitted to ACPD by Z. Juranyi and R. Weller:

The manuscript presents a thorough derivation of the real part of the refractive index for atmospheric aerosol as encountered during the course of one year at the Antarctic station Neumayer.

The measurements and calculations as well as related caveats are all well described and reasonable, the techniques used are all sound. The resulting value is reasonable and of good use for climate modeling.

My main concern is that, in some parts more than in others, the language needs polishing, beyond what can be expected to be caught during the ACP-language editing

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at the end of the publication process. I will not list all these occurrences where the English has to be approved, but give at least an already longish list in this review at “Technical comments”. Also most of the “More general comments” concern issues that likely arose due to strangely formulated sentences. As such, I can recommend the manuscript for publication once these language issues will have been dealt with, and will give “minor revisions” although the list below is somewhat long and includes a few issues other than only linguistic.

More general comments:

page 5, line 5: Information on where exactly particles entered the tubing during these experiments would be good. Just underneath the roof, close to the inlet line?

page 6, line 1-2: You show this polynomial only up to 400nm - although the data (blue dots) go up to 1000nm - does this mean you only used particles up to 400nm? Please add an explanation and/or prolong the line in Fig. 1.

page 6, line 24 ff: I have an idea what you did, here, but I am not entirely sure - this could certainly be formulated much clearer. What I think you did is the following: (1) - calculate TIR for a fixed RI (2) - take the value from the TIR at the diameter of the PSL particles. I guess one confusion was due to your use of the word “bin boundary diameter”. Maybe this could be defined once and then “LAS diameter” could be used instead, throughout the text, to make the text flow better? Also, this passage sounds as if there would basically only be a signal in one bin during a PSL calibration - this is most likely not the case. Describe this more clearly.

page 8, line 15-16: Concerning possible changes in particle composition: The way you did your derivation of RI, however, was to assume that the particle chemistry was the same for all particles in one measured size distribution? Please explicitly say this here somehow, as I got confused by your remark here.

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page 8, line 29-30: “We used the method introduced in the sections 2.5 and 2.6 to determine the RI of this e-cigarette smoke.” But in the paragraph above you said that the RI of the cigarette smoke was 1.43, based on literature (and if you would have had to determine it first you would run into issues with circular reasoning if you then would use this measurement to calibrate the LAS TIR). I assume this again is an issue with formulating the text. Please review.

page 9, line 4-6: Again confusing, so let me ask you again if this is what you did: When retrieving the RI for the uncorrected LAS data, you obtained an RI of 1.35, but when you corrected the measured LAS size distribution as described above and then retrieved the RI again, you got a value of 1.43, in agreement with literature. - If this is what you did, feel free to use my sentence here in the review instead of what you wrote. Your text here was hard to follow and it took me a while until I understood what you (likely) meant.

page 12, first paragraph of 3.5: I would recommend to start this paragraph differently – the first sentence states something that seems not to hold once one read the list of RIs: when looking at this list and the most abundant components of the aerosol, one wonders if this really can be in good agreement, since particularly sea salt and ammonium sulphate are clearly above the value you retrieved. This all becomes much clearer further down, but I recommend to avoid confusion and to remove this first sentence or replace it with a sentence that says what you are aiming at in 3.5.

page 17, line 2: Maybe add that you expect this because scattering scales with the diameter squared.

page 18, first paragraph: You spend most of the space in this paragraph on discussing why this one value does not make sense, and the reason basically is that the underlying data is corrupted. Maybe just do not present the blue line in the figure and say up front that due to a) the strange kink in the LAS distribution and b) due to the low particle number concentration at the larger particle diameters no useful value resulted. (I'd be

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afraid that otherwise in the future someone might just grab that value from your figure without reading the text and use it.)

Also, this lowering for particles > ~350 nm, together with the bimodality you showed in Fig. 9 - could this point towards two different sources for particles? This is something you could discuss here, instead.

Technical comments:

Page 1, line 11: June and September have (not has).

page 2, line 8: really “RI values of the” (or “for the . . .”)?

page 2, line 20: Start a new sentence at “additionally” – these are two main clauses that are independent.

page 3, line 18: “can barely reach it, the main aerosol” better start a new sentence at “the” or combine these two sentences with an “and”. (Again, these are two main clauses.)

page 3, line 19: Antarctic is always capitalized.

page 4, line 8: Exchange “makes” with “enables” and delete “possible” at the end of the sentence.

page 4, line 12: “is” is missing between “and” and “only”.

page 4, line 13: Replace “the time” with “a time” (you are not talking about a specific time here).

page 4, line 19: Replace “in a minute” with “per minute”.

page 4, line 21: Delete the “the” in “with the time”.

page 5, line 4: Replace “such, that more” with “, so that several”.

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page 5, line 13: Replace “why we only have the complete number size distribution until 5 μm after . . .” with “why we have the complete number size distribution only up to 5 μm after . . .”.

page 6, line 12-13: You wrote: “or exceeded the particle number detected during a one hour SMPS scan with 400 cm^{-3} concentration.” – This sentence sounds quite strange, and I guess you could replace all that with “or exceeded 400 cm^{-3} “ – or maybe “exceeded 400 cm^{-3} (as measured by the SMPS) for the duration of one hour”? But it’s not clear to me if you refer to the concentration of the integrated particle number size distribution?

page 6, line 20: Replace “to any other RI” with “for any other RI”.

page 6, line 26: Do you really mean an OPC (i.e., a counter) or rather an OPS (optical particle sizer)? (Check this also in the introduction, line 19 on page 2).

page 6, line 31: Put the “RI” in front of the parenthesis.

page 8, line 9-10: This again is a strangely formulated sentence.

page 8, line 17: “and that the imaginary part of the RI is negligible.” You just said that before, a few lines above. But you could instead say: “and, as said above, the imaginary part of the RI is negligible.”

page 8, line 20: “was” -> “were” (end of this line).

page 9, Fig. 3: Is the legend correct? The green dashed should be “uncorrected”, right? Also, at first this was a bit confusing, as the fits are not close to the data - maybe change the naming convention, here and in the text, maybe “RI-fit” instead of just “fit”?

page 10, line 5: Replace “count with” with “expect”.

page 10, Fig. 4: It is slightly counter-intuitive that you give the “original” LAS curve in deep blue, which is close to the color in which you also give the resulting RI (m). I’d suggest to use the same color for the dashed line (which is the final result) and the RI

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(m), and a different color for the “original” LAC curve.

page 10, line 8: Replace “about” with “of”.

page 13, line 20-21: “The slight difference may come next to the used assumptions from the fact that we used . . .” – sounds quite strange, not English at all. Please reformulate.

page 13, line 26: Replace “among the” with “compared to the other”.

page 13, line 26-27: “This might explain as well why we have gained with the fitting procedure a slightly higher R_{leff} values for two winter months.” – Again strange sentence, the sequence of the words is somewhat off. Please reformulate.

page 14, line 3: Delete “stay” and add a comma before “caused”.

page 14, line 4: A space is missing after “site”.

page 14, line 10-12: The use of the word “points” here is a bit stange – maybe better “data”?

page 14, line 15: “independent on from which direction the wind blew” -> replace with “independent of the wind direction”.

page 15, line 5: Add “be” between “not” and “fit”.

page 16, line 5: Add “ly” to “different”.

page 17, line 4: “We can only use again the” -> “Again, we can only use, ...”

page 17, line 8: Replace “high enough” with “sufficiently many”.

page 17, line 9-10: Confusing formulation. A better way to say that: “The resulting RI values will then be valid for the respective particle sizes.”

page 18, line 3: “0.0018 is also close to the limit of 0.02 . . .” There is more than a factor of 10 between the values you give here. Check!

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page 18, line 2: The first word here should be plural (“instruments”). Author contributions: “Juranyi has” (not “have”).

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