

How to reliably detect molecular clusters and nucleation mode particles with Neutral cluster and Air Ion Spectrometer (NAIS)

The paper by Manninen et al. aims at providing a standard operation procedure to NAIS users regarding both measurement and data processing. NAIS has already been widely used in a large variety of locations, giving significant insights into our understanding of the nucleation and growth processes. I clearly believe that persevering with this instrument using harmonized procedures would benefit to the whole community. This would especially allow more accurate analysis and comparisons of the datasets that can further serve for model investigations. For that reasons, I recommend the publication of this paper. However I have some comments that should be addressed in a revised version. Also, I suggest the paper to be read and cleaned up by a native English speaker.

Specific comments

P1, L20-23: “have remained unclear until very recently”: can we really consider that the mechanisms and precursors involved in the particle formation process are now clear? I would balance this statement and rather say that our understanding of the formation process has benefited from direct atmospheric measurements that could be achieved by the improvement of measurement techniques.

P2, L13-14: The journal (Nature protocols) does not need to be specified in the text.

P4, L12: It should be mentioned that the recommended measurement cycle is for ground based measurement, since a different cycle is later suggested for airborne measurements (P11, L19).

P5, L1-5: If I understand well, the right bound of the shaded area on Fig.3 and Fig. 4 represents the lower detection limit of the NAIS? It is defined as the lower diameter for which post filtered concentrations can be considered negligible? This should be clearly stated since it is crucial for the user to be able to define this lower detection limit (see last comment regarding P21, L25-26).

P5, Section 3: The term “calibration” is used for different purposes with different meanings (e.g. P7, L2 :”the calibration (actually a flow verification)”). This can be misleading.

P6, L18-24: Can you give more details regarding the way to adjust the Venturis’ pressure drops? This will also help for the 3- and 4- blower systems described on P7 (L21: “The valves should be adjusted accordingly.”)

P7, L14: Can the calibration coefficient be directly adjusted by the user? If yes, can you give additional pieces of explanation? If no, clearly state that assistance from Airel is needed.

P10, L10-17: Can you precise the setup which is used for the “drying by heating”. Should particular precautions be taken at altitude sites to limit RH in the sample flow? High RH conditions are especially found during in-cloud measurement and can coincide with very low temperatures.

P10, L26-27: Can you give more details regarding the way to take into account the deviation between target and actual flow rates in the processing of the number size distributions?

P11, L1-8: In case of measurements performed with a one blower system, are there corrections that can be made on the data afterwards to compensate for an unappropriated use of the blower?

P12, L21-22: You should precise that the full procedure is described in the supplementary.

P18, L22-26: I am not sure to understand what the authors mean when talking about “correction”. Should we try to correct NAIS data based on SMPS measurements, and if yes how? Or should we just ignore NAIS data above 20 nm, as suggested on P23, L22?

P20, L29: “supplementary data”. Be more precised.

P21, L12: Should corrections be applied even when using the recommended inlet manufactured by Airel?

P21, L25-26: In practice, how can we accurately find out the lowest detectable size given the fact that both residual generated ions and sampled particles are present at the smallest size ranges? This should be clearly explained using Fig. 3 and 4.