RR: Reviewer's response

AR: Author's response

Reviewer 2 comments:

RR:

The paper contains a set of measurements of several units of two models of portable self-contained nanoaerosol classifier-quantifier. The devices are evaluated against a reference instrument before and after servicing. Measurements against ambient aerosols and laboratory aerosols are performed in the size range of 10-200nm. Additional information regarding flow rate calibration, laser performance and time since last service is also included but not commented on. The comparison among various instruments of the same model is uncommon in the nano aerosol field and relevant for future publications, especially after long usage intervals. The reviewer recommends addressing the following comments prior to publication.

AR:

Authors thank the reviewer for providing comments for improvement of the manuscript (MS).

RR:

Annual calibration: "The results indicate that the portable instruments must be serviced and calibrated annually" The claim for this conclusion is not demonstrated. The flowmeter error and counting inaccuracy is measured for units with known last services, but (time-since-last-service vs counting-error[corrected for final inaccuracy]) is not displayed, therefore the statement "annually" has no basis.

AR:

The statement has been modified in the revised MS.

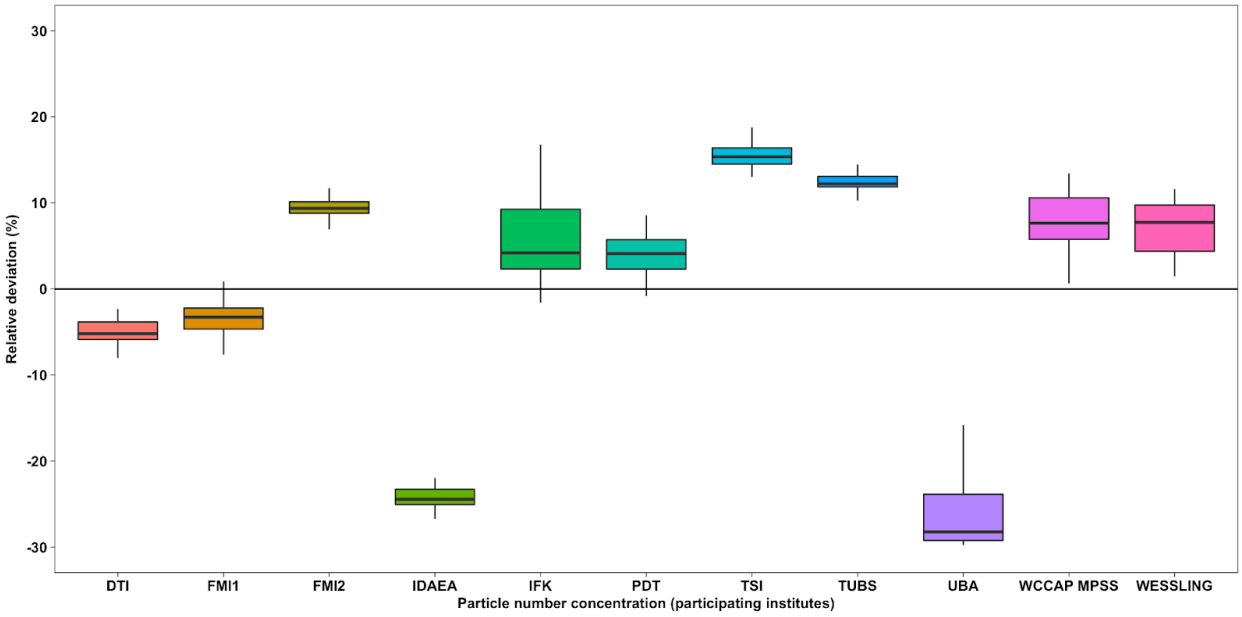
The revised statement is "The instruments need to be maintained and serviced according to the manufacturer's recommendations. For example, cleaning of NanoScan SMPS cyclones, zero check and flow measurement are tasks that have to be done regularly, also depending on the application (measurement time, concentration level etc.). The manufacturers recommend a professional annual service and calibration".

RR:

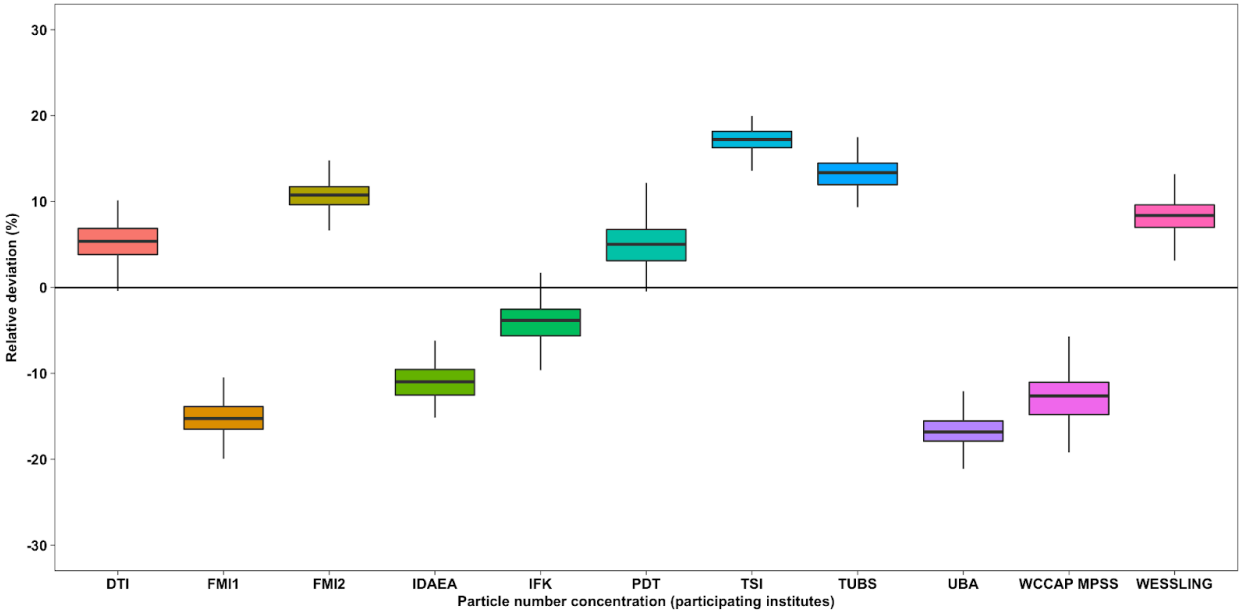
Time series ambient intercomparison: The methodology and usefulness for this measurement is unclear. I understand that the evaluated parameter is the stability over time of the overall counts. Additionally, since concentrations change over time, linearity can be evaluated Figures 9 a)b)c)d). The measurement method is confusing though. Particle number concentration over time incurs in the size dependent counting error. The Nanoscan SMPS ambient test, before and after the cleaning shows two clearly different particle distributions. A more relevant representation should evaluate the time dependent ambient aerosol per size channel or at a set of size channels, this way time linearity can be appropriately evaluated. Otherwise, if the ambient aerosol were to change its distribution counting will be affected. Figures 1b and 3b as plotted, suggest that you should not service your device as you will lose counting efficiency.

AR:

Authors thank the reviewer for this comment. The overall motive of using the time series ambient inter-comparison is to check the stability of counts over time.



(a)



(b)

Figure 1: Relative deviation of the calculated total number concentration for the measured distribution relative to the average ambient aerosol distribution.

The NanoScan SMPS ambient test, before and after the cleaning shows two clearly different particle distributions. However, in figure 1 (a) possible outliers have been identified and after cleaning and maintenance all instruments were found to be in ±20% range (Figure 1 (b)). Figure 1 corresponds to the relative deviation of the calculated total number concentration for the measured distribution relative to the average ambient aerosol distribution.

So, from figure 1 (a) and 1(b), we can suggest that maintenance of the instruments makes sense even if there are two distinct particle distributions.

RR:

Nebulizer-generated NaCl aerosol: It is not specified the generation device/method for the precharged NaCl aerosol nor if the charger on the particle classifiers was turned off.

AR:

A custom-built nebulizer, similar to the TSI constant output atomizer, is used for the NaCl generation. The particles are dried using a diffusion drier and have due to the way of their generation a relatively high pre-charge. The bipolar charger in the classifier was used for the NaCl particles in the same way as for the ambient aerosol particles. Both portable instruments used their built-in unipolar charger. The charger in the particle classifier was not turned off.

RR:

There is little to no scientific value in including results from inaccurate or defective devices with regard to the GRIMM Mini WRAS spectrometers with SW <10 being uncalibrated. Unless a dedicated section addresses the background of said updates commenting on the inversion algorithm I would suggest removing any measurement data regarding said units. Data could be left as is, as a correction for previous publications with these instruments, if a comment is added.

AR:

Authors thank the reviewer for the suggestion. Actually, the direct correction of old data to the one recorded is not easily possible, since the inversion algorithms are in detail relatively different and require different correction factors. In addition, it cannot be guaranteed that the instrument would have behaved the same at an earlier time (would have had the same correction factor) as during the (later) calibration for the use of the newer software.

Therefore, we would like to keep the old data as it is, also showing the improvement in data inversion using the newer software version.

RR:

Regarding the test against 125nm PSL particles. This is quite a relevant plot, it provides a high concentration high resolution aerosol, which challenges both devices and shows the limitations of the instruments. For any of the cases it is not commented on the nature of the particles with aerodynamic diameters <<125nm. For 125nm the charging efficiencies of radioactive and corona should be similar but there is clearly a difference on the small size residues? A comment will help the reader with this plot. Maybe the devices did reach saturation

AR:

Authors thank the reviewer for considering the relevance of PSL tests carried out on portable instruments. The TSI NanoScan SMPS and GRIMM Mini WRAS spectrometers cannot resolve the monodisperse peaks of single and doubly charged PSL particles due to the limited size resolution. The ambient particle number size distribution is broad and for PSL it is quasi monodisperse. Therefore, these instruments are principally unable to capture a PSL number size distribution.