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Atmospheric Measurement Techniques Discussions

Interactive comment on "B3010: A Boosted TSI 3010 CPC for Airborne Studies" *by* David Picard et al.

Anonymous Referee #3

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The paper describes a method to boost the performance of the condensational particle counter CPC TSI 3010 used originally in monitoring of clean rooms, but also in atmospheric applications, e.g. in airborne measurements. The instrument is already not produced, however it is widely used and available on second-hand market, thus the method is of boosted performance in atmospheric (particularly airborne) applications is possible interest to many researchers from e.g. cloud physics community and/or aerosol community. The proposed boost is aimed at enhancement of detection limit in small aerosol particles from 1 nm in the original design down to 1.5 nm in the boosted version, labeled B3010.

The basic physical principle on which the improvement in the performance nab be obtained is change of the operation temperatures of the counter.

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In the boosted version the saturator, condenser and the optics of the original 3010 model are used, however improvements in the temperatures of saturator and condenser as well as in the volume flow rate are introduced. The electronics and control elements of the system is projected and introduced from scratch.

The new B3010 was tested in the laboratory using two substantially different types of sub 3 nm particles: electrospray meeting molecular standards (for organics) and metal oxides from glowing wire generator (for non-organic).

The tests indicate noticeable detection efficiency of both, organic and non-organic particles beginning from ∼2nm comparably to the existing ultrafine CPCs TSI 3015 and TSI 3776.

Criticism

While the idea of enhancing the performance of the existing CPC is appealing and important, the main drawback of the work id lacking direct laboratory comparison to the existing instruments of similar detection range. I do understand that this wad behind the reach of the authors, however to convince the readers to the performance of the boosted sensor more detailed description and discussion is needed.

Correction suggestions: 1) Figure 1. The scheme of B3010 should indicate which elements have been improved/changed compared to the standard 3010 instrument. The adequate edits tn the modification description should be added in the text.

2) Expand, please the section 3, provide more details on the DMA (Dynamic mechanical Analyzer) and the reference AEM used.

3) Results and discussion section should be expended and better explained. Why do you see remarkable differences in detection for positively and negatively charged particles? How do you measure pressure? Figures in this section need better descriptions, some error analysis should be added into the text. Also more discussion real measurements and comparison between B3010 and 3025 should be more detailed. Do you

observe drift in the performance of the sensor in the course of the tests, which Fig. 10 suggest? If so why?

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