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Atmospheric Measurement Techniques Discussions

Interactive comment on "Characterization of a new fast mixing type CPC and its application for atmospheric particle measurements" *by* B. Wehner et al.

Anonymous Referee #2

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GENERAL COMMENTS

The manuscript by Wehner et al. describes the design of a fast mixing type condensation particle counter (CPC) for applications in atmospheric research which require a much higher temporal resolution of the measurement than usually provided by commercial CPCs. The authors discuss results of laboratory tests to characterise the new instrument with respect mainly to sampling efficiency, lower particle cut-off diameter and response time. The paper is well written and the description of methods and results is sound and clear. The topic is of relevance to the atmospheric community

interested in CPC measurements, especially in fast CPC measurements obviously. In general, I recommend publishing the manuscript, but I do have a few minor questions or comments, which the authors might want to consider in preparing a revised version for final submission.

SPECIFIC COMMENTS

The design of the new FCPC was mentioned to be targeted at airborne use. Many CPCs flying on aircraft have to be designed to work in the pressurised aircraft cabin. I would like the authors to comment on this aspect regarding their new FCPC.

Reading the acknowledgement one could get the impression that different setups of the FCPC have been tested, some of which were probably not fulfilling the requirements. I wonder if it is worth mentioning which setups failed to deliver. This could certainly help to understand critical aspects of the setup finally chosen for the FCPC.

Page 5910, line 22, "In contrast to . . ." — Why "In contrast"? The purpose of the Wang et al. design hasn't been stated.

Page 5911, line 13 — How was the thermal decoupling actually achieved? The Swagelok T being mentioned is a stainless steel type, I assume? Is every part of the flow system connected by Swagelok fittings?

Page 5911, lines 5-6 — How was ensured that the temperature sensor is actually measuring the "right" temperature of the gas flow? In other words: Are there relevant temperature gradients?

Page 5913, lines 19-23 — three temperature settings have been evaluated as described (leading to three different cut-offs). What about other temperature settings? Have these not been tested or have they not allowed successful operation?

Page 5916, lines 6-8 — I am not familiar with power spectrum analysis. The -5/3 slope: is that standard textbook knowledge? Can a reference be provided here?

Page 5919, lines 21-27 (and corresponding discussion in Section 3.3.2) — I am a bit confused by the view of a CPC measurement addressing a spatial scale (of 60 cm). Can this be better explained? It is obvious that the response time is crucial to capture effects of turbulence in a time series of data. Why discussing a spatial scale?

Fig. 5, lower panel. Why is this not a strict 1:1 relationship? What is the meaning of the offset in the FCPC concentration data if compared to the electrometer data? How does this relate to the stated sampling efficiency of the FCPC of 0.97 in the asymptotic branch of the efficiency curve?

TECHNICAL COMMENTS

Page 5909, line 6, "The spectrum . . ." — spectrum doesn't seem to be the right word in this context.

Page 5910, line 3 — there should be a single tilde to denote "approximately 100"

Page 5911, line 6 — insert "temperature" before "sensor"

Page 5912, line 20 — The actual type of the electrometer ("TSI . . .") could be mentioned a couple of lines higher up when the electrometer gets mentioned for the first time.

Page 5913, line 12, "the slope" — I think I know what the authors refer to, but a better wording should be found to describe where the standard deviation was actually higher.

Interactive comment on Atmos. Meas. Tech. Discuss., 3, 5907, 2010.