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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Number size distributions and seasonality of submicron particles in Europe 2008–2009" *by* A. Asmi et al.

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TNO SMPS data presented in the paper are not corrected for (diffusional) losses in the inlet system and SMPS system itself. Below we will present the corrections that will be applied to the data in the updated manuscript, where we will discriminate between losses in the long sampling line (60 meter) and the SMPS system itself.

Losses in inlet system From ambient conditions at 60m altitude to dried conditions entering the instrument in the basement of measurement tower. The aerosol flow passes a size selective PM10 inlet, a smoothly curved pipe that connects to a bundle of nafion dryers, a straight stainless steel pipe of 60 meter, a manifold that splits the flow to

the suit of instruments and a tube of 1 meter length that connects an instrument (in this case the SMPS) to the manifold. In Fig. 1 the several parts together with the estimated losses based on theoretical calculations are shown (Gormley and Kennedy, 1949). For the final correction in the paper this theoretical findings are compared with measured losses that are obtained by measuring simultaneously before and after the various parts of the inlet system.

Losses in SMPS system The SMPS system consists of: impactor, charger, DMA and CPC. The counting efficiency curve of the latter is determined during a dedicated workshop at IFT, the curve is presented in Fig 2. For the other three parts of the SMPS system theoretical estimates are given in Fig 3. For the impactor the losses are minimal, for the charger for the loss calculation equivalence to a 1 meter straight tube assumed (Covert et al., 1997), for the DMA an equivalent length of 7.1m is used (Karlsson et al., 2003). These theoretical estimates together with the CPC counting efficiency, will finally be used for the correction for the final manuscript.

Impact on presented results and conclusions 1. Page 9, right column 3rd paragraph. "Station CBW size distributions have similar behaviour as Central European stations, with high concentrations and almost unimodal size distribution and low differences between seasons". This conclusion is based on Fig. 7 (top row). Although the figure will change by a small shift in the median and 16th and 84th percentile distributions, the conclusion remains unchanged. 2. Page 12, right column 2nd paragraph. "Of the western European stations, the CBW station (Fig.9m) has an unimodal N30-50 histogram with, similar to Central European stations. CBW concentrations were high, with N30-50 median of 1482 cmˆ-3". This conclusion is based on Fig. 9 (m). The diffusion corrections impact strongest on the particle number concentrations on small particle end of the spectrum. The value 1482 will therefore change considerable and the lines and shadings in Fig 9 will shift to the right (on the presented log-scale this shift will however be small. Moreover, the conclusions w.r.t. "low seasonal variation, similar to Central European stations and concentrations were high." remain unchanged. 3. Page

18, left column 5th paragraph. " Station CBW histogram is similar to Central European stations with unimodal shape, high concentrations especially in N50 and (median 2996 cmˆ-3) and non-existent seasonal variation." This conclusion is based on Figures 10 and Table 4. Numbers in Table 4 will change: under N30-50 considerable, under N50 changes are noticeable, under N100 changes are marginally. The conclusion that high concentrations are especially in N50 will hold but will be less convincing. Other conclusions: "similar to Central European stations with unimodal shape" and "non-existent seasonal variation" will remain unchanged. 4. Table 5 line CBW, standard deviations (SD) and geometric SD will change under N30-50 considerable, under N50 changes are noticeable, under N100 changes are marginally. 5. page 25, right column ad 1) "the "Central European Aerosol", observed at low-land stations from Netherlands to Hungary showing overall low seasonal changes, high concentrations of particles and CCN, almost unimodal median distributions and relatively low variability" .... "The station CBW in Netherlands has many features common with the Central European stations and can be categorized in this group" This main conclusions (in section 5 Conclusions) remains unaltered 6. All numbers and figures w.r.t. CBW will be updated be other than that will have no consequences on text or conclusions.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 8893, 2011.

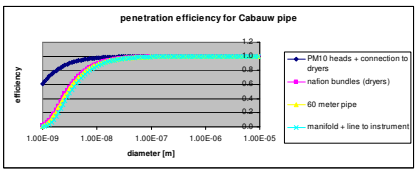

Fig. 1. Fig. 1. Penetration efficiency of inlet, dryer, pipe and manifold according to theoretical calculations.

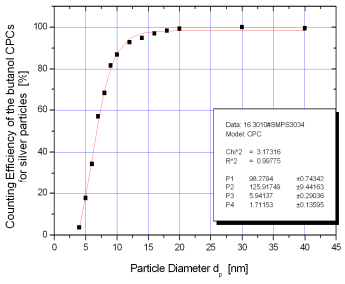

Fig. 2. CPC counting efficiency curve

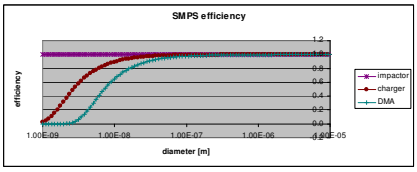

Fig. 3. SMPS penetration efficiency