Atmos. Chem. Phys. Discuss.,
doi:10.5194/acp-2016-57-AC1, 2016

Atmospheric Chemistry and Physics Discussions

Interactive comment on "BAERLIN2014 – The influence of land surface types on and the horizontal heterogeneity of air pollutant levels in Berlin" *by* B. Bonn et al.

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Received and published: 21 April 2016

We would like to thank the anonymous reviewer very much for the detailed and constructive comments with respect to our study. In the following we will respond to the specific comments given to show the improvements suggested by the necessary changes where feasible and to indicate our motivation in the way of presentation (appendix).

1) Structure of appendix and supplementary material: Reviewer 1 asked for shifting the current appendix part to the supporting online information (SOI) as the difference between both parts was not clearly resolved. We agree on this and would only prefer to keep the additional information about the measurements (Table A1) included as

appendix in the main document as measurement methods, major results and conclusions should be incorporated in a single file for download later on. The other parts of the appendix will be shifted to the corresponding part in the SOI.

2) Including the position sensor in Table A1 (mentioned twice): Excellent remark and immediately done.

3) Temporal resolution of particular mass measurements via bicycle platform: Correct remark. The time resolution of the GRIMM1.108 instrument got mixed with the temperature sensor linked to. Will be corrected to 6 s.

4) p. 7, "air-borne": Is a typo and is corrected. Thanks.

5) Page 8 (lines 23-32), instruments at reference site and mobile ones: The comment is very important and our approach will be explained: For PM measurements the instruments used were of identical type (GRIMM 1.108). But the types differed for particle number concentration measurements. This is partly caused by the need for different techniques for mobile measurements with an unsteady surface. The usage of a condensing agent to make particles grow to detectable sizes is impossible. The mobile technique is novel and was available only once. Because of this we applied regular parallel measurement phases when visiting the reference site and checking the stationary instrument status. Based on these repeated measurements of about every second day for 30 min we made scatter plots of stationary and mobile measurements results and derived a calibration factors for the individual parameters. These factors staid pretty constant throughout the three months and are listed with standard deviations in Table S1.1.

6) Order of S1 and S2 in the supplementary material: Good point. Will be done.

7) The lack of Table 7, PM10 effects: Thanks. It was not missing but shifted to the appendix without correcting the reference number. As we moved the tables and figures to the SOI, we move back Table C1 to Table 7 to keep it in the document.

8) P. 17 l. 26, negligibility of larger particle sizes with respect to particle number concentrations: Nice suggestion. We will add the median percentage of the particle number concentration (diameter Dp >300 nm) to total particle number concentration 0.63% (mean: 1.2 $\pm$ 1.4 %, non-Gaussian distribution) to the text next to “negligible” and place figures to the SOI displaying the cumulative particle number concentrations for the individual types (stationary in Berlin-Neukölln during more than 2 months and mobile via van for 6 days of measurement). The figures can be seen as Fig. R1 below. The median values display 16% of the particles to be larger than 100 nm and 63% of the particles were found between particle diameters of 20 and 100 nm. Below 15 nm only 12% were found by the van measurements. Hopefully these numbers elucidate our remark “negligible” somewhat. Please note that these relative contributions refer to particle numbers but not to mass distributions. For particulate masses about a third (38%, stationary background) or a half (median: 46%, mean: 56%, mobile) is larger than 1 micron, about half (52%, stationary) or 75% (median, mobile)- 81% (mean, mobile) is larger than 500 nm and 90% (stationary) or nearly 100% (mobile) is larger than 100 nm in particle diameter. In here stationary measurements show a much better agreement of mean and median than the mobile observations most likely due to on-site production and rapid aerosol dynamic processes beyond equilibrium.

9) Page 19 (lines 1-12), effect of particle size detection ranges in urban areas with respect to number concentration: It is certainly important to consider the slightly different size ranges detected by the stationary TSI 3776 and the mobile DiSCmini (see Table A1). While generally different detection ranges in the lowermost range would be expected to result in different results especially in areas of intense new particle formation (Seinfeld and Pandis, 2006; Kulmala et al., Nat. Protoc., 2012; Ma and Birmili, Sci. Total Environ., 2015), the results are hardly different below 10 nm in particle diameter. The cause remains unresolved but speculations deal for example with (a) the extensive growth rate of freshly formed particles about 2 to 5 times larger than for instance in remote areas [Dal Maso et al., Boreal Env. Res., 2005; Ahlm et al., J. Geophys. Res., 2012; Ma and Birmili, Sci. Total Environ., 2015; Yu et al., Atmos. Chem. Phys., 2016]

and (b) unstable partially organic particles that crack and vanish during detection (substances splitter and escape their detection) [Bonn et al., Atmos. Chem. Phys. Diss., 2007].

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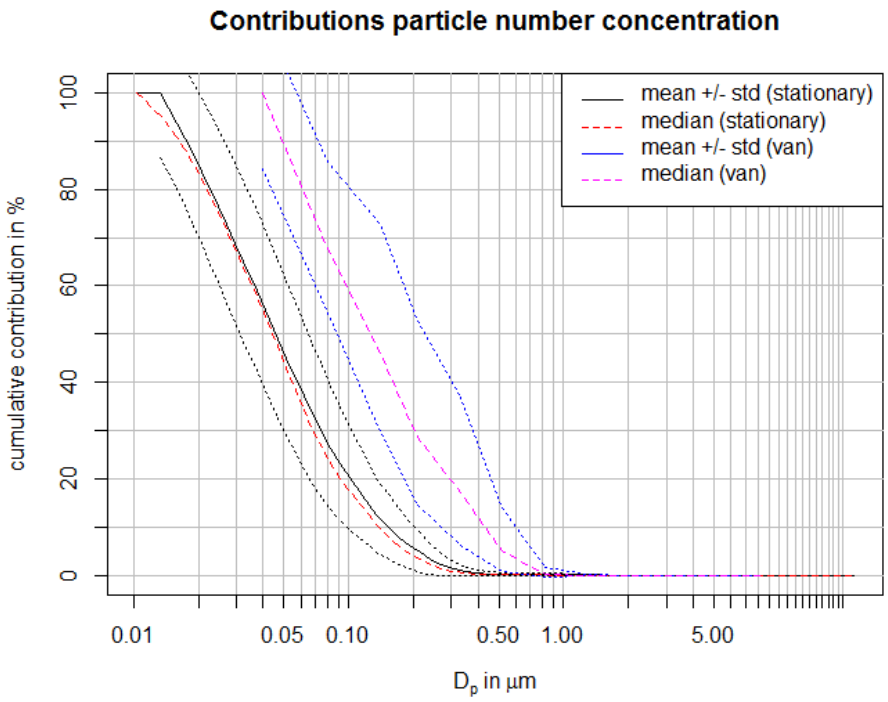

Fig. 1. Cumulative contribution to total particle number concentration above 10 nm in particle diameter starting at the largest size of 20 micron. Displayed are two datasets, i.e. (a) based on the stationary