

Interactive comment on “Size-resolved particle number emissions in Beijing determined from measured particle size distributions” by Jenni Kontkanen et al.

Anonymous Referee #2

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In this study, a novel method was introduced for estimating size-resolved particle number emissions. The population balance method was used to estimate particle number emissions into a column extending from the ground to the top of the atmospheric mixing layer. In general, the manuscript is well written and provided some interesting results. But the origins and sources affecting particles number are very complex, but the variables represented in equation 2 is a bit insufficient. And the uncertainty of each variable in the equation needs to be considered more carefully. Therefore, I recommend it can be published on ACP after addressing the following comments.

1. The effect of advection transportation from surroundings was parameterized by the

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experience of long-term measurements, which might induce large bias. The emissions of particles from surroundings are time-dependent, that should have diurnal and seasonal variation. In case using an annual-averaged parameter, these variations will be ignored. Therefore, I suggest considering the season cycle and diurnal cycle of advection transportation.

2. The height of the mixing layer was hard to estimate. In Eq. (2) we assume that ML is homogeneously mixed, which is not necessarily true in an urban environment. And the effect of dilution on their concentrations inside the ML might be overestimated.

3. Particle loss by a constant deposition rate can cause uncertainties in estimated emissions. It should also have seasonal and diurnal variations.

4. The growth rate is assumed as a constant for all the size bins, 3 nm/h. From chapter 3.5, the particle emissions at small sizes are sensitive to the value of GR. If GR was considered as a constant, at non-NPF days, the second and the third term in equation (2) can be offset.

5. This method doesn't work well especially on NPF days. The parameters like J, GR, as well as start time may have big differences in different events, so these parameters or constants in the balanced equation should be changed in different episodes. Thus the daily averaged could not describe the progress of an NPF event. There are some questions: how to define the value of J and GR on non-NPF days? Did the authors use constant values of GR for all NPF days, like 3nm/h? If the nucleation processes are not considered on non-NPF days, how to get rid of the influence of nuclei particles on non-NPF days. I suggest, at least, to do some sensitivity test on the influence of NPF on the calculation.

6. The data of wind directions are used to show the affection of different origins of anthropogenic emissions, however, in my opinion, the map of the city should be added and other metrological conditions should also be considered.

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7. There are few other data to support the prediction of the sources of particles. In addition, I think the impact of seasonal variation of sources to the particle concentration is not considered using one year's observation. For instance, the heating in winter in NCP area should discharge a large number of soot particles, but the paper didn't mention it.

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