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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Remarkable dynamics of nanoparticles in the urban atmosphere" *by* M. Dall'Osto et al.

Anonymous Referee #1

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The paper shows interesting aerosol size distributions measured at different sites in London, a shift in the size distribution are sometimes found, this can be due to a semivolatile fraction. To be sure that other processes do not transform the particles, more carful analyze of data should be done.

Major issues

(1) Instruments. It is to difficult to remember the different cuts for the CPCs, it is better to write out diameters e.g for Dp > 7nm or Dp > 2.5nm both in text and Figure 2. Table 1 is unclear, what is nano and what is normal, use models and diameters instead. Include also the different CPCs in the table. Are two CPC running at each site, one

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for the DMPS/SMPS system and one for the total? In 2.2 The CPC in R. Park has a cut of 2.5 nm Dp and in 2.4 the SPMS at Marylebone Road has a CPC with a cut of 2.5 nm Dp, do you have any data for total number concentration for the CPC at Marylebone Road, for comparison with R. Park? For the R. Park, you can look at the difference between the two CPCs, for the size interval 2.5-7 nm Dp, and see how/if this size interval shifts over the day, if new particle formation occur you can also see an increase in the number concentration.

(2) More meteorology data has to be included. Can you see different size distributions depending on wind direction? Both Barlow et al. (2010) and in Martin et al. (2008) show that westerly winds are most frequent, are the size distributions in R. Park and at BT Tower changing depending on wind direction? Is it possible to use data from only the south sector for R. Park in Fig 3, 5 and 6, to be sure that the sampled aerosol is traffic related? Martin et al. (2008) show that during the 2006 campaign the mean temperature was over 15 degrees Celsius, which is higher than during 2007, can the size distribution in R. Park been influenced by temperature? On page 30665 line 24: the shift to smaller size in the park is during the warm part of the day. How large is temperature difference during the day? Can the particles easily be transported into the park with horizontal winds, how many trees are growing in the park, they will influence the deposition, the trees can also be a source for volatile compounds, have you seen new particle formation in the park? Can you use the stability data in Barlow et al. (2010), you say that the Lidar is a surrogate for the turbulence strength? Rain frequency during campaign, are the hours with rain sorted out? Are any data sorted out? How large is the long range transport of accumulation mode particles into London, is this transport depending on wind direction?

(3) Traffic related questions. Martin et al. (2008) saw differences in emission between weekdays versus weekends, are the size distribution in R. Park changing due to this? Are all days included in the averages shown? Are people having barbeque in the park during weekends? Would be interesting to see a figure with the size distribution as

ACPD
10, C13453–C13456, 2011

a function of time (with concentration in colors), to see how the 10 nm mode in the Park change over time. Paragraph 3.2 page 30666 line 17 staring with This clearly reflects the fact that small particles emitted within London are transported vertically to the height of the tower more efficiently during the day than at night The emissions of particles from the city are much less during night depending on less traffic, even if the M Road has dense traffic during the night, the traffic in London is reduced.

(4) On several places it is stated that the shift in particles size cannot be due to dispersion, this has to be more carefully discussed, both the dry deposition in the street canyon and the effect of mixing can be large for the 20-30 nm particles (as many of the references has seen when they have modeled the urban aerosol).

(5) Paragraph 3.3. It is difficult to follow the paragraph with the combination of Lidar, SMPS, and NOX measurements, it has to be rewritten. E.g. in Barlow et al. (2010), three heights are defined, ZBL, ZAER, and ZMH, this has to better be clarified. Is BL in the text one more height defined? Difficult to understand that the increased accumulation mode can be due to long range transport, Barlow et al. (2010) can not see long rang transport. Line 20 page 30668 . . ..lifetime of surface-derived sub-50nm particles is short compared to that of NOx and larger particles, Yes, this is true, but can also be due to high dry deposition velocity for sub-50nm particles

Minor issues

Fig.2 In text REPARTEE I, but paragraph 2.2 says REPARTEE II

Page 30666 line 21 Martin et al. (2009) measured total particle number flux, should be Martin et al. (2009) measured particle number flux for DP > 10 nm

Page 30672 line 17 have totally failed to account for their semi-volatility (Gidhagen et al., 2005; Clarke et al., 2004). Better to write something like the effect of the semi-volatility has not been considered.

Page 30673 1 line Vertical dispersion of ground-level emissions to the top of the tower

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10, C13453–C13456, 2011

takes around 5 min in conditions of high turbulence, and 10 min in more stable conditions (Barlow et al., 2010). No, Barlow et al. (2010) show 10 minutes for high turbulence and 20-50 minutes for more stable conditions

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10, C13453–C13456, 2011

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