

## ***Interactive comment on “Spatio-temporal variability and principal components of the particle number size distribution in an urban atmosphere” by F. Costabile et al.***

### **Anonymous Referee #1**

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Costabile et al.: Spatio-temporal variability and principal components of the particle number size distribution in an urban atmosphere

The paper reports sparticle size distribution measurements conducted in and around Leipzig, Germany, at a number of eight stations in total. The data basis consists of a long term data set (2 years of data at 3 sites) and a short term data set (1 month of data at 8 sites). It must be one of the largest data sets of simultaneously available urban particle size distributions and therefore provides an excellent basis to study spatio-temporal variations of the urban aerosol. In a first part case studies of aerosol size distributions of eight stations are analysed &#8211; showing homogeneous (sim-

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ilar time evolution of size distribution at all stations) and heterogeneous (different time evolution of concentration regimes) behaviour. In the second part the data is analysed in terms of a principal component analysis. Different significant modes in the nucleation, Aitken and accumulation modes are worked out and interpreted in terms of spatio-temporal variability and effects by meteorology.

I recommend the paper for publication in Atmospheric Chemistry and Physics after some revisions.

General remarks:

p. 18164, l. 18: You state that measurement results of the different aerosol spectrometers should be comparable within 10% in term of total number concentration. But did you also correct for deviations in size channels between the different instruments (besides the correction for diffusion losses as stated in the paper)?

Section 4.1: You give an overview of different case studies concerning homogeneous and heterogeneous aerosol events. Did you perform a sort of frequency study to have an estimate how often those cases appear during your study period/within a year?

Specific remarks:

p. 18158, l. 8: I think it should read '&#8216;more sensitive to.&#8217; instead '&#8216;more sensitive on.&#8217;

p. 18177, l. 13: You calculated '&#8216;signature size distributions&#8217; from PCA coefficients (Fig. 7). I can not fully follow this approach. Could you please briefly comment on how those size distributions were calculated.

p. 18178, l. 25: In the urban meteorology community the term '&#8216;urban canopy layer&#8217; is more established instead of '&#8216;roughness layer&#8217;. The term urban roughness (sub)layer refers to a certain layer (where fluxes are not constant with height due to the presence of roughness elements) in terms of turbulence in urban boundary layers.

p. 18184, l. 13: I can not follow your argument that traffic emission enhanced rural nucleation. Do you refer to advection of particles to the rural area downwind of Leipzig? Please briefly comment on this.

p. 18208, Fig. 5 a: In the text you state (p. 18174, l.3) that PC4 and PC5 illustrate urban traffic by a wide Aitken mode. However, only one of the roadside stations is elevated in PC 4 and PC5. Why not both roadside stations are commonly elevated above the other stations in both PC's?

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Interactive comment on Atmos. Chem. Phys. Discuss., 8, 18155, 2008.

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