

***Interactive comment on “Fine and ultrafine particles in the Zürich (Switzerland) area measured with a mobile laboratory. An assessment of the seasonal and regional variation throughout a year” by N. Bukowiecki et al.***

**Anonymous Referee #2**

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**GENERAL COMMENTS:**

The paper discusses measurements of fine and ultrafine particles in Switzerland. Its strengths are the use of a well-equipped mobile laboratory allowing the measurements of particles in a 35×20 km area, a good dataset, and a thorough statistical analysis of the results. Its weaknesses are that it fails to address one of its goals, the evaluation of the mobile measurement platform against results from stationary measuring sites and that the detailed presentation of the statistics makes the paper lengthy sometimes distracting the reader from the main points of the work. Overall, it is a significant contribution to the field and a good illustration of the promise and the challenges of the

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use of mobile air quality laboratories.

### **SPECIFIC COMMENTS:**

(1) *Mobile versus stationary measurement platforms.* The authors state that they evaluated whether the use of a mobile laboratory is a promising approach to measure and study atmospheric processes. This is obviously a serious issue because the measurements are taking place on roads and are expected to be dominated by automotive emissions. The authors filter their data to calculate the background concentrations, but it is not clear what exactly is measured by the mobile laboratory in this area of significant concentration gradients.

The comparison of mobile versus stationary measurements is restricted to comparison of median seasonal values of PM10, PM2.5 and CO. Even if this is a rather weak test, the mobile platform results are significantly different from the regular monitoring sites during the autumn and winter. No information is provided about the particle number concentrations and size distributions, the day to day variation, the maxima of the concentrations, etc. There are no comparisons of the spatial and temporal patterns with measurements from stationary platforms.

The authors should discuss what exactly is measured by the mobile platform given the significant concentration gradients (especially for ultrafine particles) and the multiple plumes (of different ages and dispersion stage) that exist near roadways.

The claim that *mobile measurements are suitable for long-term pollutant assessments to obtain good information on spatial variability and reasonable information on spatial variability* should be deleted from the conclusions or additional support should be provided.

(2) *Statistics and length of the paper.* While the use of the ANOVA and PCA techniques strengthens the analysis, the presentation of the statistical results is quite lengthy and somewhat confusing. For example, the authors devote several pages and figures to ar-

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gue a point (the day to day variation because of meteorology is larger than the spatial variation) that is rather obvious based on Figure 2. This discussion could be significantly shortened and several figures (e.g., 3, 4, 5) could be eliminated. The same is partially true for the PCA analysis. After several pages the authors reach the main conclusion of the section, the enhanced emission of ultrafine particles in urban areas during cold periods. It appears that the same conclusion can be reached following a much simpler path and (see for example Figure 14).

(3) *Secondary particle formation (nucleation)*. The discussion of primary particle emission and secondary particle formation is rather confusing. The authors do define their use of the terms in the introduction, but they do not use them consistently. Both pathways involve nucleation, but only the second involves chemical reactions in the atmosphere. Some care is necessary to avoid confusing the reader.

The evidence for secondary particle formation is quite weak. The authors correctly conclude in page 15 that this might be an indication of secondary particle formation. However, a much stronger statement exists in the conclusions section and it should be rephrased.

(4) *Absolute number concentrations*. A number of groups are reporting measured number concentrations in different areas. To allow the intercomparison of these values it is important to clearly state the smallest particle size included in the number concentration and the corrections (charging, losses both in the sampling lines and the instruments, etc.) to the raw data for the ultrafine particles.

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Interactive comment on Atmos. Chem. Phys. Discuss., 3, 2739, 2003.

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