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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Ultrafine particle formation in the inland sea breeze airflow in Southwest Europe" *by* R. Fernández-Camacho et al.

Anonymous Referee #1

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General:

In this paper, the role of various sources and processes in ultrafine particles formation in an urban area has been investigated. Two complementary approaches were used: i) measured particle number/BC concentration ratios and ii) principal component analysis. The analysis clearly provides new insight into the subject areas of urban ultrafine particle sources and should therefore be published. The paper appears scientifically sound and it is relatively well written. There are, however, a few mostly minor issues that should be addressed before final acceptance for publication.

Major issues:

Interpretation of N1 and N2 (section 3.4.1), as well as their association with different principal components (section 3.4.2), should be made more clear. In its current form, the text is a bit confusing for most of the readers, especially those not very familiar with urban emissions.

I suppose that the point authors aim to make is that 1) all primary particle emissions from traffic belong to N1, 2) all non-traffic-related nucleated particles belong to N2, and 3) particles formed immediately after dilution of traffic emissions (primary nucleation from traffic)may contribute to both N1 and N2. This picture emerges gradually when reading the whole text, but it should be made clearer already in section 3.4.1.

The PCA analysis shows some differences between the morning and afternoon, as well as between the summer and winter. Again, it would help the reader if the authors immediately explained the main points: 2 principal components in the morning and 3 in the afternoon, how they are related to N1 and N2. The numbering of PCs in Table 2 is a bit confusing (vehicle exhaust is PC1 and 2 in morning but PC3 in afternoon).

I think that the main findings are summarized nicely in section 4, but the authors should try to help readers already earlier.

Minor issues:

Page 17755, line 24: maybe 80-90 per cent is more typical than 85 per cent.

Page 17756, lines 2-5: The actual nucleation process in primary vehicle emissions is probably more complicated than pure binary water-sulfuric acid nucleation, and the mechanism may vary from situation to situation (see e.g. De Filippo and Maricq, Environ. Sci. Technol. 42, 7957-62, 2008; Ronkko et al., Environ Sci Technol 41, 6384-89, 2007; Du and Yu, Atmos. Chem. Phys. 8, 4729-39, 2008; Heikkila et al., Environ Sci Technol 43, 9501-06, 2009).

Page 17758, lines 20 forwards: are the two studies given here the only ones who have investigated this topic? If not, please provide some additional information.

Page 17761, section 2.2.2: Please provide some reference for trace gas monitoring. European directives are not familiar to everyone, and certainly not a scientific way of defining instrument performances.

Page 17762, lines 20-28: Please provide a more complete picture on urban ultrafine particle concentrations (see, for example, the overview by Putaud et al., Atmos. Environ. 44, 1308-1320, 2010).

Pages 17763-64, section 3.3: Are the author aware of other N/BC slopes as mentioned here?

Page 17766, line 13 (also conclusions): please tell more quantitatively what you mean by “rapid growth”. Do the particles need to grow much faster than a few nm/hour typically observed in regional nucleation events.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 17753, 2010.