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

R. Fernández-Camacho et al.

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We first want to thank the review and comments performed by this referee. These suggestions allow the better understanding and clarify some concepts. These comments definitively contribute to improve the manuscript. The replies to the referee’s suggestions and questions are listed below. Most of suggestions have been introduced in the manuscript and will appear in the final version.

Major issue: Comment-1. Regarding the interpretation of N1 and N2. Reply (C1): The description of the referee on the type of particles contributing to N1 and N2 [1). ...2). ...3).] is right, I meant that is the interpretation we do on this. This interpre-

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tation has been rewritten in the new version of the manuscript following the suggestion of the referee.

Comment-2. About the PCAs.

Reply (C2): this part has also been rewritten following the referee's suggestion. The numbering of PC was assigned according to the variance explained by each PC. The PC accounting for the highest variance was assigned as PC-1, so on by decreasing the variance. This was also modified according to the referee's suggestion.

Minor issues: Comment-3. Referee suggested "Page 17755, line 24: replace "80-90" with "85 per cent" Reply (C3): done.

Comment-4. Referee said "Page 17756, lines 2-5" "The actual nucleation process in primary vehicle emission is probably more complicated than pure binary water-sulfuric acid nucleation, and the mechanism may vary from situation to situation".

Reply (C4): thanks for this comment. We only try to describe the process that is believed to be the most frequent one. We have rewritten this part of the text in order to introduce the suggestion of the referee, including the processes described in the papers provided by the referee.

Comment-5. In the comment of page 17758, lines 20 forwards, referee asked "Are the two studies given here the only ones who have investigated this topic? Reply (C5): More references have been added to these lines in page 17761: "Sánchez de la Campa et al., 2007; Sánchez-Rodas et al., 2008; Sánchez de la Campa et al., 2009; De la Rosa et al., 2010".

Comment-6. Referee asked about some reference for trace gas monitoring. Reply (C6): In page 17761, section 2.2.2, the following European Directive (reference methods for trace gases measurements) has been added: "EU (2008) 2008/50/EC Council Directive on ambient air quality and cleaner air for Europe. Official Journal L 152, 11/06/2008 P. 0001 – 0044".

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Comment-7. On this comment, referee asked us for provide a more complete picture on urban ultrafine particle concentrations. Reply (C7): This is a very good suggestion. We already tried to provide this general picture of urban ultrafine particles by comparing with other studies that included measurements from a number of sites (e.g. Van Dingenen et al., 2004, Atmos Environ, 38, 2561–2577; Rodriguez et al., 2007, Atmos Chem Phys, 7, 2217–2232; Putaud et al., 2010, Atmos Environ 44, 1308-1320). However, most of these studies are based on measurements of particles coarser than 10 nm, whereas our measurements are based on particles coarser than 2.5 nm. We only found a few studies providing this type of measurements (those cited in the ACPD manuscript). Nonetheless, the suggestion of the referee is really interesting. Thus, we have performed a slight modification of this part of the text for describing the general picture in terms of particles > 10nm, the most commonly measured in urban European air.

Comment-8. Referee asked, “Are the author aware of other N/BC slope as mentioned here? Reply (C8): Unfortunately we do not know about more data on N/BC slopes. The method applied for the data treatment used here was originally developed by Rodriguez and Cuevas (included in the references list). They apply this technique for a data set of Santa Cruz de Tenerife city. Perez et al. (included in the references list) determined the N/BC ratios in Barcelona. As far as we know there are no more data published on N/BC slope and ratios.

Comment-9. Referee told us what “we mean by rapid growth?”. Do the particles need to grow much faster than a few nm/hour typically observed in regional nucleation events?. Reply (C9): We didn’t mean that particles should growth faster than a few nm /h. unfortunately we couldn’t measure size distribution and consequently growth rates were not determined. We simply tried to say that particles should growth to a detectable size (≥ 2.5 nm) during the rush hours (2-3 hours duration). We mean rapid particle growth with growth rates within the range of typical growth rates, 1-20 nm h⁻¹ at mid-latitudes (Kulmala et al., 2004).

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