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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Spatial Extent of New Particle Events over the Mediterranean basin from multiple ground-based and airborne measurements" *by* Kevin Berland et al.

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We thank Reviewer N°1 for his comments and suggestions, which we hope will help improving the manuscript. We have addressed the comments point by point below.

Specific comment 1: (Line 79) Which frequencies are 25-36%? In Finokalia, Spain, or both?

Reply 1: These frequencies are for Finokalia, which is now clearly indicated.

SC2: In Section 4.1.1 you provide percentage of data, but please include how many measurement days you had so that the % becomes meaningful to the readers and we can assess the strength of the statistics you are giving us. Please also include number

of bad/discarded data days. This could be a table. You mention number of event days in section 4.1.2. Please transfer to section 4.1.1 and expand for each class.

Reply2: As suggested, a Table was included in Section 4.1.1, providing the total number of measurement after filtering bad data, the number of event days for each event type (I and II), the number of undefined days and the number of non-event days.

SC3: (189) Add a reference to the spring annual maxima in NPF occurrence (such as reference to Maninnen et al. 2010)

Reply 3: Reference to Maninnen et al. (2010) was transferred from l191 to l190.

SC4: (237) "Shows" would not be the right word. Although we expect high emissions and radiation in summer, you haven't included (and thus, 'shown') this data. However, you do refer to both radiation and emissions throughout the paper. It is important to include at least solar radiation data in your work, which I understand is available in both stations, or explain why you haven't. But unless there is no access to solar radiation for the days in this study, I would strongly argue for including radiation (and other meteorology parameters) in your analysis, as your arguments are dependent on it.

Reply4: A figure showing the seasonal variations of temperature (affecting emissions of biogenic precursors) and radiation (affecting the oxidation of these biogenic vapors) was added to the supplementary. Also, the discussion in the main text has been slightly developed compared to initial manuscript: "As previously suggested by Manninen et al. (2010, and references therein) and further supported by Fig. S1, higher NPF frequencies in spring are most probably related to the onset of biogenic emissions which is favored by increasing temperatures, together with higher solar radiation enhancing the production of low volatile oxidized vapors".

SC5: (235-250): It is interesting the Cs differs the most between stations not between event and nonevent days, as in Hyytiälä, Finland, where there can be an order of

maginitude difference for example. While I agree with your conclusion in terms of higher emissions needed in Finokalia to make up for a high Cs in summer, I don't see how Cs is really a determining factor in the important months of spring (March-April) between an event and nonevent, when Js and GRs are highest in both stations, but median Cs is similar during events and nonevents, and across both stations, but you still get âĹij50% of the month being nonevents andâĹij50% type1&2 events. Perhaps for Spring, another factor is equally or more important than Cs (which has low levels in spring). This is just my observation.

Reply 5: This is actually a good remark. Additional discussion is now included in the manuscript: "One should however note that during spring months (especially March and April), median CS is similar on event and non-event days. This observation suggests that during this period, the strength of precursors emissions together with radiation might be driving the occurrence NPF to a major extent."

SC6: (254-255) The conclusion of deriving the number of event days to the an order of maginute less than the distance between the station seems unfounded. It is not clear how you arrived to this conclusion, other than the numbers differing by a factor or x10. Please expand explanation.

Reply 6: We did not aim at connecting those numbers (number of event days vs distance between the sites), which would have of course been unfounded. The purpose of the sentence was only to highlight the fact that observing events from these two stations on similar days could suggest a large spatial extent of NPF, in the order of 1000km, which is the distance between the stations. The sentence was slightly change to avoid misunderstanding.

SC7: (272-273): It's not clear how/based on what you chose the speciïňĄc days of 5th and 29th of July (eg. why 5th of July instead of 4th, based on Fig.7). You do mention in the next section 4.2.2. that 9th August had the most similarities in all 3 sites, although there was an instrumental breakdown at Finokalia in the morning that prevented a full

interstation comparison. And you have airborne data see an event on July 30th and Aug 1st, why did you not choose a day for a horizontal (3 stations) + vertical (airborne) analysis? While the 3 days are indeed interesting, it would be good to know what we are missing or not missing from the other days. Please brieïňĆy explain your decision.

Reply 7: The aim of the comparison reported in Section 4.2.2 was to investigate NPF at the three stations, in terms "timing" at the day scale and "strength", especially for the closest sites (Ersa and Cap Es Pinar). This analysis thus relies on formation and growth rates calculations. The 3 specific days included in the analysis are those for which such calculations could be performed with a sufficient level of confidence (type I events) both for Ersa and Cap Es Pinar (this is now mentioned in the text), and unfortunately do not include those days for which NPF was also detected from the ATR-42: "Type one events were observed in Ersa and Cap Es Pinar on those specific days, thus allowing for particle formation and growth rates calculations, and further direct comparison of event intensity at these two sites."

SC8: Conclusion: The ïňĄrst part of the analysis is the yearlong comparison between Finokalia and Ersa, which resulted in similar median NPF characteristics. The day case studies however, focus on Ersa and Mallorca, with more difference found in Finokalia. It may be interesting to expand the conclusions that can be made from long term single median values and their representation of the sites and processes, compared to analysis case studies.

Reply8: We added a comment in the conclusion addressing this aspect: "The case studies also showed that despite the fact that nucleation monthly frequencies, monthly nucleation rates and growth rates had similar seasonnal variations in Ersa and Finokalia, different behaviors were observed on a daily basis between the western and eastern mediterranean bassins. Again, the combination of favourable synoptic conditions and seasonnal variations in general emission schemes may favour a seasonnal behavior of the NPF frequency and characteristics, but local conditions are modulating the general behavior of regional NPF."

SC9 Figure 7: Please include colorbar for the number concentration.

Reply 9: The colorbar already existed but Fig. 7 was too big and part of it was cropped in when editing the manuscript in ACPD. This should now be fine.

Technical corrections: they were all addressed.

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