

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.

Anonymous Referee #1

Received and published: 10 January 2017

Manuscript: Berland et al.: Spatial Extent of New Particle Events over the Mediterranean basin from multiple groundbased and airborne measurements.

General comments: The manuscript offers an important overview of both the horizontal and vertical spatial characteristics of new particle formation in the Mediterranean Basin (Corsica, Crete, and Mallorca) through the use of multiple ground-stations and airborne data. Additionally, it compares case studies of days presenting continental versus marine onset locations of new particle formation. The data provides an important addition to new particle formation (NPF) characteristics in the Mediterranean, by providing regional year-long comparison between the Mediterranean islands, and a differentiation in characteristics between NPF source origins (marine vs. continental) and

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altitude. The measurements form part of the CHARMEX-ADRIDMED and CHARMEX-SafMed projects. The manuscript is overall easy to read and follow. However, I would have liked to see meteorology data when comparing differences in NPF characteristics across the sites, in addition to the back trajectories and wind direction. The paper would have been stronger with a more complete comparison of meteorological conditions, particularly on the seasonality comparison between Ersa and Finokalia. I felt this limited the wider scope this paper could have had in identifying NPF processes in the Mediterranean, although overall, the study receives merit in providing a good, general overview of Mediterranean NPF characteristics including formation and growth rates as well as indicating both marine and continental origins of NPF. I recommend the following revisions, after which I would recommend for publication in ACP.

Specific comments (line number inside parenthesis): (Line 79) Which frequencies are 25-36%? In Finokalia, Spain, or both?

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.

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

(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

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it.

(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 magnitude 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 ~50% of the month being nonevents and ~50% 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.

(254-255) The conclusion of deriving the number of event days to the an order of magnitude 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.

(272-273): It's not clear how/based on what you chose the specific 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 briefly explain your decision.

Conclusion: The first part of the analysis is the year long 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.

Figure 7: Please include colorbar for the number concentration.

Technical corrections:

(Line 1). Consider adding 'formation' in the title, as you are specifically referring to NPF.

(24). 'to analyze'.

(26). Consider substituting the word 'Globally' since it can be ambiguous ('worldwide', or 'generally').

(32) 'a daily scale'

(43). Chronological order of references. The same throughout the text.

(46). Consider editing line to: 'and use parameterizations which are based on a limited number of mechanisms...'

(55-56). Manninen et al. 2010 precisely does do an spatial extent analysis of NPF.

(67). rephrase to: "up to 500 km away from"...

(76). rephrase to: "only a few studies related to NPF"...

(83). rephrase to: "exposed to high solar radiation"...

(86). Only French community?

(91) add word: "the long term analysis"

(97) rephrase to: "at a daily scale"

(103) remove comma in "(Mallorca,)"

(104) remove repeated year in "October 15th 2013, 2013)"

(112) rephrase to “South-Eastern Europe”

(115) ‘type’ is not necessary. Remove caps to make it the same style as in line 130 (‘scanning mobility particle sizer)

(123) consider rephrasing to “with wind speeds stronger than...”

(136) lowercase K in ‘Km’.

(144) remove ‘in’, or remove parenthesis before author’s name “Crumeyolle et al.”.

(145) remove comma in (TSI, 3010)

(156) rephrase to “NPF days”, and add period in “et al.”

(183) rephrase to “are very similar at Finokalia and Ersa, being 36% and 35%, respectively.”

(191) rephrase to “in the different event categories”...

(195) ‘Globally’ can be misunderstood to mean that worldwide these events are most frequent. Substitute word, perhaps ‘annually’.

(251) please rephrase “Globally”.

(275) “Table 2”, instead of “Tab. 2”

(295-297): You first refer to Figure 9 before Figure 8. Please add ‘see Fig. 9, since the present order of the figures does not need to be changed.

Figure fonts could be larger, particularly Fig.7 and 11, and thickness/color of lines in Fig.8.

Please also note the supplement to this comment:

<http://www.atmos-chem-phys-discuss.net/acp-2016-931/acp-2016-931-RC1-supplement.pdf>

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