

## ***Interactive comment on “New Particle Formation and Sub-10 nm Size Distribution Measurements during the A-LIFE field experiment in Paphos, Cyprus” by Sophia Brilke et al.***

### **Anonymous Referee #1**

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#### General Comments

This work presents the results from a field campaign in Eastern Mediterranean, focusing on new particle formation and presenting results from a novel instrument, the DMA-train. The deployment of such new techniques to the field is expected to provide valuable information on new particle formation processes. Nevertheless, improvements both in the presentation and the content are required so that this manuscript meets the standards of ACP.

As the DMA-train is a new instrument and no field measurements demonstrating its capabilities are available I strongly recommend that there is a dedicated paragraph

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showing all available measurements in terms of total and segregated channel number concentrations, correlations between various channels, field calibration performance if available, comparison to other instruments (MPSS, PSM), formation rates.

With respect to the campaign itself there is sufficient room for discussion of all events, even if it comes to a few sentences. Air mass back trajectories, meteorological conditions and additional measurements should be described.

#### Specific Comments

Abstract: Please consider changing this paragraph to Past tense, past and present are used simultaneously ie “The newly developed DMA-train is deployed” and “The nearby Paphos airport was found to be”. The same stands for the rest of the manuscript.

Line 54: There should be also a reference to Particle Size Magnifier (PSM).

Line 72: Update to Kalivitis et al., 2019.

Line 99: The instrument types for the trace gas measurements should be described.

Line 121: The flow rate of 5th and 6th CPCs are not mentioned.

Line 143: It is not clear to me why the overall uncertainty is set to 20%, please explain further.

Line 148: What about corrections for diffusional losses in the tubing and within the DMAs? These losses are significant for the nucleation size ranges and they have definitely to be taken into account.

Line 150: The formation rates calculated from the DMA-train should also be discussed in the manuscript.

Line 164: To my opinion Figures S2 (and hence Figure 4) and S3 should be merged in a single Figure and presented in the manuscript, as they are totally in line with the description in the main text and they will assist the reader understand the methodology

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for calculating GRs. On the other hand, the scheme by Dal Maso et al., (2005) in Figure 2 is well established and used repeatedly in the literature and there is no need to present it again.

Line 183: The number of events should be clearly stated rather than “several”.

Line 190: During the study period there was only one event that according to Table 1 was captured simultaneously from the DMA-train and the MPSS, or at least it was the only event that GR in size ranges from both techniques was possible to be calculated (22 April). How many events were observed by both techniques, it is not clear from Table 1.

Line 212: It is worth presenting the number concentrations of different size ranges of aerosol particles during the whole study period. At least for the nucleation mode, and since there were strong pollution sources, it would be interesting to see how various process contribute to the number concentrations.

Line 220: There is no discussion here about trace gases and only little discussion about meteorological parameters. What were the wind velocities, temperature range, cloud cover, trace gases, PM etc. A more thorough discussion of the event is required.

Line 240: In panel c. there are nucleation mode particles, even if not as a clear mode. Dilution is a possible explanation, or perhaps scavenging. It is also recommended that the survival probability is calculated.

Figure 1: In the wind rose diagrams the hours in the frame are 18:00-06:00 and 06:00-18:00, while in the caption the times are 18:00-08:00 and 08:00-18:00. Correct to the proper time period and additionally state if it is local or UTC. Are the displayed data hourly averaged, please explain what the radial frequency is.

Figure 3: The middle panel (b.) depicts an undefined event rather than a non event. Prior to 06:00 there are no nucleation mode particles, while after that significant concentrations are observed but no growth of these particles. To my opinion it is closer to

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c. rather to a non-event.

#### References

Kalivitis et al., <https://doi.org/10.5194/acp-19-2671-2019>, 2019

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Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2019-1123>, 2019.

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