

## ***Interactive comment on* “Towards understanding the mechanisms of new particle formation in the Eastern Mediterranean” by Rima Baalbaki et al.**

### **Anonymous Referee #1**

Received and published: 13 January 2021

The manuscript titled “Towards understanding the mechanisms of new particle formation in the Eastern Mediterranean” presents yearlong observations of NPF events at a rural background location in Cyprus. Observations are based on various instrumentation providing information about NPF events since the early cluster sizes. These are very important observations in the poorly presented in the literature region of East Mediterranean and Middle East and it is worth being published after some minor revisions. I think however that the title is rather misleading since the manuscript is focused on the description of NPF events in Cyprus and their general characteristics and it does not contribute to actually understanding the underlying processes governing the formation of atmospheric particles and therefore I recommend a more modest title.

General comments

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The authors are only briefly describing observations of NPF events during periods that desert dust was present in the atmosphere. Although it has been pointed out that mixed conditions of dust and pollution may result to the formation of new particles even under conditions with high preexisting aerosol loadings, the observations reported in the literature are scarce and only in few locations around the world. During the study period, 37 out of the 50 dust days were categorized as NPF days. This is an extraordinary figure and these events should have been prioritized in their analysis, given that under dust conditions it is more possible to have an NPF event (74%) compared to the average situation (57%). On the contrary, the authors choose not to present a single event. Even if it is chosen to present these events in a separate research article, the intention of the present work to introduce the scientific community to a novel location under the EMME atmospheric conditions which are greatly affected by the presence of desert dust makes the presentation of such NPF events in more detail necessary.

Another general comment has to do with the presentation of the driving parameters of NPF in the atmosphere of EMME. The authors have available a great set of complementary measurements to examine which atmospheric conditions favor or suppress NPF. The authors choose to present annual variability of each parameter rather than utilizing simple statistical tests to explore possible correlations. Visual inspection of event vs non-event conditions is not enough to contribute to the understanding the mechanisms of NPF and I would like to see some more in depth analysis such as PMF, PCA or simply regression analysis, for instance of cluster mode number concentration vs the various atmospheric components.

Specific comments.

L. 101: The most populated island in the Mediterranean is Sicily, Cyprus is the third most populous.

L. 103: Also Isreal to the southeast.

L. 139: How were the data prior to June 2018 treated with regard to activation efficien-

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cies distortion?

L. 208: A reference is needed here to support this statement.

L. 231: The start and end time are not fully described here, more details should be given.

L. 350: The calendar does not contribute to the discussion of the results, it rather occupies a great extent of the given page. I would prefer to move the diurnal patterns from Supplementary material next to annual variations and remove the calendar.

L. 387: Since there are only few references of dust relevant NPF event in the literature, these 37 events should be described in more detail and compared to dust free days. At least an example of such possible events should be given.

L. 405: How do you support your hypothesis? This is highly speculative.

L.407: I would like to see all these information about Js in a Figure like 2 or 9.

L. 408: How have the J values reported in Table1 been calculated, ie from average daily J values, maximum daily values, average values during event duration or something else?

L. 433: Once again a figure for GR would be nice here.

L. 493: However, during the same period, SO<sub>2</sub> concentrations are much higher during events than during non events, it seems that the SO<sub>2</sub> abundance does make a difference.

L. 515: What compounds could that be? Such an assumption may be investigated looking for instance at SO<sub>2</sub> charts for the region.

Table 1: Remove the period punctuation mark from the units of J.

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Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2020-1066>, 2020.

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