

Response to the review of “Relationships between particles, cloud condensation nuclei and cloud droplet activation during the third Pallas Cloud Experiment”

We would like to thank the reviewer for his valuable comments. The comments are displayed below in italics, followed by our replies in normal font.

General Comments:

1) Introduction: For readers not familiar for the first two Pallas Cloud Experiments, a more in depth description of the motivation and results of these two Experiments is needed.

We aim to keep the introduction section as brief as possible and the detailed descriptions are available in the cited publications. For these reasons, such discussion does not fit to the scope of the introduction.

2) Introduction: While the goals of the third Pallas Cloud Experiments are listed, additional description of the unanswered questions from the first two Experiments would be helpful. Additional discussion of how the third Experiment will answer these questions (different technologies, season, focus, etc.) would also fit well in this section.

The topic is now briefly covered in the end of the fifth paragraph of the introduction.

3) Sect. 2.2: Inspection of Table 1 shows that the five cloud events have very different properties that are not well described. I would like to see an additional figure with back-trajectories of the five events with additional discussion to better understand the aerosol and air mass source region.

Trajectories are now included, and a brief discussion on the impact of air mass history to the particle concentrations is given in the section.

4) Sect. 2.2: Another figure that would be helpful in a supplement would be visible satellite images of the region during the cloud events to get an idea of the cloud coverage and synoptic conditions.

Thanks for the suggestion. Unfortunately in this campaign we have only five cloud events, and satellite data is available only from the first one, and even in that case there seems to be multilayered clouds as cloud top temperature as retrieved from MODIS is varying between 250K and 280K.. For these reasons, no satellite data were included.

5) Section 6.1: “As can be seen from Fig. 5, the cloud droplet number concentrations could be reproduced accurately in this manner. Also, Table 2 shows the average values of modeled CDNC for each cloud event which are seen to compare well with the corresponding experimental values displayed in Table 1.” If I understand correctly for each case, the updraft velocity was chosen to minimize the difference between experimental and modeled cloud droplet number concentrations. Therefore, by default, modeled and measured CDNCs must agree well. Can authors report standard deviation for each averaging interval within the event? That can give some insight into the effect of updraft velocity fluctuations on CDNC.

This is correct. We have now omitted the figure as being unnecessary and potentially misleading. Instead we report the degree of agreement in the text. Also, the standard deviations of the updraft

velocity are now displayed in Table 3 (Table 2 formerly) and the effect of velocity fluctuations is discussed in the third paragraph of Section 6.1.

6) Section 6.1: According to the paper “During the investigated cloudy periods, the inferred number of cloud droplets varied typically between 50 and 150 cm^{-3} .” Based on Fig. 9 authors argue that there is a poor correlation between CDNC and the corresponding updraft values. While this may be true, I am curious to see how Fig. 9 would change if the outliers (i.e., CDNCs with values outside 50 to 150 cm^{-3}) are removed. Please also report R^2 value as done for Fig. 10.

The R^2 value is reported, and the effect on removing the outliers from the analysis is now discussed.

7) I recommend different symbols to be used for different events (i.e., A to E) on Figs. 5,7,9,10. That would help the reader to see if there are any systematic discrepancies between the measured and modeled values for a particular event.

The figures have been modified accordingly.

Minor Comments:

1) Page 13698, line 13: In not sure what “DMPS:s” refers to.

This expression now reads as” ...two DMPS instruments operated in parallel...”.

2) Page 13705, line 5: Needs to be “Kammermann et al. (2010)”.

This has been corrected.