

## **Reviewer #1:**

The manuscript was substantially improved and I congratulate the authors. I am willing to accept the paper after the following technical corrections are taken into account.

### **Specific comments**

P6, L19: I am wondering how reliable the PM2.5 data are as the sampling time was 2.5km away from the filter sampling location. Do the authors assume that the PM2.5 concentrations are homogenously distributed in that large area? Do you think that the lower correlation discussed in P9 Line 22 is coming from the aforementioned limitation? It could be discussed in the text.

### **Technical corrections**

P1, P3-P10, P15: “Aerosols” should be replaced by “aerosol particles” or “aerosol”.

P2, L8: Replace “freezing nuclei” with “FN”

P2, L17; P3 L16: Deposition nucleation is not a freezing process because it does not involve the transition from liquid to solid. I suggest to replace “deposition freezing” by “deposition nucleation”.

P2, L18-19: I don’t think that this is the best definition of immersion freezing. Is it possible to define it in a different way?

P3, L9: I think the word “many” is not necessary here.

P3, L22: Replace “create” with “form”.

P3, L22: There is a semi-colon missing between Moreover and Lohmann.

P4, L8: I suggest to replace “research” with “study”.

P5, L24: Ice nuclei was defined in P2 line 14. Use the abbreviation (IN) here.

P6, L1: Remove the “s” in “meters”.

P6, L10: “Activated fraction” was already defined in the abstract. No need to define it again. Use “AF” instead.

P6, L10: Replace “freezing nuclei” with “FN”.

P7, L11: There should no be space between “10” and “ml”

P7, L17-18: FN was already defined. Avoid redundancy.

P7, L24: Replace “ice nuclei” with “IN”

P9, L19 and L27: Replace “freezing nuclei” with “FN”.

P10, L10: AF was already defined. Avoid redundancy.

P10, L14: Replaced “activated fraction” with “AF”.

P10, L16: A period is missing after (1997).

P12, L2: I think that the word “shows” sounds better than “demonstrates”.

P12, L3: Replace “2” by “two”.

P12, L14-15: ESEM and EDS were defined in page 7. Avoid redundancy.

P13, L16: INAS was defined two lines above. There is no need to define it again.

P13, L17: There is a comma in red. It should be black.

P13, L27: Please re-phrase the following:… the figure presents the present results…

P14, L19: “i” should be in italics.

P14, L24: INAS was already defined. Avoid redundancy.

P15, L4: A comma is no needed after fN.

P15, L5: Replace “activated fraction” with “AF”

P15, L19: Replace “freezing nuclei” with “FN”.

P15, L27 and L29: Replace “ice nuclei” with “IN”.

P16, L3, 4, 6, 8, 10, 17-18: Replace “ice nuclei” with “IN”.

P16, L8: There is no need to link “are” with “associated”

P16, L1, L15 and L27: Replace “activated fraction” with “AF”

P16, L12 and L21: Replace “freezing nuclei” with “FN”.

P17, L13: Replace “freezing nuclei” with “FN”.

Table 1: It would be nice to mention what are the uncertainties reported in this table (e.g. standard deviation).

Table 2: Be consistent with the used of decimals. For example, -16 or -15 should be -16.0 and -15.0.

There is a space missing the fourth column after the word temperature.

Table 3: Be consistent with the used of decimals. For example,  $19\pm 3.6$  should be  $19\pm 4$ .

## **Editor comments**

### **Follow-up comments to the response to Paul DeMott's review:**

p. 1, l. 24: Following up on Paul DeMott's comment on the 'relative cleanliness' of your clean episodes, I suggest pointing out here already that 'clean' actually just means 'cleaner' but yet not completely dust-free.

p. 11, l. 11: On the same note as the comment above, it might be useful to add a value (or multiple values) here of PM10 concentrations at other locations, just for comparison.

p. 17, l. 3: Some clarification along the same lines might be useful here, too.

## **Technical corrections**

p. 1, l. 21: A higher correlation value...

p. 1, l. 26: Even though it is often used in the literature, I don't think that 'warmer temperature' is correct. A temperature can be high or low, a material or gas can be warm or cold. – I suggest changing it throughout the manuscript.

p. 2, l. 22/23: 'The relative importance of the different freezing modes [...] is limited.' – This sentence needs rewording.

p. 3, l. 19: 'modes' is redundant here

p. 4, l. 9: during dust storm days

p. 5, l. 22: 'Schneidmesser' misspelled

p. 6, l. 7/8: Reorder: ...a TSI Particle Size Selector was used, with a number of screens ...,

p. 6, l. 30: than the removal method

p. 8, l. 20: was similar

p. 9, l. 10: I suggest rewording: "Freezing was found to occur at higher temperatures" (or similar text)

p. 9, l. 15: 'stratiform' misspelled

p. 10, l. 7: These values (or freezing temperatures) are also higher...

p. 10, l. 16/17: However, the lowest AF value was much lower than that as reported by Pruppacher and Klett (1997).

p. 11, l. 14: Numbers and their error should be rounded to their significant figures, i.e.  $500 \pm 200$ .

p. 11, l. 23: t test

p. 11, l. 25: in terms of

p. 12, l. 5/6: is less common

p. 12, l. 11: t test

p. 12, l. 24: has been reported

p. 12, l. 30: in agreement

p. 13, l. 18: was measured

p. 13, l. 21: in the range of 0.1 to 3  $\mu\text{m}$

p. 13, l. 21: during only four days

p. 14, l. 7: on days during which

p. 14, Eq5 and Eq6: Is there a difference between  $n_i$  and  $n_i^*$ ? If not, please, use only one of them, if yes, define  $n_i$ .

p. 14, l. 21: days on which ...

p. 14, l. 23: ...while on (or 'during') others...

p. 16, l. 28: either 'between  $8.7 \times 10^{-8}$  and  $4.9 \times 10^{-4}$ ' or 'from  $8.7 \times 10^{-8}$  to  $4.9 \times 10^{-4}$ '

p. 16, l. 29: was measured

p. 17, l. 7: in terms of

Table 1 and Table 3: All numbers in this table should be also rounded to their significant figures

$640 \pm 30$

$700 \pm 100$

$1250 \pm 70$  etc. cf for example

<http://www2.southeastern.edu/Academics/Faculty/rallain/plab194/error.html>

Figure 4: Caption: significantly lower values

Figure 5: y-axis: Change axis description to 'Activated fraction'

Figure 6: Can you indicate the different freezing modes (e.g. in the legend, next to the references)?