

Review of:

Dimensions and aspect ratios of natural ice crystals.

by J. Um, M. McFarquar, Y.P. Hong, S.-S. Lee, C.H. Jung, R.P. Lawson, and Q. Mo

General comments

The paper represents a comprehensive compilation of the characteristics of natural ice crystals. It also includes a detailed review of previous measurements with comparisons. The evaluation of the data sets from three diverse geographic regimes and different cloud types includes extensive analyses of cloud particle images and a complex assessment of the results.

I think the manuscript is nearly ready for publishing except some minor revisions regarding mainly the presentation of the paper.

Specific comments

1. Introduction, page 31114, line 7: Please include a short discussion why the aspect ratio is described in different ways and what is the significance of it.
2. Introduction, page 31114, line 13: What is the difference between the L-W ratio and the aspect ratio?
3. Section 3.1, page 31117, line 7 to the end of the paragraph: Resolution of 2.3 μm : Does this mean that smaller particles are not detected?
4. Section 3.2, page 31119, lines 4ff: Does this mean that only 10% of the ice crystals in the investigated clouds were analysed? However, I fully agree that the analyses of pristine crystals is important because of the reasons you give.
5. Section 3.2, page 31120, lines 1 and 2: Please include a more detailed discussion about the consequences of the fact that the ice crystals characteristics are projected ones.
6. Section 3.2, page 31120, line 14: What does “manually measured” exactly mean?
7. Section 3.2, page 31120, line 16: Please include a discussion to explain the differences between the IC-Ruler and the automatic CPIView software.
8. Section 4.3, page 31127, line 23: Explain in the text the meaning of “r”.
9. Section 4.3, page 3128, first paragraph: From the description in the text the meaning of Figure 15 is not clear to me, the same in the caption of Figure 15: what do the equations mean? It might be better to explain this in the text. Furthermore, it is written that “y” are indicated in the figure legend” but is not shown.
10. Section 4.4 in general: This complete section I found rather complicate to follow and to understand the basic results and conclusions. Maybe you could try to find a way to better present your findings.

Technical corrections

11. Introduction, page 31113, lines 16 and 17: there are commas missing after 1948 and 1990.
12. Introduction, page 31114, line 10: I suggest to write the equation in a separate line.

13. Introduction, page 31114, page 31115, line 18: The expression “remainder” seems to be not appropriate here as the major part of the paper is still following.
14. Introduction, page 31114, lines 19/20: To underline the contrast of new to previous data I would suggest to write “the newly collected data” or something similar.
15. Section 2, page 31116, line 3: Write “Tables 1 to 3”, also in all other cases in the paper later on, just as “Figure x to Figure y”, e.g. on page 31126.
16. Section 3.1, page 31117, line 7 to the end of the paragraph: This sentence is too long, please split it.
17. Section 3.1, page 3118, line 21: Please explain SD in brackets (standard deviation).
18. Section 4.1, page 31121: I think it would help the reader if you mention the different geographic regimes where the field campaigns were performed, also in the other results sections.
19. Section 4.1, page 31121, lines 13 and 14: Please reformulate this sentence, it is not clearly understandable.
20. Section 4.1, page 31122, line 5: Write “Compared with **the** other campaigns, ...”
21. Section 4.1, line 9: Include “bottom row **of Figure 4**”
22. Section 4.2, page 31123, line 18: Please reword “within which”.
23. Section 4.2, page 31124, line 6: Reformulate the sentence after “further”.
24. Section 4.2, page 31124, line 15: It is clear from the temperature ranges that during two campaigns mixed-phase clouds were investigated but this should be mentioned earlier in the text and in Tables 4 to 6. Again, as I mentioned above, I think it would help the reader by the understanding and interpretation of the results if the geographic regimes of the different campaigns are mentioned in the text at some places.
25. Section 4.2, page 31125, lines 1ff: Reformulate this sentence for a better understanding.
26. Section 4.3, page 31125, line 19: reformulate this part of the sentence.
27. Section 4.3, page 31125, lines 22 to 24: Please reword this sentence in the way that “in this study” is put at the beginning.
28. Section 4.3, page 31126, lines 5 to 7. Split this sentence.
29. Section 4.3, page 31126, lines 8 and 9: Include “solid colored lines”.
30. Section 4.3, page 31126, line 11: Add “This indicates **that**...”.
31. Section 4.3, page 31126, line 14: Add “L and H showed **that** the...”.
32. Section 4.3, page 31126, lines 20 to 22: Reformulate this sentence for a better understanding.
33. Section 4.3, page 31127, lines 1 to 5: These sentences appear complicate because you always use “increase” and “decrease”. Try to replace it in some cases by other words, e.g., enhancement, rise, decline, reduction.
34. Section 4.3, page 31128, lines 12 to 14: Reformulate this sentence.
35. Section 4.4, page 31128, lines 22 to 23: Reformulate this sentence.

36. Section 4.4, page 31128, lines 23 to 25: Put “Additionally,” at the beginning of the sentence instead of “also”.
37. Section 5, pages 31134 and 31135, points 1 to 6: Here is also some confusion with all the “increase” and “decrease”. I would suggest to replace some by similar expressions.
38. Section 5, page 31135, line 20: “measured” instead of “measuring”?
39. References, page 31139, line 7: The reference Goodman et al. is not mentioned in the text. Please do so or remove them from the list.
40. Tables: In some tables the type size should be enhanced as it is too small in comparison to the general type size, in particular in Tables 1, 2, 3, and 7.
41. Captions of Table 1, 2, and 3: Please reformulate the part “when original work indicated”. Add “NA indicates **that** corresponding...”.
42. Caption of Table 7: Please replace: “The numberss in parentheses indicate **the** numbers of samples... **The** occurrence percentage...”.
43. Figures: Most of the figures are very small and should be enhanced, Figures 4, 5, 7 to 14, 16, and 17.
44. Caption of Figure 2: Replace “... of ice crystals of (a)...” by “... of ice crystals: (a)...”
45. Caption of Figure 3: Add “... and those **obtained** from CPIView.”.
46. Caption of Figure 4, last line: “total numberss ...”.
47. Caption of Figure 5, second line: “... **are** shown ...”
48. Caption of Figure 8: last line: “...the number of bullet rosettess...”.
49. Caption of Figure 9, last line: “indicated with dotted liness”.
50. Caption of Figure 15, last line: “... **values of y**...”.
51. Caption of Figure 16, second line “... when more than 14 crystals **are available** within each 5°C **interval**...”.
52. Caption of Figure 17, last line: “... and 12 lines are shown in (b).” What does this mean?
53. Figures 9 to 10 are somewhat overloaded with information. Please try to reduce it. For instance, the lines describing the temperature ranges are not needed in every diagram.