

## ***Interactive comment on “A general database of hydrometeor single scattering properties at microwave and sub-millimetre wavelengths” by Patrick Eriksson et al.***

### **Anonymous Referee #2**

Received and published: 29 May 2018

This work describes an important contribution to our capability in using electromagnetic scattering properties of ice particles to learn more about them in Earth's atmosphere. It is certainly worthy of publication in ESSD. It is recommended for publication after the authors deal with the suggested minor revisions below.

After writing out all of the suggested minor revisions below, perhaps the biggest gift the authors can give readers of their article is described in the sentence at the end of comment 20 below:

"Even though the paper is long, the authors need to go over every sentence within it time and again so as to get them all in as good as shape as is possible."

C1

### Suggested Minor Revisions:

0) I wrote comments on the manuscript as I read through it. As some of them may be of value to the authors, I am returning the marked-up manuscript to the authors for their consideration.

1) The authors use of "e.g." throughout is interesting. Consider Line 8 of the abstract where the phrase

"and remaining habits are aggregates of different types, representing, e.g., snow and hail"

occurs. In this instance "e.g." is used not only to demarcate a list but also to assist in the transition started with "representing." In this case is the word "representing" really necessary? I think the word "representing" can be left out:

"and remaining habits are aggregates of different types, e.g., snow and hail"

This happens in so many places throughout the text that I thought it worthwhile for the authors to think about it.

2) Page 1, Lines 18-20: The part of the sentence after the "and" has nothing to do with the part of the sentence before the "and". As a result, this sentence would appear to me as a run on sentence whose logic is not completely clear. This happens a lot throughout the manuscript and the manuscript would be a lot more pleasant to read if these types of sentences were eliminated.

3) Page 2, Lines 11-12: "Extinction due to scattering is the main process by which rain and ice particles are sensed" Is this a generally true statement? What about emission from rain at frequencies for which the underlying surface has a low emissivity?

4) Page 4, Lines 14-15: "but already this version is more extensive than earlier datasets"

As the database currently stands, it will not be used that much for radar applications

C2

because it contains results only for randomly oriented particles and the value of polarimetry is limited for such particle orientations. For example, ZDR is always 1 (or 0 in units of dB) for randomly oriented particles but in nature it is often much different from 1 (or 0 dB); as a result, the current database has nothing to offer in terms of ZDR. Only when the database comes to include results for oriented particles might the statement above become true.

5) Page 6, Line 21: What is a "subscribing sphere"? Do you mean "circumscribing sphere" here?

6) Page 6, Lines 22-23: Dmax is not ambiguous at all if it is defined as the maximum distance between any two points within an ice particle.

7) Page 6, Line 24: "the mass or Dveq should in general be preferred"

Knowing the mass of a particle is always important. But why the "should" in "Dveq should in general be preferred"? Perhaps Dveq is preferred in your application but it is not so clear why it should be preferred in general.

8) Table 3 brings no value to what is already contained in Table 1. Removing Table 3 does no harm to the manuscript.

9) Page 7, Line 21: "The top category is 'phase'" and yet in Table 2 the top category is "Orientation"; the text is inconsistent with the table and "Orientation" within Table 2 is never considered in the text. Can this row of Table 2 be removed?

10) Figure 1j: The "Gem ice cloud" looks like a sphere but on Page 20, Line 15, it is described as being a spheroid. Can you make it look a bit like a spheroid in Figure 1j for the sake of consistency and to distinguish it from Figure 1h?

11) Page 12, Line 14: Beginning to notice lots of occurrences of "should". Better in scientific writing to stay away from "should" as this word does not mean much in such writing.

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12) Page 14, Lines 19-26: The description about aggregation is confusing. How can "modelled as if the two particles collide with each other at random angles" be consistent with "the two involved surface normals are forced to be parallel"? If "face to face sticking is ensured" the particles would be flat but the figures do not show flat aggregates. Something is awry here.

13) Page 15, Line 14: "to take the temperature gradient into account"

This phrase has no context. Where did it come from and why is it important?

14) Page 16, Line 29: The Mueller matrix is Vector M and the 11 element of of the Mueller matrix is Vector M sub 11. But on Page 18, Line 1, the 11 element of vector S is not Vector S sub 11; it is simply S sub 11. This is inconsistent. Using bold fonts for matrix elements seems unusual. From this perspective Page 18, Line 1, might be the more conventional way of expressing elements. Nonetheless, make all consistent here.

15) Page 17, Line 7: What does "More negative sigma sub a" mean? Not clear.

16) Figure 6: The legend on this figure is never defined nor is the symbol dBT.

17) Page 22, Lines 2-3: "with their faces against each other"

This is related to comment 12) above. This would seem to indicate flat aggregates but the aggregates are not flat so same misunderstanding as before.

18) Page 22, Line 4: "the whole set of particles"

What comprises a "whole set of particles"? This is not quite clear from the text just before it. On Page 21, Line 30, the statement "six simulations in total were performed" which would seem to imply six distinct particles being created. Perhaps this should be "six sets of simulations in total were performed" in which each set is for a habit and the elements of the set for a habit are particles of different sizes? Is this correct? What is going on here is not quite so clear.

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19) Page 22, Line 20: What does "15%" mean on this line? 15% of some quantity such as the density of solid ice? And if so, why so low as compared to the densities of graupel in Figure 11? The meaning of this "15%" is confusing.

20) Page 23, Lines 14-15: "DDA can shift the pattern somewhat in size, causing the data for a specific size to deviate significantly"

It is this type of sentence that hurts the quality of the manuscript. What does "DDA can shift the pattern somewhat in size" mean? The word "somewhat" is vague and how does DDA shift anything? DDA is an algorithm that computes values and does not move anything around. This phrase also contains a misspelled word that would be caught by a spell checker. Even though the paper is long, the authors need to go over every sentence within it time and again so as to get them all in as good a shape as possible.

21) Page 28, Lines 8-16: The line plots within the four subpanels of Figure 12 are being compared on these lines of text, yet not a single x-axis or y-axis are identical amongst the four subpanels. This makes comparing the lines difficult. Is there a way to treat the x- and y-axes of these four subpanels to make comparisons between them easier?

22) Page 29, Eq. 19: This equation should contain  $\sigma_B(D_{\max})$ ; that is, the  $D_{\max}$  must be in parentheses.

23) Page 30, Lines 5-6: Why even bring up the topic of liquid water refractive indices when liquid water results do not occur anywhere within Figure 13?

24) Page 31, Line 30: Should the second "phaMatElem" be "phaMat\_data"? Note that "PhaMat\_data" occurs in the text while "phaMat\_data" occurs in the table.

Please also note the supplement to this comment:

<https://www.earth-syst-sci-data-discuss.net/essd-2018-23/essd-2018-23-RC2-supplement.pdf>

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Interactive comment on Earth Syst. Sci. Data Discuss., <https://doi.org/10.5194/essd-2018-23>, 2018.

C6