Technical note:
Bimodal Parameterizations of
in-situ Ice Clouds Particle Size Distributions

by Irene Bartolomé García et al.

Answer to the Editor

The comments of the Editor are in black,
responses by the authors in blue,
changes in the manuscript text in light blue

Minor revision

06 Dec 2023
Editor decision: Publish subject to technical corrections
by Barbara Ervens
Public justification (visible to the public if the article is accepted and published):
Dear Authors,
many thanks for addressing the remaining referee comments. I am happy to accept your paper for publication in ACP.
Prior to uploading your files for paper production, please fix the minor/technical issues as listed below.
Sincerely,
Barbara Ervens
==========
Line numbers refer to the manuscript version without annotations.
l. 63: analyzes
Done

l. 71: Please define IWC here (unless I missed it before)
Done

l. 86: consisted of
Done

Table1: State at least in the caption what 'ranges' refer to (e.g., '...of ice particle diameters') so that the table is more self-explanatory
Done

l. 128, 131, 202, 202 (and possibly other instances): 'warm temperature' is scientifically not fully correct:
temperature denotes a value – which can be high or low; warm/cold describes an intensive property of matter (e.g. gases, ice, water). Thus, high temperature leads to warming.
Done

l. 131: can you specify the temperature range for which it is valid?
The temperature range covered in the m-D relationships used in the comparison in Afchine et al. (2018) are:
- Heymsfield et al. (2010): -60 ˚C < T < 0 ˚C
- Mitchell et al. (2010): -60 ˚C < T < -20 ˚C
- Cotton et al. (2013): -60 ˚C < T < -20 ˚C
- Erfani and Mitchell (2016): -65 ˚C < T < -20 ˚C

The following line has been added in lines 127-128: …with other m-D relations from the literature (covering, depending on the m-D relation, temperatures between -65 ˚C and 0˚C)

l. 135: should it be 'using' and 'fitting' to logically continue the list of steps starting with 'computing'?
Done

l. 140: Is it relevant that Dm is in units of meters? This equation is generally valid, independently of units, provided consistent units, e.g. mass in kg and density in kg/m^3. I understand that the coefficients alpha, beta might have been derived using SI units (kg, m, ...) but this could be generally stated around Eq.-6.
It should be Deq instead of Dm. We specified the used units for consistency with the description of the method in D14.

l. 160 ff: The equations should be numbered with separate numbers, i.e. 7, 8, 9. Make sure to refer to them accordingly in the text (e.g. l. 207)
Done

l. 175/6: The new sentence does not read well. May be better something like: In the temperature range just below 235 K, the clouds may originate as mixed-phase clouds ascending from lower altitudes, undergoing complete glaciation at ≥ 235 K.
Done

l. 181: Either 'in a temperature range of' or 'at temperatures'
Changed to 'at temperatures'

Table 2: Please improve the table caption so that the table is more self-explanatory
Done

l. 191: Either 'another indicator of cirri that have... '(https://www.merriam-webster.com/dictionary/cirrus) or 'another indicator of cirrus clouds...'
Changed to cirrus clouds

l. 206: define (remove 'd')
Done

l. 229: each of them
Done

Figure 3, caption: What do you mean by 'left triangle'? The symbol for the new parameterization (JULIA 1 M) looks to me like a circle.
Changed to 'black circle'

l. 233: ...do not play any role
Done

l. 235/6: replace 'and' by 'whereas' to avoid ambiguity:
due to depositional growth WHEREAS sedimentation and aggregation are less significant.
Done

l. 238/9: The structure of the new sentence does not seem right (verb missing?). Maybe better:
Initially, the few heterogeneously nucleated ice crystals may grow to larger sizes, followed by ...
Done

l. 254: Better: From Fig. 4a and 4c... (to avoid confusion as you refer to Fig 2 in the previous sentence... which doesn't even have a, b, c...).
Done

l. 256, 260: panel b, d should be Fig 4b, 4d etc (see previous comment)
Done

l. 271: small and large modes (add 's')
Done

l. 281: 'subset' cannot be used as a verb. Better:
Binning this data into 10-K temperature intervals between -90C and -60 C...
Done

l. 284/5: Please clarify: (i) what do you mean by 'temperature ranges' (also Fig 5 caption)? Temperature intervals (or 'bins')?
(ii) intervals of 10 degree C and 10 K are the same. What exactly did you compare here?
We mean temperature intervals. In the caption of Fig. 5 K has been replaced with ˚C.

l. 290: do you mean indeed 'when' or rather 'if' (implying that it is not always the case)?
We mean when. Not all PSDs are bimodal, but when there are bimodal PSDs, having the two modes fits better the observations than having only one mode.

Figure 4, caption: Is there a word missing at the end? Over the complete size RANGE?
Added the word "range"

l. 301/2: The new sentence does not read well. Please improve. My suggestion (check whether reflects the intended meaning!):
Considering a second mode improves the PSD prediction of both small and large ice crystals despite the large measurement uncertainties associated with the latter.
Done