

Interactive comment on “Characterization of Arctic mixed-phase cloud properties at small scale and coupling with satellite remote sensing” by Guillaume Mioche et al.

Anonymous Referee #1

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This is a good paper looking at Arctic mixed phase clouds. Polar clouds in general are poorly studied and this study is a significant contribution to the subject. It looks at in situ data from 18 flights over 4 field campaigns. These campaigns are all during April or May so these flights only look at conditions in spring close to Spitzbergen and although this might seem limiting the paper does show this work can be extended using satellite data. Although I think it should be published and I would not have too many problems if it were published unchanged I have some queries and suggestions that I feel might make it even better – or at least make it easier for me to understand. These are in the order they appear – not in order of importance.

1) (page 5 line 189 and appendix B) I am a little unhappy about the dismissal of the

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effect of shattering on the probes. I understand that this is difficult with older probes but surely the CPI would have provided inter arrival time information and possibly visual evidence of shattering – this would then add weight to the comparison of the extinction coefficients in appendix B. Also were the clouds heated – I don't think this is mentioned.

2) (page 5 line 195) Was the air temperature probe heated and what type of probe was used? A heavily iced probe can have a large influence on the air temperature.

3) (Page 6 line 219) Surely there are only 5 normalised levels in the cloud?

4) (Page 8 line 278..) It would be interesting to compare the LWC values in clouds with that obtained with an adiabatic ascent from the cloud base – this would give further confidence in the observed LWC values.

5) (page 9 line 323 ..) It would be interesting to see how the habit (and the number) of the ice crystals observed varied with temperature as well as with height.

6) I am surprised at the lack of needles reported – there appear to be clouds warmer than -10 degC where I would expect the Hallet Mossop process to be important and at these temperatures I would expect there to be columns present (see Lloyd et al ACP 15 p. 3719-3737)

7) (page 13 line 503 and figure 9b) And why does figure 9b show no ice above -10deg C. I feel that this apparent absence of secondary ice at warmer temperature should be discussed – if only briefly.

8) (page 15 line 579 onwards) I think comparison between the satellite data and the observations is very useful. However I would have liked more description of the DARDAR scheme and how retrievals method used to determine cloud phase differs between the satellite and in situ measurements. Are the two retrieval methods looking at different things.

9) (Page 17 line 655) I cannot really see the pink in figure 13

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