**Atmospheric
Chemistry
and Physics
Discussions**

Interactive comment on "Single ice crystal measurements during nucleation experiments with the depolarization detector IODE" *by* M. Nicolet et al.

Anonymous Referee #1

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The paper deals with a newly-developed instrument IODE which is designed for detecting single ice crystals in nucleation chambers. The work presented in the MS is of wide interest and relevance in the field of atmospheric chemistry and physics. The MS is suitable for publication in ACP after the following points have been addressed. One of the major issues is the deficient printing of the fonts in Figs. 2, 4, 5, 8, 9, 10, 11, at least with my version of Acrobat Reader. Without being able to read the text in the figures it is very difficult to judge the quality of the results.

Specific comments:

1) The abstract needs clarification: in its present form the abstract does not give a

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Discussion Paper

clear comment on the performance of IODE and its capability to detect ice crystals. Also, the abstract is not self-explaining, for instance, the authors state in the end of the abstract that "In presence of ice crystals, peaks were detected in both channels, creating polarization signals". If the reader has not read the whole MS, it is not clear what channels the authors are talking about. Also, for a reader not familiar with the subject it is not clear what is the broad relevance of knowing that "Mean values of δ ranged from 0.24 to 0.37".

2) Theory: at this form the theory is not useful for a reader who is not familiar with the subject. For instance, what is the connection between the vector I containing the Stokes parameters and the scattering matrix F. It would also be good if the authors would explain all variables they are showing in equations. Now, for instance, the components of F are not explained, Isca is not explained, and the components of Z are not explained. A reader who is already familiar with the theory of course already knows what these are, but does he/she the theory section then at all? On the other hand, the theory section would be very useful for a reader who is not familiar with the subject, but in its present form, the theory section is no explanatory enough and the reader needs to guess what different variables might mean. I thus suggest a careful revision of the theory section. Another, although in my opinion worse, option would be to skip the equations and just explain the very basic principles of light scattering and polarization.

3) Figures 2, 4, 5, 8, 9, 10, 11: At least in my version of Acrobat reader none of the texts in the figures are printed correctly, but replaced with dots instead. The authors might thus want to change the font used in the figures to a more common one. This naturally makes it nearly impossible to read the figures and/or judge their contents. The actual contents of the figures (e.g. what is plotted against what and what are the main points of interest on the figures) are also quite poorly explained in the captions and in the text (I assume the figures themselves would have been more self-explanatory) so it is very difficult to understand the details of the results section at all at its present form.

4) Introduction, p. 20968, line 7: 10 l^{-1} is a strange unit. Why not use cm^{-3} or m^{-3}?

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5) Introduction, p. 20968, line 13: "single events". What events? Again, clarify for reader who is not familiar with the experiments.

6) p. 20977, line 5: In the beginning of the section the authors say "In this activation experiment, the gain was set to 1.27 x 103 and 5.33 x 103 for the parallel channel and the perpendicular one...". What gain? If the reader is not familiar with the setup, it is difficult to guess what these numbers actually mean (as they do not have units).

7) p. 20977, line 19: the authors refer to OPC channels from 90 to 160. What particle sizes do these channels correspond to, even approximately?

8) Figures 3, 6, 7: In the second panel of the figures the y-axis is just labelled as "bins". What would the equivalent sizes for the different bins be?

9) Have the authors made any estimation for the evaporation times of water droplets in the "water breakthrough" events? This could be easily done with simple evaporation/diffusion models and would make the estimates a little more quantitative. If such a study has been made, it should be cited here.

14) p. 20979, lines 23-24: The authors state that "The Snomax particles may deliquesce and no efflorescence occurs after that as we are well above the efflorescence point in the evaporation section." I think a study on the efflorescence point should be cited here.

Technical comments:

11) p. 20973, line 15: folowing -> following

12) p. 20973, eq. 10, explain all the variables in the equation

13) p. 20975, eq. 13, explain all the variables in the equation

14) p. 20976, line 26: traditionnal -> traditional

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 20965, 2008.