

Interactive comment on “No anomalous supersaturation in ultracold cirrus laboratory experiments” by Benjamin W. Clouser et al.

Anonymous Referee #2

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GENERAL REMARKS

The study presented in the manuscript investigates potential processes which may cause the observed supersaturation with respect to ice in ultracold cirrus clouds. Whereas these supersaturations have been reported from field observations, the presented study uses for the first time the facilities of the AIDA cloud and aerosol chamber to investigate potential processes responsible for creating these supersaturations. The key research question is whether or not metastable ice whose vapour pressure exceeds that of hexagonal ice, may dominate the formation of ultracold cirrus.

The experiments are very carefully designed, and the uncertainties of applied instruments and modelling tools are assessed in-depth. Overall, the study is scientifically sound and makes a significant contribution to the research field of high-altitude cirrus

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clouds. The manuscript is very well organized and fits perfectly to the scope of the journal. Before publication, only minor revisions should be considered which are listed below.

SPECIFIC COMMENTS

As mentioned in the introduction section, several studies suggest as possible explanation for observed ice-supersaturations in cirrus clouds, that uptake rates on ice crystals for typical conditions in cirrus clouds (low temperatures, low ice crystal number concentrations, small ice crystals) are slow and cause long times for relaxation to saturation, so that in lifting air masses a dynamical equilibrium is reached. In the manuscript, the term “pseudo-equilibrium” is used. The authors may consider whether or not the term “dynamical equilibrium” is more appropriate, or discuss the issue.

MINOR ISSUES

Sometimes the unit ppm is used for the volume mixing ratio, and sometimes ppmv. I suggest using ppmv (ppbv) throughout the manuscript, including axis labels.

Page 1, line 21: here the reference to MK should be added.

Page 3, line 31: The sentence seems to be incomplete. I guess it should read: “. . . ice should grow exclusively in hexagonal layers, regardless of the nucleation method . . .”

Page 5, Figure 1 and page 7, line 1ff: In Fig. 1, 5 thermocouples are shown but only the use of four is explained. For completeness, it may be worth mentioning the use of thermocouple T5.

Page 6, line 30: uncertainty from Poisson statistics is proportional to $1/\sqrt{n}$. That should be written here.

Page 11, line 9: the term “particle #” is not explained and may be replaced by “particle number”.

Page 15, line 6: the reference to Schilling et al. (2006) should be given here, not only

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the name of the first author.

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