

## ***Interactive comment on “Single particle analysis of ice crystal residuals observed in orographic wave clouds over Scandinavia during INTACC experiment” by A. C. Targino et al.***

**Anonymous Referee #1**

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The paper discusses the elemental composition of aerosols in ice crystals formed in orographic clouds over Scandinavia. The ice crystals are allowed to evaporate upon entering a CVI mounted on an airplane. The results are not completely surprising, but they add important knowledge to our understanding of the formation of ice. Although, the subject of ice formation in clouds has been studied for many years, we still cannot explain the lack of correlation between the measured ice nuclei in the atmosphere and the concentrations of ice crystals in clouds. The present paper does help us a little to better understand this relationship, at least in orographic clouds. As such, the paper fits well with the subject matter discussed in ACP.

The paper is clearly and carefully written, touching on most important topics of methodology, instrumentation and data analysis. There are a few points that I feel should be addressed in the final revised version:

Page 8056 line 27. The word "inhibit" implies that it prevents the formation of ice. In fact the organic particles may simply be poor IN. I would suggest modifying this word.

Page 8058 line 1-3 and also in many other parts of the paper. The authors use the term freezing nuclei. I think this is wrong. The method used for the analysis prevents one from determining whether the nucleation is by freezing (immersion) or by contact (assuming nucleation by deposition is ruled out). Either define at the beginning that since you do not know the actual ice formation mechanism you will call it "freezing" or use the term "ice formation" or "ice nucleation".

Page 8058 lines 3-4. There were a number of papers by Hans Georgii and his group dealing with the same subject. I think that mentioning them and discussing them in light of the present measurements would be valuable. The references are: Georgii, H.-W. and R.S. Kaller, Ueber die Inaktivierung von Gefrierkernen durch Koagulation mit Aitkenkernen. ("On the deactivation of ice nuclei by coagulation with Aitken nuclei"). Berichte des Institutes fuer Meteorologie und Geophysik, Frankfurt/M, No. 21, 1970. Georgii, H. W., and E. Kleinjung, 1967: Relations between the chemical composition of atmospheric aerosol particles and the concentration of natural ice nuclei. J. Rech. Atmos., 3, 145-156, 1967. Grosch, M. and H-W. Georgii, Elemental composition of atmospheric aerosols and natural ice forming nuclei. J. Rech. Atmos., 10, 227-232, 1976.

Same page line 19. Again the use of freezing nucleation is used.

Page 8062 last paragraph. I assume that the peak counts of the different elements in the EDS are used for the ratios between the elements. It is not clear if the emission efficiency of the different elements have been taken into consideration.

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Page 8070 line 7. Similar observations were reported by Levin et al (1996): Levin, Z., E. Ganor, and V. Gladstein, The effects of desert particles coated with sulfate on rain formation in the eastern Mediterranean, J. Appl. Meteorol., 35, 1511-1523, 1996.

Page 8072 line 3. Use the same reference as above. The one mentioned in the reference list is only an abstract.

The same page line 8. The abstract mentioned does not state that sulfate originated from the source. It could not rule this possibility out, although the modification of its composition during transport was favored (see: Wurzler, S., T. G. Reisin and Z. Levin: Modification of mineral dust particles by cloud processing and subsequent effects on drop size distributions. J. Geophys. Res. 105 , 4501, 2000.)

Page 8076 line 17. The word "with" is missing after "but".

The same page line 25. I cannot understand how it can be stated with confidence that the nucleation was by freezing. I think that the word used above in line 19 is correct. Namely, speculate!! I would prefer to leave this point unanswered, since ice nuclei in the form of biological material could have played a role in the formation of ice.

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Interactive comment on Atmos. Chem. Phys. Discuss., 5, 8055, 2005.

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