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Interactive comment on "Precipitation of salts in freezing seawater and ozone depletion events: a status report" *by* S. Morin et al.

S. Morin et al.

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We thank E. Wolff for his balanced evaluation of our work. The submission of a revised version of our manuscript follows his encouragements and its content has benefited from his insightful comments.

The identification of ikaite in Antarctic brine (Dieckmann et al., 2008) is of major relevance to the modeling work presented here, so the content and the conclusions of the manuscript were amended to a larger extent than initially recommended by E. Wolff.

We have performed FREZCHEM simulations in the two cases where ikaite and calcite are the only calcium carbonate mineral which precipitates and found large variations in the response of the system in terms of the alkalinity during freezing. The comparison between these two model runs constitutes the main scientific achievement

of the present study, which has important implications, as described in the revised manuscript. In brief, when ikaite precipitates, there is no depletion of the alkalinity during the freezing, while when calcite precipitates the alkalinity is depleted in the proportions given in our initial manuscript (ACPD). Thus the conclusions of the conceptual work by Sander et al. (2006) do not appear to be robust and should not be taken for granted in modeling work dealing with reactive halogen chemistry in polar regions, until new *experimental* data on sea-water brines can be confronted to model predictions.

As stated by E. Wolff, most technical details pertaining to the FREZCHEM model were extensively discussed in previous publications cited in our manuscript, thus we preferred to keep our contribution brief and concise, and let the interested reader refer to more technical publications on the FREZCHEM model itself.

We have included a sketch in the introductory section of the manuscript, to introduce some mechanisms by which chemical fractionation in the brine (due to sequential precipitation of salts) can drive changes in the chemical composition in aerosols, or surfaces likely to promote bromine explosion.

Given that our results finally do not corroborate the results of Sander et al. (2006), we have decided to not include FREZCHEM output as a supplement to the article, because they should not be used as such in other investigations, without explicitly running the FREZCHEM model in the context interested readers may be interested in exploring (see also the reply to R. Sander's comments).

Typographical errors were fixed as requested.

References

Dieckmann, G. S., Nehrke, G., Papadimitriou, S., Göttlicher, J., Steininger, R., Kennedy, H., Wolf-Gladrow, D., and Thomas, D. N.: Calcium carbonate as ikaite crys-

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tals in Antarctic sea ice, Geophys. Res. Lett., 35, L08501, 10.1029/2008GL033540, 2008.

Sander, R., Burrows, J. P., and Kaleschke, L.: Carbonate precipitation in brine - a potential trigger for tropospheric ozone depletion events, Atmos. Chem. Phys., 6, 4653 – 4658, 2006.

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 9035, 2008.