Atmos. Chem. Phys. Discuss., 9, C8312–C8313, 2009
www.atmos-chem-phys-discuss.net/9/C8312/2009/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Introducing the bromide/alkalinity ratio for a follow-up discussion on "Precipitation of salts in freezing seawater and ozone depletion events: a status report", by Morin et al., published in Atmos. Chem. Phys., 8, 7317–7324, 2008" *by* R. Sander and S. Morin

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Received and published: 14 December 2009

I thank Samuel Morin for his further explanation. I think that there has been quite an evolution in the way the authors are thinking about this problem, and there is probably not too much point in me commenting more on the current version, as I sense that any new version will already have substantially different arguments in it, and will need a further review. Just for clarification therefore, I make a couple of short comments:

Morin's new point 2, that the alkalinity he calculated is much lower than that in Sander et al's ozone-depleting "PRECIP" run is an interesting point I had missed. It immediately highlights that the alkalinity in that run is higher than it was in seawater at zero degrees, and asks the question then why sea ice is needed at all to get the bromine explosion. Re-reading Sander it then seems that the critical factor is the temperature sensitivity of the BrCl/Br- reaction (R2 in Sander); a slight reduction in alkalinity was also needed, but this beocmes second order. It will then be important to know how robust this temperature sensitivity is, and whether it is treated the same in FREZCHEM as it was by Sander.

Morin's new point 3 considers a different process from the one I had been focussing on, the evapoconcentration of aerosol - an interesting new line to follow. Fig 1 of Morin's reply could be clearer: the horizontal solid lines are presumably [Na_sat] and not [Na_brine] as I was expecting. I also like the clever aspect of equation 4 that finds a justification for the ratio of A_T/Br- in the initial brine. I agree with the maths, but be a little cautious about the chemical significance of this ratio, because you could have substituted any other ion that was not significantly precipitated into the top and bottom lines of eq 4 (for example nitrate) but that would not imply that that chemical had any chemical significance to the process.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 20765, 2009.