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Atmospheric Chemistry and Physics Discussions

Interactive comment on "First-year sea-ice contact predicts bromine monoxide (BrO) levels better than potential frost flower contact" *by* W. R. Simpson et al.

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The chemistry of O3 depletion events in polar regions is complex and involves many factors related to sea ice and atmospheric processes. Hence finding the main process(es) that allow the prediction of these events is bound to be difficult. In my opinion, this short and concise paper presents in a rigorous manner a new idea that makes a useful contribution to the problem of understanding and predicting ODEs. The authors propose that one factor, the contact with first year ice, explains a significant fraction of BrO levels. Obviously, any one factor will never explain such a complex phenomenon in an entirely satisfactory manner. From this obvious statement, the review can go 2

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ways: (1) point the inevitable imperfections in the approach and suggest significant changes, request numerous details and that many other considerations be taken into account; or (2) recognize the interest of this novel idea, however imperfect, and accept it in a simple and concise form, as a contribution to a subject under intense debate. The first option would in my opinion kill the very nature of a paper that is clearly to the point. I will therefore recommend the second option, and I believe that this paper should be published with only moderate changes, aimed mostly at stressing the somewhat preliminary aspect of this analysis, and also the fact that the data come from only one site and a single springtime period (to be compared with 9 years of statistics in the recent Bottenheim and Chan paper, JGR, 111, D19301, 2006). I also believe that if possible, the authors consider including data from other sites in the analysis.

Specific suggestions

Study site : Clearly Barrow is a good site to study O3 depletion because the chemistry is probably happening on site, while at places like Alert or Ny Alesund, the chemistry often took place elsewhere and air masses were transported. Still, would it be possible to analyze events such as the 28 April 2000 depletion seen at Alert (Hönninger and Platt, AE 36, 2481, 2002) and see how both algorithms behave.

Choice of BrO vs. O3: maybe explain more clearly why BrO was chosen as a chemical indicator rather than O3. Perhaps also mention what correlations are found between BrO and O3, and O3 and FYI.

Discuss future steps : Although I like the FYI suggestion, it is clearly an imperfect algorithm and a more elaborate discussion on how to improve it would be nice. Aspects such as the actual origin of bromide in snow, a survey of bromide concentrations in snow, the impact of leads in multiyear ice on BrO concentrations and ozone depletion, may all contribute to a better understanding of BrO concentrations and O3 destruction. A few ideas on key aspects that need to be developed would be welcome. Finally, a brief discussion of the results of Bottenheim and Chan (2006) and how they impact the

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FYI idea would be welcome.

Minor points

P 11054, line 2. The SSA of FF is closer to that of depth hoar (120 cm2/g) than to that of surface hoar (350 cm2/g).

P 11059, 6 lines up. Replace “to that of snow” with “to that of aged snow”

Interactive comment on Atmos. Chem. Phys. Discuss., 6, 11051, 2006.