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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Atmospheric nitric oxide and ozone at the WAIS Divide deep coring site: a discussion of local sources and transport in West Antarctica" *by* S. Masclin et al.

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A considerable amount of effort has obviously gone into this work, including that to produce such data from what sounds like a difficult field season. A few comments and questions that I have regarding the study are presented below.

1) Page 6822; Equation (4):

I'm confused about why the depth-integrated NO2 flux was multiplied by the k(R7)/k(R8) ratio, i.e., by a factor of 8 to 9. Isn't this the ratio of the quantum yields for the NO2 (R7) and NO2- (R8) pathways, respectively? The photolysis rate constant,

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however, was already calculated specifically for the NO2 pathway since the quantum yield from Chu and Anastasio is for (R7) only.

2) Use of HYSPLIT in Antarctica:

How confident are you that your back trajectories are accurate? I assume these are based on the NCEP reanalysis data that HYSPLIT uses by default. The reliability of the various reanalysis datasets (NCEP, ECMWF ERA...) differs in Antarctica (even in the satellite era) since they use different assimilation schemes and there is a paucity of surface and radiosonde observational constraint. This has been highlighted in several papers, e.g.,

Bromwich, D. H., R. L. Fogt, K. I. Hodges, and J. E. Walsh (2007), A tropospheric assessment of the ERA-40, NCEP, and JRA-25 global reanalyses in the polar regions, J. Geophys. Res., 112(D10), D10111, doi:10.1029/2006jd007859.

"After 1979, large differences still exist between the reanalyses in the circulation, precipitation and SAM trends. It is even more apparent from this body of evidence that the reanalyses in the high southern latitudes are strongly dependent upon the satellite sounder data for guidance."

And see: Bromwich, D. H., and R. L. Fogt (2004), Strong Trends in the Skill of the ERA-40 and NCEP–NCAR Reanalyses in the High and Midlatitudes of the Southern Hemisphere, 1958–2001*, J. Clim., 17(23), 4603-4619, doi:10.1175/3241.1.

The general conclusion is that the ERA data may be more accurate for Antarctica. Since you can import any downloaded ECMWF ERA-Interim (this replaced the ERA-40) data into HYSPLIT, I think it would useful to compute and compare back trajectories using these data with those based on the NCEP data.

3) Figures 5a and 6a:

I'm not sure how you can make any conclusions about trends or temporal variability in surface snow nitrate concentration when the range of values from each of the days

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with five simultaneous surface collections spans that of the entire dataset! The same would go for what you can say about surface variability being due to degassing and/or photolysis. Also, you seem to suggest on page 6818 (line 12) that nitrate can only be contributed by snowfall, but what about fog, riming or dry deposition?

4) Figure 1a (1 min NO averages):

Does this plot contain the data that were contaminated by camp pollution? Rejecting 25% of the entire dataset seems large, so it might be useful to see which points these were or to mark the threshold above which the samples were rejected. If these spikes are the polluted samples, then doesn't it seem like contamination is ubiquitous? If not, are these indications of large, rapid and short term NO fluxes?

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 6807, 2013.