

Interactive comment on “1-D air-snowpack modeling of atmospheric nitrous acid at South Pole during ANTCI 2003” by Wei Liao and D. Tan

Anonymous Referee #1

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Interactive comment on “1-D air-snowpack modeling of atmospheric nitrous acid at South Pole during ANTCI 2003”; by Wei Liao and D. Tan

Anonymous Referee

Liao and Tan describes the use of a 1-D air-snowpack model to constrain HONO measurements at South Pole during ANTCI 2003. For this specific site, they provide an alternate mechanism for the release of HONO by equilibrium between QLL nitrite and firn air HONO (i.e., at ~ 30 cm below the surface), which is contrary to one of the previously proposed mechanisms, where nitrate is the dominant source of HONO emissions. This is an exciting proposed mechanism since it may be widespread throughout snow-covered regions! Overall, amidst a few grammatical errors, which are easily

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amendable, the manuscript is well-written. The 1-D air-snowpack model is constrained appropriately by well-quantified physics and chemistry, representative of the snowpack. With that said, this manuscript would be an appropriate and timely contribution to Atmospheric Chemistry and Physics.

Few Comments and Questions:

1. As a function of depth (e.g., down to 30 cm) and pH, what would be the % contribution for HONO(g) production from NO₃- photochemistry versus HONO(g) produced from equilibrium of QLL nitrite and firn air HONO(g)?
2. Page 9733: the last paragraph needs to be revised due several grammatical errors.
3. Page 9734: line 19, add "the"; before "polar region,";
4. Page 9736: line 21, add the after "within";.
5. Page 9736: line 23, eliminate the period after "Pole"; and write as "Pole, during ANTCI 2003.";
6. Page 9737: line 5, eliminate "the"; after "with";.
7. Page 9737: line 27 should be joined to the line 26.
8. Page 9739: what is the variation of [NO₃-] with depth from the surface (0 cm) to 30 cm? Would including this variation as a function of depth affect the amount of HONO(g) produced as a function of depth and pH?
9. Page 9740: line 14, add "the"; after "through";.
10. Page 9740: line 17, italicize "a"; (the snow grain radius).
11. Page 9741: line 3, eliminate "the"; after "with";.
12. Page 9741: please amend grammatical errors from lines 14 & 20.
13. Page 9741: add "the"; after the "form";.

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14. The pH limit where HONO will form the nitroacidium ion is pH 3; please include.

15. Table 3 can be perceived as confusing. I would advise the authors to slightly revise it such that the term HONO (pptv) is contained above its actual concentration values.

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 9731, 2008.

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