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Atmospheric Chemistry and Physics Discussions



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

**P. Anderson**

philip.s.anderson@bas.ac.uk

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I draw the attention to the subject of "model selection", with reference to Equation (3) and the comment at the bottom of the page on 9734 : levels at 30 cm $>$ levels at 10 cm, depite hardly any actinic flux.

Using the simplest diffusion model will explain this, assuming 1. local near equilibrium of chemsitry and therefore C proportional upon actinic flux 2. steady state profiles 3. true diffusion term (term 1 on RHS eq 3)

d/dz(D.dC/dz) that is, the gadient in diffusivity, D, is incuded in the model. e.g. if actinic derived concentration is given as

Aexp(k.z)



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with k = 1/0.2 (typical from figure 3) z depth (negative) and diffusivity , D is given as

D = 5e-4 * exp(k_D.z)

with k_D = 1/0.05 (which also looks reasonable, and describes the enhanced diffusivity near the surface due to ventilation), then solving

dC/dt = Aexp(k.z) + d/dz(D.dC/dz)

with boundary conditions of C = 0 at z = 0 and -infinity produces a peak in C at a depth of 30 cm.

Parsimony would imply that the data presented cannot therefore discriminate between the chemistry and the diffusion.

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



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Interactive Comment