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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Behaviour of tracer diffusion in simple atmospheric boundary layer models" *by* P. S. Anderson

Anonymous Referee #1

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This paper presents an interesting diffusion model applied to the atmospheric boundary layer. Comparisons of modelled and measured NOx are shown within the context of a recent polar air chemistry campaign (CHABLIS) at Halley Station, Antarctica. The approach of including a degree of diurnal variation in the boundary layer depth is of interest for the air chemistry/modelling community since most atmospheric models would use a single/fixed upper boundary. The manuscript is well written and easy to read. This paper fits very well into the scope of ACP, in particular into the CHABLIS special issue, and I recommend publication after consideration of the general comment below:

General comment:

The model would benefit from a treatment of the atmospheric radiative transfer which

accounts for the wavelength dependence in the diurnal and seasonal variation of the irradiance reaching the surface. This should be considered when employing the model to investigate case studies, for instance photolysis and photochemically induced release of NOx at high solar zenith angles. Although the model has been employed to asses NOx measurements at 4 m above snowpack, and as pointed out by the author, the determination of vertical profiles should contemplate the chemistry of these species. In the current version the model assumes a constant loss term but not transformation (recombination chemistry and photochemistry, which should be included in the model to establish trace gas vertical profiles. The partitioning of NO/NO2 and the total NOx budget may be different at different altitudes within the boundary layer due to the likely inhomogeneous distribution of chemical scavengers and aerosol over Halley Station. The paper would benefit from a more thorough discussion of the points above.

Interactive comment on Atmos. Chem. Phys. Discuss., 6, 13111, 2006.